American Society of Ophthalmic Plastic & Reconstructive Surgery
OCULOFACIAL PLASTIC SURGERY®

ASOPRS 52ND ANNUAL FALL SCIENTIFIC SYMPOSIUM

HYBRID MEETING

ONLINE & IN-PERSON: November 11-12, 2021

Hyatt Regency, New Orleans, Louisiana

SYLLABUS

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All other individuals in control of content have declared that they have no financial disclosures.

7 – 7:04 am

Orbital Inflammation Following COVID-19 Vaccination

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Introduction: We report three cases of orbital inflammation that occurred within days after administration of the Pfizer COVID-19 vaccine.

Methods: Retrospective case series.

Results: A 33 year-old female and a 68 year-old male both presented with binocular diplopia, pain with extraocular movements and periorbital swelling one and four days after their second dose of Pfizer COVID-19 vaccine, respectively. The first patient had normal afferent function, unilateral limitation of abduction, 3 mm of proptosis, conjunctival injection and chemosis (Figure 1A). Magnetic resonance imaging (MRI) of the orbits with contrast revealed inflammation and enlargement of the left medial and lateral rectus muscles (Figure 1B, arrows). Of note, she had a previous episode of orbital inflammation one day following influenza vaccination one year prior with an unrevealing work-up, and resolution after treatment with oral corticosteroids. The second patient had normal afferent function, limitation of supraduction more severe in adduction, and 3 mm of proptosis (Figure 2A). Computed tomography (CT) of the orbits with contrast revealed inflammation of the left superior oblique muscle (Figure 2B, arrows).

A 13 year-old boy with history of recurrent idiopathic orbital inflammation previously quiescent for over a year presented with left periorbital swelling, erythema, and pain one day after his first dose of Pfizer COVID-19 vaccine. Examination revealed normal afferent function, 3 mm of proptosis, limitation of left supraduction and abduction, conjunctival injection and chemosis (Figure 3A). MRI of the orbits with contrast revealed recurrent orbital inflammation with left lacrimal gland enlargement and intraconal fat stranding not noted on surveillance MRI orbit several weeks prior (Figure 3B, arrows).

In all three cases, an extensive infectious and inflammatory lab work-up was unremarkable and signs and symptoms improved after treatment with high-dose oral prednisone.

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Conclusions: Orbital myositis or dacryoadenitis may occur within days after administration of the COVID-19 vaccine. If no underlying etiology is identified, an inflammatory post-vaccine etiology could be considered as an alternative to a presumed idiopathic diagnosis. Prior history of orbital inflammation may be a predisposing factor.

Figure 1

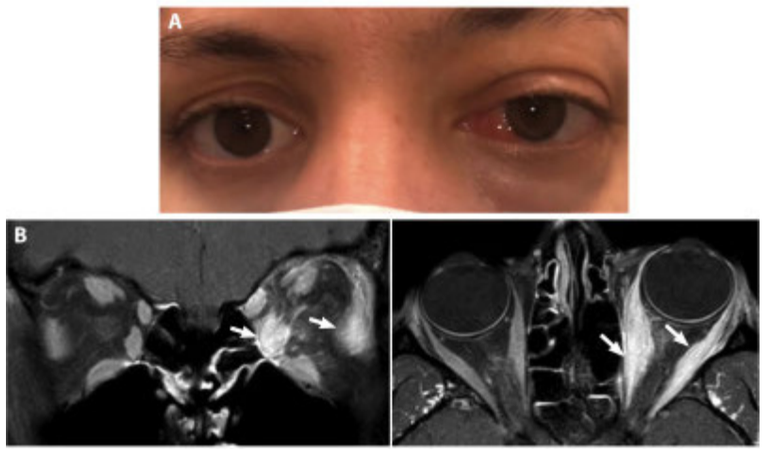


Figure 2

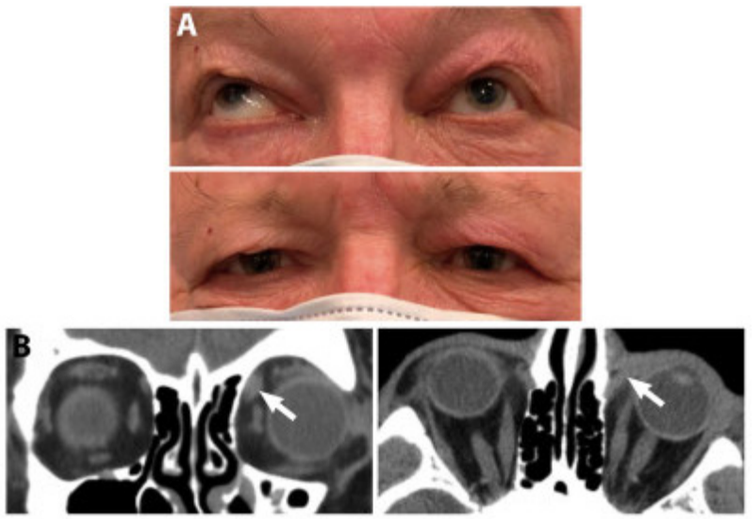
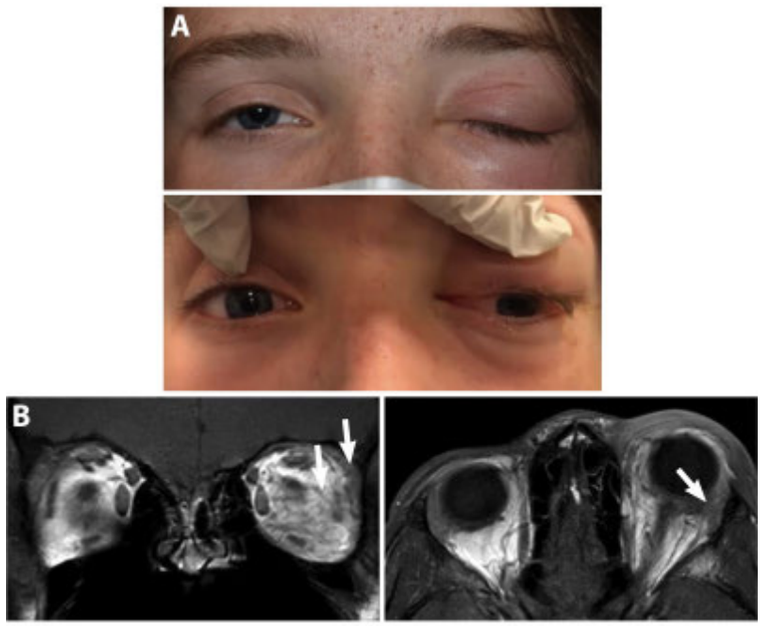


Figure 3



7:04 – 7:08 am

Complete Loss of Meibomian Glands Following Free Tarsal Graft in Eyelid Reconstruction

Sruti Akella, Sudarshan Srivatsan, Pete Setabutr
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Introduction: Meibomian glands are an integral part of a healthy ocular surface; atrophy or dropout of these glands is strongly correlated with dry eye syndrome (DES).[1-3] Despite the growing interest in meibography as part of the workup for DES, relatively little is known about the changes to Meibomian glands following eyelid surgery. Here we explore whether Meibomian glands are successfully transplanted following free tarsal grafts.

Methods: In this case series, infrared meibography was performed on three patients who previously underwent placement of free tarsal grafts for posterior lamella reconstruction (LipiView Interferometer, TearScience Inc., Morrisville, NC, USA). Images were taken of the reconstructed eyelid, the donor eyelid, and the control eyelid (an eyelid that had not undergone any surgery) where possible. Images were examined for gland dropout. Lipid layer thickness (LLT) was also calculated in each eye (donor eye, reconstructed eye, or control eye) to serve as a marker of functional DES.

Results: Three patients (male sex, n=2; range 52-78 years) underwent full-thickness eyelid reconstructions after excision of various tumors (basal cell carcinoma, n=1; sebaceous cell carcinoma, n=1; mucinous adenocarcinoma, n=1). For all patients, reconstruction of anterior lamella was performed with skin flap advancement. In all three patients, infrared meibography showed significant dropout of glands in the area of the graft (Figure 1). In the two patients with a donor eye and a reconstructed eye, the donor eyes had consistently higher LLT scores (average 139.5nm) than the reconstructed eyes (average 74.5nm). One patient had a control eye and an eye that served as both the donor and the reconstructed eye; the control eye had a higher LLT (67nm) than the reconstructed eye (47nm).

Conclusions: Free tarsal grafts are a valuable tool in posterior lamella reconstructions. However, transplanted Meibomian glands do not survive the grafting process. Functionally, this appears to lower the LLT of the reconstructed eye. Interestingly, the average LLT of the donor eyes was significantly higher than the average LLT of the reconstructed eyes, suggesting that harvesting the graft is less damaging to the lipid layer than placing the graft. Patients undergoing reconstruction with tarsal grafts should be aware of the high likelihood of developing dry eye syndrome following surgery.

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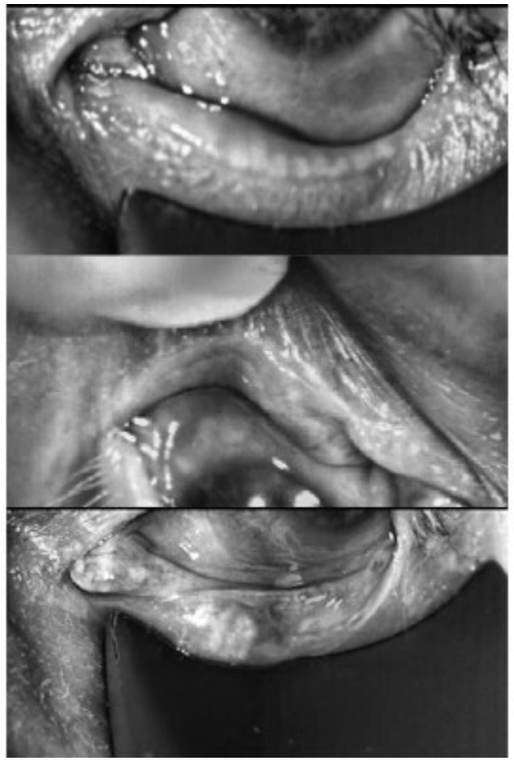
Figure 1



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7:08 – 7:12 am

Correction of Cicatricial Medial Lower Eyelid Retraction with Full-Thickness Bucket Handle Flap and Suspensory Suture

Loreley Smith[1,2,3], Stuart Seiff[1,3]
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Introduction: The correction of refractory cicatricial lower eyelid retraction typically involves combining multiple techniques including spacer grafts, full-thickness skin grafts, or myocutaneous flaps to augment the anterior and/or posterior lamella.[1-5] However, these procedures frequently fail to adequately address the medial lower lid. The purpose of this study is to describe a simplified and effective surgical technique for the correction of cicatricial medial lower eyelid retraction with a full-thickness bucket handle flap and medial suspensory suture.

Methods: Three patients underwent correction of cicatricial medial lower lid retraction using this technique. The etiology of cicatricial ectropion in each patient included resection of skin cancer with subsequent radiation therapy (n=2)[5], and extensive sino-nasal and facial reconstruction following infection (n=1). The targeted outcome was a smooth lid contour progression from the medial to the lateral canthus with a central Marginal Reflex Distance (MRD) 2 of 5-6 millimeters (mm) at 3 months post-operatively. Additional objectives included establishment of a more functional lower lid with improvement of epiphora, lagophthalmos, and ocular surface disease.

The following surgical technique was employed in all 3 cases. A bucket handle flap was first created by making a full-thickness incision along the lower eyelid, approximately 6 mm from the lid margin. The flap was detached from the cheek along its entire length so it could be freely elevated, particularly medially. A 4-0 polydioxanone suture was then passed in a horizontal mattress fashion through the inferior medial aspect of the bucket handle flap, through the tissue of the anterior medial orbit, exiting through a previously placed partial thickness incision 4-5 mm above the medial canthus where the knot is buried. The suture is passed posterior to the lacrimal system, exiting the incision above the medial canthus, with care to avoid the lacrimal sac fundus. The residual anterior lamellar defect created after elevating the bucket handle flap was then filled with a full-thickness skin graft (n=2) or a full-thickness myocutaneous pedicle flap (n=1). The graft/flap should create sufficient vertical redundancy to minimize tension in the medial lower lid.

Results: All 3 patients achieved improvement in cicatricial retraction, epiphora, lagophthalmos, ocular surface disease, and eyelid contour following surgery, and was sustained throughout the follow-up period. Average follow-up was 5.3 months (range: 3-8 months). No patients experienced disruption of the lacrimal system from the suspensory suture. Average MRD2 at 3 months post-operative was 5.5 mm (Range: 5-6 mm).
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Conclusions: The full-thickness bucket handle flap with medial suspensory suture demonstrates a simple, safe, effective and reproducible way to manage medial cicatricial lower lid retraction.[4] It provides reliable superior-posterior fixation of the medial lower lid, improving anatomic function and cosmesis, with lasting effect.

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7:12 – 7:16 am

Psychogenic Ptosis

Tiffany Ho, Steven Couch, Philip Custer
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Introduction: Psychogenic ptosis is an unusual ophthalmic manifestation of conversion disorder. The aim of this study was to describe the clinical presentation, etiology, psychological, and management of psychogenic ptosis.

Methods: Retrospective case series of all patients with psychogenic ptosis identified between 1990-2020 at a single institution. Medical records were reviewed for patient demographics, including psychiatric history, clinical findings, diagnostic studies, treatment and resolution rates.

Results: Six patients with a median age of 21 years (range 14-60 years) who presented with unilateral ptosis were diagnosed as having psychogenic ptosis in our practice (Table 1). Four patients had preexisting psychological disorders including depression (n = 3) and anxiety. Two patients had functional overlay. Physical trauma to face or head preceded the onset of ptosis in all cases. All patients were female.

Patients were previously evaluated by emergency room providers (n=3), neurologist (n=2), and otolaryngologist (n=1). Three patients received alternative diagnosis including facial palsy, migraines, and concussion. No patient was previously correctly diagnosed. Prior to referral, all patients underwent imaging studies including either computed tomography (n=4) or magnetic resonance imaging (n=2). Results were normal in all cases.

Moderate to severe ptosis with MRD1 ranging from -3 to -2 was observed. Two patients had variable MRD1 secondary to orbicularis contraction. Levator function was decreased in all affected eyelids compared to the contralateral sides. All patients had overactive orbicularis oculi muscles and spasm of the eyelid on attempted upgaze. Five patients had ipsilateral brow ptosis with contralateral eyebrow elevation and frontalis overaction.

The average time to diagnosis after inciting event was 4.3 months (median 3 months; range 1-10 months). Partial or complete resolution was seen in all but one patient who did not return for follow-up.

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Conclusions: Psychogenic ptosis is an often delayed or misdiagnosed condition, resulting in unnecessary referrals and imaging. Psychogenic ptosis should be considered in patients with atypical findings such as ipsilateral brow ptosis, orbicularis oculi spasm, squint on upgaze, and variable eyelid measurements. A prior history of minor trauma and female sex were common in this series. Our experience suggests that psychogenic ptosis can often be treated with reassurance, leading to partial or complete resolution. Given the number of patients with comorbid psychiatric conditions, we recommend a low threshold for psychiatric or psychological evaluation.

Figure 1

Table 1. Clinical features of 6 cases of psychogenic ptosis

Number	Age/sex	Laterality	Underlying psychological history	Trigger	Treatment	Resolution
1	53/F	Left	---	Ground level fall	Observation	--
2	60/F	Left	Depression	Kicked by student	Observation	Complete
3	15/F	Right	--	Punched by school mate	Contact lens holiday	Complete
4	16/F	Left	Anxiety, migraines, trichotillomania	Hit in nose by softball	Lidocaine block	Partial
5	26/F	Left	Depression	Hit by classmate	Observation with improvement to baseline before congenial ptosis surgery	Partial
6	14/F	Right	Depression	Fall off bike	Observation	Complete

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7:16 – 7:20 am

Overexpression of Insulin Like Growth Factor-1 Receptor (IGF-1R) in Non-Specific Orbital Inflammation

Kelsey Roelofs[1], Liza Cohen[2], Teresa Chen[2], Kendall Goodyear[2], Robert Goldberg[2], Daniel Rootman[2]
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Introduction: Non-specific orbital inflammation (NSOI) comprises a collection of localized orbital inflammatory processes, and can manifest as a relapsing and/or chronic condition. This condition most commonly involves the lacrimal gland (LG) (54.2%) however often other orbital tissues are involved.[1] Expression of insulin like growth factor-1 receptor (IGF-1R) has previously been documented in muscle, adipose and vascular tissue[2,3] and is over-expressed in thyroid eye disease (TED),[4] a specific sub-type of orbital inflammation. The purpose of this study was to evaluate IGF-1R expression in the LG and to determine if overexpression occurs in cases of NSOI.

Methods: In this comparative cohort study, patients undergoing LG biopsy were screened. Cases were included from two groups based on review of clinical records: clinical NSOI syndrome and controls (lacrimal prolapse). Patients were excluded if they had a history of thyroid dysfunction. Immunohistochemistry (IHC) for IGF-1R beta (Cell Signalling Technology, Beverly, MA, USA, serial no. 3027S) was performed and staining was analysed using ImageJ (NIH, Bethesda, MD, USA). The percentage of surface area staining to number of nuclei present in the slide was compared between the groups to control for cellularity of the specimen.

Results: A total of 8 (4 NSOI, 4 control) patients were included with a mean age of 45.4 ± 16.2 years. There was no difference between the groups with respect to age (p=0.462); however, the NSOI group was comprised primarily of males (3/4; 75%) whereas the control group was all female (4/4; 100%). On hematoxylin and eosin, all cases of NSOI showed acute and/or chronic inflammation, with no evidence of vasculitis, granulomas or malignancy. One of the control cases showed minimal chronic inflammation and the other three demonstrated unremarkable LG tissue. Positive staining for IGF-1R beta was seen in all cases, in both groups (Figure 1). The % surface area of staining was greater in NSOI (60.3 ± 11.0%) compared to controls (43.3 ± 6.1%) (p=0.035) (Figure 2). However, the % surface area of IGF-1R staining in proportion to number of cells (% surface area / # nuclei), was not significantly different between the groups (p=0.332) (Figure 3).

Conclusions: IGF1-R is expressed in the normal LG. In cases of NSOI the level of expression may be increased; however, this appears to be proportional to the increased cellularity of the specimen. Teprotumumab[5] has been shown to reduce inflammation and may have a potential role in the treatment of IGF1 positive inflammatory cells in NSOI. This hypothesis remains clinically unexplored at present. The findings of this study suggest that further investigation may be warranted.

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Figure 1

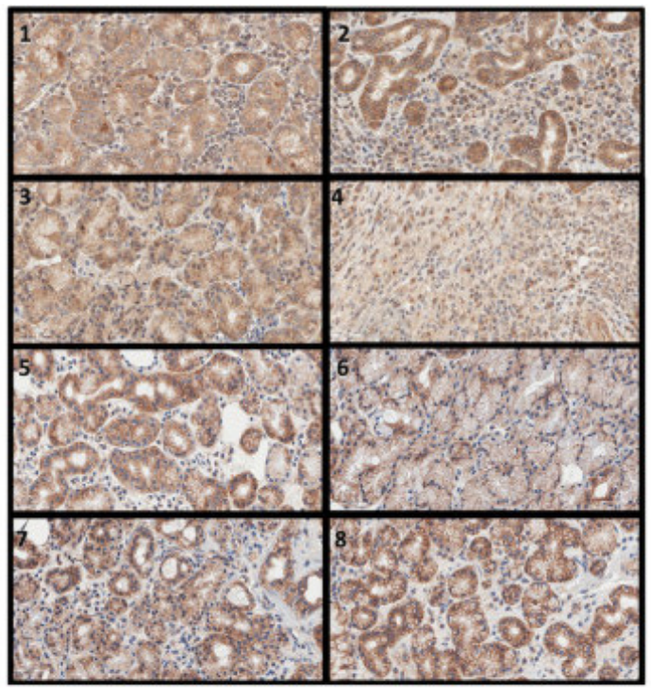

Figure 1. Immunohistochemistry for IGF-1R beta demonstrating expression in lacrimal gland biopsy specimens from cases 1 – 8 at 40X. Cases 1-4 are from NSOI specimens and 5-8 represent control cases.

Figure 2

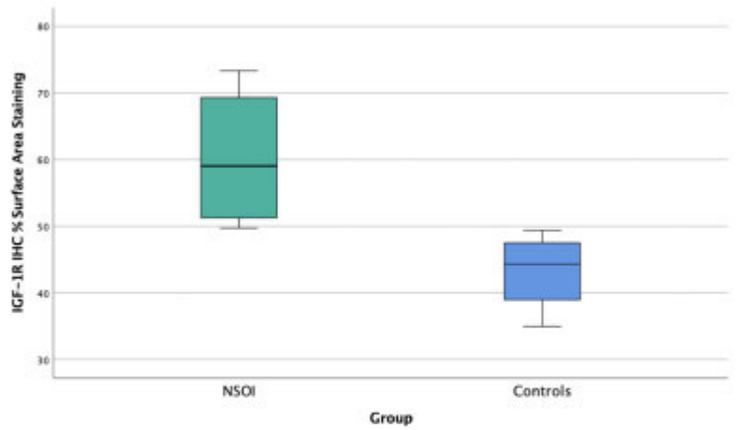

Figure 2. Boxplot illustrating percent surface area staining for IGF-1R on immunohistochemistry.

Figure 3

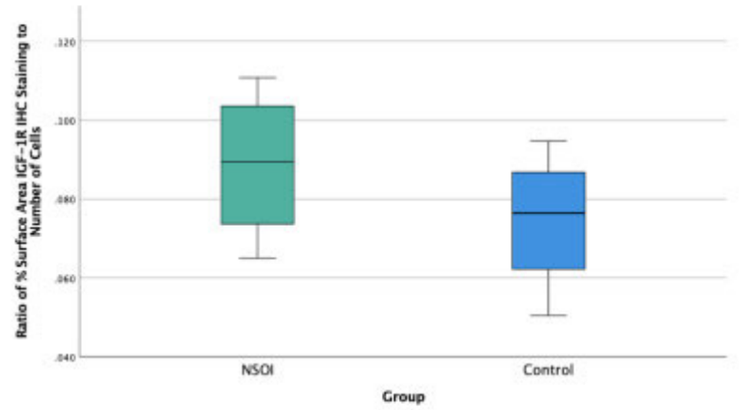

Figure 3. Boxplot demonstrating ratio of IGF-1R staining to number of nuclei present in 40X field.

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7:20 – 7:24 am

A Case of Severe Ocular Cicatricial Pemphigoid Treated with Minor Salivary Gland Transplantation and Keratoprosthesis

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Introduction: Ocular cicatricial pemphigoid (OCP) is an autoimmune subepithelial blistering disease of the ocular surface in which autoantibodies bind antigens in the epithelial basement membrane, leading to activation of the complement cascade, inflammatory cells, and fibroblasts. The progressive subconjunctival fibrosis, symblepharon formation, and corneal keratinization can lead to severe ocular morbidity and blindness.

Methods: We report a case of vision loss secondary to severe ocular cicatricial pemphigoid which was treated in our oculoplastics clinic, highlighting novel management strategies and clinical outcome. Collection and evaluation of protected patient health information were HIPAA compliant.

Results: A 78-year-old woman with a known history of biopsy-negative cicatrizing conjunctivitis presented to the eye clinic with right eye pain and redness for several days. Prior to this presentation, the patient had five years of inconsistent follow-up and had previously undergone treatment with autologous serum tears, topical steroid eyedrops, and mycophenolate mofetil. On re-presentation, her visual acuity had decreased to “E” at three feet from 20/60 in the right eye, and light perception from count fingers in the left eye. Examination of the right eye demonstrated symblepharon at the lateral canthus and a corneal epithelial defect. The left eye was found to have severe diffuse symblepharon with corneal conjunctivalization and a dry ocular surface. Oral prednisone 40mg and mycophenolate mofetil 500mg twice daily were both started, as well as topical antibiotic drops and a bandage contact lens. Over the next six months, inflammatory signs subsided as the prednisone was slowly tapered to 5mg, while the mycophenolate mofetil was titrated up to a daily dose of 2000mg. Visual acuity remained “hand motion” and the ocular surface remained dry in both eyes throughout this period. The patient then underwent symblepharolysis with labial mucous membrane grafting and salivary gland implantation in the inferior fornix, first to the right eye, then to the left eye. Post-operatively, a wet surface was achieved in both eyes due to active mucus production from the grafts. One year after salivary gland transplantation, a Boston type 2 keratoprosthesis was then implanted in the left eye with concurrent temporal tarsorrhaphy. At post-operative month four, visual acuity had improved to 20/100 in the left eye. The patient is currently awaiting placement of a keratoprosthesis in the right eye.

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Conclusions: This case demonstrates that vision loss from corneal keratinization and severe keratoconjunctivitis sicca in ocular cicatricial pemphigoid can be successfully treated with staged minor salivary gland transplantation followed by Boston type 2 keratoprosthesis implantation. Systemic control of inflammation must be achieved prior to surgical intervention.

Figure 1

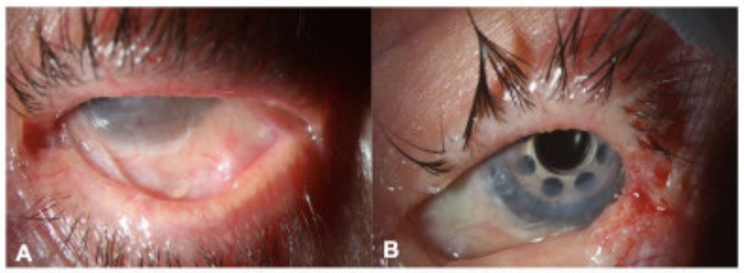

Figure 1: a) Pre-operative external photograph of the left eye demonstrates severe diffuse symblepharon and corneal conjunctivalization; b) External photograph taken 13 months after salivary gland transplantation and 1 month after keratoprosthesis implantation in the left eye.

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7:30 – 7:34 am

Proboscis Lateralis in a Newborn: A Case Report and Review of Literature

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Byers Eye Institute, Palo Alto, California, United States

Introduction: Proboscis lateralis (PL) is a rare congenital craniofacial anomaly in which a tubular, nose-like structure is seen to arise from the medial canthal area. It is caused by a developmental failure that results in the fusion of the maxillary process with the contralateral frontal process and may involve the ipsilateral medial canthus, nasal cavity, and oral cavity.[1-2] Proper management includes diagnostic imaging and surgical planning for excision and reconstruction.

Methods: Here we present a case report of a newborn with PL. Given the rare incidence of this congenital defect, we reviewed the literature for typical clinical features, radiologic findings, and surgical options.

Results: A 2-week-old female infant presented with a soft, 2.75-cm-long and 1-cm-wide trunk-like process extending from the region above the right medial canthus accompanied by a mild hypoplastic right naris and mild right upper lid retraction (Figure 1). MRI showed absence of nasal, oral, or intracranial involvement (Figure 2). She was diagnosed with PL. Complete excision and reconstruction of the PL was performed at 11 months of age. PL has an incidence of about 1 in 100,000 to 1,000,000 live births and has a slight predominance in male infants, with a male-female ratio of approximately 2 to 3:1.[3] It is usually unilateral, with only 4 bilateral cases reported in the literature.[4-7] PL is categorized into 4 Groups.[8] Group 1 consists of isolated PL without other associated anomalies (9%). Group 2 consists of PL with associated ipsilateral nasal hypoplasia or aplasia (23%). Group 3 consists of PL with associated ipsilateral nasal and/or ocular adnexal defects including anophthalmia, microphthalmia, microcornea, lenticular opacities, and colobomas of the choroid, retina, iris, or eyelid (47%). Group 4 may also have oral defects or midline clefting (21%). Brain and cranial vault defects are seen in approximately 19% of patients.[9-10] Surgical treatment is individualized to the type of presentation. Surgical excision of the tubular medial canthal lesion is typically recommended which can be used for reconstruction of significant nasal defects.[11]

Conclusions: PL is a rare congenital malformation which can involve the medial canthus and can be associated with ocular adnexal defects. Management requires a multidisciplinary approach involving ophthalmology, otolaryngology, and craniofacial plastic surgery.

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Figure 1

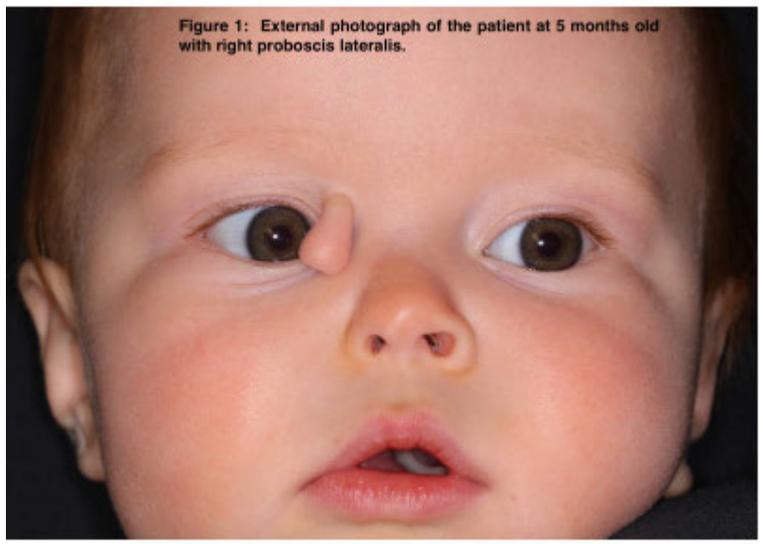
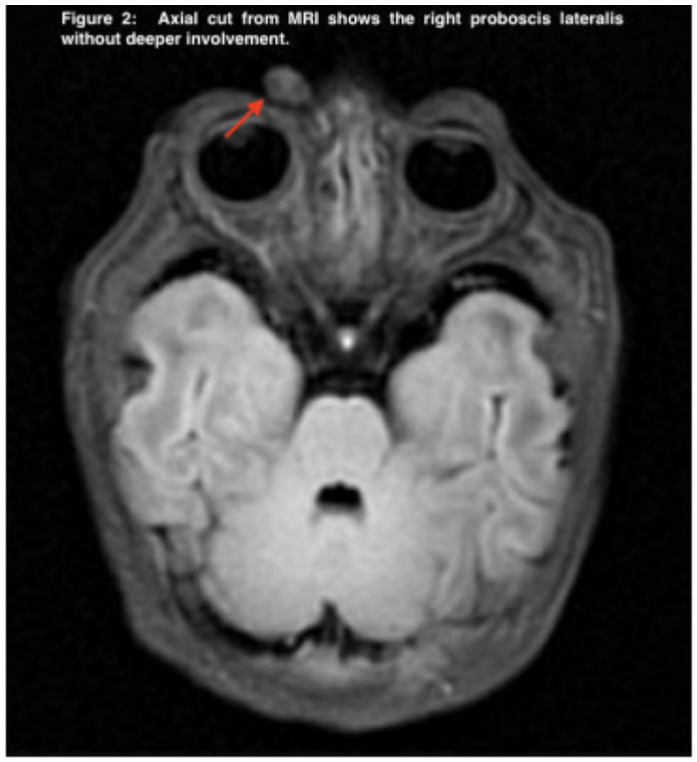


Figure 2



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7:34 – 7:38 am

Congenital Eyelid Imbrication and Floppy Eyelid Syndrome in a Patient with Cat Eye Syndrome

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Introduction: Cat eye syndrome is a rare genetic disorder with a wide variety of ophthalmic manifestations including ocular colobomas, unilateral microphthalmia, aniridia, downslanting palpebral fissures, hypertelorism, corneal clouding, cataracts, and Duane's anomaly.[1] We present the first known case of congenital floppy eyelid syndrome and eyelid imbrication in a cat eye syndrome patient.

Methods: The clinical course and surgical outcomes of a single case of cat eye syndrome are reported.

Results: A newborn male was found to have an isodicentric chromosome 22 with partial tetrasomy 22 involving the cat eye syndrome critical region (47,XY,+idic(22)(q11.1q11.21)). He required neonatal ICU admission and tracheostomy for hypoxemia and also suffered from intracranial hemorrhage, multiple cardiac defects, anal stenosis and multiple craniofacial abnormalities including orbital dysmorphia, retro- and micrognathia and cleft palate consistent with cat eye syndrome. Initial ophthalmologic exam at 8 days demonstrated hypertelorism and bilateral tight, downslanting palpebral fissures. By 2 weeks of age, he developed bilateral eyelid imbrication and floppy eyelid syndrome with excessively large eyelids that were pliable and easily everted (Figure 1A). Despite conservative management with topical lubrication, there was progressive eyelid eversion. The patient was unable to open his eyelids spontaneously, raising concern for sensory deprivation amblyopia. Cycloplegic retinoscopy revealed significant anisometropia with severe astigmatism, left greater than right, attributed to the structural impact of his eyelids. At 5 months of age, the patient underwent a single-stage bilateral full thickness wedge excision of the upper eyelids and frontalis suspension with silicone rods in a double rhomboid fashion. Histopathology revealed tarsus with chronic papillary conjunctivitis, subepithelial lympho-plasmacytic infiltrate, and meibomian cysts lined by conjunctival epithelium consistent with features seen in floppy eyelid syndrome (Figure 2). Two months post-operatively, the patient had spontaneous eyelid opening, resolution of spastic eversion of the upper eyelids, and adequate eyelid closure (Figure 1B). He continued to demonstrate aversion to light on examination, suggestive of visual development.

Conclusions: We present the first reported case of congenital floppy eyelid syndrome and eyelid imbrication in a patient with cat eye syndrome. Combined eyelid shortening and ptosis repair has demonstrated functional and aesthetic success in children with eyelid plexiform neurofibromas in whom excess tissue and ptosis co-occur in a similar fashion.[2] In this case, successful aesthetic and functional outcomes were obtained with single stage bilateral wedge resection and ptosis repair with frontalis suspension.

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Figure 1

Figure 1 A. Pre-operative photo at 4-months of age. **B.** Post-operative photo 2-months after surgical repair.

Figure 2

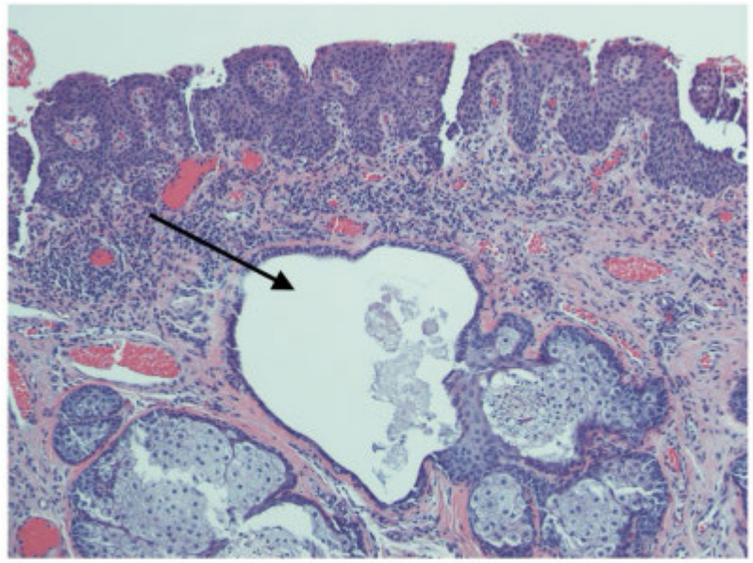

Figure 2. Posterior lamella of the eyelid that illustrates papillary hypertrophy and subepithelial lympho-plasmacytic infiltrates superficially, and a deeper meibomian cyst (black arrow) lined by conjunctival epithelium (hematoxylin-eosin, x100).

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7:38 – 7:42 am

Mechanisms Associated with Major Ophthalmic Injury in Patients with Maxillofacial Fractures

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Introduction: While many have studied orbital fractures and ocular injury, assessment of concurrent ophthalmic injury in patients with orbital fractures remains difficult to predict. Variables associated with increased risk for substantial ophthalmic injury have been previously assessed, however, accurately and quickly assessing patients most at risk for substantial ocular injury remains challenging.[1-4] This is critical in the triage of emergency patients.

Methods: A retrospective chart review was performed of 1677 charts from 2015 to 2020 for patients with midface fractures at an adult Level I trauma center; patients with isolated nasal bone, frontal process of the maxilla and orbital roof fractures were excluded. In addition to evaluation of demographic data including age, gender, ethnicity, and mechanism of injury, we evaluated fracture location and associated major or minor ocular injury. Major ophthalmic injury was defined as retrobulbar hematoma, optic neuropathy, hyphema, vitreous hemorrhage, open globe, choroidal rupture, retinal detachment, entrapment of extraocular muscles or intraocular lens dislocation. Statistical analysis was performed using Microsoft Excel and R on Linux software.

Results: Seven hundred sixty six patients met inclusion criteria. Patients ranged in age from 15 to 38, 84% percent of patients were male, 68% of patients were Caucasian or Hispanic, and 62% of patients had an ophthalmology evaluation prior to surgical intervention. Mechanisms of injury included assault (63.9%), falls (12.7%), motor vehicle collisions (11.3%), and gunshot wound (2.5%). Of these, patients with gunshot wound had the highest percentage of both major and minor ocular injury at 32% and 37% respectively. Patients suffering gunshot wound with facial fractures were significantly more likely to have associated major ophthalmic trauma compared to other mechanisms of injury (Figure 1, chi-squared, p=0.001). In patients with maxillofacial fractures, isolated zygoma and maxillary fractures were significantly less likely to have major ocular injury; patients with multiple combined fracture types were significantly more likely to have major ophthalmic injury (chi-squared, p=0.008).

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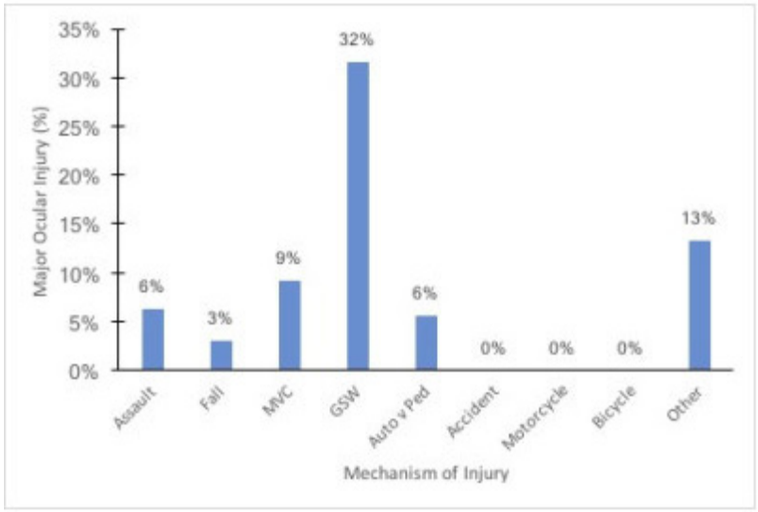
Conclusions: Amongst all patients with orbital fractures, those patients suffering gunshot wound injury with associated fracture or patients with multiple fractures were most likely to have associated major ophthalmic injury. Major ocular injury was less likely following other mechanisms such as assault or falls. Major ocular injury was also more likely in patients with multiple combined fracture types, and less likely in patients with an isolated zygoma or maxilla fracture. Mechanism of injury and fracture type can help triage the need for immediate ophthalmic evaluation; these findings support immediate ophthalmologist evaluation in patients with fractures and gunshot wounds, as well as those patients with multiple maxillofacial fractures.

Figure 1



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7:42 – 7:46 am

Patient Reported Tearing-Related Quality of Life

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Introduction: Most oculoplastic procedures aim to improve patients' quality of life, including dacryocystorhinostomy (DCR) and associated procedures for the treatment of tearing. There is, however, a paucity of research examining how tearing affects patients' quality of life. Such information is critical for the evaluation of procedures aimed at addressing this symptom. This study aims to understand the factors affecting the quality of life of tearing patients.

Methods: Patients presenting to the clinics of four oculoplastic surgeons at UCLA for evaluation of tearing during a three-month period were invited to participate in semi-structured, recorded interviews regarding their experience with tearing and its effects on their quality of life. Interviews involved patients suspected of having nasolacrimal duct obstruction (NLDO) who had not had surgical treatment, those who had undergone DCR for NLDO, and those suspected of having non-NLDO-related tearing. Telephone interviews were performed, transcribed, and subsequently coded and reviewed for recurrent themes and sub-themes by 3 researchers using the constant comparative method until thematic saturation was reached.

Results: Six main themes in patient-reported quality of life were identified: Vision, Social Functioning, Physical Functioning, Occupational Functioning, Psychological Functioning, and Medical Care. Within these six themes, 15 individual sub-themes were identified, and direct patient quotations were aligned to each. Themes, sub-themes, and representative quotations can be found in Figure 1.

Conclusions: These in depth, semi-structured interviews provide a framework for the main quality of life changes in patients being evaluated for tearing in the oculoplastic surgery clinic. This framework can be used to develop patient-centered guides or measurement tools (Table 2) that may be useful in identifying appropriate candidates for lacrimal surgery, and in gauging the outcomes of such procedures.

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Figure 1

Figure 1: Themes and Sub-Themes Regarding Tearing-Related Quality of Life

Theme	Sub-theme	Representative Quotation
Vision	A. Blurring	*We take it for granted. We just see all the time. And my vision was impaired because of the tearing.*
	B. Eyewear Issues	*And then I thought, 'Oh, maybe I shouldn't wear my contact lenses,' so I stopped wearing my contacts, which was a nuisance too…*
	C. Wiping the eye	*Having to wipe my eye all day, it's very annoying, and that kept me from seeing.*
Social Functioning	A. Need for Explanation	*If I'd be out at a dinner with friends or just around a large group of people or like people at work, it's 'Oh, are you okay? Are you crying?'*
	B. Avoiding Makeup	*I don't wear makeup anymore because it just all runs off.*
	C. Embarrassment and Decreased Socialization	*Sometimes it's just not worth, it's just frustrating, so it's not worth going out and being social.*
Physical Functioning	A. Eye discomfort	*The tearing will sting my eye, and to not have to worry about that pain…*
	B. Skin irritation	*It would actually run down my cheek…it's almost as if it was acidic on my skin.*
Occupational Functioning	A. Vision-related issues	*I work in a chemistry lab and I work with a lot of optics so I'm under a microscope. And the tearing was so bad that I couldn't even see through the optics.*
	B. Distraction	*It's horrible. It is a daily, chronic distraction and frustration. It affects absolutely everything I do.*
Psychological Functioning	A. Prognosis	*Well, I didn't think it would take so long to recover. I'm going in to see Dr. [Redacted] tomorrow, but it's been like two weeks and my nose just quit bleeding two days ago.*
	B. Cause	*Everything became an issue. I was like, 'Don't go near my eye,' because I didn't know what was causing it, so I sort of had these weird ideas trying to find a solution…*
	C. Fear of infection	*I'm always worried about that being a potential source of infection, so I'm always gelling my hands and then always trying to have clean Kleenex, and so it's just constant.*
Medical Care	A. Medical	*I tried hot compresses. I tried different eye drops, like dry eye drops. I even had… like antibiotic drops were prescribed…I tried Pataday, the allergy drops. I tried… What else did I try? Tried meditation. I'm not kidding. I really did.*
	B. Surgical	*And yeah, to the point that I went forward with two surgeries so far for it….*

7:46 – 7:50 am

Microbial Profile of Lacrimal System Dacryolith in Midwest Patient Population

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Introduction: Dacryoliths of the lacrimal excretory system are found in patients undergoing surgical treatment of primary canaliculitis and nasolacrimal duct obstruction.[1,2] Dacryoliths of the canalicular pathway are classically attributed to *Actinomyces* species, yet a growing body of literature throughout Asia and the Middle East supports a shift towards *Streptococcus* and *Staphylococcus* species being the most common cultured organism.[1-4] The Midwest microbial profile in 2009 was reported to maintain *Actinomyces* as the most common organism.[1] The objective of this paper is to update the American Midwest demographic and microbial profile of lacrimal system dacryoliths to direct tailored regional approaches to treatment.

Methods: A retrospective chart review from January 2015 to 2021 of patients with history of surgical procedure for lacrimal removal of dacryolith were identified. Demographic and clinical information, microbial culture data and surgical pathology were obtained. Patients were included with canaliculitis, canalicular obstruction, dacryocystitis and nasolacrimal duct obstruction. Specimens were cultured for anaerobes and aerobes and dacryoliths underwent histopathologic evaluation with a combination of Gram, Gomori's methenamine-silver (GMS), Brown and Brenn Gram, and periodic acid-Schiff (PAS) stains.

Results: A total of 81 patients were identified, 48 (59%) were included in the study. Patients were excluded for incomplete chart or culture data (17%) or other foreign body removed, not dacryolith, (23%). There were 67 women (83%) and 14 (17%) men with a ratio of women to men of 5:1. Patient age ranged from 4-92 years (mean 64 years). All organisms were identified by frequency (Table 1). The most common organism isolated was *Actinomyces* spp (23%), followed by *Staphylococcus* spp (21%) and *Streptococcus* spp (19%). Histopathologic staining accounted for 45% of *Actinomyces* isolation when culture data was negative. In a subgroup analysis of 7 (15% of total) lacrimal sac dacryoliths, the most common organism was *Staphylococcus* spp (29%), no *Actinomyces* were isolated from the lacrimal sac and nasolacrimal duct (Table 2).

Conclusions: The microbial profile of Midwest dacryoliths maintains a predominance of *Actinomyces* spp in cases of canalicular pathology, in contrast to the regional shifts in microbial data reported around the world. Histopathologic evaluation aids significantly in fungal isolation likely due to slow or poor growth on culture. *Actinomyces* was not found in lacrimal sac dacryoliths in this study. Future prospective evaluation is needed to elaborate on these findings and their clinical significance in patient care.

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Table 1

Table 1: Dacryolith Microbial Analysis

Pathogen (n = 48)	Number of cases (%)
Actinomyces spp	11 (23%)*
Staphylococcus spp	10 (21%)
Streptococcus spp	9 (19%)
Fusobacterium nucleatum	4 (8%)
Peptostreptococcus spp	4 (8%)
Parvimonas micra	3 (6%)
Propionibacterium spp	3 (6%)
Serratia marcescens	3 (6%)
Fungal spp⁺	3 (6%)
Escherichia coli	2 (4%)
Prevotella spp	2 (4%)
Pseudomonas aeruginosa	2 (4%)
Gemella morbillorum	2 (4%)
*Histopathologic staining yielded 5/11 (45%) of positive cases	
⁺Includes one *Candida albicans*, one *Aspergillus fumigatus*, one non-specific yeast	
The following bacteria were positive in only one case (2%): *Proteus mirabilis, Klebsiella oxytoca, Enterobacter cloacae, Capnocytophaga sputigena, Aggregatibacter aphrophilus, Haemophilus influenzae, Stenotrophomonas maltophilia*	

Table 2

Table 2: Lacrimal Sac Dacryolith

Pathogen (n = 7)	Number of cases (%)
Staphylococcus spp	2 (29%)
Peptostreptococcus spp	1 (14%)
Serratia marcescens	1 (14%)
Escherichia coli	1 (14%)
Klebsiella oxytoca	1 (14%)
Fungal yeast forms	1 (14%)
Actinomyces spp	0 (0%)

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7:50 – 7:54 am

Epidemiology of Ophthalmic Trauma at a Major Level 1 Trauma Center in the United States: The Denver Health Ophthalmic Trauma Registry (DHOTR)

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Introduction: To establish the Denver Health Ophthalmic Trauma Registry (DHOTR) and describe the epidemiology of ophthalmic trauma at Denver Health, a large safety-net hospital in Colorado.

Methods: As a Level 1 trauma center and pioneer in trauma research, Denver Health maintains a comprehensive database of trauma patients presenting to the hospital. All cases of ophthalmic trauma were identified in this database to establish DHOTR. The study period was defined as trauma occurring between January 2018 and August 2020. Descriptive statistics were used to present data and understand the epidemiology of ophthalmic trauma during the observation period.

Results: Five hundred and fifty five cases of ophthalmic trauma were identified from 7760 cases of trauma. 78% of cases occurred in males and 81% were 18-59 years. 89% of injuries were blunt trauma, 27% had blood alcohol content above 0.08 on presentation, and ophthalmic trauma numbers were higher on weekends and during the summer months. 37% of injuries were transportation related (involving motor vehicles, motorcycles, and/or bikes), 30% were violence related (22% assaults, 6% gun shot wounds and 1% stabbings), and 22% were from falls. Compared to trauma without ophthalmic injury, eye injuries were more common among males (78% vs 70%, $p<0.001$), more likely due to blunt trauma (89% vs 79%, $p<0.001$), and patients were more likely intoxicated (27% vs 17%, $p<0.001$). The most common procedure performed was eyelid and/or lacrimal repair (n=79), followed by orbital fracture repair (n=70), and removal of non-penetrating corneal foreign body (n=64).

Conclusions: This study identifies several targets for eye injury prevention including transportation-related ophthalmic trauma, assault and falls. Alcohol use in males aged 18-59 was associated with high rates of eye injury and is a key target group for preventing ophthalmic trauma. Ophthalmic plastic and reconstructive procedures were the mostly commonly performed procedures in our cohort.

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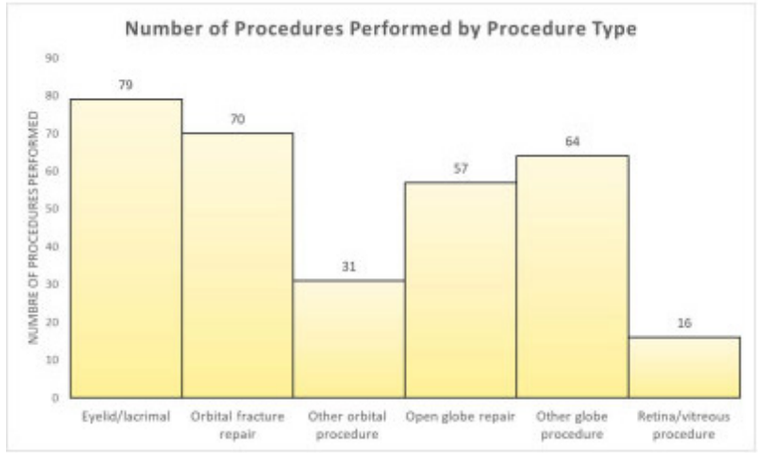
Figure 1

Study Population	Eye Trauma N=584 n (%)	All other trauma N=7,760 n (%)	p-value
Unique patients	555	7,412	-
Gender			
Male	456 (78.1%)	5,474 (70.6%)	
Female	128 (21.9%)	2,285 (29.4%)	**<0.0001**
Race/ethnicity			
White	320 (54.8%)	4,230 (54.5%)	
Hispanic	164 (28.1%)	2,149 (27.7%)	
African-American	52 (8.9%)	817 (10.5%)	
Asian	12 (2.0%)	110 (1.4%)	
Other/Unknown	36 (6.2%)	454 (5.8%)	0.677
Age category			
<18 years	34 (5.8%)	639 (8.2%)	
18-34 years	181 (31.0%)	2,466 (31.8%)	
35-59 years	258 (44.2%)	2,760 (35.6%)	
60+ years	111 (19.0%)	1,894 (24.4%)	**0.0002**
Age, Mean (SD)	42.9 (18.3)	43.6 (21.0)	0.258
Insurance type			
Government	300 (51.4%)	4,123 (53.2%)	
Private/commercial	200 (34.2%)	2,533 (32.7%)	
Self Pay	78 (13.4%)	1,038 (13.4%)	
Other	6 (1.0%)	50 (0.6%)	0.687

Figure 2

Study Population	Eye Trauma N=584 n (%)	All other trauma N=7,760 n (%)	p-value
Days in the Hospital			
None	102 (17.5%)	1,222 (15.8%)	
< 7 days	316 (54.1%)	4,946 (63.8%)	
7-30 days	131 (22.4%)	1,421 (18.3%)	
31+ days	35 (6.0%)	166 (2.1%)	**<0.0001**
Final outcome was deceased	42 (7.2%)	390 (5.0%)	0.051
Disposition			
Discharged home without services	316 (54.3%)	4,703 (61.0%)	
Discharged home with home services	18 (3.1%)	406 (5.3%)	
Transferred to other facility	77 (13.2%)	883 (11.4%)	
Long-term acute care or nursing home	21 (3.6%)	101 (1.3%)	
Not admitted or died in ED	59 (10.1%)	726 (9.4%)	
Deceased	33 (5.7%)	242 (3.1%)	
Jail	18 (3.1%)	265 (3.4%)	
Left against medical advice	14 (2.4%)	164 (2.1%)	
Psychiatric facility	5 (0.9%)	68 (0.9%)	N/a

Figure 3



8:04 – 8:10 am

Microdebridement of Intranasal Cysts Associated with Congenital Dacryocystocele

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Introduction: Introduction: The surgical management of congenital dacryocystocele has evolved in recent decades, and probing alone may no longer be considered the procedure of choice.[1–6] With the increased appreciation of the presence of intranasal cysts (INC) extending from the valve of Hasner, we have pivoted to perform surgical treatment under general anesthesia, in conjunction with an endonasal examination permitting careful powered microdebridement of these cysts. We report the results of this procedure.

Methods: Retrospective chart review of all patients with congenital dacryocystoceles who underwent endoscopic assessment and/or powered microdebridement at a single institution over a 12-year period (2009-2020).

Results: 37 eyes of 29 patients were included, eight patients (28%) had bilateral dacryocystoceles. Twenty-two (76%) were females, and 5 (17%) patients had a history of prematurity. Mean (±SD) age at diagnosis was 15±28 days (range, 0-93 d). Mean follow up was 7.5 months. Six patients had a history of in-office failed probing prior to endoscopic assessment or treatment. The right side was more commonly involved [20 (69%) OD vs 17 (59%) OS]. Dacryocystitis was diagnosed in 23 eyes (62% of all dacryocystoceles) (Figure 1).

Surgical intervention was performed in all patients at a mean age of 1.4±1.7months (range, 1 day – 9 months). INC were observed in 32 eyes (86% of 37 dacryocystoceles, 18/20 OD, 14/17 OS), and a powered microdebrider was used to excise the cyst in these cases. Bilateral endonasal assessment was performed in all cases, including in the 21 (72%) patients with unilateral dacryocystocele. In six of those (6/21, 29%), a contralateral cyst was identified and treated. Following endoscopic intervention, probing with or without mono-canalicular stent was performed in all cases. The average age of patients with INC was 39 weeks vs. 36 weeks of patients without INC (P=0.03, independent samples *t* test). Prematurity was associated with lower likelihood of INC formation; however, this was only

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marginally significant (P=0.068, Fisher's exact test). One case (3%) underwent unilateral endoscopic dacryocystorhinostomy during the follow up period due to persistent symptoms. Surgical success was found in 36 of 37 sides treated (97%).

Conclusions: Congenital dacryocystoceles are associated with intranasal cysts in the majority of cases. Intranasal cysts may be less common in premature patients. Surgical intervention was associated with a favorable outcome. Bilateral endonasal examination is recommended in all cases, as a cyst may be observed even in cases with no external signs.

Figure 1

Figure 1. A 19-day-old patient with left-sided infected dacryocystocele (A) underwent successful endoscopic powered microdebridement of intranasal cyst with complete resolution (B, 5 days postoperatively). CT images (C-F) depicted a left dacryocystocele (*yellow asterisk*) and an associated intranasal cyst (*blue asterisk*).

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8:10 – 8:16 am

Facial Asymmetry in Children with Unilateral Congenital Ptosis

Phillip Tenzel[1], Karen Brown[1], Brenda Zhou[2], Kamel Itani[1], Ronald Mancini[1]
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Introduction: To describe and analyze facial asymmetry in children undergoing surgical repair of unilateral congenital ptosis.

Methods: This is a retrospective review of all patients under 18 years old undergoing surgical repair of congenital ptosis between January 1, 2017 and December 31, 2020 at a single tertiary care center. Charts were reviewed to ensure a diagnosis of idiopathic unilateral congenital ptosis; known or noted suspected cases of secondary childhood ptosis (e.g. syndromic or traumatic) were excluded. Data recorded for all patients included gender, age at time of surgery, laterality, MRD1, levator function, and surgical intervention.

Preoperative photographs were reviewed; those which were clear and without abnormal head position were included. Photos with head turn, chin-up or chin-down position, or insufficient image quality to judge facial landmarks were excluded. Photographs of the patients were analyzed by three reviewers. Landmarks of the periorbital region, midface and lower face were marked, and measurements between these landmarks were used to quantify horizontal and vertical dimensions of the face (Figures 1 and 2). If a landmark was not identifiable in a patient, such as a poorly defined lower lid crease, the measurement was excluded. Measurements were taken using ImageJ software (NIH.gov).

The difference in measurements between the ptotic side and the non-ptotic sides were assessed using the ratio of (ptotic side measurement)/(non-ptotic side measurement). Two-tailed Student's t-test was used to analyze this ratio in comparison to the expected value of 1 for perfect symmetry. Relationships between different measurements on the same side of the face were also analyzed using paired-variable regressions.

Results: Forty-four patients with unilateral congenital ptosis were included in the study. Of these, 24/44 (55%) were male and the left upper eyelid was ptotic in 28/44 (64%) cases. The mean age at time of surgery was 6.0±4.2 years. The surgical management chosen most often was frontalis suspension (20/44, 45%), followed by levator resection (16/44, 36%) and Mullerectomy (8/44, 18%). The side of the face with blepharoptosis was found to more often have a smaller MRD1 ($p<0.001$), smaller MRD2 ($p=0.001$), smaller horizontal palpebral fissure ($p=0.049$), a shorter midface height ($p<0.001$), and a more inferiorly-displaced lateral canthus ($p<0.001$) relative to the side of the face without ptosis. The hemifacial area measurement was strongly correlated with horizontal measurements and seemed to be independent of vertical metrics, including MRD1.

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Conclusions: Unilateral congenital ptosis is associated with eyelid, midface, and lateral canthal asymmetries.

Figure 1: AL = area line, CB = Cupid's bow, Ch = chelion, CLR = cornea light reflex, MC = medial canthus, Me= menton, LC = lateral canthus, LLM = lower lid margin, Na = nasion, ULM= upper lid margin. The lower lid crease is not identifiable in this photograph.

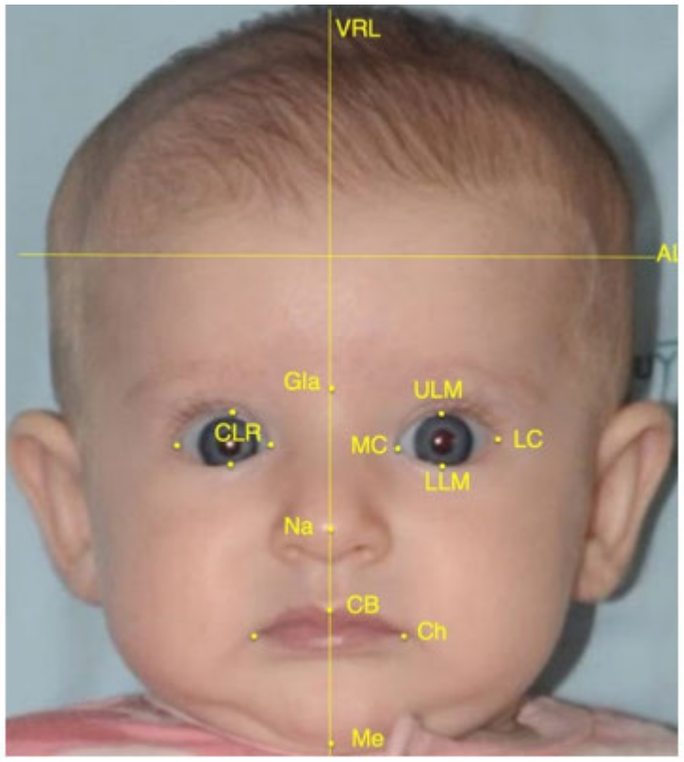
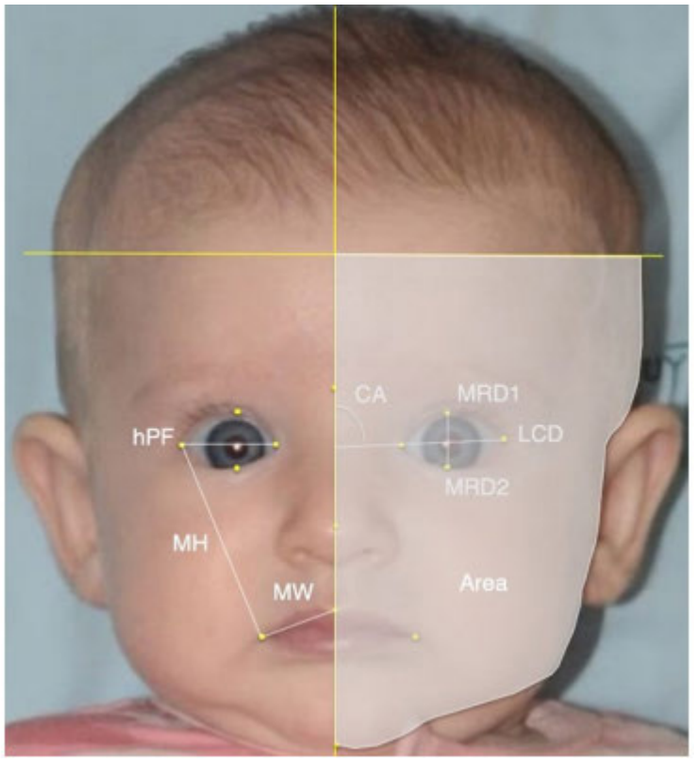


Figure 2: CA = canthal angle, hPF = horizontal palpebral fissure, LCD = lateral canthal distance, MH = miface height, MRD1 = margin to reflex distance 1, MRD2 = margin to reflex distance 2, MW = mouth width. The lower lid crease is not identifiable in this photograph.



8:16 – 8:22 am

Modified External Levator Advancement with Superior Tarsectomy for the Repair of Congenital Blepharoptosis

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Introduction: The challenges associated with the successful correction of congenital blepharoptosis have resulted in the multiplicity of described surgical techniques.[1,2] The authors describe a modified external levator advancement with superior tarsectomy. Using this approach, the eyelid crease can be easily formed, excess skin can be excised, and a graded tarsal resection performed in a simplified fashion.

Methods: A retrospective study was conducted of a novel modified levator resection performed by a single surgeon MK. Preoperative and post-operative measurements recorded included margin-to-reflex distance-1 (MRD1), appearance of lid crease, pre-operative levator function, and post-operative upper lid height symmetry. Postoperative complications are reported.

Results: *Surgical Technique:* Through an upper eyelid crease incision the orbicularis is divided, the septum opened and the superior border of the tarsus exposed. The eyelid is everted, and two 4-0 silk-traction sutures are placed along the superior border of the tarsus. With the tarsus on stretch using the silk sutures, a superior horizontal tarsectomy ranging 1 to 2 mm (depending upon the desired amount of correction desired) is performed with a 15-blade, followed by vertical relaxing incisions in the levator/Mueller/conjunctival complex nasally and temporally. The lid is returned to its natural position, and the silk traction sutures are externalized through the skin incision. The conjunctiva is then dissected from the superior portion of this flap and reattached to the superior border of tarsus with 6-0 plain gut sutures. Three double-armed 5-0 vicryl sutures are passed partial thickness in the superior tarsal border and then through Mueller and levator muscles. The eyelid contour is adjusted as needed. Redundant levator/Mueller muscle is resected. Lid crease forming sutures are placed, redundant skin is excised, and the skin closed.

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Surgical Outcomes: A total of 35 eyelids from 32 patients were included in this study with a mean age 4.2 years (8 months – 14 years), 31% female. Average follow up was 5 months (8 days - 8 years). Patient demographics and pre-operative characteristics are displayed in Table 1. The mean preoperative MRD1 was 0.7 mm (0 – 2.5 mm). The mean postoperative MRD1 was 3.0mm (0.5 – 5 mm), with an average increase of 2.3mm (Table 2). Symmetry within 1 mm to the contralateral eye was achieved in 83%. Improvement in the appearance of the lid crease was seen in 54% and 91% achieved a moderate or good outcome. 8.6% of eyelids required revision for under-correction. No significant contour abnormalities were observed. Lagophthalmos was seen early in the post-operative course in 20% (n=7), but only 8.6% (n=3) had persistent lagophthalmos by the end of the study period. No patient developed significant ocular surface disease. One case of mild overcorrection was observed but was not significant enough to require revision.

Conclusions: A combination external levator advancement with superior tarsectomy allows for additional eyelid lift and formation of the lid crease when needed. The use of silk traction sutures provides a controlled approach for graded tarsectomy and levator advancement with greater ease than some may find with the standard Berke ptosis clamp. This enhanced procedure demonstrates excellent functional and aesthetic outcomes for the correction of congenital blepharoptosis.

Figure 1

Table 1. Patient demographics and pre-operative characteristics.

	n (%)
Eyelids	35
Mean age in yrs (range)	4.2 (8 mos – 14 yrs)
Female	11 (31)
Levator Function*	32
Poor (≤ 4mm)	8 (25)
Moderate (5-7mm)	16 (50)
Good (≥ 8mm)	8 (25)
Lid Crease Appearance	33
Absent	14 (42)
Poor	4 (12)
Moderate	2 (6)
Good	13 (39)

*Levator function was categorized per Beard 1981 classification[3]

Figure 2

Table 2. Results.

	Mean	Range
Pre-op MRD1 (mm)	0.7	0 – 2.5
Post-op MRD1 (mm)	3.0	0.5 – 5.0
Increase MRD1 (mm)	2.3	0.5 – 4.0
Post-operative symmetry (mm)	0.6	0 - 2
Improvement in lid crease appearance (%)	54%	n/a

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8:22 – 8:28 am

Silicone Sling Double-Triangle Frontalis Suspension for Simple Congenital Ptosis

Daphna Landau Prat[1], Meera Ramakrishnan[2], Cindy Zhao[3], Karen Revere[4], William Katowitz[4], James Katowitz[4]
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Introduction: Frontalis suspension (FS) surgery is considered the treatment of choice in congenital ptosis with poor levator function. We report the surgical outcomes of FS using a double triangle silicone sling in typical congenital ptosis and to evaluate the re-operation rate and timing.

Methods: A retrospective chart review of all pediatric patients with simple myogenic congenital ptosis treated at a single children's hospital with FS over a 12-year period (2009-2020). The double triangle technique utilized a relatively thin silicone sling secured by simple knots rather than a silicone sleeve. Atypical cases (e.g. BPES, CFEOM, MGJW, CPEO, mechanical ptosis) were excluded. Pre- and post-operative MRD1 measurements were determined from clinical photographs using ImageJ software. Main outcome measures were improvement in eyelid height, eyelid asymmetry, reoperation rate and timing.

Results: 139 patients (174 eyes) were included, 35 (25%) underwent bilateral surgery, 93 (67%) were males. Mean (±SD) age was 1.4±1.9 years (range 0.1-14 y); 78 patients (56%) were younger than one year. Mean follow up time was 32±20.5 months (range, 1-92 m). Sixteen patients (11%) had a history of previous ptosis surgery performed elsewhere, prior to presentation. Mean MRD1 improved by an average of 1.5 mm, from 0.2 mm preoperatively to 1.7 mm at final visit ($p<0.001$). The MRD1 difference between both eyes in all patients improved from 2.5 mm preoperatively to 1.2 mm at final visit ($p<0.001$). Postoperatively, bilateral cases had less asymmetry ($p<0.001$). Complications included infection (n=5, 4%), corneal erosion (n=2, 1%), sling extrusion (n=2, 1%), and suture granuloma (n=1, 1%). Two patients (1.4%) were treated for overcorrection with unilateral eyelid retraction. Repeat ptosis repair was performed in 47 patients (34%), 34.2±19.8 months after the initial procedure (range 7.6-64.6 m) (Figure 1). The reoperation rate was higher in patients with a history of previous ptosis repair (62% vs. 30%, P= 0.01), but was not influenced by gender, bilateral surgery, preoperative MRD1, or age. The final MRD1 in the reoperation group was 1.0 mm, vs an MRD1 of 2.1 mm in the successful group ($p<0.001$).

Conclusions: A double triangle FCI silicone frontalis suspension has a favorable outcome in a majority of pediatric patients with simple myogenic congenital ptosis. Sling failure may be due to rapid facial growth in young children and can be addressed with a second repair, using either fascia lata or silicone sling, depending on patient age.

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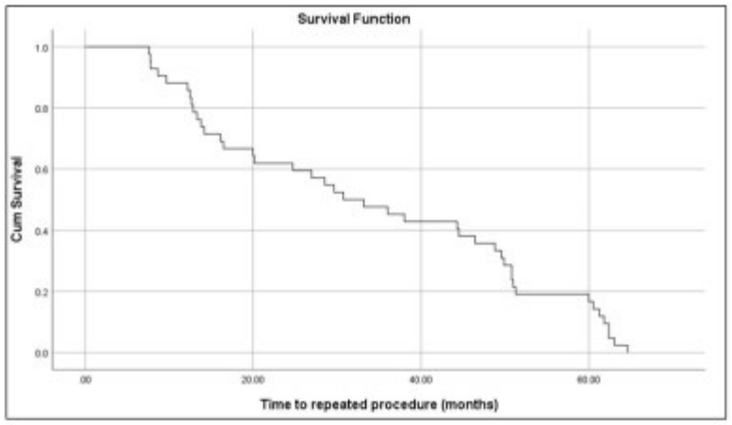
Figure 1

Figure 1. Kaplan-Meier curve demonstrating cumulative survival of 139 pediatric patients who underwent ptosis repair using double-triangle, frontalis suspension silicone slings. Event was defined as a repeated procedure, which was observed in 47 patients (34%), 34.2 months after the initial procedure.



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8:28 – 8:34 am

Lacrimal Gland Botulinum Toxin Injection for Tearing from Punctal Disease, Lacrimal Sacrifice During Cancer Excision, and a Faulty Lacrimal Pump: Experience in 41 Patients

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Introduction: Tearing is a common ophthalmic complaint that can cause irritation, decreased vision and unpleasant social interactions. Various etiologies can lead to bothersome tearing including hypersecretion or maladies with the tear drainage pathway. The treatment of these entities often requires surgical intervention, or in the case of a faulty lacrimal pump lacks satisfactory treatment options. Botulinum toxin (BT) injection has previously been described in the treatment of epiphora from gustatory tearing and lacrimal obstruction. Here we report our experience using lacrimal gland (LG) BT in treating tearing from several etiologies not previously reported in the literature including diseases of the puncta, lacrimal sacrifice from cancer excision and a faulty lacrimal pump. We also attempt to assess the pain of injection in a quantitative manner.

Methods: Retrospective non-comparative interventional series of 41 consecutive patients with subjective tearing treated with BT injections. Patients were offered more traditional treatments when appropriate based on etiology and surgical risk and either failed or deferred. Tearing severity and frequency were recorded in a semi-quantified manner from 0 to 4 based on grading previously described by Keegan at each visit.[1] Etiology of tearing was confirmed through complete ophthalmic exam. Schirmer test was conducted before treatment and at each subsequent visit. A transconjunctival 2.5u BT injection was performed into the LG after topical anesthetic. Patients graded injection pain using a Likert-type Wong Baker FACES Pain analog scale. Follow-up visits occurred at 1, 4, and 12 weeks. Patients who did not improve satisfactorily after 1 week were re-injected with 2.5u and a new follow-up regimen began with repeat injections dosed at 5u. If benefit persisted at 12 weeks, patients were called monthly until tearing returned and re-injection offered. Exclusion criteria included significant dry eye including Schirmer's test <10mm, follow-up <6 months among others.

Results: Table 1 summarizes the pertinent mean cohort data. Twenty three females and 18 males had a mean age of 57.7 years (range 19-93). The tearing etiologies included punctal occlusion (18 patients, 44%), lacrimal sacrifice from cancer excision (8, 20%), faulty lacrimal pump (7, 17%), punctal stenosis (6, 14%) and punctal agenesis (2, 5%). Reported injection pain was low at a mean of 0.2 (range 0-2), with 23 patients (81%) reporting no pain. Thirty seven (90.2%) improved within 1 week, and 40 (97.6%) improved within 4 weeks. The mean tearing severity and frequency declined sharply by week 1 (3.1 to 1.0, $p<0.05$; 3.5 to 1.1, $p<0.05$), and more gradually by week 4 (1.0 to 0.6, $p<0.05$; 1.1 to 0.7, $p<0.05$). The least amount of residual tearing was noted in patients with punctal stenosis and punctal occlusion.

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Two patients required additional 2.5u (5u total) injections, with 1 noting improvement and 1 having stable persistent tearing. Six patients (14.6%) improved subjectively without matching improvement in Schirmer testing. Thirty seven patients (90.2%) elected for repeat injections after a favorable clinical response. The mean frequency of re-injection was 3.3 months. Side effects noted with 2.5u dosing included 1 patient with dry eyes that resolved with lubricating drops. Mean follow-up was 33.1 months (range 6-68).

Conclusions: This may represent the first series describing LG BT for epiphora etiologies including punctal stenosis/occlusion, lacrimal sacrifice during cancer excision and a faulty lacrimal pump. Tearing severity and frequency improved in the great majority of patients, with the most drastic improvements noted for punctal stenosis and occlusion. Injections were well tolerated with low perceived injection pain scores, and a single patient with reversible dry eye as the only side effect noted. A re-injection rate of 90.8% reflects the high patient satisfaction rate. Although there is a theoretic risk of damage to the lacrimal secretory apparatus and dry eye with repeated trauma to the LG, we did not notice this to be a marked problem in our cohort who received a mean of 9.1 injections. Clinicians may wish to consider LG BT in patients who have failed, defer, or are suboptimal candidates for conventional treatment.

Figure 1

Diagnosis	# of Patients	Age	Sex	Severity, Frequency (Pre-Treatment)	Schirmer's test (Pre-Treatment)	Pain during injection	Severity, Frequency (1 week)	Schirmer's Test (1 week)	Severity and Frequency (4 weeks)	Schirmer's Test (4 weeks)	Frequency of Injections (mos)	# of Injections	Side Effects	F/u (mos)
Punctal Occlusion	16	63.1	6F, 10M	5.2,5.7	98	0.5	0.4 ,0.4	14.8	0.4 ,0.3	12.1	3.5	0.8	None	38.5
Lacrimal Sacrifice during CA Excision	8	77.1	1F, 7M	3.5, 3.8	46.1	0.3	2, 2	26.1	1.4, 1.5	23.5	3.3	0.9	1 DES	25.3
Faulty Lacrimal Pump	7	52.7	4F, 3M	4,3.6	43	0	1, 1.3	24.2	1,1.1	22.7	3	8.9	None	33.1
Punctal Stenosis	6	53.7	4F, 2M	2.6, 3.1	26	0.4	0.5, 0.4	13.4	0, 0	11	3.5	9.1	None	34.7
Punctal Agenesis	2	38.2	1F	4,4	34	0	1.8, 2.7	31	1.7, 1.8	29.2	3	12.1	None	38.1
Totals	41	57.7	21F, 19M	3.1, 3.3	42	0.2	1.0, 1.1	20.1	0.6, 0.7	16.2	3.3	9.1	1 DES	33.1

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8:34 – 8:40 am

Change in Lacrimal Gland Volume and Tear Production Following Treatment with Teprotumumab

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Introduction: Dry eye syndrome (DES) may be the most common cause of discomfort in thyroid eye disease (TED), occurring in up to 85% of patients.[1] Eyelid malposition plays an important role in disrupting the ability of the eyelids to protect the ocular surface. However, recent work has shown that mechanical factors, such as upper eyelid retraction, interpalpebral fissure distance, or proptosis, were not predictive of the development of DES in patients with chronic TED.[2] Enlargement of the lacrimal gland in TED has been found to correlate with subjective tearing.[3] We reviewed the impact of teprotumumab on the volume of lacrimal glands and tear production.

Methods: In this prospective longitudinal study, all patients presenting at our institution for the treatment of TED were considered for study eligibility. Patients who were currently on any other medical therapy for TED or had received rituximab or tocilizumab in the past were excluded. Primary outcome measures included a change in the volume of the lacrimal gland and the production of tears following treatment with teprotumumab. Secondary outcome measures included eyelid position: margin-to-reflex distance (MRD) 1, change in proptosis and change in clinical activity score (CAS). Three-dimensional volumetric analyses of the lacrimal gland were performed using previously validated image analysis software, MIMICS (Materialise, Leuven, Belgium).[4] Briefly, a mask of the lacrimal gland was created using high-resolution ((<1-mm thickness) CT scans by manual segmentation using all 3 image planes (axial, coronal and sagittal), slice by slice. A 3D model created by voxel addition was expressed in millimeters cubed. Tear secretion was measured by the Schirmer test in each eye for 5 minutes. The orbit with the worse proptosis was designated as the study orbit. Statistical analysis of the change in lacrimal gland volume or wetting with Schirmer's test was conducted using a dependent t test. Relationships between continuous variables were analyzed using bivariate and multivariate statistics. Intraobserver and interobserver variability for the calculation of lacrimal gland volume was calculated by having two observers doing all calculations twice on two separate days.

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Results: Twenty patients were included in the study. The mean (SD) age was 52 (13) years, and the mean (SD) duration of TED prior to therapy was 30 (35) months. All patients completed 8 infusions. Clinically, the mean (SD) CAS for the study eye was 5 (1.7) at baseline and 0.7 (0.8) post-treatment. Lacrimal gland volume (SD) decreased from 751 (349) mm3 to 418 (134) mm3 following treatment in the study orbit ($p < 0.01$). In the fellow orbit, mean (SD) lacrimal gland volume decreased from 576 (301) mm3 to 417 (134) mm3 ($p<0.05$) (Fig. 1). Wetting in the study eye during Schirmer's testing increased from 14.5 (10.5) mm at baseline to 22 (11) mm following treatment (Fig. 2). There were no associations between MRD1, proptosis, steroid use, and duration of TED with lacrimal gland volume or tear production.

Conclusions: Teprotumumab significantly reduces TED-related expansion of the lacrimal gland and increases tear production. These changes were significant in patients with acute and chronic TED.

Figure 1

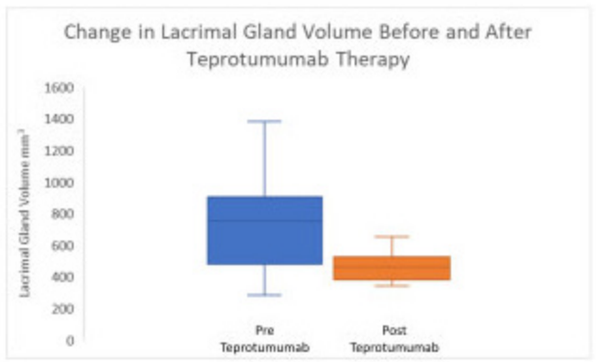
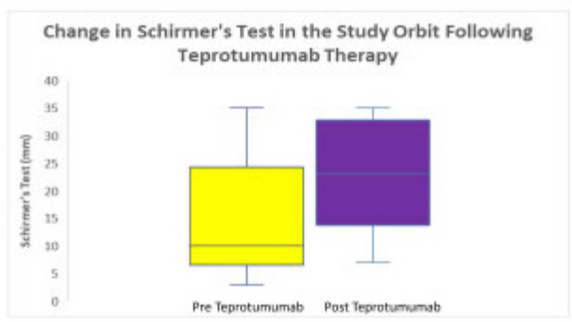


Figure 2



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8:40 – 8:46 am

Conjunctivodacryomaxillostomy: A Novel Alternative to Conjunctivodacryocystorhinostomy

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Introduction: To describe two patients with recurrent tube dysfunction after conjunctivodacryocystorhinostomy (CDCR), treated with Jones tube revision with maxillary placement of the Jones tube.

Methods: Retrospective case series of two patients with epiphora due to nasolacrimal duct obstruction (NLDO) and canalicular stenosis who underwent conjunctivodacryomaxillostomy (CDM) with placement of the Jones tube into the maxillary sinus.

Results: Case 1 is a 66-year-old gentleman with NLDO who initially underwent dacryocystorhinostomy (DCR). He developed recurrent epiphora and stenosis of the canaliculi, eventually requiring CDCR. Subsequent to CDCR, the Jones tube was removed secondary to intranasal displacement. He underwent repeat CDCR and due to scar tissue within the nasal space and recurrent displacement of the Jones tube, the decision was made to place the internal ostium of the Jones tube in the maxillary sinus rather than the nasal space. Dissection was carried down to the floor of the orbit just posterior to the orbital rim, and a curved hemostat was used to make a small opening in the orbital floor into the maxillary sinus. A size 24 mm long Pyrex glass Jones tube was placed into the maxillary sinus using a dental wire for guidance. He did well postoperatively and at 2 year follow up remained without epiphora and with patent Jones tube in good position. Case 2 is a 55-year-old woman who presented with bilateral epiphora due to bilateral NLDO and canalicular stenosis. She had previously undergone bilateral CDCR. She developed recurrent left-sided epiphora due to intranasal migration of the left Jones tube, with occlusion of the internal ostium by the nasal septum (Figure 1). She underwent left Jones tube exchange, again with recurrent migration and occlusion of the Jones tube. She was referred to otolaryngology and declined septoplasty. As an alternative, a transconjunctival incision was made near the inferomedial fornix, and a StopLoss (FCI Ophthalmics, Paris, France) Jones tube was introduced into the maxillary sinus. The tube remained in good position on follow up and with resolution of epiphora at 3-month postoperative follow-up.

Conclusions: For patients with recurrent Jones tube complications, CDM, or transconjunctival placement of the Jones tube into the maxillary sinus, is an alternative to revision of conventional CDCR.

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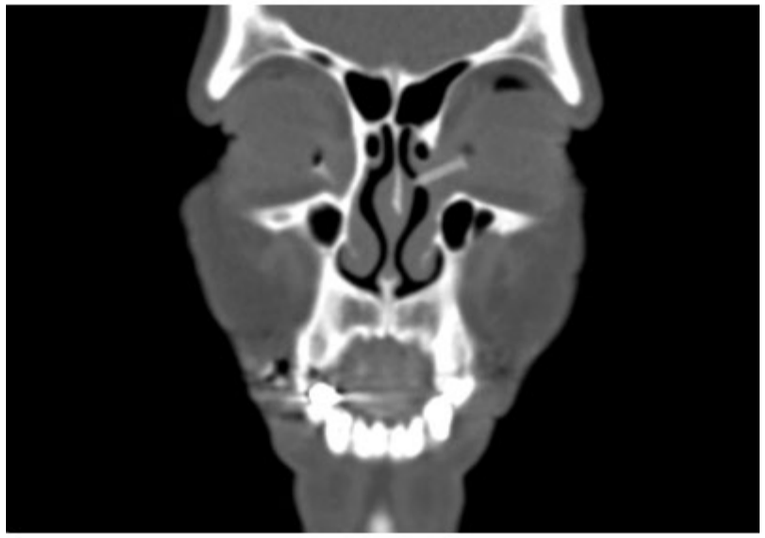
Figure 1: Coronal section of the maxillofacial computed tomography for case 2, demonstrating bilateral Jones tube placement, a large osteotomy on the left side, cramped intranasal anatomy, and the internal ostium of the left Jones tube abutting the nasal septum.



All times listed in Central Time

Moderator: Thomas E. Johnson

9:04 – 9:27 am

Power Foods for the Brain

Neal D. Barnard, MD, FACC

10:02 – 10:08 am

Use of Deep-Learning to Automatically Detect Eyelid and Orbital Disease from Photographs

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Introduction: Limited access to healthcare, rising health care costs, and delayed diagnosis or referral of ocular pathology limits our ability to provide quality care to our patients. Recent computer vision advances provide an objective approach to quantify ocular regions and landmarks, allowing for remote diagnosis of eyelid abnormalities. Our aim is to develop an approach based on deep-learning networks (DLN) to automatically detect eyelid position abnormalities from digital photographs.

Methods: Manual annotation of ocular landmarks were performed with photos from the public Chicago Face Database (CFD) to train semantic segmentation DLN (SegNet, DeepLab v3+). F1 score was used to compare performance across DLN. Segmentation of the upper and lower eyelids and limbal margins were performed using edge detection and circular Hough transform algorithms, respectively. Photos were scored both manually and automatically for ptosis and eyelid retraction. Then the Eyemeter program was used to evaluate photographs of oculoplastic clinic patients. 10 clinical photos of ptosis patients and 24 thyroid eye disease (TED) patients were evaluated by trained ophthalmologists and Eyemeter to assess the accuracy of Eyemeter for detection of known clinical disease.

Results: DeepLab v3+ was the best performing DLN (F1 score = 0.93). 71% (n=77 images) cases of ptosis and 80% (n=57 images) of retraction were correctly identified by DLN. MRD1 values measured in clinical photos by trained ophthalmologists and Eyemeter revealed agreement (Intra-Class Coefficient, ICC) of 0.61. Good correlation between measurements by Eyemeter and trained ophthalmologists was also seen for detection of retraction in thyroid eye disease (ICC=0.79), but the DLN had a higher failure rate in segmenting the corneoscleral region of TED patients, as opposed to healthy subjects.

Conclusions: Deep-learning models can accurately detect common eyelid position abnormalities from photographs, suggesting a potential role for use in screening, early detection, and close follow up of ocular disease. Additional optimization of our program is necessary, along with analyzing a large photo database to increase the accuracy of disease detection.

10:08 – 10:14 am

Effect of Subcutaneous Tranexamic Acid on Hemostasis and Ecchymosis in Upper Eyelid Blepharoplasty: A Double-Blind, Placebo-Controlled, Randomized Clinical Trial

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Introduction: Upper eyelid blepharoplasty is a common surgical treatment for dermatochalasis. Excess intraoperative bleeding can prolong surgical time and increase cautery use with subsequent scarring. Postoperative bleeding may lead to delayed healing, prolonged recovery, patient discomfort, and visual loss from post-septal dissection – all preventing patients from resuming normal activities in a timely manner. This is of particular concern for patients having cosmetic blepharoplasty. Tranexamic acid (TXA) is a synthetic lysine analogue that acts as an antifibrinolytic halting the lysis of fibrin clots by preventing plasminogen activation to plasmin. TXA has been used safely systemically and locally to reduce bleeding in periocular surgery, facelift, rhinoplasty, dermatologic procedures, and various other procedures. A small pilot study by Sagiv et al did not find a statistically significant difference in bleeding during upper blepharoplasty when TXA was used in a local anesthetic injection. The aim of this study was to assess the hemostatic effect of subcutaneous TXA during upper blepharoplasty.

Methods: This is a prospective, randomized, placebo-controlled, double-blind study of consecutive patients undergoing bilateral upper blepharoplasty by a single surgeon (RS) between 11/2020 - 3/2021. Exclusion criteria included a personal/family history of thromboembolic event, oral contraceptive use, factor V Leiden mutation, allergy to TXA, systolic BP > 200, prior history of upper lid surgery or trauma, additional concurrent surgeries planned, and follow-up < 1 month. Anticoagulants were held 7 days prior to surgery. Patients were randomized to receive TXA in one eyelid while the contralateral lid received placebo. 1.5ml of local anesthetic was injected per lid. TXA is provided in a concentration of 100 mg/ml. The TXA solution contained 0.67ml of 1% lidocaine with epinephrine 1:100,000 + 0.67ml of 0.5% bupivacaine with epinephrine 1:200,000 + 0.15ml of TXA yielding a concentration of 1mg TXA / 1ml local anesthetic. The placebo solution was similar except 0.15ml normal saline replaced the TXA. The patient and surgeon were blinded to which lid received which injection. Skin-only blepharoplasty was performed without sedation. Scalpel skin incision began 15 minutes after local injection. High-temperature cautery was used for skin excision and hemostasis. Wounds were closed with running 6-0 plain gut. Operative and cautery time were recorded by nursing staff. Post-operative instructions included icing and head elevation. Photos were taken at post-operative day (POD) seven. Two blinded oculoplastic surgeons scored ecchymosis on each side using the 4-point Winker-Black bruising scale. Patients recorded the POD the ecchymosis resolved for each side.

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Results: A summary of patient outcomes is illustrated in Table 1. 110 patients, 68 (62%) of whom were female, had a mean age of 65.6 years (range 38-87). Duration of cautery and surgery, POD7 ecchymosis grade, and duration to ecchymosis resolution were all significantly less for the TXA group than the placebo group ($P<0.05$ for all variables). The mean differences were 43 seconds of cautery time, 1.8 minutes of surgical time, and 3.3 days until ecchymosis resolution. No complications including thromboembolic events were noted in the TXA group.

Conclusions: Subcutaneous TXA in local anesthetic proved safe and effective at reducing bleeding resulting in less cautery and surgical time, less ecchymosis on POD7, and a shorter duration of ecchymosis in this upper blepharoplasty cohort. Given that intra- and postoperative hemostasis plays an important role in preventing complications and optimizing outcomes, clinicians may wish to consider use of TXA for upper blepharoplasty. Future studies are warranted to investigate ideal route and dose of TXA, utilization in patients taking anticoagulants, and its role in other oculofacial surgeries.

Figure 1

	TXA	placebo	p-value
Duration of surgery (mins)	12.1	13.9	0.032
Duration of cautery (secs)	24	73	0.001
POD7 ecchymosis (0=none, 1=mild, 2=mod, 3=severe)	0.9	1.6	0.014
Duration until ecchymosis resolution (days)	12.3	15.6	0.026

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10:14 – 10:20 am

The Association of Suture Type with Foreign Body Granuloma Formation

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Introduction: Benign, granulomatous inflammatory reactions known as foreign body granulomas can develop from suture material within the skin or subcutaneous tissues. Management of a suture granuloma post-operatively can include topical steroids to reduce inflammation or surgical removal of the offending suture. Anecdotally, certain suture materials may be more prone to developing granulomas. There have not been any large studies comparing the incidence of granuloma formation with regards to suture type. The current study evaluates commonly used sutures in periocular surgery and looks to identify their possible association with developing a suture granuloma.

Methods: A retrospective review of medical records between 2016-2020 identified patients who had canthal surgery: ectropion repair, entropion repair, medial canthopexy, lateral canthopexy or canthoplasty. Data collected included patient age, gender, surgeon, date of procedure, procedure type, laterality, suture type, duration of follow up, and presence of a suture granuloma. If a granuloma was documented, additional information obtained included time to diagnosis, histopathological findings (when obtained), management, and overall outcomes. Statistical analysis was performed using Stata 14.2 Software (College Station, TX). Descriptive statistics were reported as mean and standard deviation for continuous variables, and as frequencies or proportions for categorical variables. Univariate and multivariate logistic regression (with a penalized likelihood approach given the rarity of the outcome of interest) and effect modification were performed to identify variables with statistically significant associations with granuloma formation. Effect estimates were reported as odds ratios.

Results: The study included 732 procedures from 2016-2020. Seven commonly used suture materials were identified including nylon, polydioxanone, polyester, polyester with polybutylate coating, polyester with polytetrafluoroethylene coating, polyglactin 910, and polypropylene. The most frequently encountered procedure was ectropion repair (n=436) followed by entropion repair (n=117). Overall, 18 granulomas were observed (2.5%) with eight identified histopathologically and 10 diagnosed clinically due to a painful nodule with overlying inflammation not resolving over weeks. The average duration to granuloma diagnosis was 93.6 days after surgery. Fifteen of the granulomas were associated with polyester, two with polyester with polytetrafluoroethylene coating, and one with polypropylene. After controlling for confounders, patients who received polyester suture were 28.4 times more likely to develop a granuloma than those who received polyglactin 910 suture (p = 0.032). When grouped by category, nonabsorbable, braided sutures were 23.8 times more

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likely to lead to granulomas than absorbable, braided sutures (p = 0.036). There were no other covariates with a significant association to granuloma development, and there was no significant effect modification by sex.

Conclusions: Treatment of a suture granuloma may necessitate additional surgery. Therefore, it is essential that surgeons are aware of the factors associated with their formation. Our study demonstrates that the incidence of suture granuloma formation is low. Importantly, permanent braided sutures, specifically polyester, have a significantly increased risk of suture granuloma development. Permanent monofilament or resorbable braided sutures should be considered as an alternative when possible. To our knowledge, this is the first study in the literature to assess the association of suture type and other factors to suture granuloma formation.

10:20 – 10:26 am

The Utility of Preoperative Phenylephrine Testing in Mullers Muscle Conjunctival Resection Surgery for Involutional Ptosis

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Introduction: Classically, preoperative testing of ptosis patients utilizing topical phenylephrine is employed widely in decision-making regarding the selection of Mullers Muscle Conjunctival Resection (MMCR) surgery, the assignment of resection length, the utilization of tarsectomy augmentation, testing for Hering sign, and the demonstration of predicted results to patients[1-3]. However, the literature regarding accuracy and predictability of this test is mixed, suggesting questionable utility[4-7]. This investigation describes results of MMCR surgery without preoperative phenylephrine testing.

Methods: In this multi-institutional, cross-sectional study, patients undergoing MMCR surgery at one of four centers were screened for study entry. Patients were included if they presented with involutional ptosis and levator excursion >12mm. Patients undergoing concurrent upper eyelid surgery, with a prior history of ptosis surgery or trauma, or with follow-up <2 months were excluded. Demographic, clinical, and MRD1 data were extracted. Two groups were collected – those undergoing preoperative phenylephrine testing (control) and those who did not (case). The latter group was derived from historical cases. The primary outcome measure was final MRD1 at the last follow up visit. Secondary outcomes include change in MRD1, requirement for reoperation and predictive capacity of phenylephrine testing. Bilateral and unilateral cases were compared separately and as a combined sample. Analysis was performed utilizing SPSS for Mac V27.

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Results: A total of 270 eyelids, 154 cases and 116 controls, met criteria and were included in the analysis. Mean (SD) age of the total sample was 62.6 (15.9) years and 68.5% were female. Mean (SD) preoperative MRD1, resection length and postoperative MRD1 were 1.26 mm (0.89), 7.4 mm (1.3) and 3.07 mm (1.09) respectively. There were no significant differences in pre-operative MRD1, resection length, postoperative MRD1 or rate of reoperation between the groups (Table 1). These results did not differ between the unilateral and bilateral samples. The mean (SD) measured ratio of resection:elevation was 5.9 (27.7) and the post-phenylephrine pre-operative MRD1 predicted the postoperative MRD1 within 1mm for 60.2% of cases. The prediction was lower than the outcome in 56.5% of cases.

Conclusions: In this multi-institutional study, the outcome of MMCR surgery was not significantly different between patients undergoing pre-operative phenylephrine testing and those that did not. Phenylephrine testing produced an accurate representation of surgical outcome (within 1 mm) approximately 60% of the time, over- and underestimating approximately equally. The utility of preoperative phenylephrine testing in MMCR surgery is debatable and may not need to be universally employed.

Table 1

Table 1: Patients undergoing MMCR ptosis surgery with preoperative phenylephrine testing (Control) and without (Case)

	Control	Case	p-value
Levator function	14 (2.35)	13.71 (4.19)	P=0.514
Tissue Resected (mm)	7.39 (1.38)	7.35 (1.29)	P=0.840
Preoperative MRD1 (mm)	1.29 (0.98)	1.24 (0.83)	P=0.658
Postoperative MRD1	2.97 (1.14)	3.15 (1.05)	P=0.165

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10:26 – 10:32 am

Optimizing Management of Asymmetric Ptosis: A Comparison of Three Posterior Approach Resection Algorithms

Kelsey Roelofs[1], Teresa Chen[2], Kendall Goodyear[2], Robert Goldberg[2], Daniel Rootman[2]
[1]UCLA Jules Stein Eye Institute, Division of Oculoplastic Surgery, Los Angeles, California, United States, [2]Division of Orbital and Ophthalmic Plastic Surgery, Jules Stein Eye Institute, University of California, Los Angeles, California, United States

Introduction: Mullers Muscle Conjunctival Resection (MMCR) is a commonly performed ptosis procedure,[1] and several algorithms have been proposed to determine the amount of tissue resection.[2,3] The purpose of this study was to compare the efficacy of three resection techniques in the management of patients with asymmetric ptosis.

Methods: Patients undergoing bilateral MMCR surgery were identified. Standardized pre-operative clinical photographs were examined and margin reflex distance 1 (MRD1) was measured using ImageJ. Patients presenting with ≥1mm of asymmetry in MRD1 were included. Operative reports were reviewed to determine the amount of tissue resected. Patents were divided into three groups: variable resection (determined by the surgeon's nomogram with the lower side receiving a greater resection length), fixed resection (7mm bilaterally), and tarsectomy (7mm with 0.5 – 1.0 mm of tarsus resected on the lower pre-operative side). Post-operative MRD1 was measured from photographs obtained 3-months after surgery. The primary outcome measure was postoperative asymmetry. Secondary measures included net change in asymmetry (net change irrespective of higher eyelid laterality) and absolute change in asymmetry (total change including reversal).

Results: A total of 92 patients with a mean age of 70.7 ± 11.0 years were included. Mean follow up time was 4.7 ± 7.0 months. Forty patients underwent variable resection, 32 were treated with a fixed resection, and 20 patients had a tarsectomy on the lower pre-operative eyelid. There were no differences between the three groups with respect to length of follow up (p=0.627). No significant differences in MRD1 of the higher or lower eyelid were noted at the pre-operative time point (p=0.503 and p=0.138).

Pre-operative asymmetry was greater in the tarsectomy group than the other two (p=0.001). Postoperative asymmetry was not found to be significantly different between the groups (p=0.108). Absolute change and net change in asymmetry were greater in the tarsectomy group (p=0.001 and p=0.016, respectively). The proportion of cases in which the lower eyelid pre-operatively became higher post-operatively was not significantly different between the three groups (p=0.150).

On multivariate analysis, the only significant predictor of absolute change in asymmetry was pre-operative asymmetry (p<0.001). Surgical group was not a significant predictor of absolute change in asymmetry (p=0.723).

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Conclusions: Resection amount and technique did not predict post-operative outcomes in cases of asymmetric ptosis. This may support the hypothesis that improvement in eyelid position and symmetry is due to a dynamic system, rather than a result of purely mechanical forces.

Figure 1

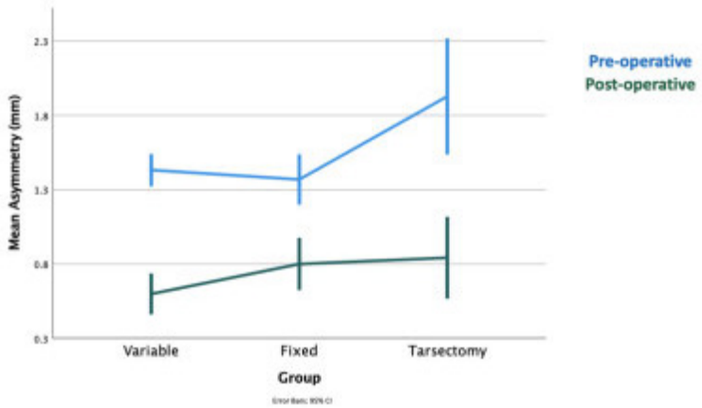

Figure 1. Comparison of pre- and post-operative asymmetry between the three surgical groups demonstrating similar post-operative symmetry in eyelid position regardless of surgical technique selected.

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10:32 – 10:38 am

Elastase Treated Cartilage: Feasibility As a Tarsal Substitute for Use in Eyelid Reconstruction

Justin Karlin[1], Joseph Park[2], Somaye Jafari[2], Joseph Demer[2]
[1]Stein and Doheny Eye Institute UCLA, Los Angeles, California, United States, [2]Stein Eye Institute UCLA, Los Angeles, California, United States

Introduction: Upper eyelid reconstruction can be challenging when most or all is missing due to trauma or tumor excision. Repairing defects exceeding 50% of the area of the upper eyelid is may require use of contralateral eyelid tarsal free grafts or pedicled flaps, such as reverse Hughes or Cutler-Beard type procedures. There are currently no xenograft or allograft tarsal substitutes that can routinely be placed in the upper eyelid. Although auricular cartilage is abundant, and may have thickness similar to native tarsus, the presence of elastin protein makes auricular cartilage too stiff to use as a superior tarsal substitute because such rigidity may damage the cornea during blinking. Removal of elastin from auricular cartilage using elastase might sufficiently soften cartilage to render it useful as a tarsal substitute in upper eyelid reconstruction.

Methods: Porcine auricular cartilage (Sierra for Biomedical Science, Whittier, CA) was harvested and incubated in elastase (CAS Number 39445-21-1, Sigma-Aldrich) reconstituted in Tris buffer, pH 8.0 to a final concentration of 1 U/mL, and incubated at room temperature for 24 hours. Samples of elastase treated cartilage, and buffer treated control cartilage, were fixed in formalin and stained using Masson trichrome for microscopy. A horizontal tensile loads cell incorporating a linear motor (Ibex Engineering, Newbury Park, CA) and a force sensor (LSB200, FUTEK, Irvine, CA) having 5 mN resolution, and a spherical indenter, 0.3 mm diameter) were used for indentation testing. At 37° C temperature, the indenter tip, once in contact with the sample surface, was advanced to 0.15 mm depth at 0.2 mm/sec nominal loading rate that was maintained for 300 seconds. Indentation was performed at three positions on each of three samples of elastase treated cartilage, and three samples of control cartilage. Young modulus (MPa) was calculated using the Hertzian method.

Results: Gross examination indicated that elastin treatment increased specimen flexibility. Microscopy showed that elastase treated specimens had more haphazardly arranged and lower density perichondrium as compared to control specimens. Elastase treated samples exhibited lower mean (SD) compressive Young modulus than controls, instantaneously [E0] 1.27 x 102 (3.0 x 102) vs. 1.18 x 105 (5.58 x 104) MPa and at equilibrium [E∞] 7.19 x 102 (3.4 x 102) vs. 2.23 x 100 (7.0 x 10-1) MPa.

Conclusions: Elastase treatment of porcine auricular cartilage increased its flexibility and the irregularity of its perichondrial weave. Mechanical indentation testing revealed that elastase treated cartilage exhibited decreased instantaneous and equilibrium Young modulus during compressive loading. Taken together, these data suggest that auricular cartilage softened by elastase could feasibly be used in eyelid reconstruction as an autograft or xenograft, as a substitute for tarsus grafts or pedicled tarsoconjunctival flaps.

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Figure 1

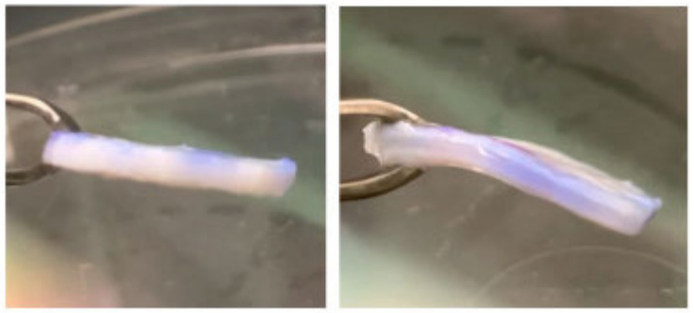

Figure 1. Gross appearance of control cartilage (left) and elastase-treated cartilage (right).

Figure 2

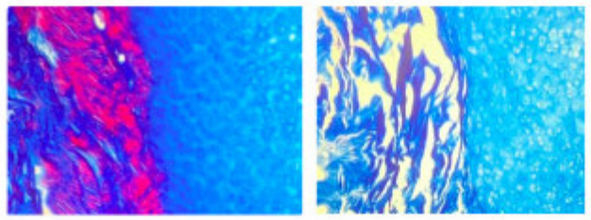

Figure 2. Histopathologic appearance of control cartilage (left) and elastase treated cartilage (right) (x40 magnification, Masson trichrome stain). These slides depict the junction between the cartilage proper and the perichondrium. Compared to the control cartilage, in the elastase treated sample the density of the perichondrium is decreased and the perichondrial fibers are more haphazardly arranged.

Figure 3

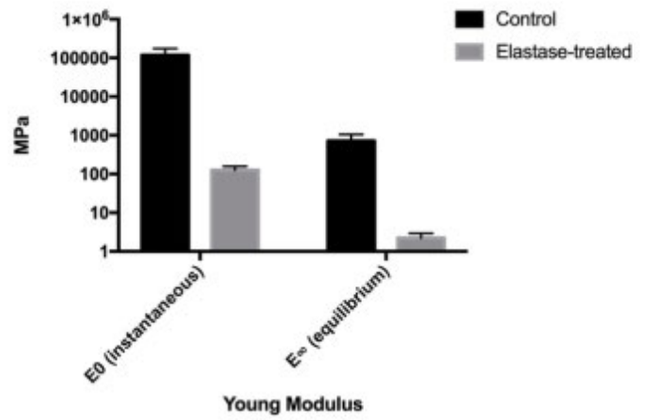

Figure 3. Compressive Young modulus (MPa). E_0 (left pair of bars) represents the Young modulus instantaneously during indentation (time = 0), E_∞ (right pair of bars) represents the Young modulus equilibrium (time = ∞). The mean of three successive measurements of compressive Young modulus on control cartilage (black bars) and elastase treated cartilage (grey bars) is shown. Whiskers represent standard deviation. Control cartilage demonstrated greater mean (SD) E_0, 1.27×10^2 (3.0×10^2) vs. 1.18×10^5 (5.58×10^4) MPa and E_∞, 7.19×10^2 (3.4×10^2) vs. 2.23×10^0 (7.0×10^{-1}) MPa.

10:38 – 10:44 am

Medical Cannabis Oil for Benign Essential Blepharospasm – A New Horizon of Treatment: Prospective, Randomized Controlled Pilot Study

Ofira Zloto[1], Alon Weisman[1], Inbal Avisar[2], Tal Serlin[1], Daphna Landau Prat[1], Guy Ben Simon[1]
[1]Goldschleger Eye Institute, Sheba Medical Center, Tel-Hashomer, Israel affiliated to Sackler Faculty of Medicine, Tel-Aviv University, Tel Aviv, Israel, Ramat Gan, Israel, [2]Rabin Medical Center, Petach Tikva, Israel affiliated to Sackler Faculty of Medicine, Tel-Aviv University, Tel Aviv, Israel, Petach Tikva, Israel

Introduction: To examine the efficacy and safety of medical cannabis in benign essential blepharospasm (BEB).

Methods: This is a prospective, double blind, placebo-controlled, randomized study. Adult BEB patients who were previously treated successfully with botulinum toxin A (BTX-A) injections between 3/2019 to 2/2020 were recruite. All study patients were randomly allocated to two groups in a 1:1 ratio: treatment and control (placebo) group. In the first 6 weeks, the treatment group used the cannabis and the control group the placebo oil. In the second half of 6 weeks both groups were treated with medical cannabis. The dose was gradually increased for each patient depending on the effect and tolerability of the cannabis. The differences between the groups in number of spasms attacks, duration of each spasm (in minutes) , spasm degree (1-4) and number of drops.

Results: Six patients were included, 3 in each group. In the first six weeks, the mean duration of spasm attack was 4.29 minutes in the treatment group and 73.9 minutes in the placebo group ($p<0.01$). In the last 6 weeks, the treatment group used 6.27 drops in average while the placebo group used 5.36 drops ($p=0.478$). There were 61 spasm events in the treatment group and 94 spasm events in the placebo group ($p=0.05$). The mean duration of spasm attack was 1.77 minutes in the treatment group and 8.96 minutes in the placebo group ($p<0.01$). Mild side effects including; general fatigue, dry mouth and insomnia.

Conclusions: Medical cannabis (mainly THC) can be an effective and a safe treatment for BEB as a second line after botulinum toxin A injections when used for 3 months. No significant ocular or systemic side effects were associated with treatment.

FEATURED SPEAKER: NEAL D. BARNARD, MD, FACC

Thursday, November 11

All times listed in Central Time

Moderator: Kathleen F. Archer

10:51 – 11:11 am

Your Body in Balance: The New Science of Food, Hormones, and Health

Neal D. Barnard, MD, FACC

11:16 – 11:22 am

Changing Trends in Asian Blepharoplasty – Are Beauty Perceptions Evolving?

Cat N. Burkat[1], Mariah Boldt[2]

[1]University of Wisconsin-Madison, Oculoplastics, Orbital, & Cosmetic Facial Surgery; Department of Ophthalmology & Visual Sciences, Madison, Wisconsin, United States, [2]University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin, United States

Introduction: Traditional teaching of upper blepharoplasty in patients of East Asian descent typically emphasizes the critical concept of preserving the original ethnic appearance, with attention to the low eyelid crease height and maintenance of the epicanthal fold. More recently, increasing numbers of Asians in the United States are seeking aesthetic blepharoplasty, especially at younger ages. Most published recommendations and clinical evidence reference Western aesthetic ideals, while stating that Asians differ in terms of attitudes to beauty and structural facial anatomy, and prefer to not have "westernized" eyelids. This study sought to assess whether Asian patients seeking cosmetic upper blepharoplasty prefer to maintain these typical features, using representative internet images and images of themselves, with or without digital alteration.

Methods: Patients desiring cosmetic Asian blepharoplasty were evaluated in regards to eyelid crease height, tarsal show, fat, epicanthal fold, MRD1, and their desired outcome. Discussion included showing each patient preselected internet images of representative Asian eyelid appearances to illustrate variations in: low vs high crease heights, epicanthal fold preservation or epicanthoplasty, tarsal platform show. Patient preference was noted, and then a curved eyelid crease simulator device was used directly on the patients to replicate the various configurations and epicanthal variations shown, and photos taken of each (Figure 1). The patients then reviewed their own images and again selected which they preferred. These selections were compared to their selection of internet photos/celebrities, to see if their initial desired outcome was the same once seen on their own face. In some, variations were further demonstrated by digitally altering the upper eyelid anatomy. It was also noted whether their desired results were images of their youthful self, vs Asian celebrities or altered selfies (via phone applications/social media), and if they were born in or outside the US.

Results: 19 patients of East Asian descent between 2018-May 2021 underwent cosmetic upper blepharoplasty via a full incision and eyelid crease reformation. 42% preferred concurrent epicanthoplasty to debulk subcutaneous epicanthal tissue and posteriorly tack the medial crease higher. 80% of patients requested a second consult to rediscuss crease height/epicanthus, and of those, 30% changed

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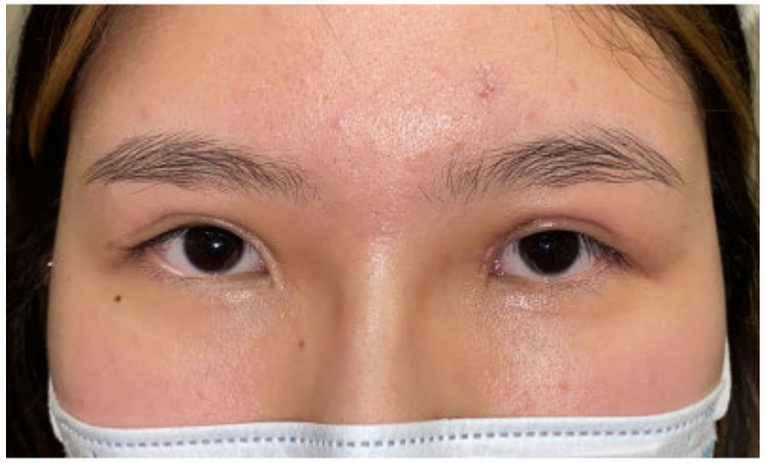
their original request to now preferring epicanthoplasty. On follow-up at least 3 months later, all were pleased with the outcome, but 26% stated they would now be interested in further crease elevation, in contrast to how they felt preoperatively; they had become used to the higher crease/greater tarsal show during the early postoperative period when the pretarsal edema resulted in a temporary elevated eyelid crease. Patients born in Asia and recently relocated or studying locally had a greater tendency to preserve ethnic features, compared to second/third generation, or adopted, patients who tended towards higher creases and epicanthoplasty. More patients who showed online/celebrity images vs younger photos of themselves preferred a more westernized appearance.

Conclusions: While many Asian patients seek optimization of intrinsic ethnic features, younger patients may now be trending towards eyelid creases at 8-11mm, or higher (Figure 2), and softening of epicanthal folds. Direct simulation of the outcome on the patient's eyelid is helpful in preoperative discussion. Further studies are needed to determine geographic variations within the US and current trends in Asia, but the physician should be aware that traditional concepts in teaching may be evolving to a new ideal of the attractive Asian eyelid.

Figure 1

Figure 2



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11:22 – 11:28 am

Fascial Attachments of the Facial Artery – An Anatomical Assessment of the "Danger Zones" Associated with Filler Related Vascular Events

Shoaib Ugradar[1], Jonathan Hoenig[1,2]
[1]Oculoplastics, UCLA, Los Angeles, California, United States, [2]Beverly Hills, Private Practice, Los Angeles, California, United States

Introduction: Given the increase in rise of the popularity of filler injections, there has also been a concomitant rise in filler related vascular events. These may include blindness, stroke or death[1]. The current consensus to prevent these events involves avoiding or being cautious in areas designated "danger zones.[2]" Broadly, these zones reflect the course of the facial artery in the midface. In this study, we review the anatomy and fixation of the facial artery along its course to determine if regions of greater fixation correspond to areas most associated with vascular events.

Methods: The facial artery was dissected from both sides of 3 cadavers by a facial plastic surgeon with 30 years' experience. The cadavers were donated to our institution for research purposes. Dissection was started at the neck, to identify the external carotid artery and subsequently the facial artery. At this point, Methylene blue was injected to highlight the course of the vessel. Dissection was carried out layer by layer, from the skin, until the facial artery was visualised, care was taken not to disturb the fascial attachments of the arteries. Once each segment was identified, a 5/0 Nylon suture was passed under the vessel, care was taken not to pierce it. The vessel was then distracted off the cadaver, perpendicular to the surface of the face. A dynamometer (FG – 3500, Shimpo, Glendale Heights, IL, USA) was used to measure the force required to distract the vessel 10 mm off the surface. These measurements were made at regions corresponding to the angle of the jaw, mid way between the angle of the jaw and the inferior labial artery, inferior and superior labial arteries and the angular artery (at the take-off of the lateral nasal artery). An ANOVA was used to analyse differences between regions of the same cadaver and a dependent t test was used to analyse differences between differences within the same regions of different cadavers. Further, sections of the facial artery corresponding to the aforementioned regions were sent for tissue analysis to review the fascial attachments of the vessel in these areas. Immunohistochemical analysis with Hematoxylin / Eosin and Trichrome – Masson (stains connective tissue) was used for qualitative analysis.

Results: The mean (SD) force required to distract the facial artery at the angle of the jaw was 1.3 N (0.4), 0.1 N (0.06) at the level midway between the engle of the jaw and inferior labial artery, 0.9 N (0.3) at the level of the inferior labial artery, 1.6 N (0.2) at the level of the superior labial artery and 3.2 N (0.83) in the angular artery at the level of the lateral nasal artery. There was a significant difference between the forces required to distract the vessels at different portions of the face ($p < 0.05$). Further, there was a greater amount

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of collagen (indicating fascial attachments) around the facial artery at the level of the lateral nasal artery and also the superior labial branch compared to other regions.

Conclusions: The results of this study indicate that the facial artery has a greater amount of fascial attachments in regions corresponding to previously identified danger zones. In these regions, fascial coverings anchor the artery onto underlying tissue, rendering it immobile and therefore more likely to be perforated.

References

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11:28 – 11:34 am

Choroidal Ischemia After Self-Injection of Hyaluronic Acid Filler Into the Temple

Aliza Epstein[1], Donovan Reed[1], Clio Armitage Harper[2,3], Tanuj Nakra[1,3], Marie Somogyi[1,3]
[1]TOC Eye and Face, Austin, Texas, United States, [2]Austin Retina Associates, Austin, Texas, United States, [3]Ophthalmology, The University of Texas at Austin Dell Medical School, Austin, Texas, United States

Introduction: Cosmetic filler injections are a popular nonsurgical treatment for facial rejuvenation, with hyaluronic acid (HA) fillers most commonly utilized given their reversibility and low side effect profile.[1] However, HA injection carries risk of rare but serious complications, including tissue necrosis, ischemia, and blindness. The primary mechanism of vision loss involves injection site arterial perforation and retrograde passage of filler to the ophthalmic artery and its branches.1 Therefore, ophthalmic complications vary depending on location and size of vessel occlusion.[2] Herein, we describe a case of a patient who self-injected HA into the temple and cheek leading to vision loss. Unlike most reports of filler-related vision loss in the literature, we provide objective visual acuity measurements and retinal imaging related to our case.

Methods: Case Report

Results: A 34-year-old woman self-injected 0.4 cc of HA filler into the right temple and cheek using a 27-gauge needle. Approximately 50 minutes after injection, right eye visual changes were noted, and the patient ingested three tablets of aspirin 325 mg. Ophthalmic evaluation two and a half hours after injection revealed visual acuity of 20/50 in the right eye and 20/20 in the left eye, right eye intraocular pressure of 14 mmHg, normal pupillary reaction without an afferent pupillary defect, and full ocular motility. There was mild erythema and normal capillary refill at the injection sites, without skin mottling or necrosis. Four hundred units of hyaluronidase were injected at the temple and over the zygoma, as well as 300 units into the retrobulbar space. The retina and optic nerve appeared normal on dilated fundus exam. Topical timolol and oral acetazolamide (500 mg BID) were initiated. The following day, vision had improved to 20/20 and fluorescein angiography (FA) revealed normal retinal filling with patchy choroidal ischemia temporal to the macula and inferonasal to the optic nerve (Figure 1). Choroidal filling defects were confirmed on indocyanine green fluorescence (ICG) imaging (Figure 2). There were no visual fields defects seen on 30-2 Humphrey visual field (HVF) testing. One week later, visual acuity remained at 20/20 without change in choroidal defects on FA or ICG imaging (Figure 3).

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Conclusions: The cosmetic filler injection sites at highest risk for visual complications include the glabella, nasal dorsum, and nasolabial fold.[3] A less commonly reported injection site leading to vision loss is the temple. Direct injection of the superficial temporal artery can lead to retrograde embolization to the ophthalmic artery via supraorbital artery anastamoses.[1,4] The severity of vision loss varies depending on the location and extent of vessel occlusion. In our case, FA and ICG confirming choroidal ischemia with normal retinal circulation suggested localized posterior ciliary artery occlusion.[2] Treatment protocols for filler related vision loss vary. Retrobulbar hyaluronidase is often attempted as treatment for vision loss after hyaluronic acid filler injection, without firm evidence to bolster its utility given lack of objective vision and retinal imaging included in reports.[5] In our patient, prompt treatment with hyaluronidase injection lead to objective vision improvement despite continued evidence of choroidal filling defects one week after injection.

Figure 1

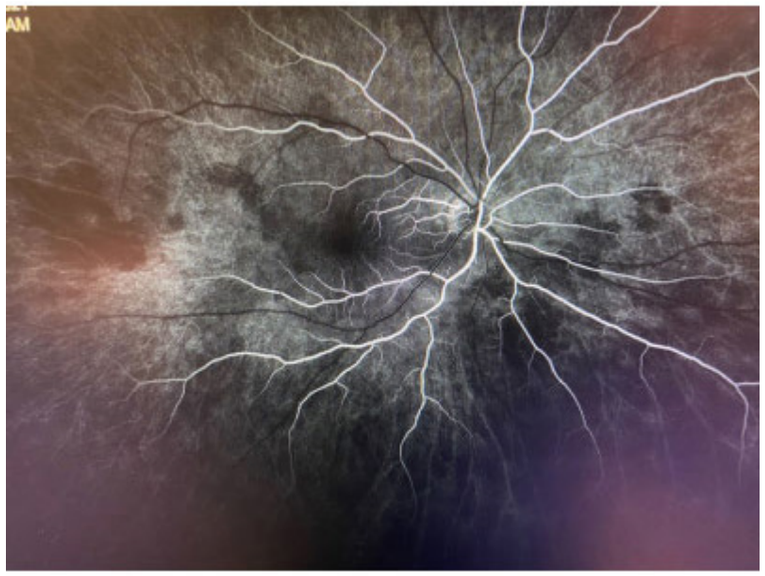


Figure 2

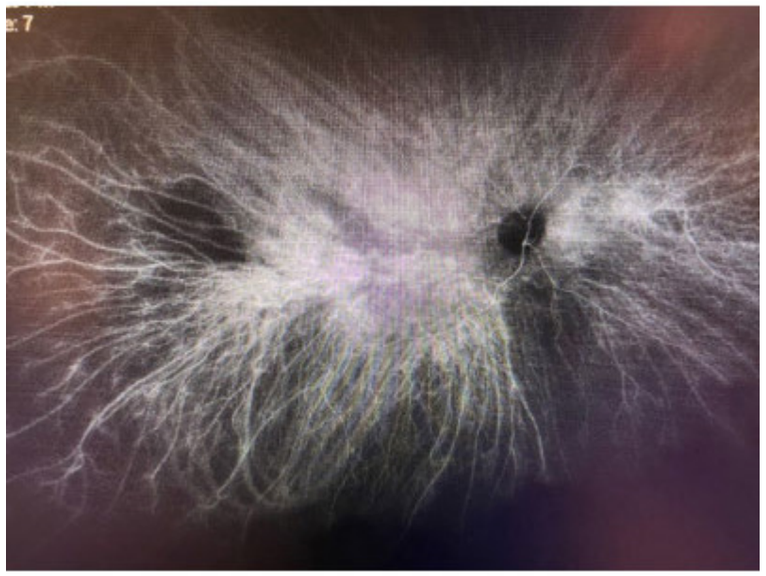
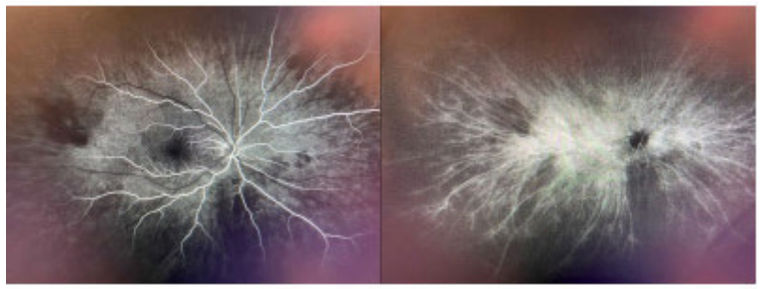


Figure 3



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11:34 – 11:40 am

Lateral Band Platysma Paddle for Powerful Neck Lift

Liza Cohen[1], Peter Fodor[2], Robert Goldberg[1]
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Introduction: Creation of a rejuvenated neck contour is a key goal of lower facelift surgery. A common principle of neck lifting is use of the platysma muscle as a deep stabilizing structure to take tension off the skin closure. Many variations of platysmal tightening procedures have been described, including midline corset plications[1] and various types of lateral tightening.[2,3] We describe a technique that logically utilizes the anatomy of the platysma and its bands, creates a robust myocutaneous flap for support, and decreases the chance of injury to the marginal mandibular and greater auricular nerves.

Methods: The lateral and medial platysmal bands are marked, along with a point 3 cm from the mandibular border (safely far from the marginal mandibular nerve) (Figure 1). Through a standard face and neck lift incision, a skin flap is dissected 1 cm past the edge of the lateral band, leaving the skin attached over the remainder of the platysma medially. Then, a platysma window is opened with a 4-6 cm vertical slit, and a subplatysmal plane is dissected, using a lighted retractor or endoscope, all the way to the midline (Figure 2). Supra or subplatysmal fat can be excised or suctioned as indicated. At the inferior extent of the window, the caudal edge of the platysma is incised with a scissor to the medial band, releasing the platysmal paddle (Figure 3). Then, the flap can be engaged with whip sutures of an absorbing material, such as 3-0 Polydioxanone, and imbricated in hang-back fashion to the sternocleidomastoid fascia (safely lateral to the greater auricular nerve). Three hang-back sutures are placed, in the caudal, central, and rostral portions of the cut edge of the platysma, to create an appropriate lifting contour (Figure 4).

Results: Because the platysma remains connected to the midline skin, released from the subplatysmal plane, the platysma paddle that is created provides a robust “handle” to tighten the skin, allowing the skin incision to be closed with minimal tension. With careful suture placement, dimpling of the adjacent skin can be minimized. Preoperative (left) and postoperative (right) photographs demonstrate an improved cervicomental angle and rejuvenated neck contour with this procedure (Figure 5).

Conclusions: Of the many types of platysma tightening procedures that have been described, we find that the lateral band platysma paddle has several advantages. The flap is designed to minimize the likelihood of injury to the marginal mandibular and greater auricular nerves. By completely releasing the medial platysma from the deep structures and incising the muscle along the caudal extent of the paddle, a robust composite myocutaneous flap is created. Placing traction on the platysma all the way to the paramedian location

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provides more effective tightening than pulling from the lateral edge of the platysma. This allows for tight redraping of the skin in a graded and contoured fashion.

Figure 1

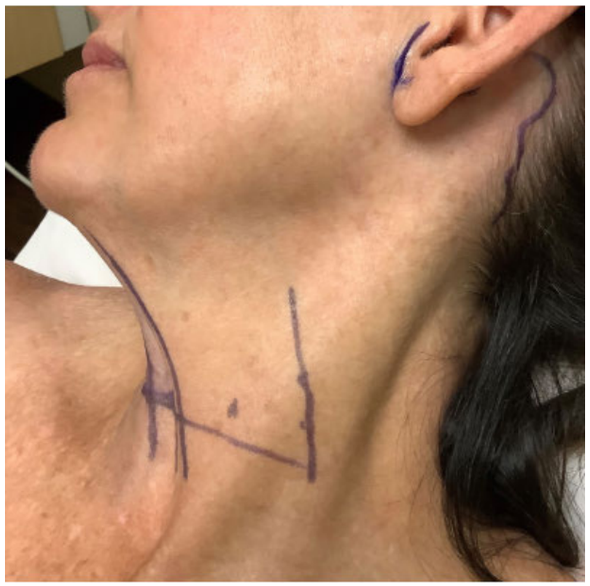


Figure 2

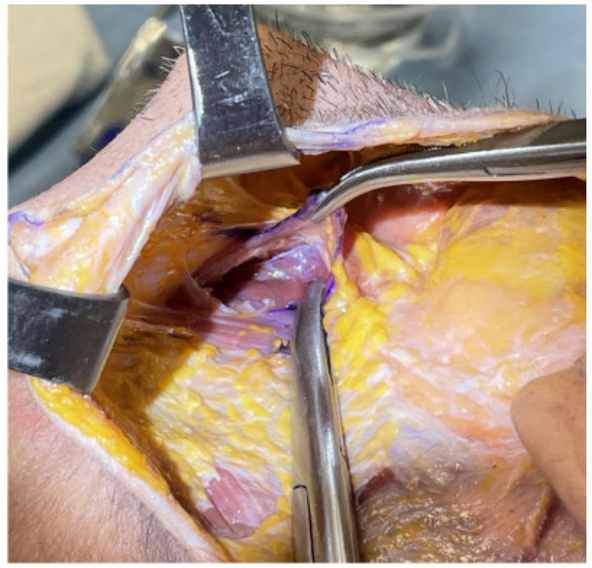


Figure 3

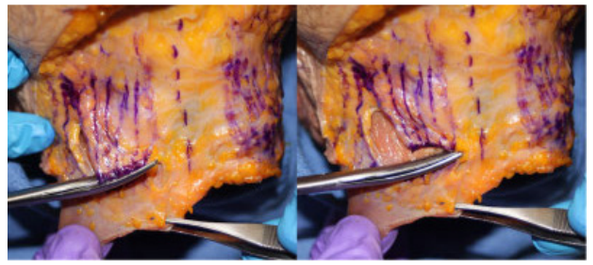


Figure 4

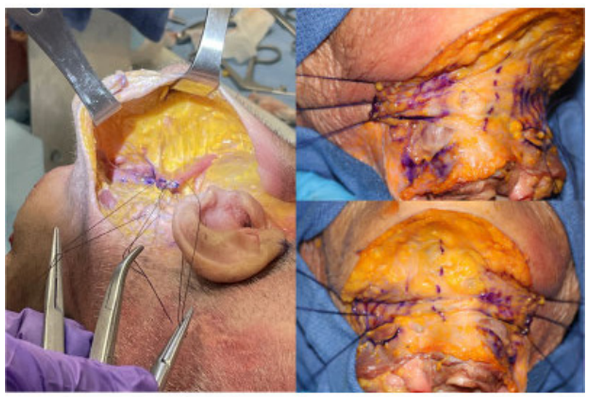
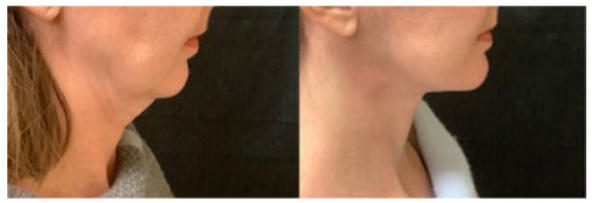


Figure 5



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11:40 – 11:46 am

A Feasibility Study of Non-Thermal Nano-Pulse Stimulation (NPS) Technology for Treating Syringoma

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Introduction: Nano-Pulse Stimulation (NPS) technology has been shown to be effective for treating cellular-based benign lesions on the face. NPS has been shown histologically to target adnexal structures, including hair follicles, sebaceous glands and sweat glands, and has been effective clinically in clearing sebaceous hyperplasia (SH) lesions on the face. This study further examines the use of NPS technology to treat syringoma lesions which are of eccrine origin.

Methods: In this feasibility study, adults were treated with 1-2 NPS procedures for 2-10 Syringoma lesions, outside the orbital rim. Lesions were treated with 2 Treatment Tips (1.5mmx1.5mm, 2.5x2.5mm) with low energy (1.5mm: 110, 145, 150mJ/mm3; 2.5mm: 30mJ/mm3). A 2nd procedure was performed at 30 days for lesions rated not clear or partially clear. Lesion clearance, healing and residual skin effects, were observed at each follow up visit (30, 60 days post-last procedure), with endpoints at 60 days post-last procedure. Additionally, subject pain scores during treatment and satisfaction following study completion were captured.

Results: 5 subjects (24 total lesions) completed the study. Subjects were 80% female with a mean age of 62, 100% Caucasian and had a Fitzpatrick Skin Type of II or III. 96% of lesions were treated with the 1.5mm tip, and 1 with the 2.5mm tip, and 92% of lesions were located on the upper cheek or lower eyelid. Eyelid lesions were only treated if they were overlying or outside the orbital rim. 83% (20/24) of lesions were rated clear / mostly clear (C/MC), with 38% (9/24) C/MC after a single procedure. Healing was typically resolved by 30 days post-last treatment, with erythema (100%) and crusting (79%) the most commonly reported observation at day 7. No erythema or crusting was observed 30 days post-last treatment, though one instance of flaking was noted. 100% of subjects were satisfied upon study exit. No residual skin effects (hyperpigmentation, hypopigmentation, focal surface irregularity) were observed for any lesions at 30 or 60 days post-last procedure, with the exception of 1 lesion (7%) showing focal surface irregularity at 30 days post-last treatment, which resolved by 60 days post-last treatment.

Conclusions: This pilot study demonstrated that nanopulse technology can be used to safely and successfully treat syringomas. A larger cohort of subjects and treatment of lesions inside the orbital rim where many syringomas are typically located is necessary to determine the ultimate role nanopulse technology can play in treatment of this vexing clinical challenge.

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11:46 – 11:52 am

Reversal of Graves' Disease-Associated Facial Volume Expansion and Eyelid Changes Following Teprotumumab Therapy

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Introduction: Thyroid eye disease (TED) causes orbital soft tissue expansion. Recent studies have suggested that brow and temple changes may also occur. Teprotumumab, a monoclonal antibody to the insulin-like growth factor-1 receptor (IGF-1R), reduces orbital soft tissue swelling in TED. In this study, we quantified the changes to pan-facial soft tissue volumes and eyelid position following treatment with teprotumumab.

Methods: In this prospective study, all patients presenting at our institution for the treatment of TED were considered for study eligibility. Patients who were currently on any other medical therapy for TED or had received rituximab or tocilizumab in the past were excluded. Further, patients who had any plans to embark on a weight loss regimen or begin medications that may result in weight loss were excluded. The primary outcome measure was a change in soft tissue volume of the face from baseline to within 3 weeks of the final infusion. Secondary outcome measures included eyelid position: margin-to-reflex distance (MRD) 1, MRD2, eyelid contour analysis (of all four eyelids), and intercanthal distance within the same orbit. Other secondary outcomes included changes in proptosis, clinical activity score (CAS), and body weight. All patients had 3D facial imaging using the Vectra H2 (Canfield, USA), the landmarks used for image registration are shown in Fig. 1. The use of the Vectra imaging system has been shown to be reliable and accurate in quantifying volumetric changes in facial soft tissues.[1]

The statistical significance of the difference between eyelid height measurements at pre- and post-treatment was calculated using a dependent t test. Eyelid contour analysis was conducted using a Bézier curve analysis as previously described.[2] Relationships between continuous variables were analyzed using bivariate and multivariate analysis. Intraobserver and interobserver variability was calculated by two observers doing all calculations twice on two separate days.

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Results: Forty-three patients were included in the study. The mean duration of TED was 30 (34) months. Following teprotumumab therapy, the mean (SD) decrease in volume for each region was 0.74 (0.82) mL in the upper face, 1.9 (1.2) mL in the periorbital region, 0.18 (0.6) mL in the temples, 1.73 (2.2) mL in the midface, and 2.84 (4.7) mL in the lower face. The mean (SD) decrease in the volume of the full face was 8.4 (8.5) mL (Fig. 2). There was also a significant reduction in MRD1, MRD2, and the intercanthal distance following treatment ($p < 0.05$). The contours of both upper and lower eyelids changed significantly following therapy ($p < 0.05$). Mean (SD) weight was 75 (12) kg prior to therapy and 69 (15) kg following therapy ($p < 0.05$). There was no relationship between prior steroid use and reduction in total body weight or changes in facial volume.

Conclusions: The results of this study suggest that the sequelae of TED may affect soft tissues beyond the orbit and periorbita and may result in changes across the entire face. Teprotumumab can significantly reduce such changes, including eyelid retraction.

Figure 1

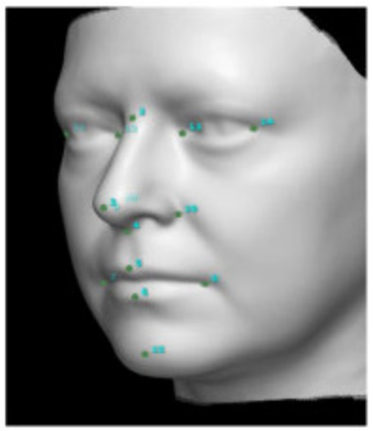
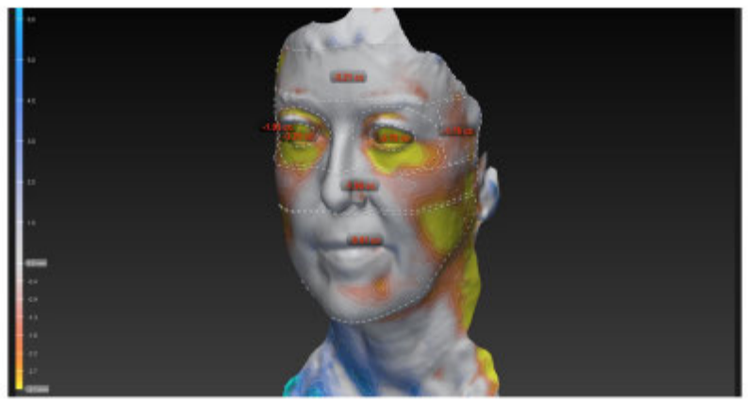


Figure 2



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1 – 1:06 pm

Characteristics of Malpositioned Orbital Implants Following Orbital Fracture Repair

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Introduction: The success of orbital wall fracture repair can be markedly affected by the positioning of the implant. Improperly placed implants, often with postoperative herniation of orbital tissue, can result in functional, cosmetic, and psychological complications, and in rare cases, permanent vision loss. The aim of the present study is to describe the characteristics of malpositioned implants following orbital fracture repair and to raise awareness of the prevalence of this complication.

Methods: The charts of all patients with previously repaired orbital fractures who had postoperative computed tomography (CT) scans available were reviewed, and patients whose implants were improperly placed were included in the study. The review encompassed patients referred to the practice of one surgeon (PDL) from 2005 to 2021. An implant was considered malpositioned if it did not cover the bony ledges of the fracture, if it impinged on orbital structures, or if it extended beyond the confines of the orbit. Patient demographics and their postoperative clinical and radiographical findings were collected.

Results: A total of 77 patients were found whose orbital implants were improperly placed as visualized on postoperative CT scans. The most common orbital fracture type was orbital floor fracture (52 of 77, 68%), followed by combined orbital floor and medial wall fracture (20 of 77, 26%). 53 of 77 (69%) patients had implants with inadequate coverage of posterior ledge, followed by 16 (21%) with inadequate coverage of posterior ledge and another wall, and 3 (4%) with implant placement in the middle of the orbit impinging on the globe or extraocular muscles (Figure 1, Table 1). Of those whose primary surgeon was known, 26 of 45 (58%) were plastic and reconstructive surgeons and 17 (38%) were oral and maxillofacial surgeons. Significant postoperative complications such as diplopia and enophthalmos required removal of the malpositioned implant with secondary reconstruction in 42 (55%) patients.

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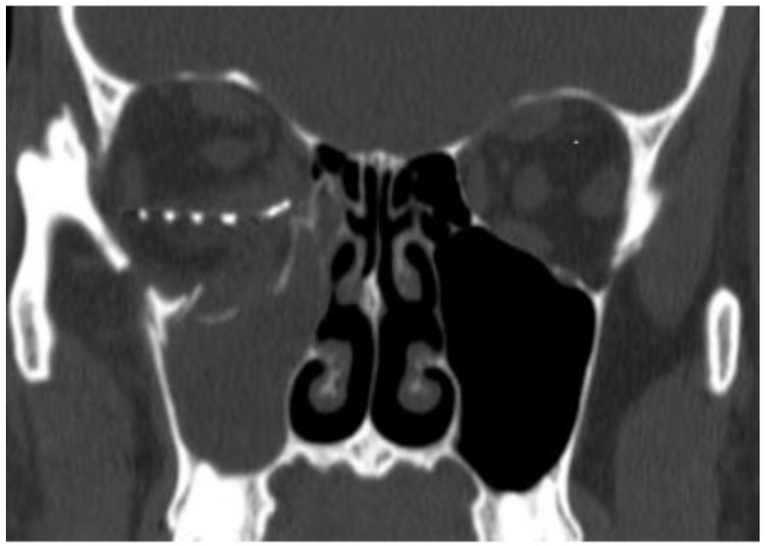
Table 1. Position of malpositioned orbital implant (n=77).

Implant with inadequate coverage of posterior ledge, 53 (69%)
Implant with inadequate coverage of posterior ledge and another wall, 16 (21%)
Implant in the middle of orbit, 3 (4%)
Implant too large, 2 (3%)
Implant with inadequate coverage of medial wall, 2 (3%)
Implant with inadequate coverage of lateral wall, 1 (1%)

Conclusions: Incorrect positioning of an orbital fracture implant is extraordinarily common and is virtually unrecognized as a complication by the majority of non-ophthalmologists performing orbital fracture repair. In many patients, the improperly placed implant was not symptomatic and was only incidentally discovered on CT imaging for an unrelated condition. Many patients required reoperation to address postoperative complications, while some patients deferred additional surgery despite symptoms caused by the malpositioned implant. Instituting routine CT imaging after orbital fracture repair would not only confirm implant location but would serve as a useful adjunct for surgeons to continually assess and improve their surgical proficiency.

Figure 1



1:06 – 1:12 pm

Extraocular Muscle Necrosis as a Feature of Orbital Myositis Associated with Crohn's Disease: A Case Series and Literature Review

Jessica Crawford[1], Steven Couch[2], Irina Belinsky[3], Karina Richani-Reverol[4]
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Introduction: Orbital myositis is a nonspecific localized orbital inflammatory process involving one or more of the extraocular muscles, and it has been reported as a rare extraintestinal manifestation of inflammatory bowel disease. Necrotizing orbital myositis of the rectus muscles is exceedingly rare, with only one previous case report documented in the literature, and it has not been previously described in the setting of inflammatory bowel disease. This study reports six patients with necrotizing orbital myositis, five of whom had a diagnosis of Crohn's disease.

Methods: Multi-center retrospective case series with literature review.

Results: Six patients (3 male/3 female, ages 31-49) with orbital myositis were identified by neuroimaging to have intramuscular necrosis of one or more extraocular muscles. Four of the six patients had a history of Crohn's disease prior to orbital myositis presentation, and one was diagnosed with Crohn's after presentation. All six patients demonstrated typical signs and symptoms of orbital myositis, and two patients had decreased visual acuity. In all cases, MRI demonstrated extraocular muscle enlargement with contrast enhancement and central hypointensity, consistent with a pattern of myonecrosis. Two of the patients underwent rectus muscle biopsy confirming the presence of necrosis. All six patients were treated with high dose steroids, resulting in the resolution of symptoms. Three patients had recurrent orbital myositis that was successfully treated with high dose steroids.

Conclusions: Extraocular muscle necrosis in the setting of orbital myositis appears to be strongly associated with Crohn's disease. This case series highlights specific MRI findings supportive of the diagnosis of necrotizing orbital myositis. The presence of these radiographic findings should alert the clinician to the potential diagnosis of Crohn's disease.

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Figure 1

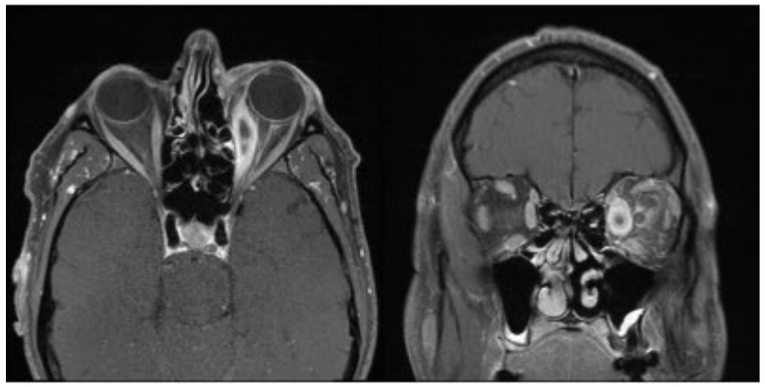
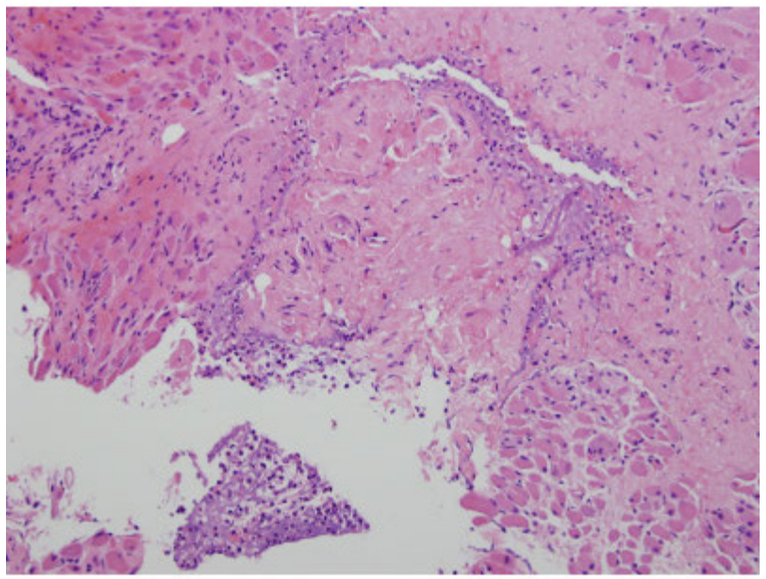


Figure 2



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1:12 – 1:18 pm

Intralesional Rituximab Injection for the Management of Biopsy-Proven Idiopathic Dacryoadenitis

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Introduction: The most common treatment for idiopathic dacryoadenitis is systemic corticosteroids. Also used are intralesional corticosteroid injection, surgical excision, systemic immunosuppressive therapy, and observation.[1] A review of the literature reported that 20% of dacryoadenitis cases were recalcitrant to therapy and 17% showed incomplete response.[1] Recurrence was observed in 15% of cases.[2] These observations indicate a need for alternative therapies with better disease control. Rituximab is an anti-CD 20 monoclonal antibody and has been used systemically in orbital inflammation as a first-line or second-line therapy. Intralesional/intraorbital Rituxamib injections have been used in conjunctival and orbital lymphomas.[3,4] In this study, we evaluated our experience with intralesiona/ intraorbitall rituximab injection for biopsy-proven idiopathic dacryoadenitis and surrounding orbital inflammation.

Methods: Fifteen consecutive patients with biopsy-proven idiopathic dacryoadenitis and surrounding orbit were included. Patients with serological or clinical signs of viral or bacterial dacryoadenitis, or any inflammatory disease were excluded. Off label, intralesional/ intraorbital rituximab (50 mg in 5 ml) was injected into the lacrimal gland and surrounding orbit with a month interval. The patients were scheduled to receive two rituximab injections. If symptoms resolved after one injection, no further injection was given. If symptoms were not resolved after two injections, one more injection was given. Treatment response was assessed using RECIST guidelines (version 1.1) and resolution of symptoms as complete or partial response, progressive or stable disease, using orbital CT or MRI images after the second or third injections when they finished treatment. The patients did not receive any systemic steroids or immunotherapy unless they did not show any response.

Results: The mean patient age was 56 years (range; 23-69 years). Of 15 patients, 13(87%) were women and 2 (13%) men. The right eye was involved in 12 (80%) patients and the left eye in 3 (20%) patients. The orbital inflammation involved lacrimal gland with surrounding orbit in 15 (100%) cases. Histopathologic evaluation showed chronic inflammation in 11 patients (73%), chronic inflammation and sclerosis in 3 patients (20%) patients, and IgG4-related orbital inflammation in 1 patient (7%). Intralesional rituximab was injected once in 1 patient (7%), twice in 9 patients (60%), and three times in 5 patients (33%). After a mean follow-up of 27 months (median 26 months, range 5 -56 months), 94% of patients showed clinical response with 87% showing complete response and 7% obtaining partial response. The one patient (7%) did not respond after 3 injections and placed on systemic steroid therapy. In patients who responded to the rituxan, the average months between first injection and first response was 2.5 months (range 1-7 months).

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Conclusions: Intralesional rituximab injection may be an effective treatment for idiopathic dacryoadenitis and surrounding orbital inflammation. All patients responded to the treatment with 87% complete response rate in this series. Local treatment with rituximab has the potential to spare ocular and systemic side effects of local and systemic corticosteroid and immunosuppressive treatment.

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1:18 – 1:24 pm

Longterm Outcomes for Pain Relief from Intraorbital Frontal Nerve Resection in Patients with Idiopathic versus Postherpetic Trigeminal Neuralgia

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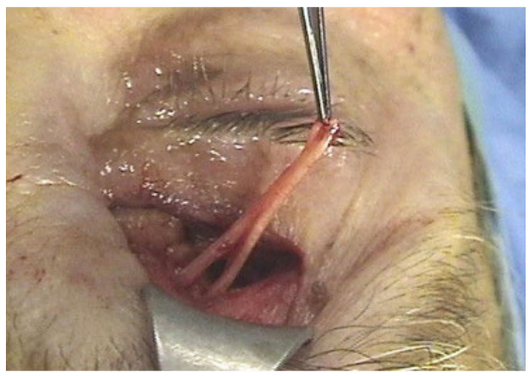
Introduction: The purpose of this study is to compare pain relief after resection of the frontal nerve and its branches in patients with idiopathic trigeminal neuralgia versus postherpetic neuralgia.

Methods: A retrospective chart review was performed on eight patients suffering from first division idiopathic trigeminal neuralgia (tic douloureux) and four patients from chronic postherpetic neuralgia between 2002 and 2019.

Results: Five of eight patients with first division trigeminal neuralgia have had no recurrence of pain 9-19 years following the procedure. In the remaining three patients, pain recurred at 20 months, five years and 11 years. All four patients with postherpetic neuralgia have had persistent postoperative pain.

Conclusions: Surgical resection of the frontal nerve and its branches provides long-lasting pain relief for the majority of patients with idiopathic trigeminal neuralgia, but at best lessens the pain for postherpetic neuralgia. This outcome supports the different pathogenesis for pain in these two disorders.

Figure 1



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1:24 – 1:30 pm

Factors Contributing to Visual Outcome in Orbital Compartment Syndrome

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Introduction: Orbital compartment syndrome (OCS) can result in permanent loss of vision, yet few studies have assessed factors contributing to visual outcomes, including time from OCS onset to intervention. This retrospective study sought to evaluate potential factors correlated with differences in visual recovery after lateral canthotomy and cantholysis.

Methods: A retrospective chart review was performed on all patients at a Level I Trauma Center who were diagnosed with OCS and underwent emergency lateral canthotomy and cantholysis (LCC). Age, sex, relative afferent pupillary defect, hypertension, diabetes, coronary artery disease (CAD), smoking history, blood thinner use, initial and final intraocular pressures (IOP), ocular perfusion pressures (mean arterial pressure – initial IOP), initial and final visual acuities (in LogMar), and time from presumed onset of OCS to LCC were recorded. In assessing the association of visual outcomes, defined as 'LogMar change', with time to LCC, patient demographic and clinical characteristics were first examined for possible associations with LogMar change, and then included as covariates in a linear regression model. For categorical variables, the association was expressed as the mean difference in LogMar change, adjusted for initial LogMar, between the categories. For continuous variables, the regression slope estimate was expressed as the mean difference in LogMar change, adjusted for initial LogMar, that is associated with a one standard deviation increase in the continuous variable. Statistical significance was defined as a p-value of < 0.05.

Results: A total of 53 subjects underwent LCC for OCS. Twenty-four patients were excluded due to a concomitant diagnosis of ruptured globe or missing values of visual acuity or IOP, with a total of 29 patients included in the study. Demographics and selected variables are displayed in Tables 1A and 1B. Covariate analysis of all factors, shown in Table 2, demonstrated a significant association of age and sex with LogMar change without significant correlation with LCC. Thus, age and sex were included as covariates in the regression analysis examining the association of LCC with LogMar change. The results of the regression analyses of LogMar change are summarized in Table 3, which shows the regression parameter estimate (slope) for LCC with and without covariates. In addition, there was greater than or equal to 2 lines of visual improvement up to 390 minutes and 1 line of visual improvement up to 600 minutes from onset of OCS to LCC.

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Conclusions: This study represents the largest study to date evaluating visual outcomes in the management of OCS. Improved visual outcomes were found to be significantly associated with younger age and female sex. Although there was not a significant association with overall improvement in visual acuity with time to LCC, there was an association between improved visual outcomes with shorter times to LCC. As time to LCC is the only modifiable factor in patients presenting with OCS, this study suggests that bedside surgical intervention should be performed without delay to maximize the possibility of visual recovery regardless of the elapsed time from onset of OCS.

Table 1A

Table 1A: Descriptive statistics of continuous variables (n=29)

Variable	Mean	Standard Dev	Range
Age (years)	61.3	24.1	18.0 – 92.0
Ocular Perfusion Pressure (mmHg)	41.3	22.0	-15.0 – 72.0
Initial IOP (mmHg)	62.7	17.6	31.0 – 98.0
Final IOP (mmHg)	25.7	8.3	12.0 – 46.0
Initial LogMar	2.1	1.0	0.3 – 3.0
Final LogMar	1.1	1.3	-0.1 – 3.0
LogMar change	-1.0	1.1	-3.1 – 0.6
Time to LCC (minutes)	280.0	142.0	10.0 – 600.0

Table 1B

Table 1B: Descriptive statistics of categorical variables (n=29)

Variable	Frequency	Percentage (%)
Sex, male	19	66
Diabetes	6	21
Hypertension	20	69
CAD	14	48
Blood Thinners	13	45
Smoking History	14	48
RAPD (n=25)	19	76

Table 2

Table 2: Association of patient demographics and clinical variables with LogMar change

Variable	LogMar change	
	Mean difference* (95% CI)	p-value
Age	0.5 (0.1, 0.9)	0.02
Ocular Perfusion Pressure	0.0 (-0.5, 0.4)	0.89
Initial IOP	0.1 (-0.4, 0.6)	0.62
Sex	0.9 (0.1, 1.7)	0.03
Diabetes	0.6 (-0.4, 1.6)	0.21
Hypertension	0.1 (-0.8, 1.0)	0.85
CAD	0.8 (-0.2, 1.6)	0.05
Use of Blood Thinners	0.4 (-0.5, 1.2)	0.39
Smoking History	-0.5 (-1.3, 0.3)	0.22
RAPD	0.7 (-0.4, 1.9)	0.21

**adjusted for initial LogMar*

Table 3

Table 3: Fitted regression models to examine the association of time to LCC with LogMar change

Parameter	No covariates		With initial LogMar as covariate		With initial LogMar, age, sex as covariates	
	Estimate (95% CI)	p-value	Estimate (95% CI)	p-value	Estimate (95% CI)	p-value
Time to LCC (per 10min)	0.03 (-0.00, 0.05)	0.08	0.03 (-0.00, 0.06)	0.06	0.02 (-0.01, 0.05)	0.11
Initial LogMar			-0.25 (-0.67, 0.17)	0.23	-0.33 (-0.72, 0.05)	0.09
Sex, (Female)					0.75 (-0.02, 1.51)	0.06
Age (per 10yrs)					0.13 (-0.04, 0.29)	0.12

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2. Hayreh, S.S., H.E. Kolder, and T.A. Weingeist, *Central retinal artery occlusion and retinal tolerance time.* Ophthalmology, 1980. **87**(1): p. 75-8.
3. Timlin, H.M., et al., *Treatment outcomes of lateral canthotomy and cantholysis for orbital compartment syndrome.* Br J Oral Maxillofac Surg, 2019. **57**(5): p. 488-490.
4. Bailey, L.A., et al., *Visual Outcomes of Patients With Retrobulbar Hemorrhage Undergoing Lateral Canthotomy and Cantholysis.* Ophthalmic Plast Reconstr Surg, 2019. **35**(6): p. 586-589.

1:30 – 1:36 pm

Virtual and Augmented Reality Based Teaching Tool for Orbital and Skull Base Anatomy Utilizing 3D Volumetric Models

Muhammad Hassan[1], Clara Men[1], Giancarlo Garcia[1], Vera Vigo[2,3], Louisa Lu[1], Juan Fernandez-Miranda[4,5], Andrea Kossler[1]
[1]Ophthalmology, Byers Eye Institute, Stanford University, Palo Alto, California, United States, [2]Neurosurgery, The Stanford Neurosurgical Training and Innovation Center, Stanford University, Palo Alto, California, United States, [3]Neurosurgery, Neurosurgery Unit, Ferrara University Hospital, Department of Morphology Surgery and Experimental Medicine, Ferrara, Italy, [4]The Stanford Neurosurgical Training and Innovation Center, Stanford University, Palo Alto, California, United States, [5]Department of Neurological Surgery, Stanford University, Palo Alto, California, United States

Introduction: The orbital space, although small in volume (30 cm3), is a complex anatomical location with intimate association and access to the skull base.[1] Comprehensive understanding of 3-dimensional (3D) orbital and skull base anatomy, and their visuospatial relationships, is of particular value for orbital surgeons and trainees. Our purpose is to evaluate the utility of virtual or augmented reality-based learning modules compared to conventional anatomic training for orbital and skull base surgical education.

Methods: 3D volumetric models, on post-mortem orbits, demonstrating the step-by-step dissection of the transorbital approach to the middle cranial fossa were created using the photogrammetry technique.[2,3] About 100-150 images were obtained using 0° and 30° endoscopes (Storz HD camera, Karl Storz, Tuttlingen, Germany). Volumetric models were created using a photogrammetry software (Agisoft Metashape Professional 1.6.4, Agisoft LCC, St. Petersburg, Russia), uploaded to a web-based viewer app (Sketchfab, New York, USA), and viewed using virtual reality (VR) headsets (Oculus, Facebook, Menlo Park, USA) (Figure 1). Ophthalmology trainees tested the VR 3D modules for 30 min and then performed 30 min of conventional 2D anatomical study. Trainees rated their educational experience of the 3D learning environment compared to 2D traditional learning using a numerical rating scale (0=Worst, 5=Equal, 10=Best). The areas measured were: 1) visuospatial relationships in the orbit; 2) visuospatial relationships in the middle cranial fossa; 3) lateral orbital anatomy; 4) middle cranial fossa anatomy; 5) the surgical approach to the lateral orbit; 6) the surgical approach to the middle cranial fossa. 7) experience enjoyment; 8) would review this material again; 9) would recommend this approach to a friend.

Results: The virtual reality system allowed manipulation of the model along all linear axis as well as rotational axis. Additionally, the model could be scaled to various sizes to allow the user to explore it in various manners. Users rated the 3D VR learning experience as significantly more advantageous compared to 2D in all the areas tested (Figure 2). The highest-rated areas were enjoyability, would review the material again, and would recommend this to a friend with a mean score of 9.75/10. The visuospatial relationships of orbit and

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middle cranial fossa were rate 9/10. The anatomical details of the orbit and middle cranial fossa received a score of 9.25 and 9 out of 10, respectively. Surgical approaches were rate 8.75 and 9 out of 10 for lateral orbital and middle cranial fossa, respectively.

Conclusions: 3D volumetric models are an excellent tool for residents and rising orbital surgeons to acclimatize to the complex visuospatial anatomic relationships within the human orbit. Virtual or augmented reality-based learning using these 3D models can serve as an excellent teaching adjunct to the traditional methods.

Figure 1

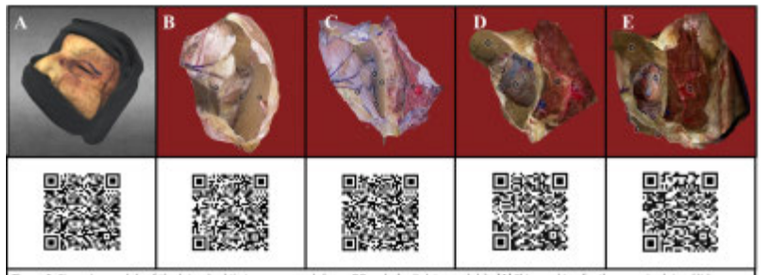

Figure 1: Stepwise models of the lateral orbitotomy approach (scan QR code for link to models). **(A)** Skin marking for the superior lateral lid crease incision. **(B)** Subperiosteal dissection exposes the lateral orbital rim and wall. **(C)** The lateral orbital rim is taken down to provide access to the greater wing of the sphenoid bone. **(D)** After removal of the sphenoid bone, the dura of the temporal lobe is exposed. **(E)** The dura is opened to reveal the intracranial structures of the middle cranial fossa.

Figure 2

Area of Interest	Average Score
Visuospatial relationships in the orbit	9
Visuospatial relationships in the middle cranial fossa	9
Lateral orbital anatomy	9.25
Middle cranial fossa anatomy	9
Surgical approach to the lateral orbit	8.75
Surgical approach to the middle cranial fossa	9
Enjoyed this learning experience	9.75
Would review this material again	9.75
Would recommend this approach to a friend	9.75

Figure 2: Table outlining average responses to study questions comparing 3D learning methods to 2D traditional learning

References

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3. Rubio RR, Shehata J, Kournoutas I, et al. Construction of Neuroanatomical Volumetric Models Using 3-Dimensional Scanning Techniques: Technical Note and Applications. *World Neurosurg*. 2019;126:359-368.

1:36 – 1:42 pm

Multidisciplinary, Transorbital Surgery for Orbital Apex and Skull Base Lesions

Ann Tran[1], Andrew Lee[2], Victoria North[1], Irina Belinksy[3], Kira Segal[1], Gary Lelli[1], Benjamin Levine[1], Theodore Schwartz[4], Kyle Godfrey[1]
[1]Department of Ophthalmology, Weill Cornell Medicine, New York, New York, United States, [2]Weill Cornell Medical College, New York, New York, United States, [3]Department of Ophthalmology, NYU Langone Medical Center, New York, New York, United States, [4]Department of Neurological Surgery, Weill Cornell Medicine, New York, New York, United States

Introduction: Transorbital surgery approaches offer minimally invasive alternatives to traditional craniotomy-based approaches for pathology at the orbital apex and anterior and middle cranial fossae, including the lateral cavernous sinus and Meckel's cave.[1] Prior transorbital series have included limited ophthalmologic data.

Methods: A retrospective review of transorbital approaches to the orbital apex and skull base performed between 2016 – 2021 was reported. All cases were performed by neurosurgery and oculoplastics. Pre- and post-operative ophthalmologic measurements were documented and recorded. Patients with inadequate ophthalmologic follow-up were excluded from the analysis.

Results: Ten patients met inclusion criteria. The mean age at operation was 59 ± 20 years (range 23 - 81) and all were female. Pathology and goals of surgery were spheno-orbital meningioma (2; Gross Total Resection (GTR) of hyperostosis component), schwannoma (2; GTR), metastatic disease (2; biopsy), recurrent glioblastoma (1; biopsy), epidermoid cyst (1; GTR), dermoid cyst (1; drainage) and amyloid angiopathy (1; Bx). GTR was achieved in all cases where it was the goal of surgery. All biopsies were diagnostic. The mean follow-up duration was 15 ± 19 months (2 weeks – 4.7 years). One case of meningioma required an additional craniotomy due to recurrent right orbital mass causing compressive optic neuropathy.

The lesions had a mixture of intracranial (90%) and orbital (70%) pathology. 57% of orbital involvement was extraconal. Intracranial lesions were in the middle cranial fossa (78%), anterior cranial fossa (11%) or both (11%). The lesions involved the sphenoid wing (50%), cavernous sinus (40%), Meckel's cave (30%), optic canal (30%) and superior orbital fissure (20%).

Lateral orbitotomy through an eyelid crease incision was performed in all cases. The lateral orbital rim was only removed in a biopsy of metastatic disease and a STR of schwannoma. Drilling of the deep lateral wall for removal of lesion or access to the middle cranial fossa was performed in 40% of cases. Intra-operative minor CSF leak was noted in 40% of cases. A duroplasty was performed in 50% of cases with either Duragen® or Duraguard®. One case utilized a dermis fat graft for repair. The orbital roof was not reconstructed in any case. The average time in the operating room was 291 minutes (167 – 419 minutes) with a mean surgical time of 219 minutes (78 – 336 minutes).

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Ophthalmologic outcomes were assessed pre-and post-operatively. Proptosis (50%), extra-ocular motility deficits (40%) and compressive optic neuropathy (30%) were the most common pre-operative findings. Improvement in pain (40%), vision (30%), diplopia (30%) was seen post-operatively, although one patient had persistent diplopia despite improvement. Enophthalmos was encountered postoperatively in 20% of cases. No cases of vision loss, neurosurgical complications requiring re-operation, or additional eyelid or extraocular muscle surgery was required post-operatively.

Conclusions: Transorbital approaches provide minimally invasive alternatives to more traditional transcranial approaches for skull base and orbital apex pathology. Shared decision-making regarding goals of the surgery should always be considered when selecting an approach. Multi-disciplinary management of these cases with ophthalmology involvement may improve outcomes and help guide treatment decisions.

References

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All times listed in Central Time

Moderator: Steven M. Couch

1:55 – 2:20 pm

Transorbital Neuroendoscopic Surgery: The Orbit As a Gateway to the Skull Base and Brain

Kris S. Moe, MD, FACS

All times listed in Central Time

Moderator: Steven M. Couch

3 – 3:30 pm

Industry and Innovation in Oculofacial Plastic Surgery Panel

Panelists: Andrea L. Kossler

Wendy W. Lee

Hui Bae Harold Lee

Michael Kazim

BREAKOUT #1: AESTHETICS

All times listed in Central Time

Moderator: Michael T. Yen
Chair: Wendy W. Lee

3:30 – 3:42 pm

Anatomy and Facial Aging

Robert M. Schwarcz

3:42 – 3:54 pm

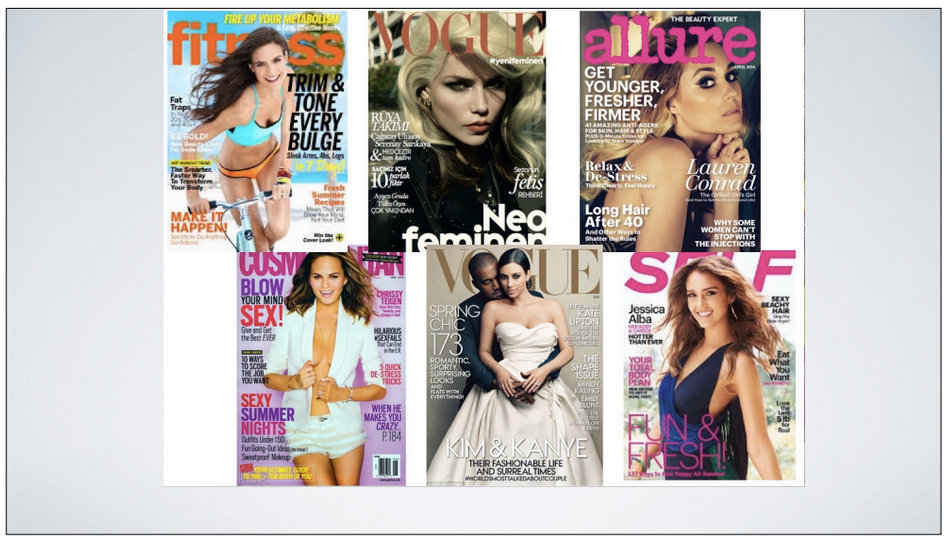
Rejuvenating the Upper Half of the Face: Forehead to Midface

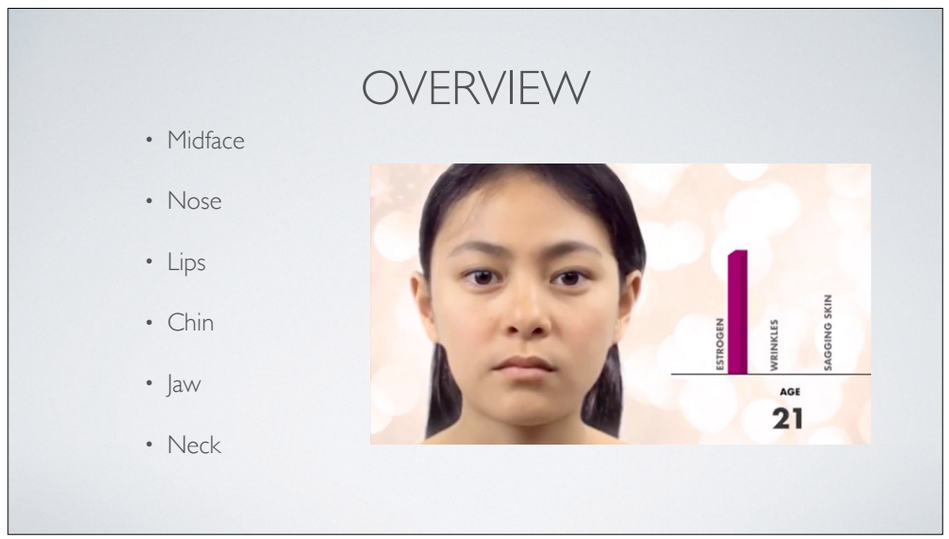
Charles Boyd

3:54 – 4:06 pm

Rejuvenating the Lower Half of the Face: Lips, Chin and Neck

Julie A. Woodward





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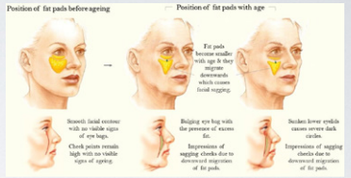
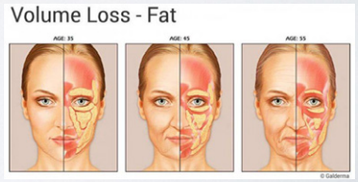
AGING

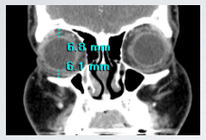
- Skin - elasticity, collagen
- SMAS - attenuates
- Fat Pads - deflate - superficial and deep
- Muscles - attenuate, deflate
- Bones - remodel





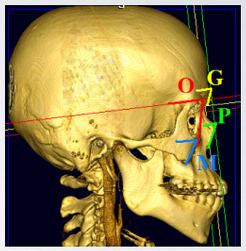
MAXILLA RESORPTION - 2009

SIMILAR TO LAMBROTH'S ALGORITHM



Floor of orbit drops 2.1mm from the globe

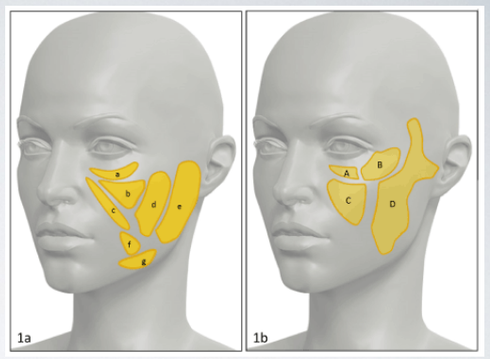
- **ANGULAR CHANGES**
- G 67.5° +/- 2.9 → 63.3° +/- 3.6
- O 76.2° +/- 4.6 → 67.2° +/- 3.8
- P 68.6° +/- 4.9 → 55.4° +/- 4.4
- M 65.1° +/- 3.3 → 61.3° +/- 3.7



Richard MJ, Morris C, Deen BF, Gray L, **Woodward** JA. Analysis of the anatomic changes of the aging facial skeleton using computer-assisted tomography. ***Ophthal Plast Reconstr Surg.*** 2009 Sep-Oct;25(5):382-6.

FAT COMPARTMENT AGING

Pessa JE (2000) An algorithm of facial aging: verification of Lambros's theory by three-dimensional stereolithography, with reference to the pathogenesis of midfacial aging, scleral show, and the lateral suborbital trough deformity. *Plast Reconstr Surg* 106: 479-488.



- Infraorbital fat (IF);
- Superficial medial cheek fat (SMCF);
- Nasolabial fat (NLF); Middle cheek fat (MCF);
- Lateral temporal-cheek fat (LTCF);
- Superior Jowl fat (SJF);
- Inferior Jowl fat (IJF).
- Medial Suborbicularis Oculi Fat (M-SOOF);
- Lateral Suborbicularis Oculi fat (L-SOOF);
- Deep medial cheek fat (DMCF);
- Buccal fat (BF).

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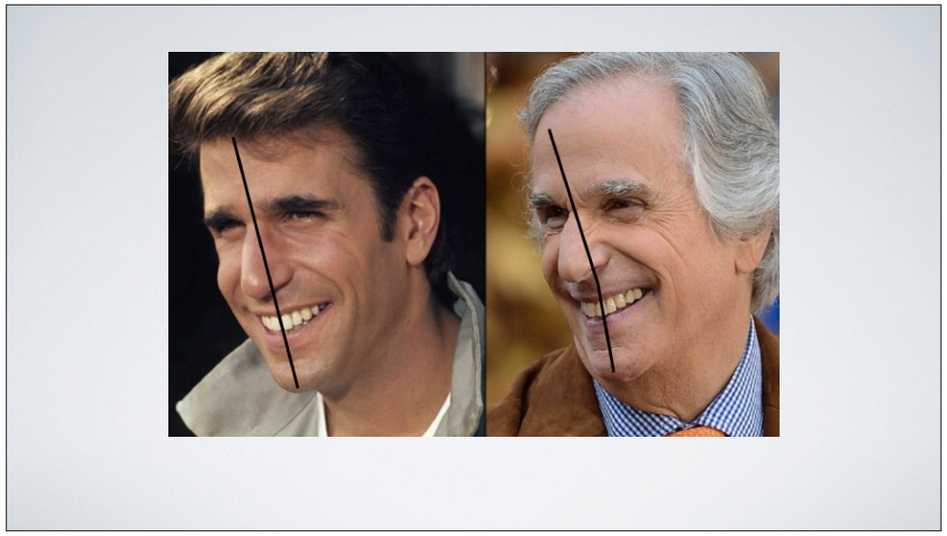

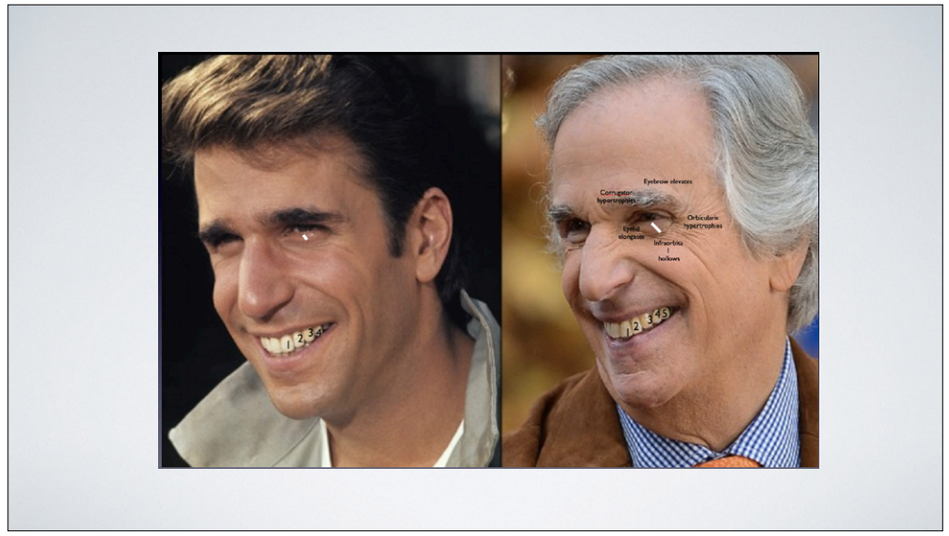

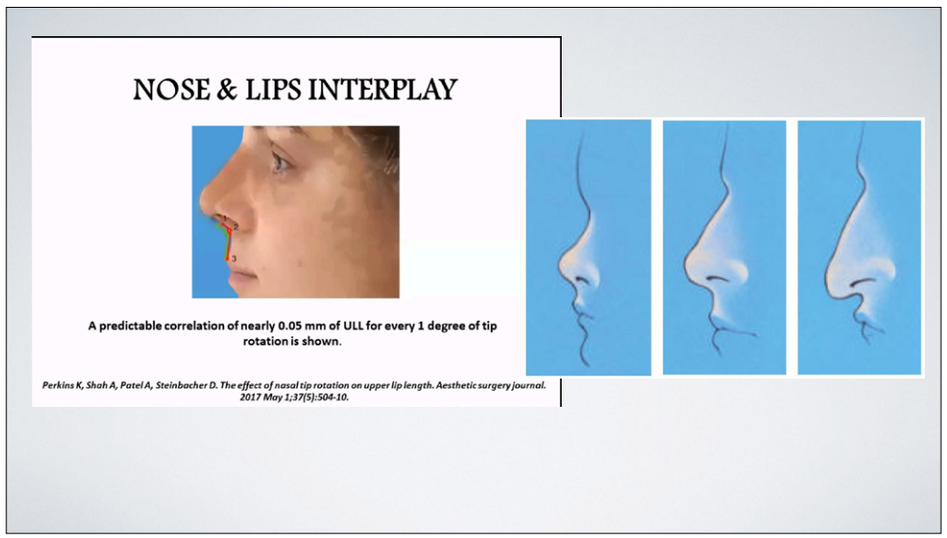

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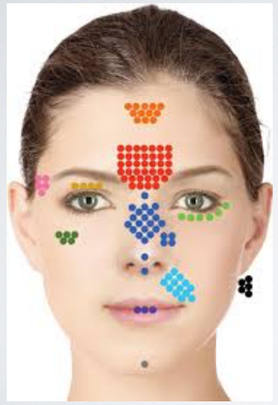
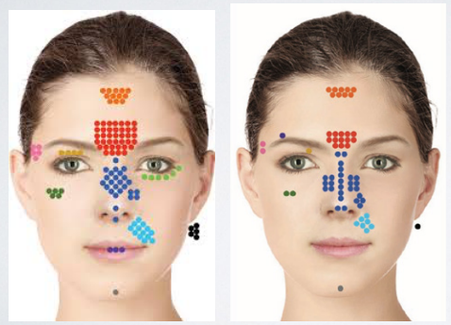
98 Cases of Blindness



Dermatol Surg. 2015 Oct;41(10):1097-117.
Avoiding and Treating Blindness From Fillers:
A Review of the World Literature.
Beleznay K Carruthers JD Humphrey S Jones D

Update Blindness - 40 Additional Published Cases



Sorensen E, Council M,
Wash U , 2018

Half were HA

LIPS

Humans are unique in that they are the only species that have red lips.

Age -related changes in the vasculature of the dermis of the upper lip vermillion. Gomi T, Imamura T
Aging.us.com. 2019 Vol 11. No. 11

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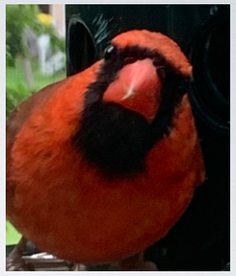
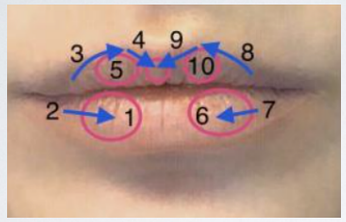
LIPS

Humans are unique in that they are the only species that have red lips.



Age -related changes in the vasculature of the dermis of the upper lip vermillion. Gomi T, Imamura T
Aging.us.com. 2019 Vol 11. No. 11

LIP INJECTION TECHNIQUES



Dr. Harris

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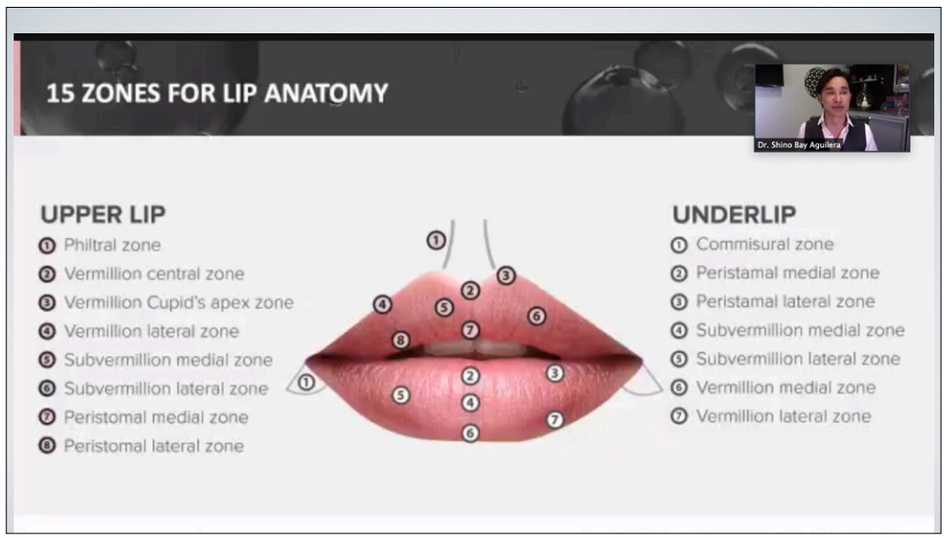
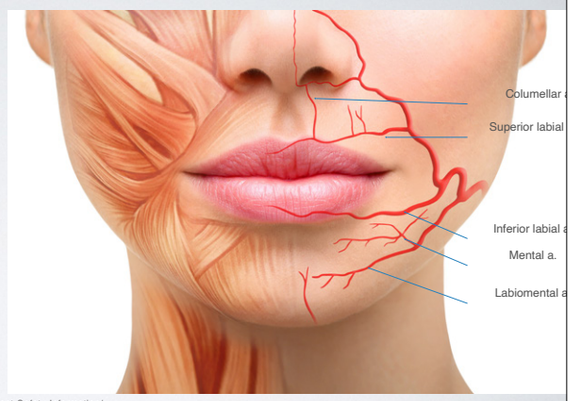


LIP ANATOMY

- SLA and ILA run both submucosal and intramuscular
- Common trunk origin for both SLA and ILA in ~30% of patients
- Arteries are always no deeper than 4 mm from vermillion
- Both SLA and ILA anastomose with opposite artery in the midline



For product and safety information, please visit: RevanesseUSA.com/Important-Safety-Information/

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> Dermatol Surg. 2021 Aug 2. doi: 10.1097/DSS.0000000000003108. Online ahead of print.

Comparing Water Absorption of Food and Drug Administration-Approved Hyaluronic Acid Fillers

Julie Woodward [1], Roshni Ranjit-Reeves, David F Katz, Francesco P Bernardini, Steven Fagien

Affiliations + expand

PMID: 34347694 DOI: 10.1097/DSS.0000000000003108

Abstract

Background: To compare the water absorption of 12 FDA-approved hyaluronic acid (HA) facial fillers in vitro in conditions relevant to in vivo injection.

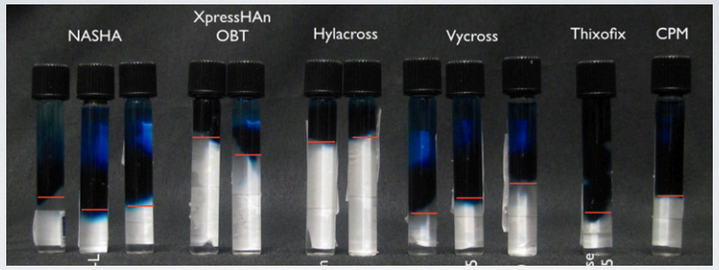
Objective: The goal of this study was to provide long-term insight into an improved, tailored facial rejuvenation approach and to understand sequelae that could affect preoperative surgical planning.

Methods: In 2 experiments, 12 FDA-approved HA fillers were loaded into test tubes with nonpreserved normal saline and then placed in a 94.5°F-96°F environment for 1 month to allow water absorption by passive diffusion. The test tubes were centrifuged so that the hydrated filler could pass to the bottom of the tube. The tubes were centrifuged for 12 minutes at 1,200 revolutions per minute in the first experiment and for 7 minutes in the second experiment. A blue dye was then instilled to demarcate the filler/saline interface.

Results: There was variation in the water absorption of different HAs. Low absorption occurred in non-animal-stabilized hyaluronic acid.

Conclusion: The pattern of water absorption was similar in the 2 experiments. The results inform us about in vivo conditions and provide guidance for filler selection.

WATER ABSORPTION IN VITRO



Woodward J, ***Derm Surg***, 2021

IS THERE A BAD CANDIDATE?

Hyaluronic Acid Filler Longevity and Localization: Magnetic Resonance Imaging Evidence

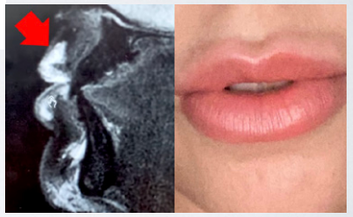
Mobin Master, M.B., B.S.
North Melbourne, Victoria, Australia

THERAPEUTIC

Summary: Hyaluronic acid is the most commonly used facial dermal filler in aesthetic medicine. Identification of placement, longevity, and localization of hyaluronic acid fillers are becoming increasingly important. This article proposes a practical approach to monitoring the location and longevity of hyaluronic acid, using magnetic resonance imaging. (*Plast. Reconstr. Surg.* 147: 50e, 2021.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, V.

Need to Dissolve…



The Modified Upper Lip Lift

Benjamin Talei MD

Facial Plastic Surgery Clinics of North America, 2019-08-01, Volume 27, Issue 3, Pages 385-398, Copyright © 2019 Elsevier Inc.

The modified upper lip lift procedure is a simple evolution of the cutaneous bullhorn subnasal lip lift. The superficial muscular aponeurotic system layer in the lip is described along with the pyriform ligament, both of which play an essential role in lip lifting. This article details an easily reproducible deep-plane technique that can be applied to patients of all ages, ethnicities, and skin types.

In recent years, there has been an emergence of patients suffering the negative effects of fillers. Permanent fillers such as silicone, fat, and other polymers such as polymethylmethacrylate (PMMA) may cause perpetual damage to the upper lip because of expansion, thickening, and effacement. They may also dramatically inhibit lip function through muscular infiltration and/or edema. The upper lip lift cannot restore the lip to a normal state, but it can re-elevate the lip to a higher position with improved eversion and improve overall appearance (Figs. 11 and 12).

Fig. 11
Modified upper lip lift combined with nasal base suspension and mucosal excision to improve silicone-caused deformities.

Temporary injectables such as hyaluronic acid (HLA) dermal fillers may have negative short-term outcomes, as well as permanent sequelae. The most notorious of these fillers to have a problem is Juvderm XC. Due to it being hydrophilic from its high HLA concentration (24 mg/mL) and migratory in nature, it accounts for most problems seen with HLA products in my practice. The tissue integration and migration of this product can cause a spreading out of the filler in the subcutaneous tissue of the lip, beyond the vermillion border where it was injected. The author has witnessed the persistence of Juvederm in reactive regions for over 8 years. Given the issues witnessed following injections of Juvederm XC, PMMA, silicone, and other polymers, the author has advised against their use in the lips. Fat injections in the lip may have similar consequences, and fat grafting should not be done without prejudice. These migratory, hydrophilic, and inflammatory fillers are most notably found within the 10-mm segment above the vermillion border months to years following injection (Figs. 13–16). They are quite noticeable on most patients, presenting with a bulge, whitish discoloration, simian upper lip convexity, and limitation in smile. Dissolving HLA filler above the vermillion border is easy to do and should be done before pursuing surgical intervention to increase precision and decrease postoperative inflammation.

Fig. 13
Front view. Top photo demonstrating simian appearance and heaviness from Juvederm. Bottom photo after dissolver and lip lift.

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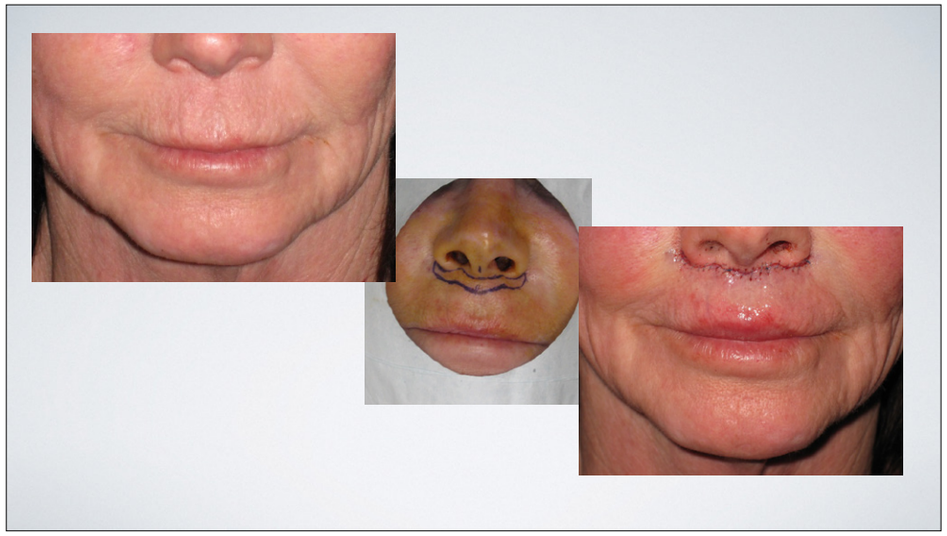

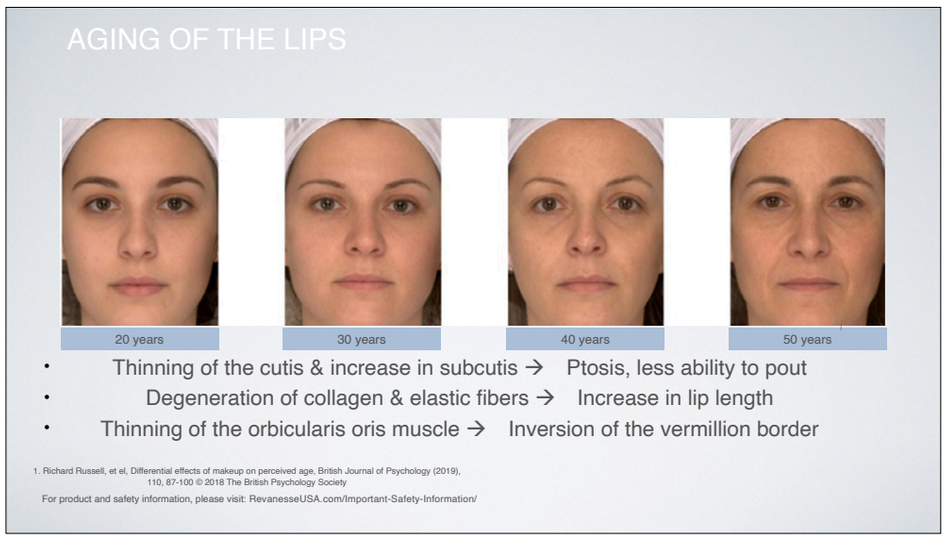

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REDUCTION IN THE MAXILLARY CENTRAL INCISOR EXPOSURE OF APPROXIMATELY 3.4 MM AS AGE INCREASED FROM 30 YEARS TO 60 YEARS

Table III. Tooth exposure by length of upper lip

Upper lip length (mm)	Mean amount of tooth exposed (mm) Maxillary central incisor	Mandibular central incisor
10-15	3.92	0.69
16-20	3.44	0.77
21-25	2.18	0.98
26-30	0.93	1.95
31-35	0.25	2.25

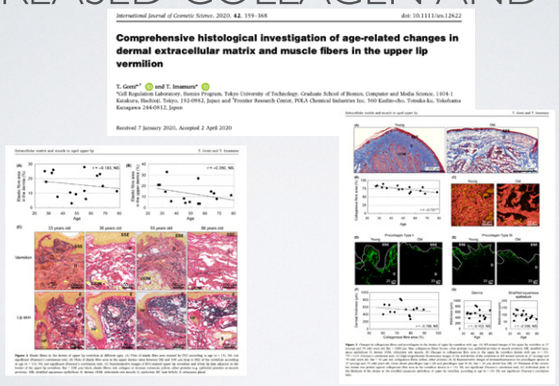
Table IV. Tooth exposure by age

Age group (yr)	Mean amount of tooth exposed (mm) Maxillary central incisor	Mandibular central incisor
Up to 29	3.37	0.51
30-39	1.38	0.80
40-49	0.95	1.96
50-59	0.46	2.44
60+	−0.04	2.95

Vig RG, Brundo GC. The kinetics of anterior tooth display. J Prosthet Dent. **1978**;39:502–504.

ICONIC LIPS – MARILYN MONROE

SOFT TISSUE AGING DECREASED COLLAGEN AND ELASTIN



International Journal of Cosmetic Science, 2020, **42**, 359–368 doi: 10.1111/ics.12622

Comprehensive histological investigation of age-related changes in dermal extracellular matrix and muscle fibers in the upper lip vermilion

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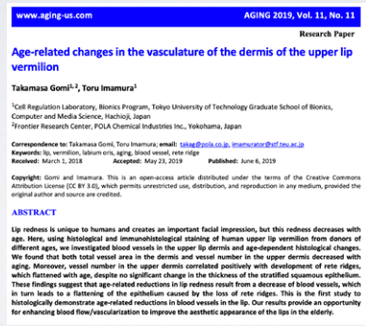
Received 7 January 2020; Accepted 2 April 2020

LOSS OF VASCULARITY/REDNESS



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Research Paper

Age-related changes in the vasculature of the dermis of the upper lip vermilion

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[2]Frontier Research Center, POLA Chemical Industries Inc., Yokohama, Japan

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Keywords: lip, vermilion, labium oris, aging, blood vessel, rete ridge
Received: March 1, 2018 **Accepted:** May 23, 2019 **Published:** June 6, 2019

ABSTRACT

Lip redness is unique to humans and creates an important facial impression, but this redness decreases with age. Here, using histological and immunohistological staining of human upper lip vermilion from donors of different ages, we investigated blood vessels in the upper lip dermis and age-dependent histological changes. We found that both total vessel area in the dermis and vessel number in the upper dermis decreased with aging. Moreover, vessel number in the upper dermis correlated positively with development of rete ridges, which flattened with age, despite no significant change in the thickness of the stratified squamous epithelium. These findings suggest that age-related reductions in lip redness result from a decrease of blood vessels, which in turn leads to a flattening of the epithelium caused by the loss of rete ridges. This is the first study to histologically demonstrate age-related reductions in blood vessels in the lip. Our results provide an opportunity for enhancing blood flow/vascularization to improve the aesthetic appearance of the lips in the elderly.

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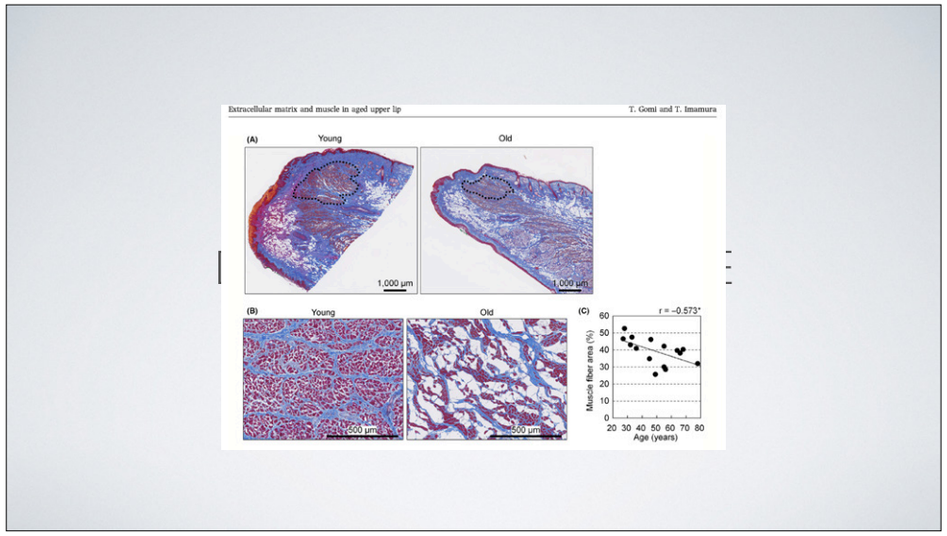

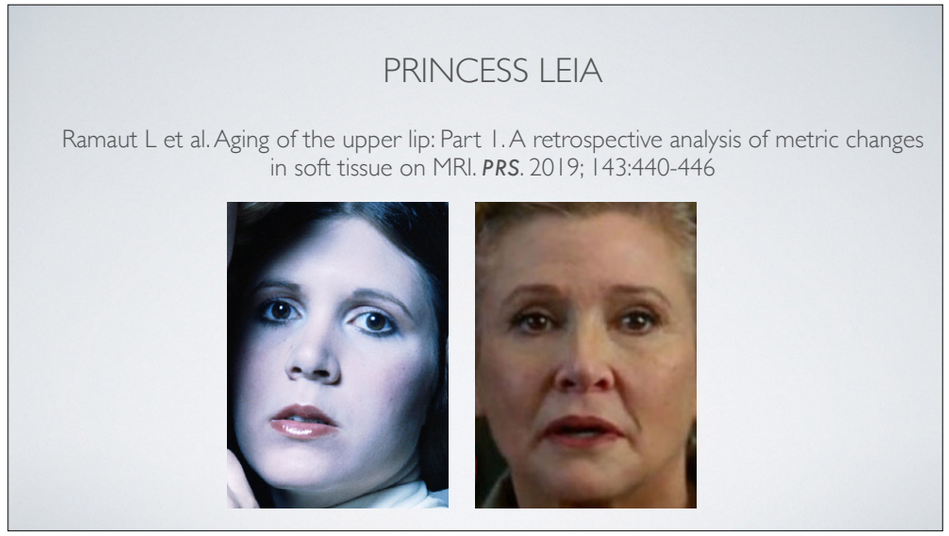

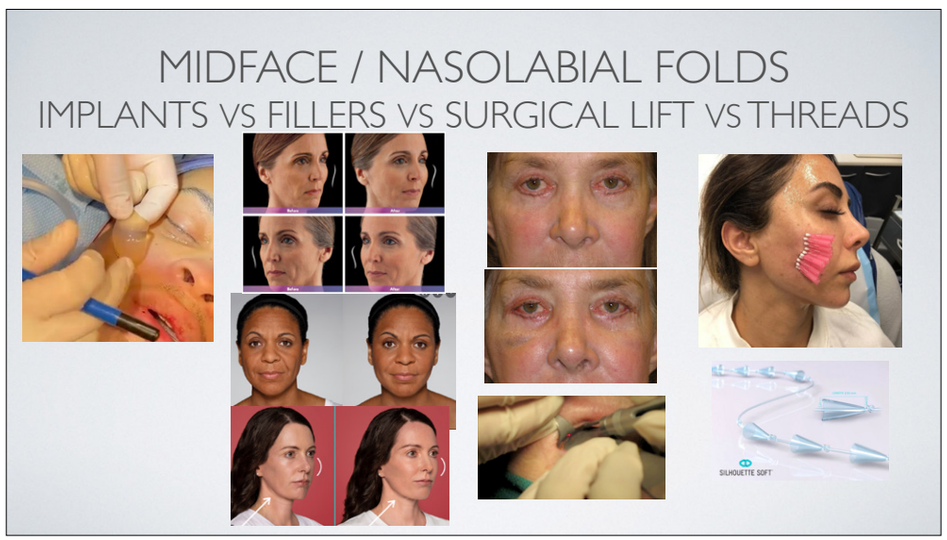

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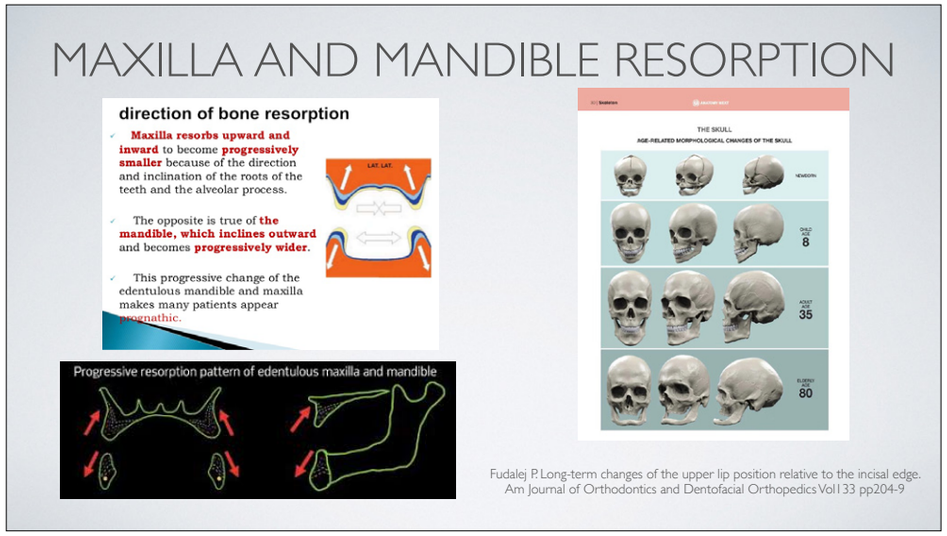

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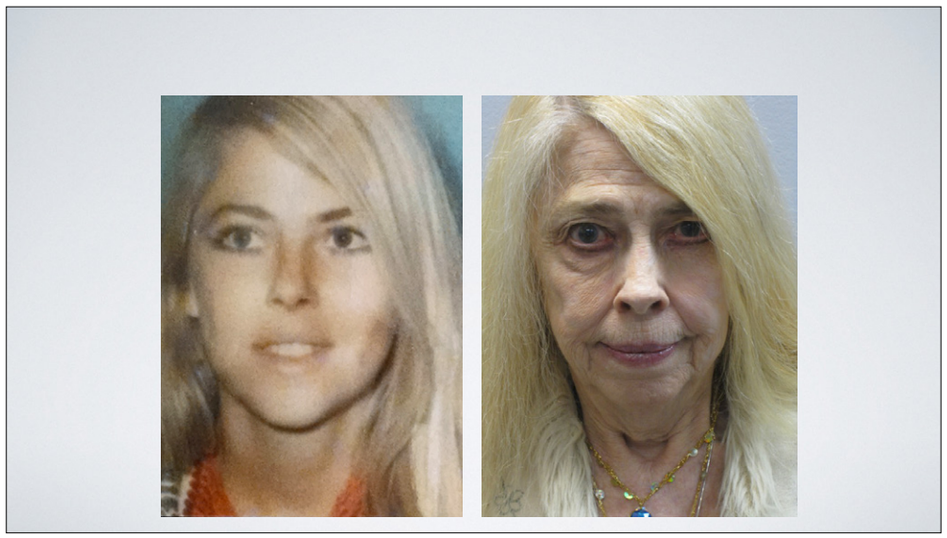

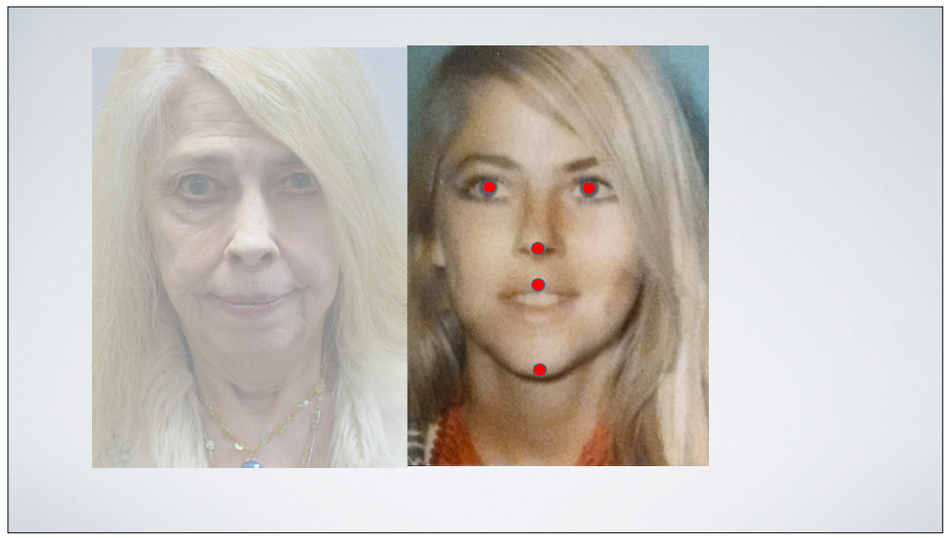

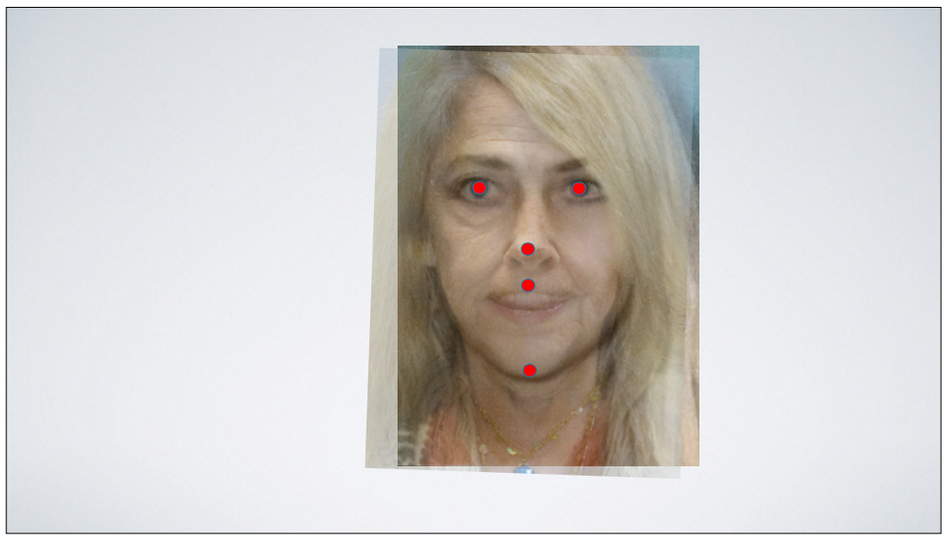

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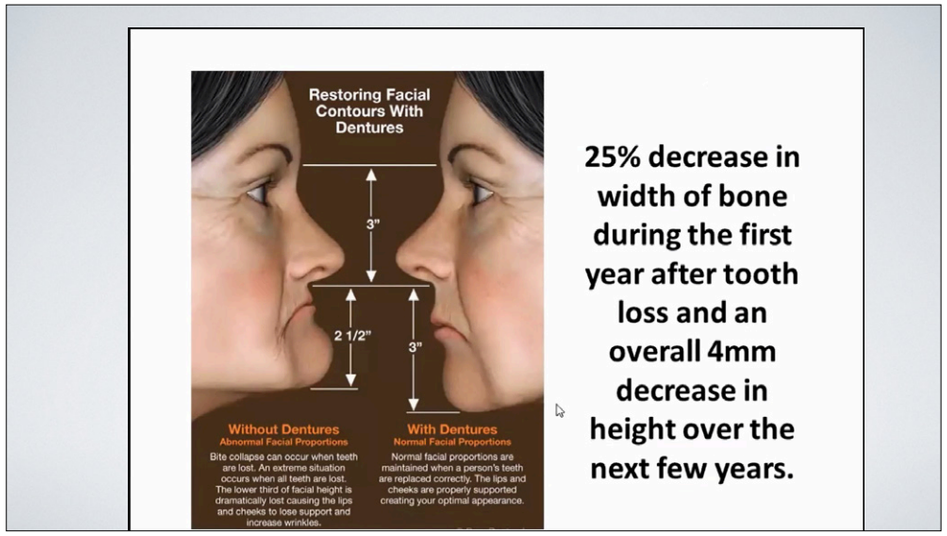

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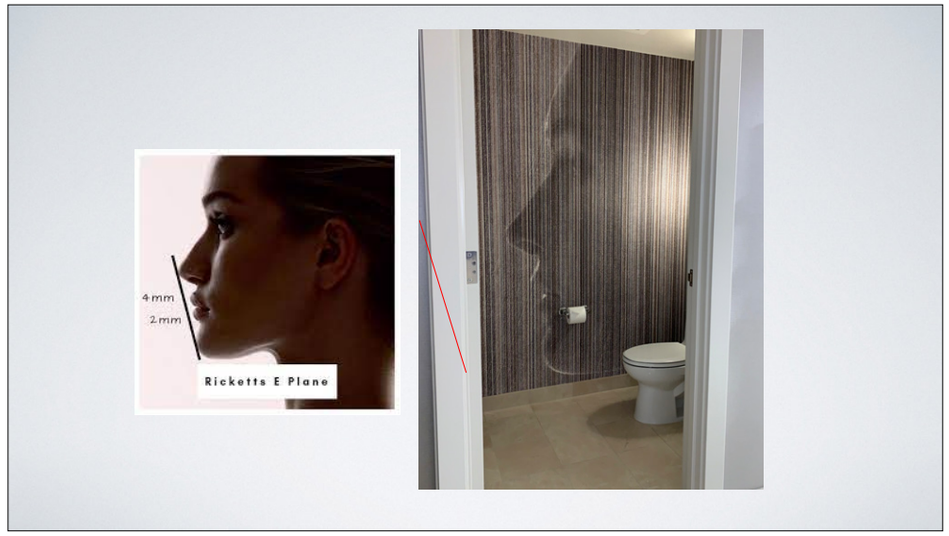

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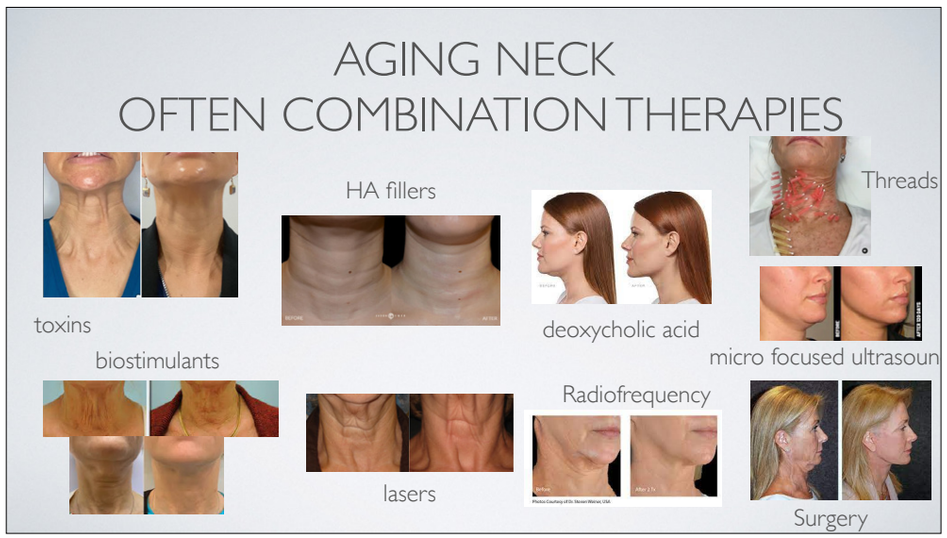

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4:06 – 4:23 pm

Pearls and Landmarks to Avoid Complications

Jose Raul Montes

Recently, there have been publications of injection-related visual compromise due to injectable implants or fillers. The majority of these cases have been covered at the Asian medical literature where filler injections are very common in the Glabellar and Nose areas.

On this presentation, the actual Incidence of cases with visual-compromised related to injectables will be discussed.

The main focus of this presentation is how to avoid such catastrophic complications.

A detailed description of an emergency protocol with the incorporation of Hyaluronidase will be demonstrated.

4:23 – 4:35 pm

Energy Based Devices for Facial Rejuvenation

Brian S. Biesman

4:35 – 5 pm

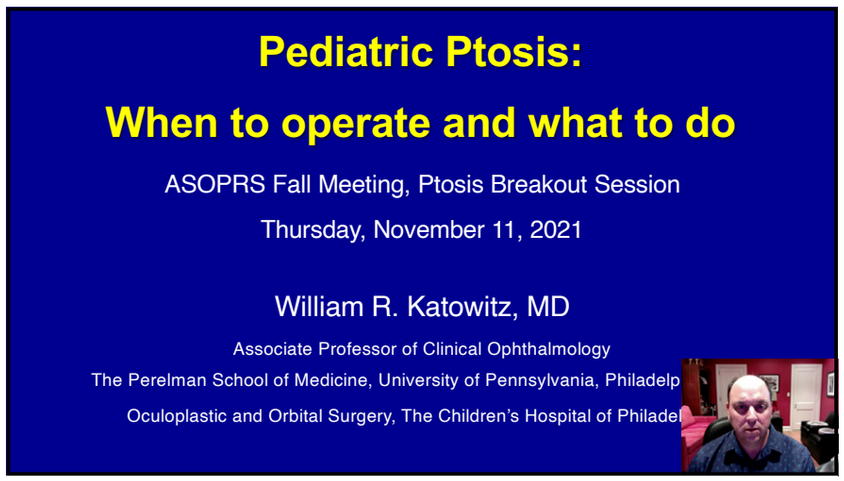
Live Injections

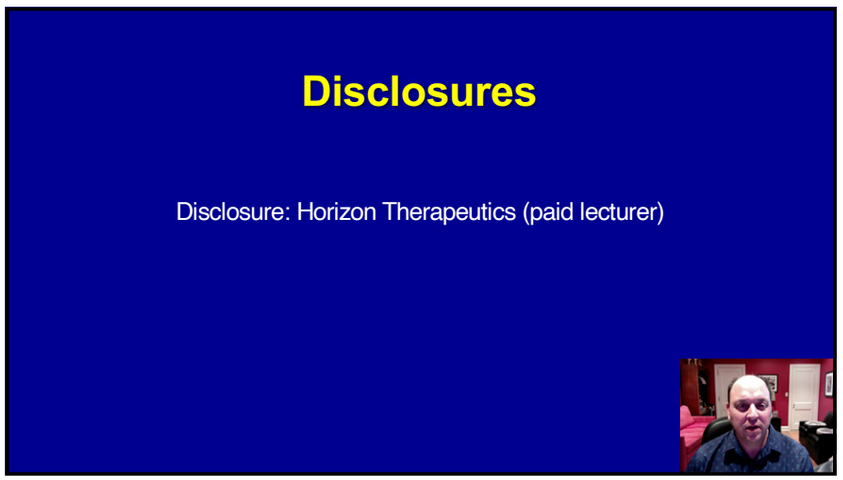
Deirdre Hooper

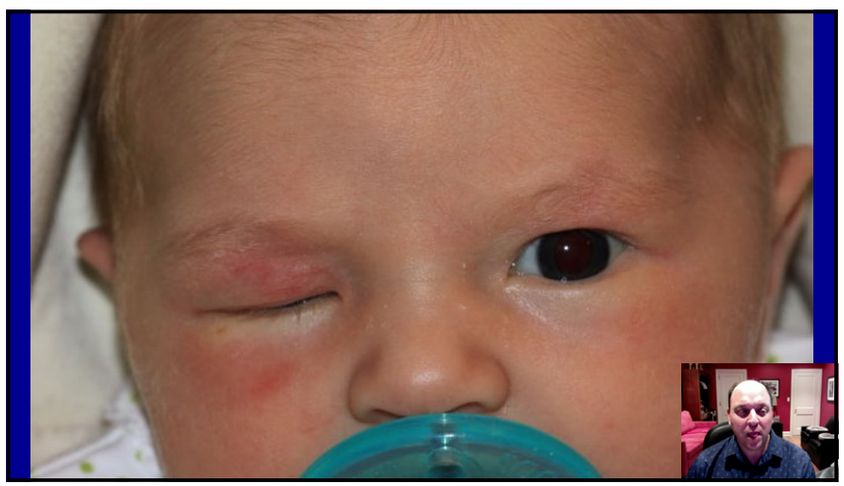
3:30 – 3:40 pm

Pediatric Ptosis – When to Operate and What to do

William R. Katowitz







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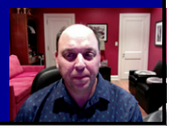
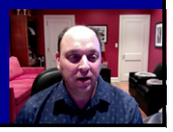
- When did the ptosis first occur?

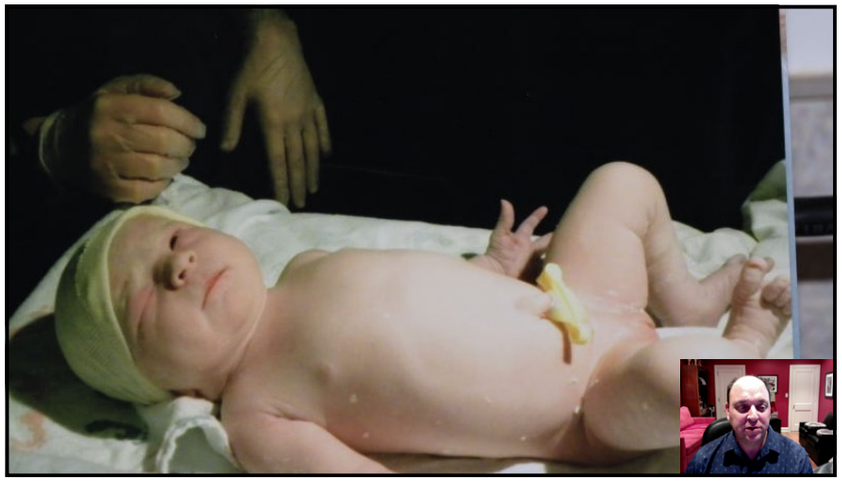
- When did the ptosis first occur?
- Birth?



- When did the ptosis first occur?
- Birth?
- Are you sure?

- When did the ptosis first occur?
- Birth?
- Are you sure?
- Old Photos?





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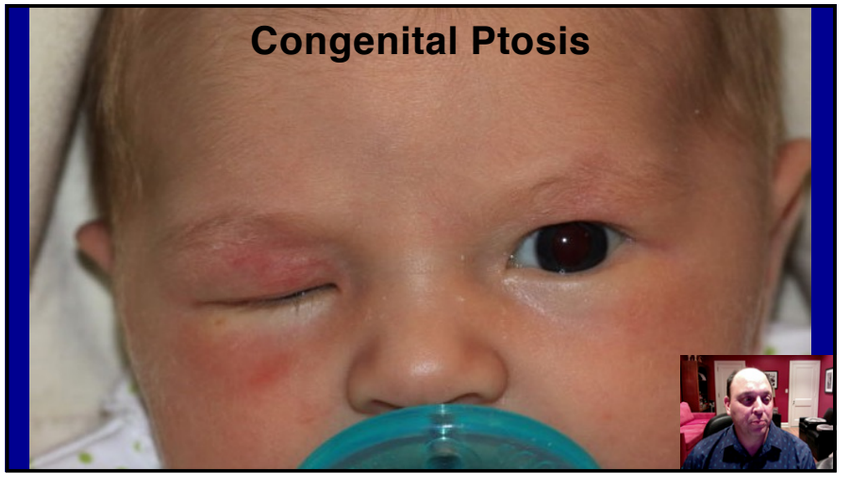
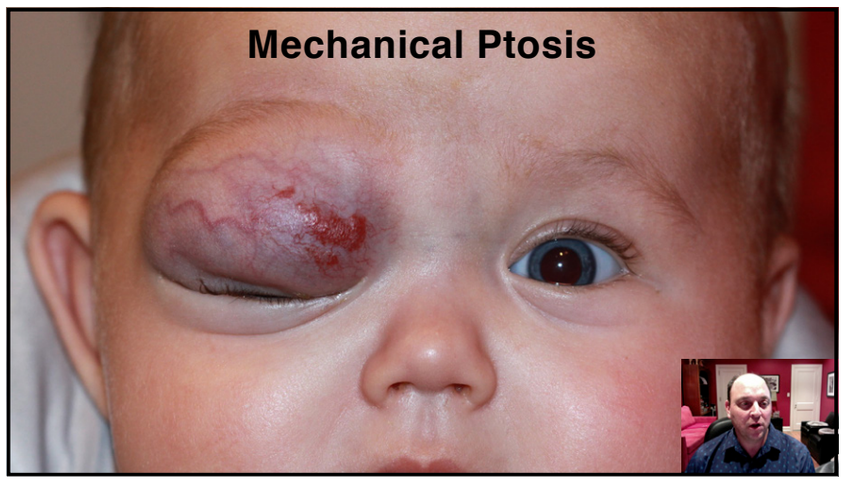
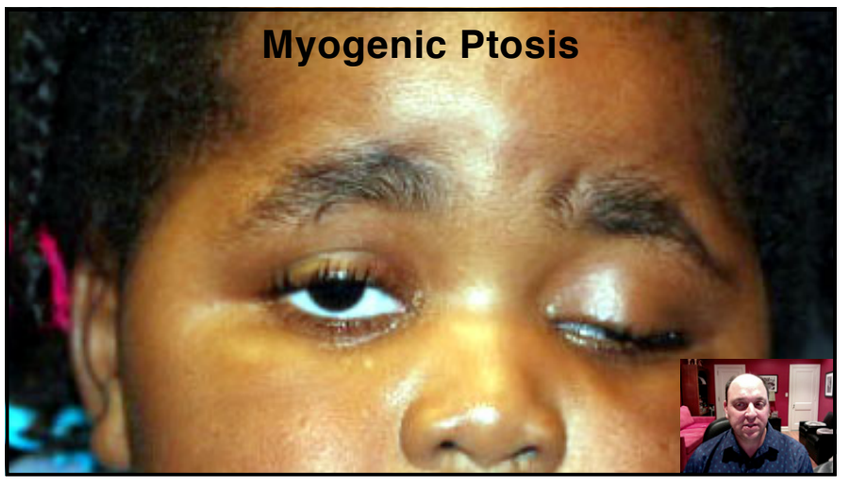
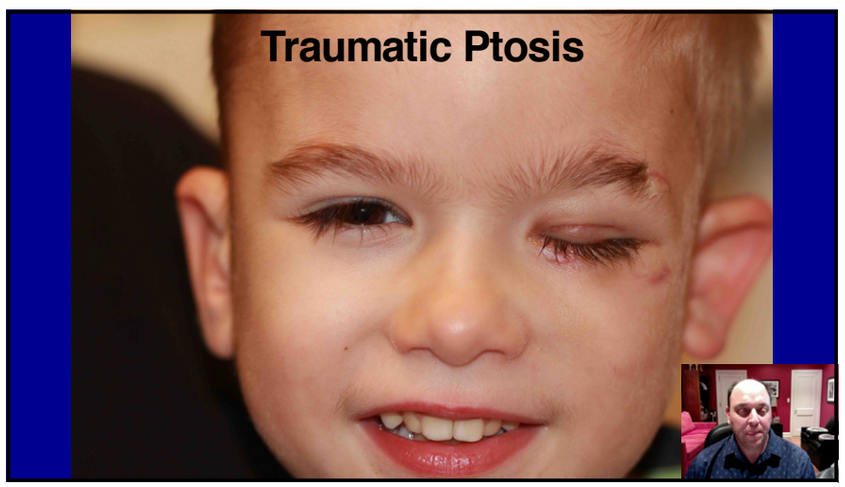
Classification

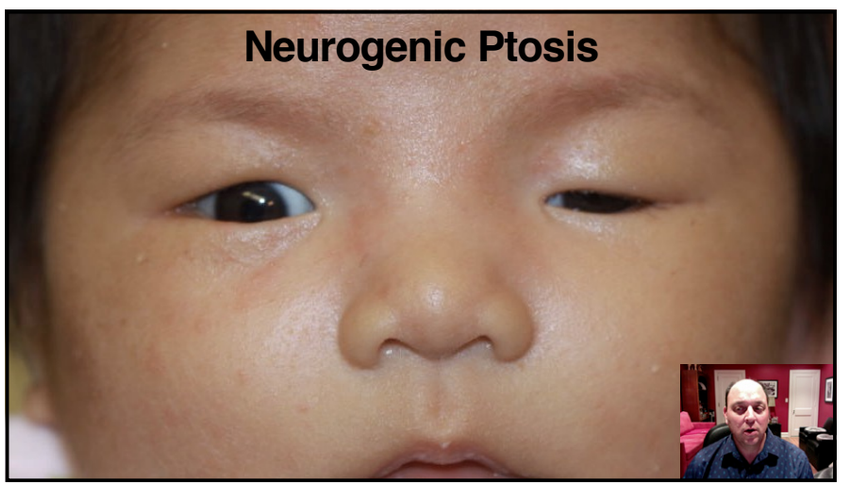
- Myogenic
- Neurogenic
- Traumatic
- Mechanical
- Aponeurotic (involutional)
- Pseudoptosis











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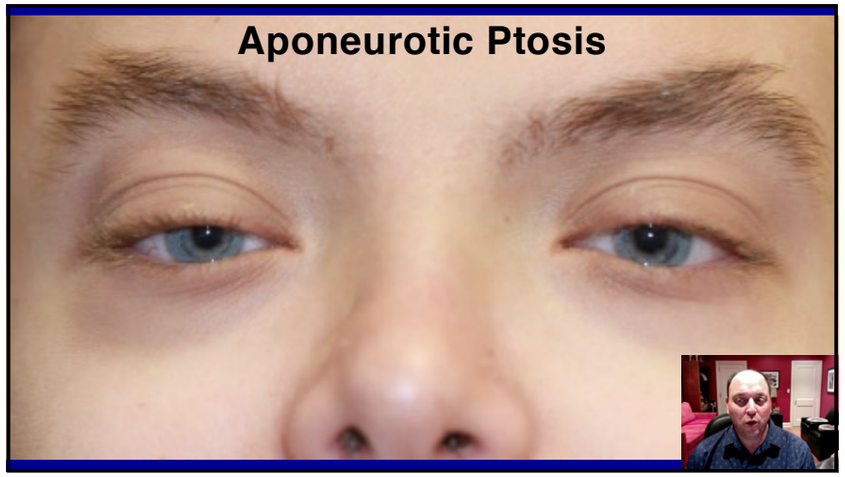

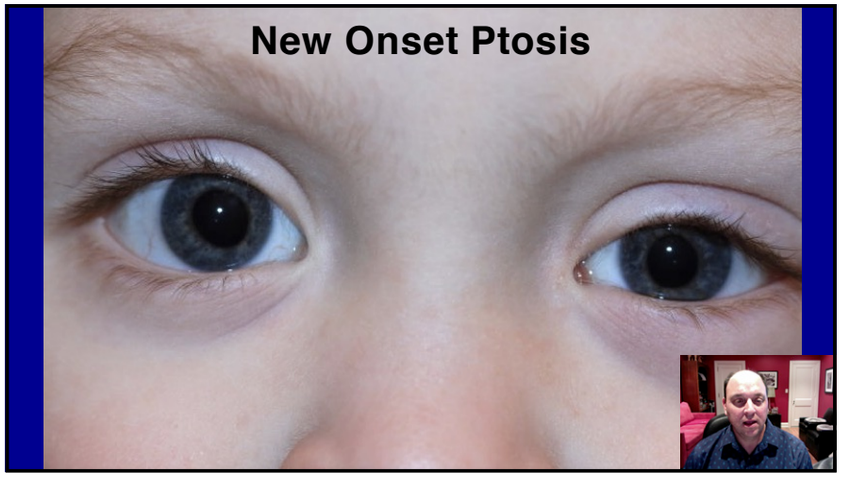

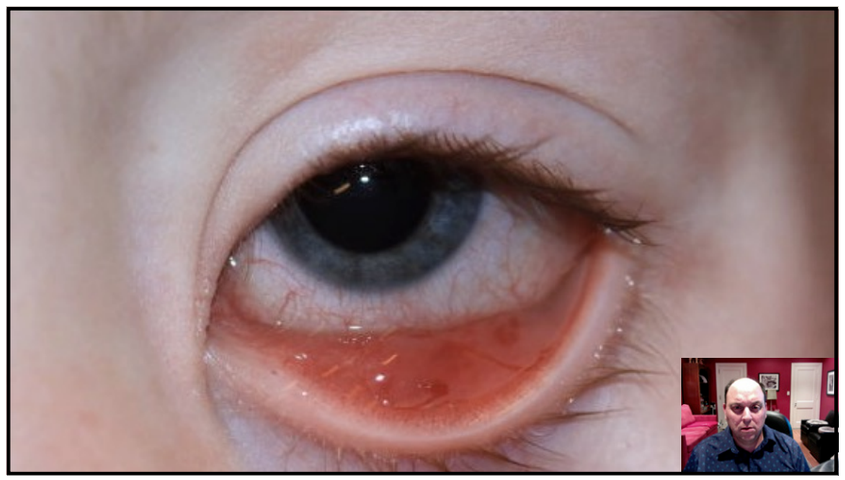

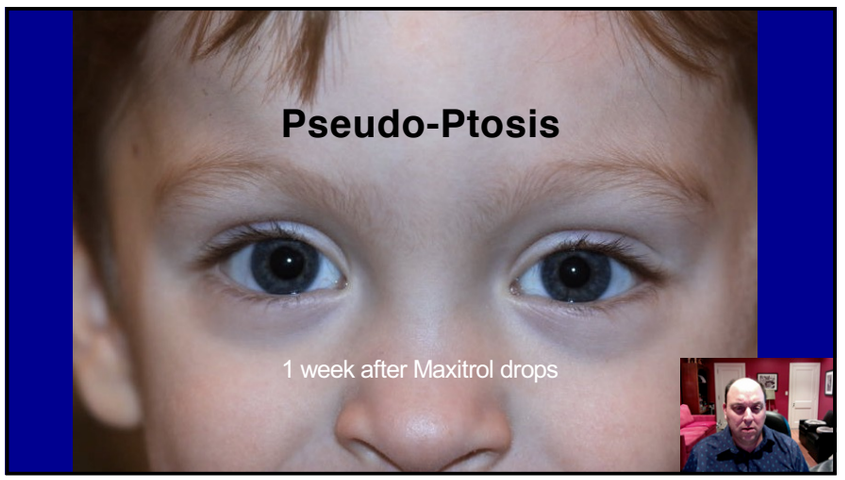

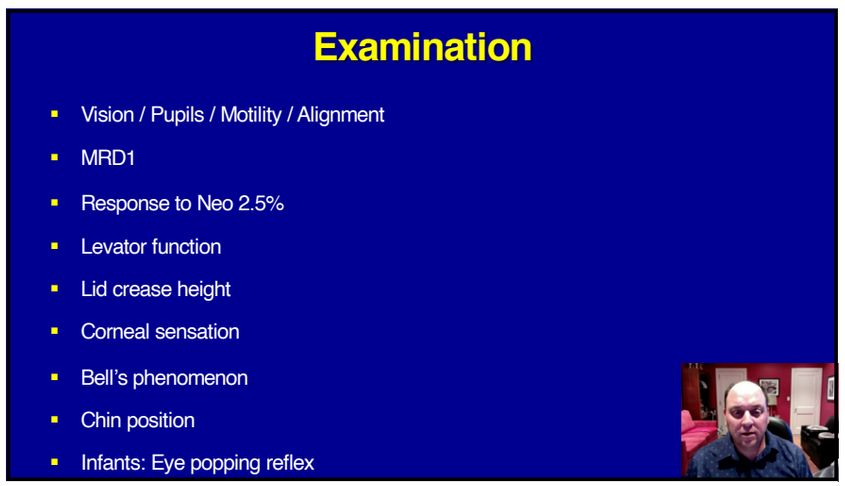

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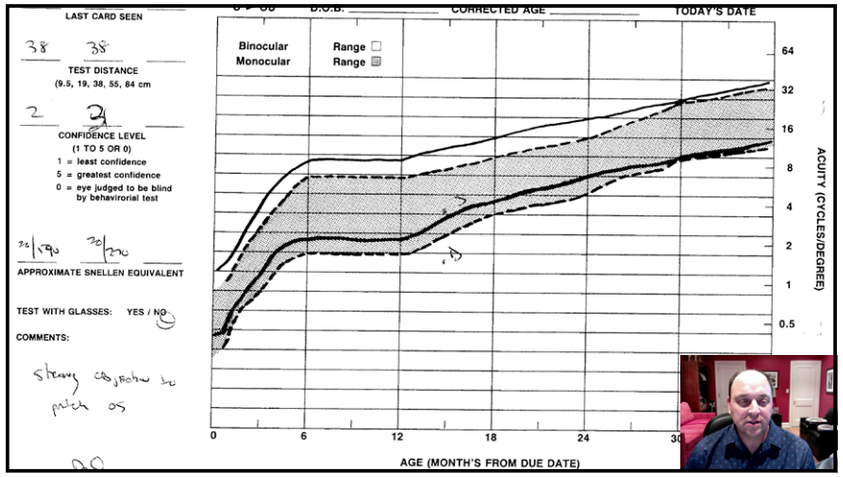
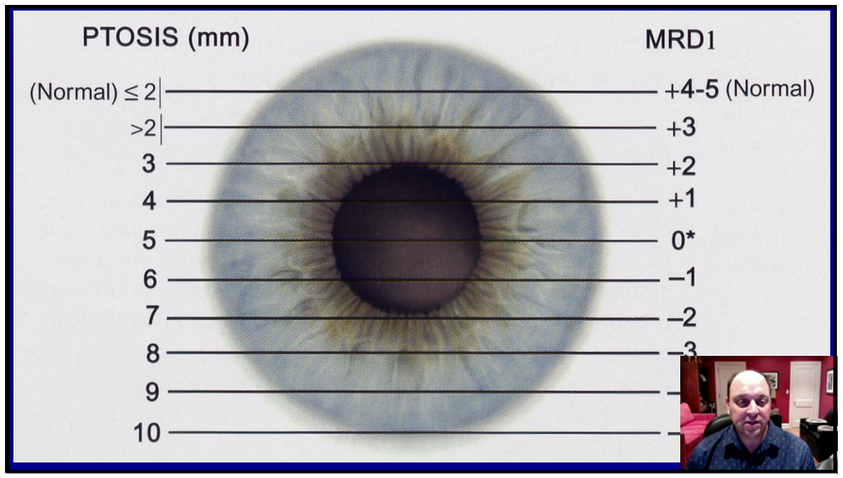
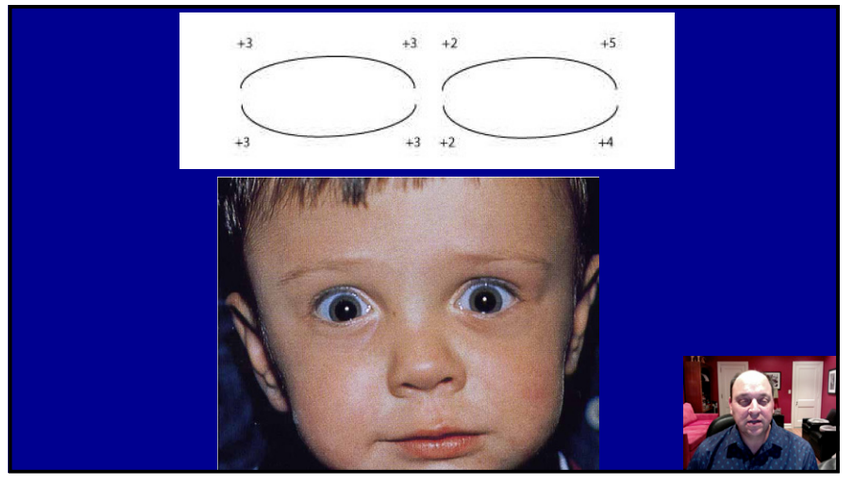


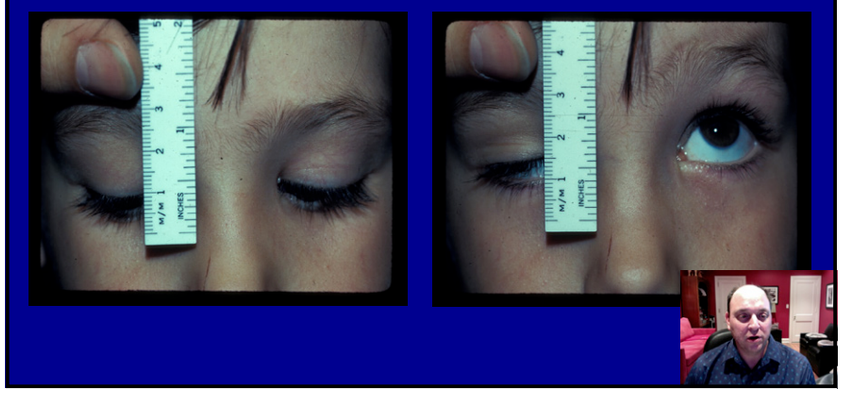
Ptosis and Amblyopia

- 25% of 92 Srinagesh et al. JAAPOS 2011
- 21.5% of 130 Lin et al. OPRS 2008
- 22.7% of 55 Beneish et al. Can J Ophthal 1983
- 11% of 65 Whitehouse et al. Ophthalmol 1

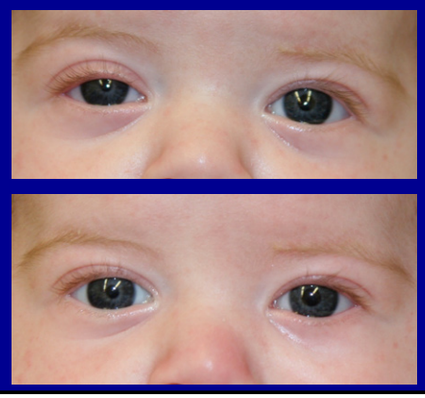




Levator Function



Phenylephrine 2.5%: Test Every Patient!



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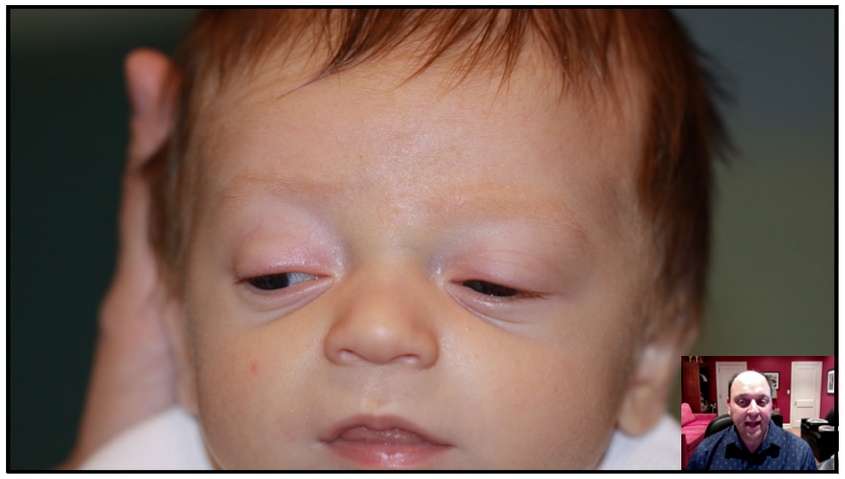

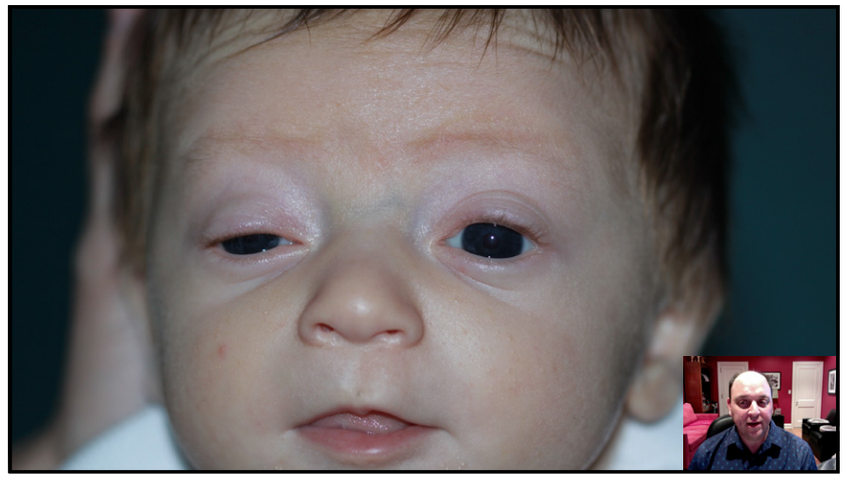

Eye Popping Reflex

- Perez RB. The eye-popping reflex of infants. J Pediatr. 1972 Jul;81(1):87-9.

Testing

- Visual field – good luck!
- Imaging – almost never in congenital ptosis
- Acetylcholine Receptor Antibody – depending on history
- Neuro-ophthalmology work up - sometimes

Pediatric Ptosis:

What Do We Care About?

What Do We Care About?

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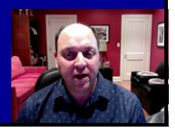
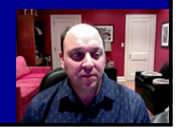
What Do We Care About?

- How a child SEES



What Do We Care About?

- How a child SEES
- How a child FEELS



What Do We Care About?

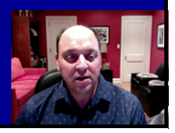
- How a child SEES
- How a child FEELS
- How a child LOOKS

What Do We Care About

- SEES

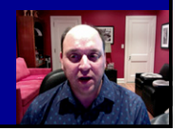
What Do We Care About

- How a child SEES
- How a child FEELS
- How a child LOOKS



Timing of Surgery

CONTROVERSY



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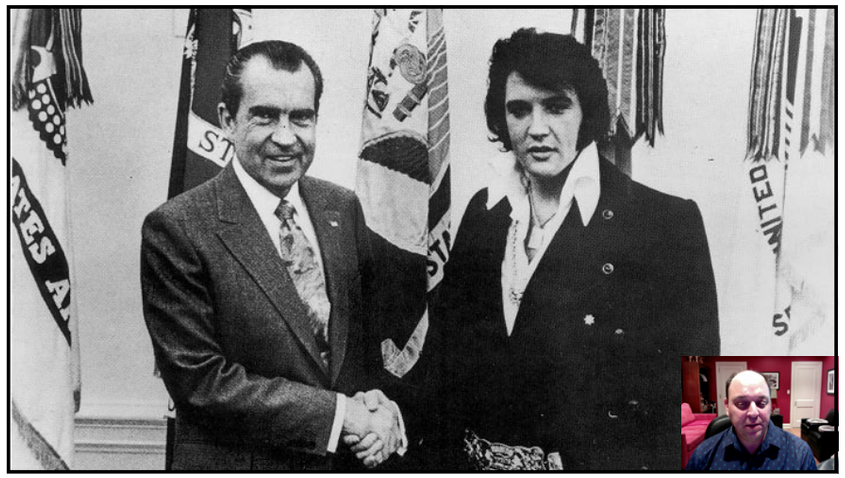
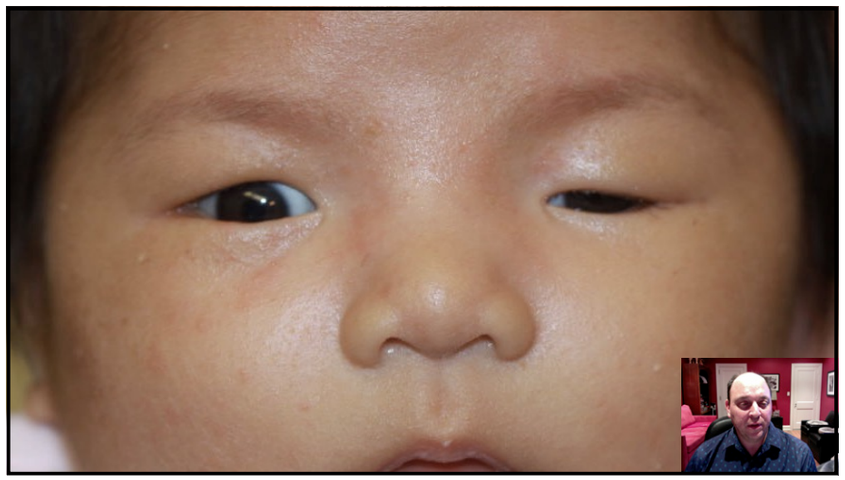
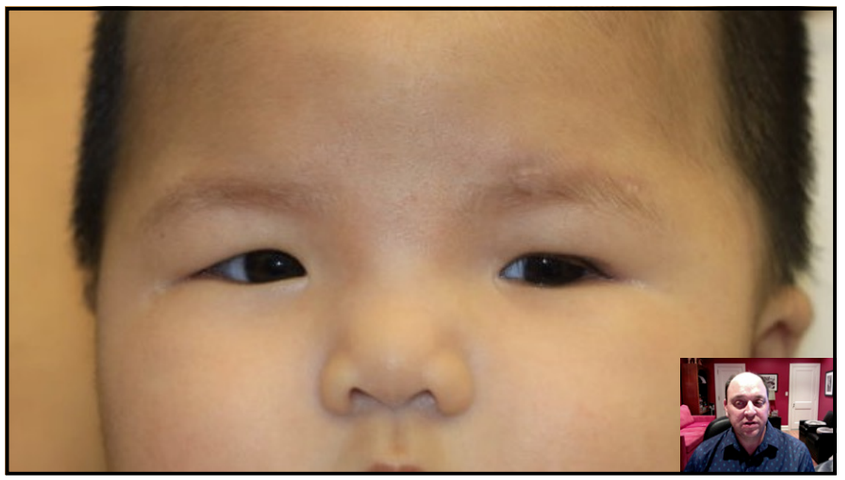






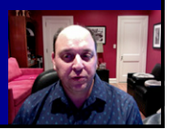
Timing

IF IT'S LOW

LIFT IT

Conservative Management

- Observation
- Patching
- Glasses
- Patient and family motivation
- Be sensitive



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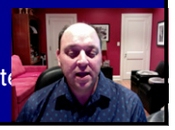
Surgical Management

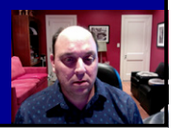
- Slings
  - Silicone, Autogenous Fascia Lata, *frontalis flap*
- Levator Resection
- Fasanella or Mullerectomy
- Modified Mullerectomy with a partial tarsectomy (Putt



Tips and Tricks in Pediatric Ptosis Surgery

TIP #1

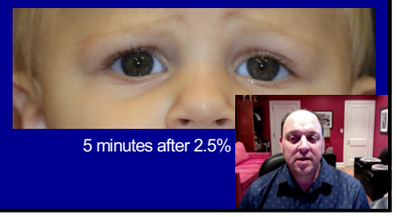
ALWAYS CONSIDER A MüLLERECTOMY



Ptosis with a Good Neo Response

- Fasanella or Müllerectomy
- Mild to moderate ptosis
- Regardless of levator function
- Who have a good Neo response
- Can be used for “high risk” patients

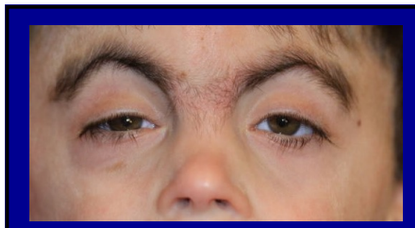
Before 2.5% Phenylephrine



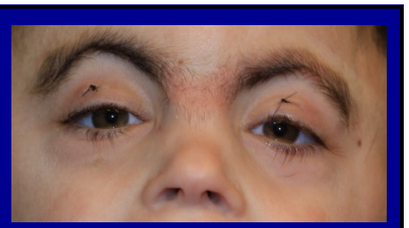
5 minutes after 2.5%

Müllerectomy for High Risk Patients

- 3rd Nerve Palsy
- Chronic Progressive External Ophthalmoplegia (Kearns Sayre Syndrome)
- Double Elevator Palsy
- Oculopharyngeal Muscular Dystrophy (OPMD)
- Myotonic Dystrophy (MD)

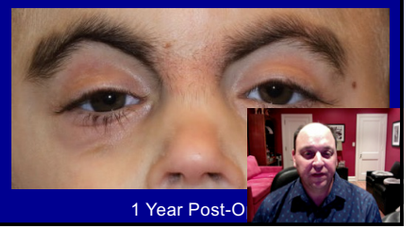


Pre-Op, Pre-Neo



1 Week Post-Op

Pre-Op, Post-Neo



1 Year Post-O

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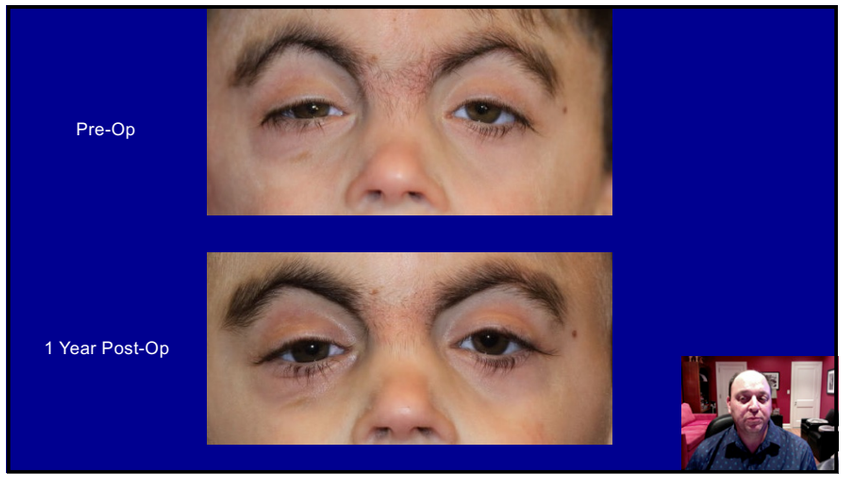

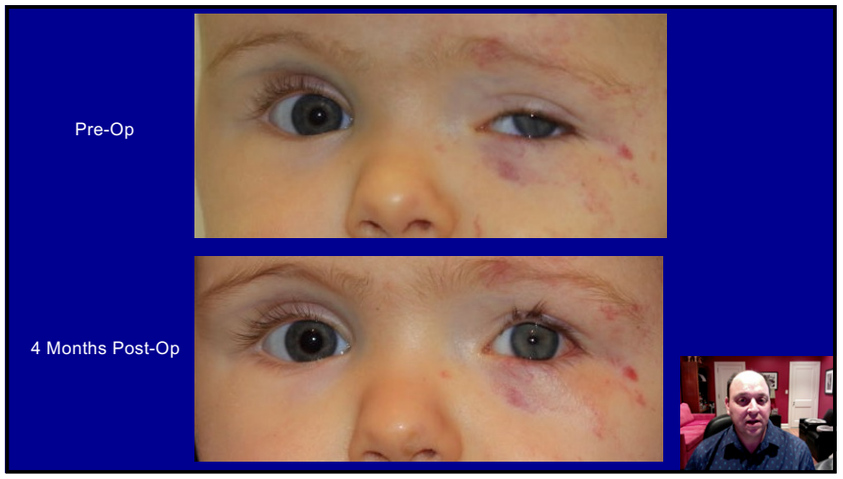

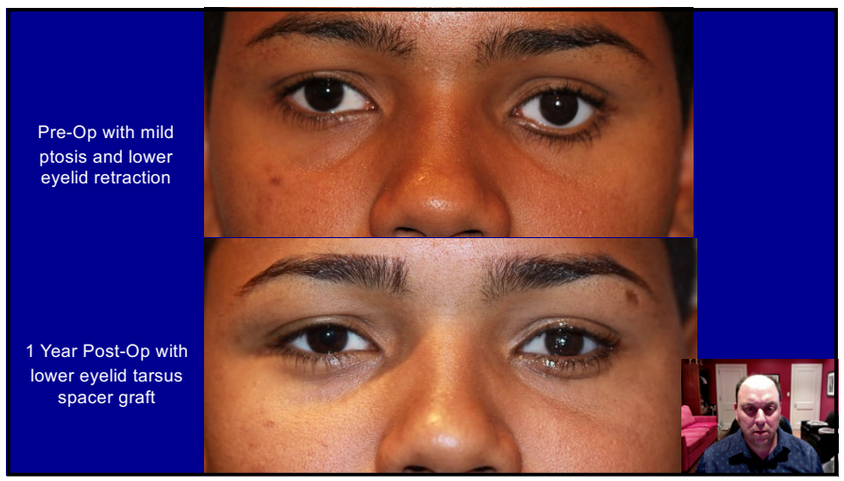

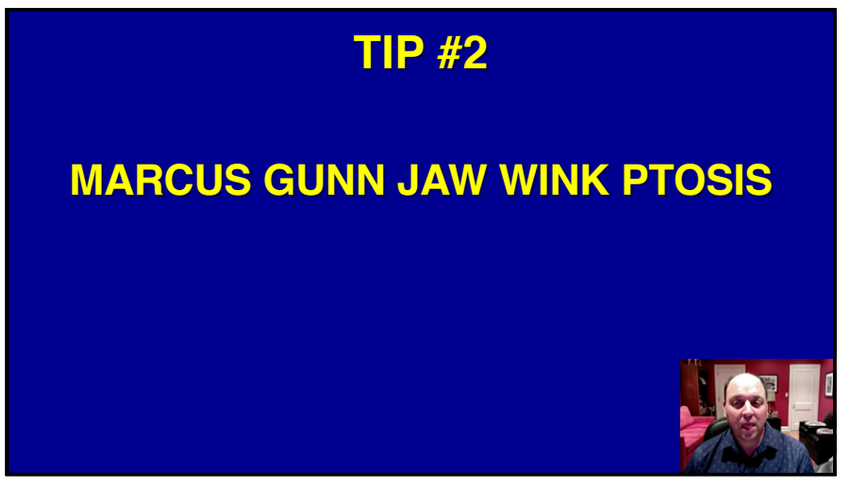

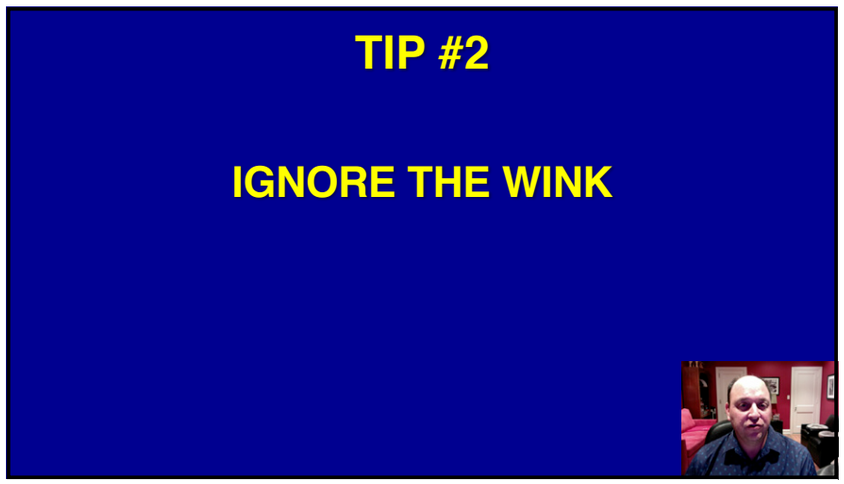

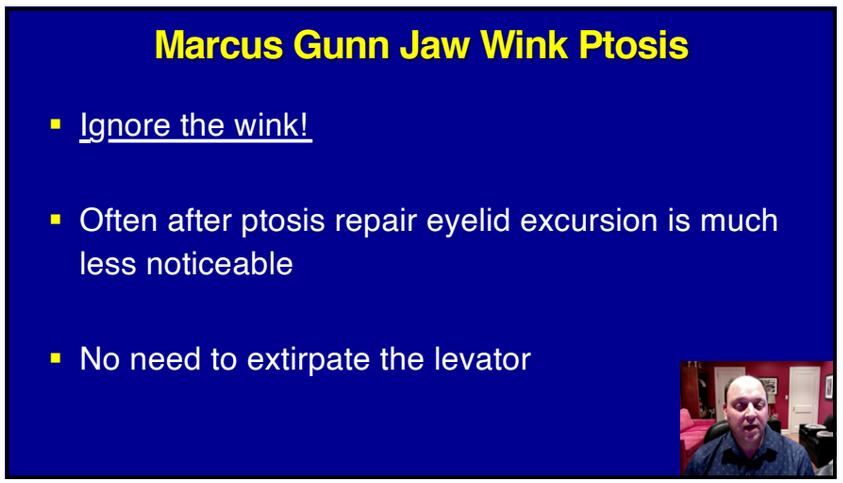

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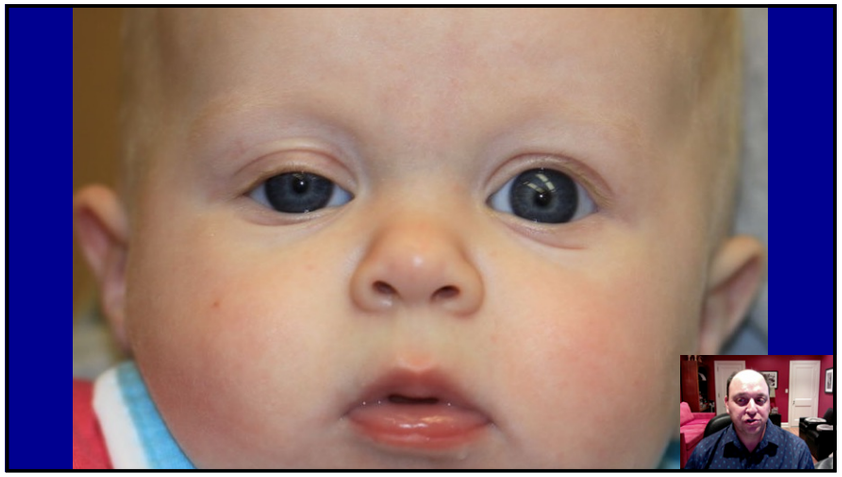
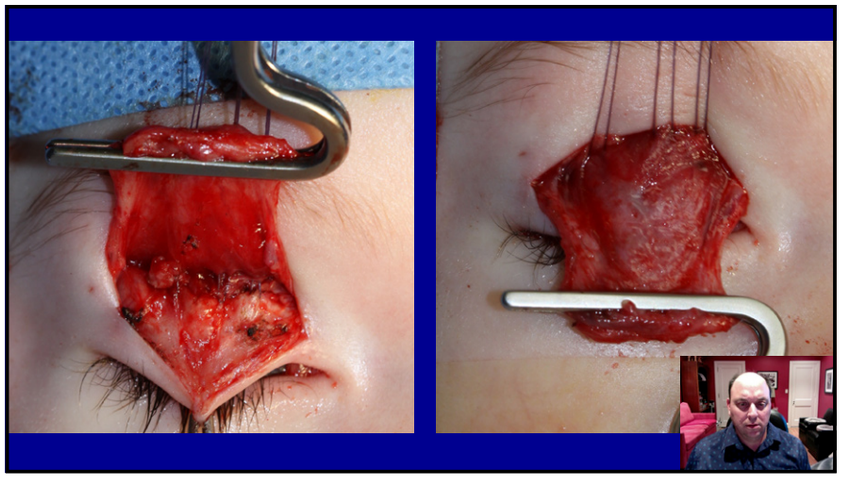
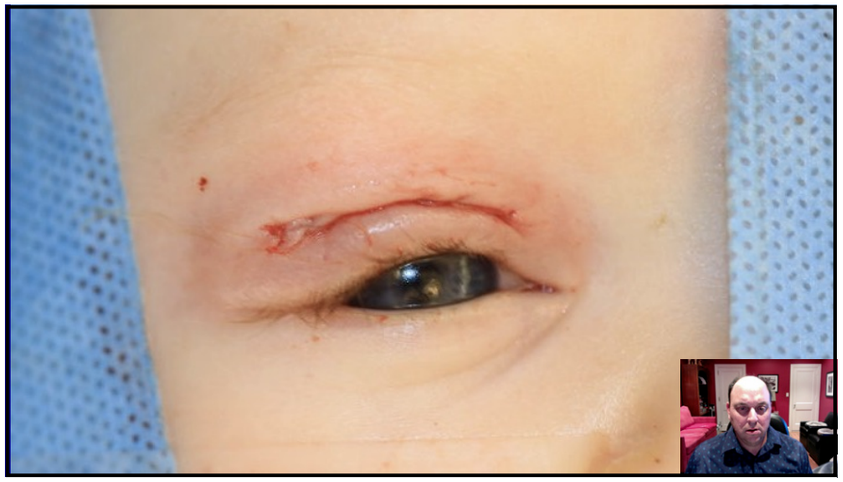
Marcus Gunn Jaw Wink

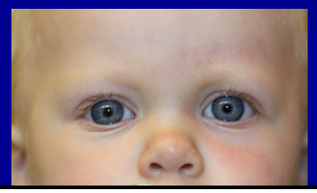
- Classically is treated +/- unilateral levator extirpation and bilateral slings
- Prefer: custom approach based on amount of ptosis and levator function







- After right levator resection:
- Right wink is minimal
- Left wink resolved



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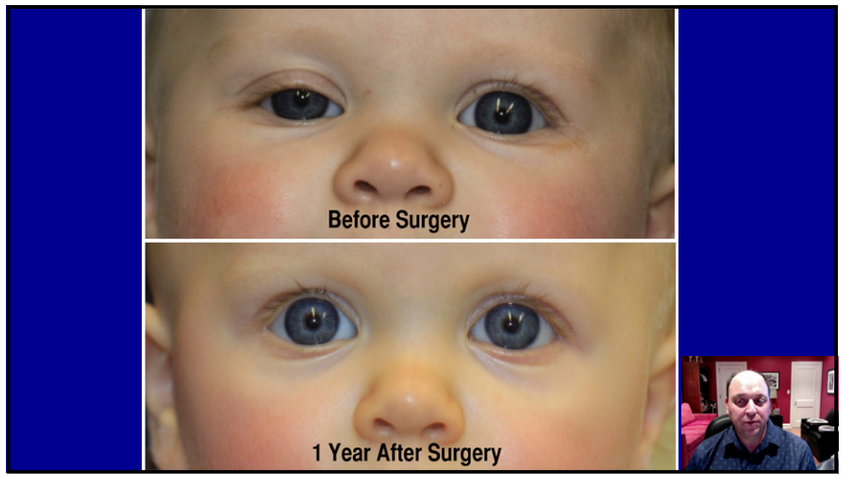
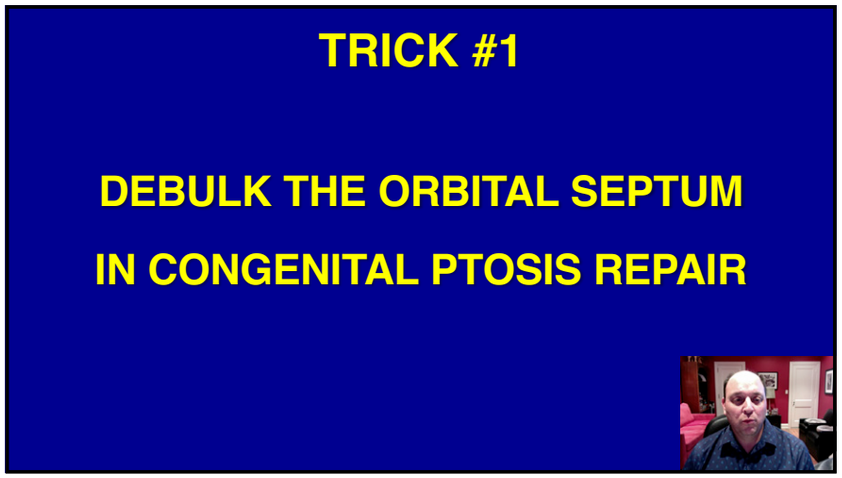
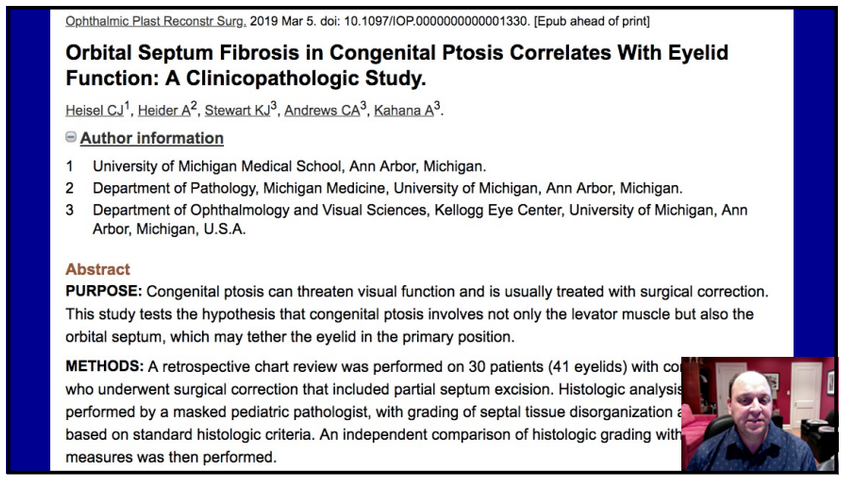






Ophthalmic Plast Reconstr Surg. 2019 Mar 5. doi: 10.1097/IOP.0000000000001330. [Epub ahead of print]

Orbital Septum Fibrosis in Congenital Ptosis Correlates With Eyelid Function: A Clinicopathologic Study.

Heisel CJ[1], Heider A[2], Stewart KJ[3], Andrews CA[3], Kahana A[3].

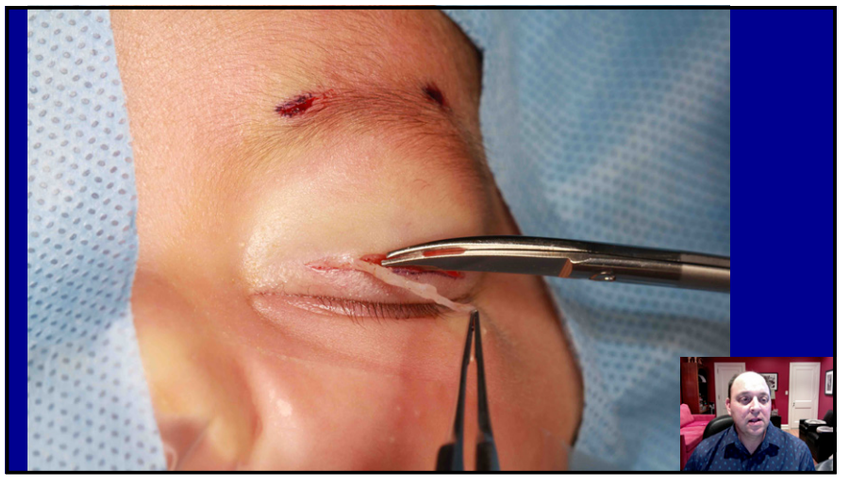
Author information

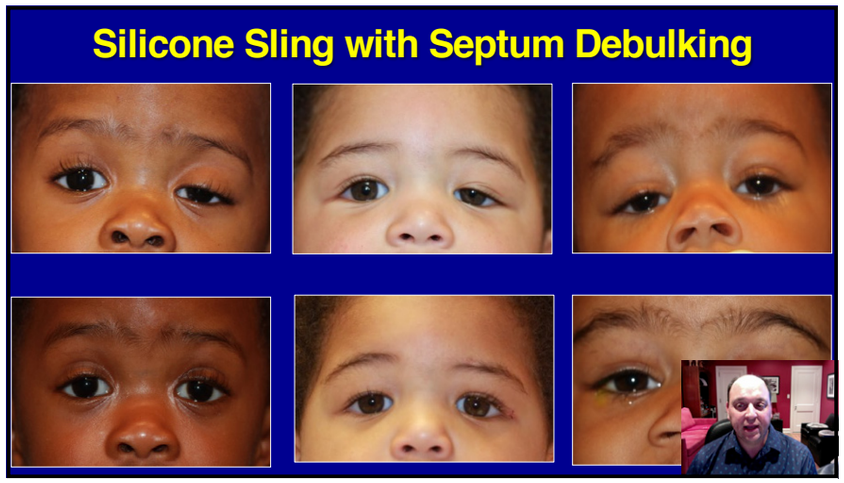
1 University of Michigan Medical School, Ann Arbor, Michigan.
2 Department of Pathology, Michigan Medicine, University of Michigan, Ann Arbor, Michigan.
3 Department of Ophthalmology and Visual Sciences, Kellogg Eye Center, University of Michigan, Ann Arbor, Michigan, U.S.A.

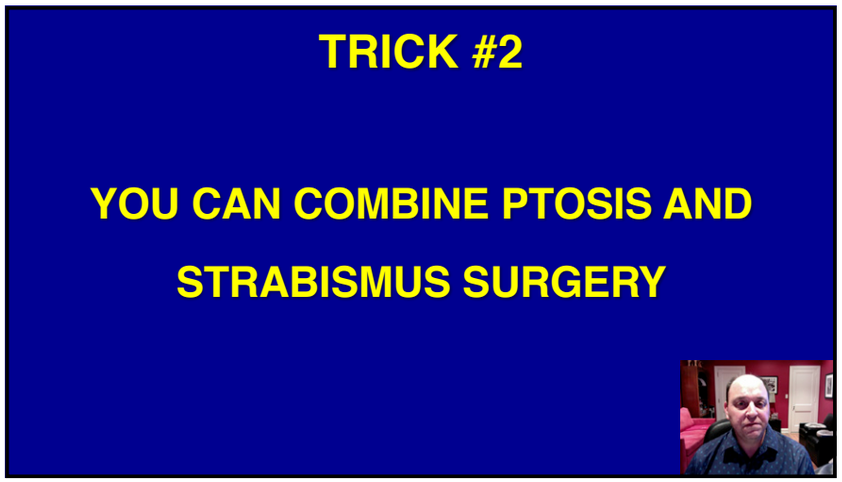
Abstract

PURPOSE: Congenital ptosis can threaten visual function and is usually treated with surgical correction. This study tests the hypothesis that congenital ptosis involves not only the levator muscle but also the orbital septum, which may tether the eyelid in the primary position.

METHODS: A retrospective chart review was performed on 30 patients (41 eyelids) with co
who underwent surgical correction that included partial septum excision. Histologic analysis
performed by a masked pediatric pathologist, with grading of septal tissue disorganization a
based on standard histologic criteria. An independent comparison of histologic grading with
measures was then performed.







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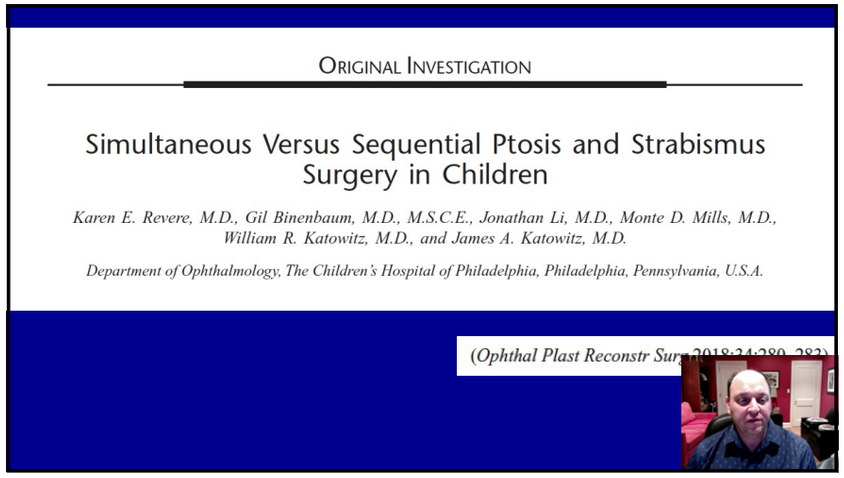


3:40 – 3:50 pm

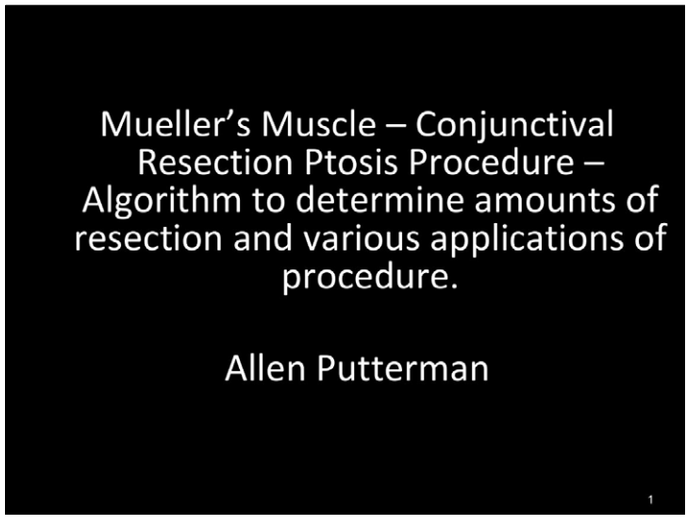
Frontalis Muscle Flaps

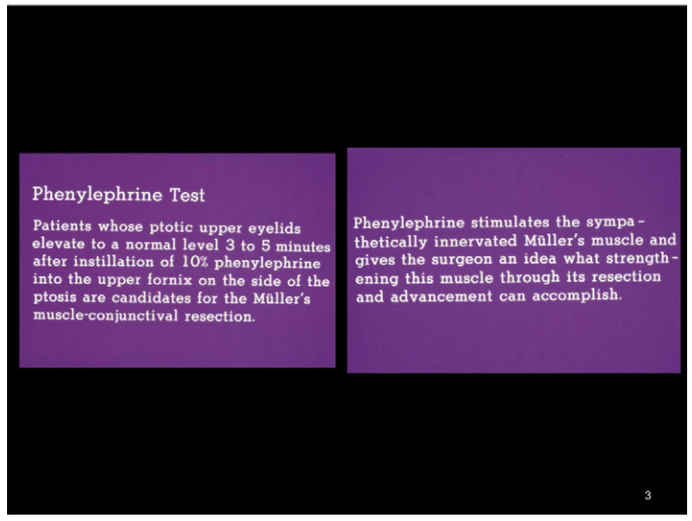
Bobby S. Korn

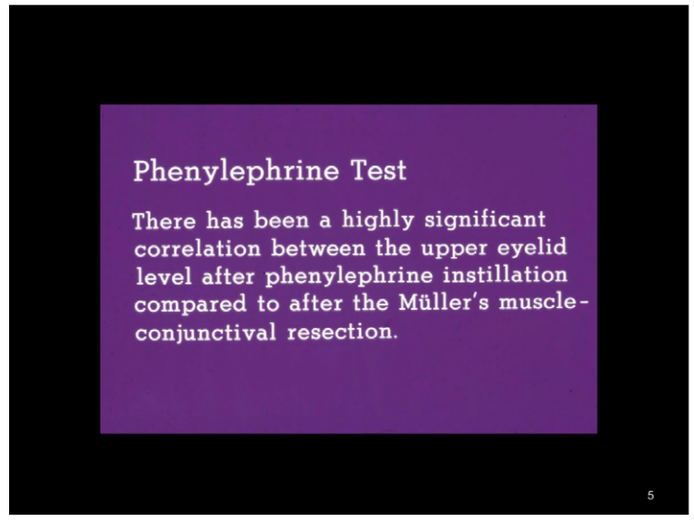
3:50 – 4 pm

Update on the MMCR

Allen M. Putterman







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Glatt HJ, Fett DR, and Putterman AM: Comparison of 2.5% and 10% phenylephrine in the elevation of upper eyelids with ptosis. *Ophthalmic Surg* 21:173, 1990.

6

Phenylephrine test

The upper eyelid level in relation to the superior limbus or a light reflex shined on the cornea must be used to evaluate response of phenylephrine instillation. (Measuring palpebral fissure width is inaccurate since Müller's muscle in the lower eyelid can also respond to phenylephrine.)

7

Putterman, A.M.: Margin Reflex Distance (MRD) 1, 2 and 3.

Letter to the Editor, Ophthal. Plast. Reconstruct. Surg. Vol. 28, No. 4, pp. 308-310, 2012

If the upper eyelid elevates to a normal level, after phenylephrine, an 8.5 millimeter (mm.) MMCR is performed. If it is slightly higher or lower than normal, then a 6 to 10mm plus 2mm of superior tarsal resection, respectively, is performed.

11

In unilateral ptosis, if there is an elevation of the ptotic lid, after phenylephrine, that is 0.5mm higher than the normal lid (plus +0.5), then an 8mm MMCR is performed; if the ptotic lid elevates to a level that is 0.5mm lower than the more normal lid (minus -0.5) then a 9mm MMCR is done, etc.

Unilateral Blepharoptosis

(MRD-1) (mm.)

•Phenylephrine difference	Amount of resection
0	8.5
+/- 0.5	8 or 9
+/- 1	7 or 9
+/-1.5	6.5 or 9.5
+/-2	6 or 10 + 2mm tarsus

12

In bilateral ptosis, if there is a 0.5mm MRD-1 difference between the levels of the upper eyelids, after phenylephrine, then a 1mm difference in the amounts of MMCR is done, 7.5mm for the less ptotic lid and 8.5mm for the more ptotic lid, etc.

Bilateral Blepharoptosis

(MRD-1) (mm.)

Phenylephrine difference	Resection difference	Amount resected
0	0	8.5
0.5	1	7.5/8.5
1	2	7.5/9.5
1.5	3	6.5/9.5
2	4	6/10 + 2mm tarsus

13

What types of Ptosis can be treated with the Mueller's Muscle – Conjunctival Resection

A) Acquired Ptosis
B) Congenital Ptosis
   1. Mild cases
   2. When other lid is treated with a supermaximal levator resection
C) Blow-out fractures with minimal enophthalmos
D) Anophthalmos
E) Horner's syndrome
F) Blepharospasm after Botox
G) With upper blepharoplasty

Putterman, AM: The Margin Reflex Distance Four (MRD-4) to Determine Medical Necessity of Upper Blepharoplasty and Brow Lifting. Letter to the Editor, Ophthal. Plast. Reconst. Surg. Ophthalmic Plastic and Reconstructive Surgery: July/August 2021-Volume 37-Issue 4- p. 391

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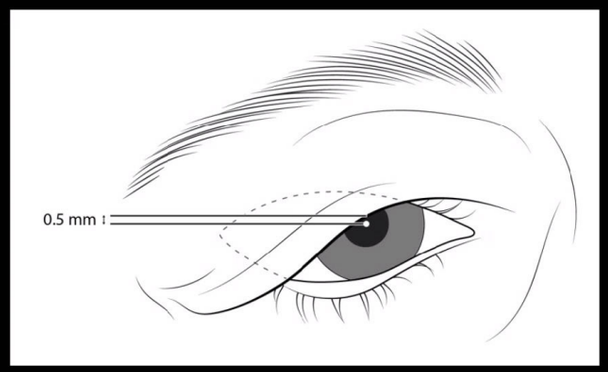

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4 – 4:10 pm

Ptosis and Brow Position

Daniel B. Rootman

4:10 – 4:20 pm

Aponeurotic Ptosis Surgery

John B. Holds

4:20 – 4:30 pm

Pharmacologic Management of Ptosis

Andrew R. Harrison

4:30 – 4:40 pm

Masqueraders and Mimics in Ptosis Surgery

Pete Setabutr

3:30 – 3:40 pm

Osseointegration Tips/Uses

Cat N. Burkat

3:40 – 3:50 pm

A Treatment Paradigm for Congenital Anophthalmos

Chad C. Zatezalo

3:50 – 4 pm

New Directions in Ocular Prosthetics

Jeremiah P. Tao

Prosthetic eye motility is important in the rehabilitation of the anophthalmic socket. This presentation will explore surgical strategies including implant selection and procedures that may maximize prosthetic eye motility. The talk will provide an update on a digital prosthetic eye concept.

4 – 4:10 pm

What I Have Learned from Being a Student of Enucleation

Philip L. Custer

Throughout my career I have been interested in enucleation. In this presentation I will review what I consider the key take home points of my clinical research and review of the literature:

Implant Motility: In patients who have undergone similar surgery with the rectus muscles attached to the implant, there is no motility benefit of porous vs nonporous implants, unless they have undergone coupling of the implant to the prosthesis. Attaching the inferior oblique to the implant my help maintain the depth of the inferior fornix.

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Implant Size: Individualizing implant size reduces postoperative volume deficit and the deep superior sulcus deformity. Trying to safely maximize implant size empirically yielded similar results as using intraoperative volume measurements. Preoperative conjunctival or Tenon's fibrosis often does not limit the ability to insert large implants. Larger implants are associated with improved implant motility and levator function.

Implant Shape: Postoperative rotation of irregularly shaped implants can interfere with prosthetic fitting and retention. Spherical implants are preferred.

Implant Material: While studies vary widely, as an aggregate, published results show a greater exposure incidence of unwrapped porous vs non-porous implants. Wrapping with polyglactin mesh, Mersiline mesh, or bovine pericardium does not reduce the exposure rate. Covering implants with donor sclera reduces the incidence of exposure for both porous and non-porous implants.

Anophthalmic Ptosis: Of the many patients with preoperative ptosis, the droop improves in about 40% after enucleation. There is also about a 40% chance that patients without preoperative ptosis will develop it after surgery.

4:10 – 4:20 pm

Porous Vs Non-Porous Implants – Which to Use

David R. Jordan
Ottawa Hospital, Ottawa, Ontario, Canada

A new era in anophthalmic socket surgery began with the introduction of coralline hydroxyapatite (HA) by Dr. A. Perry in the late 1980's.[1,2] The hydroxyapatite (HA) implant represented a new generation of buried spherical implant with an interconnecting system of pores that allowed host fibrovascular ingrowth.[2,3] By drilling into the HA implant and inserting a peg, the orbital implant could be directly coupled to the overlying prosthetic eye producing life-like movement of the prosthesis analogous to the coupled implants of the 1940's.[1] Although HA implants significantly raised the cost of rehabilitating the anophthalmic socket (e.g., higher implant costs, wrapping material costs, additional surgical time for implantation and procedures for complications or pegging as well as a confirmatory bone scan), the proposed advantages of a lower migration rate, lower extrusion rate, resistance to infection, as well as enhanced motility were used to justify the added expense.[2,3]

By 1992 HA became the most commonly used implant material.[4] Over the next several years, additional porous implants (e.g., synthetic hydroxyapatite, porous polyethylene, aluminum oxide) entered the market place, and were widely promoted.[5] Implant companies often portrayed their porous implant as better than their competitor with little scientific evidence. Marketing slogans such as; "the original, the leader, the total solution", "take a closer look at a better material", "the best choice for implantation candidates", became common at oculoplastic surgery meetings and in oculoplastic surgery journals.[6] During this same time period the author implanted over 1,500 implants including; over 300 polymethymethacrylate implants, 300+ mounded implants (eg., Iowa, Universal, Durette, Medpor Quad), 170+ coralline hydroxyapatite implants, 120+ synthetic hydroxyapatite implants, 430+ aluminum oxide implants, 20+ porous polyethylene implants (and similar products) as well as over 200 porous implants of varying material in rabbits). The author and many others reported experience on a variety of porous orbital implants including their benefits, problems and complications.[7-20] It was difficult to determine whether one porous implant was truly better than another.[7-17] It became clear that any porous implant may be associated with complications including: conjunctival thinning, implant exposure, pyogenic granulomas, socket discharge, implant infection, pain, and various pegging issues.[9,10,11,13,14] Eventually, some surgeons began to question the use of porous implants and advocated a return to non-porous spheres because of their overall low complication rate.[16,17,21,22] Spirited debate centered on multiple questions such as; which porous implant is the best, should they be wrapped, which wrap is the best, should they be pegged, which peg system is the best, who should be pegged, when should pegging be done, are porous implants truly advantageous, do they have a lower migration rate, do they have a lower extrusion rate, is there resistance to infection, and, is there any motility advantage?[23]

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With respect to implant migration; an early enucleation technique by Frost-Lange involved imbricating the extra-ocular muscles over unwrapped polymethylmethacrylate (PMMA) or silicone spheres.[24] It has now been well established this practice leads to *superotemporal* implant migration in 16% or more of patients over 8-10 years, so it has largely been abandoned.[10,25,26,27] Nunery, Wells and others have shown that attaching the rectus muscles in their normal anatomic position to non-porous spheres (e.g., PMMA, silicone) results in a very low *superotemporal* migration rate (0 - 1.3%) and are stable over many years.[18,26,27] Reports of *superotemporal* migration with porous orbital implants is not significantly different (0.5-1.7%).[4,17] However, it is this authors opinion if one also considers *anterior migration* of porous implants, the overall rate of implant migration may be higher with porous implants as this type of implant migration is seldom discussed. *Anterior migration* manifests as implant exposure. These cases are often lumped with other cases of implant exposure that may be due to a variety of other factors (e.g., inadequate or poor closure, infection, mechanical or inflammatory irritation from the rough surface of the of the porous implant, delayed ingrowth of fibrovascular tissue with subsequent breakdown, pressure points from a poorly fit prosthesis).[9] *Anterior migration* is secondary to improper seating of the porous implant. Porous implants have a rough surface and drag tissue inward as they are placed into the orbit; this "Velcro" effect makes implantation technically more demanding.[21] A tissue glide or wrap may help avoid this posterior drag of the anterior tissue.[25] Once implanted, the overlying tissue may be closed successfully over the porous implant, but with time any tissues dragged inward may return to their original relaxed position – a natural restitution of tissue (cactus syndrome).[28] As this occurs, a gradual migration of the implant anteriorly with progressive conjunctival thinning and eventual breakdown over the implant (exposure) occurs.[28] Fibrovascular ingrowth has not been shown to ensure stability of porous implants.[18] Thus, implant migration can occur with either porous or non-porous orbital implants; fortunately the risk is low with either type of implant.[4,17,18,26,27]

With respect to implant extrusion, when non-porous implants become exposed, they typically extrude.[11,16] When porous implants become exposed, the fibrovascular ingrowth helps retain them within the orbit, often preventing complete extrusion. Although porous implant exposures can be surgically repaired by a variety of techniques, large, recurrent or persistent exposures may require implant removal which essentially is a delayed extrusion (iatrogenic). Rather than ask whether porous orbital implants have a decreased extrusion rate, it is more prudent to ask whether they have a "decreased exposure rate".[26] Implant exposure is the most frequent and challenging problem associated with porous orbital implants.16 Reported exposure rates for non-porous spherical implants (e.g., PMMA/silicone) are typically low (0-3%).[4,16,18,26,27,29] Exposure rates for porous orbital implants are also generally low but can vary from 0-50%.[4,7,9,16,17,18] Custer et al reviewed pooled data and found a 6.6% exposure rate in 3,012 porous orbital implants compared to 2.9% in 615 non-porous implants.[16] More recently, Wladis et al reported that rates of exposure (and extrusion) are generally comparable between porous and non-porous implants, suggesting the choice of implant may not result in a dramatic difference in this complication.[18] Thus, there is little evidence that porous implants have a reduced extrusion or exposure rate, and in fact, it may be higher.[15,16,30] Porous implant exposures can occur anytime and the longer the follow-up, the greater the number of exposures.[11,14,16]

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With respect to infection; non-porous implants (e.g.,PMMA/silicone) have been shown to have a low infection rate (0-1%).[4,18,27] Unpegged porous orbital implants also have a low infection rate (0-2%).[7,8,9,14,17,18] Pegging porous implants is associated with an increased number of complications, one of which is infection and has been reported in up to 20% of pegged orbital implants in one study.[11,14] Fibrovascular ingrowth has not been shown to afford protection against infection.[18] Thus, there little evidence to support the suggestion that porous orbital implants have a reduced infection rate; it is at least the same as non-porous implants, and potentially higher with a peg.[11,14]

With respect to enhanced motility; peg placement has been shown to improve horizontal gaze movements in the artificial eye.[3,15,19,31,32] There is also a more life-like movement to the prosthesis because of the fine darting eye movements seen during conversation.[3,21] However, without the peg in place, there is no proven motility advantage of porous over non-porous implants.[16,18,19,31,32]

As with innovative implant designs from the past (e.g., Mules, Rudemann, Cutler) the initial wave of enthusiasm with porous implants has been tempered as an increasing number of surgeons recognize that the touted advantages have little scientific data to support them, and that the implants are associated with numerous risks and complications that may be difficult to manage.[4-12,14,16,24] Advertising, however, continues to promote them as the “gold standard” and many surgeons still favor the use of porous implants even though unpegged porous implants have no apparent advantage over nonporous spheres.[6,18]

The decision to use a porous or non-porous implant is up to the surgeon and his/her patient. Porous implants are not for every patient.[21,22] Those with chronic systemic disease (e.g., sarcoidosis, collagen vascular diseases) or who use immunosuppressive medication (e.g., prednisone, methotrexate, etc.) or have undergone radiation to the socket - are poor candidates.[10,11] Porous orbital implants are also not for every ophthalmic surgeon.[21,22] Implantation requires experience and skill to appreciate multiple technical nuances. Although I continue to use porous implants, I have become very selective in who gets a porous implant and only consider their use in healthy, adult patients wanting maximal prosthetic motility (pegging) and willing to accept the increased risk of complications. Ideally, the patient should live within a reasonable travel distance to maintain regular follow-up visits so that any minor implant problems can be addressed. Continued follow-up (e.g., every 1-2 years) is recommended in my view for porous implants (pegged or unpegged) as small problems (e.g., implant exposure) can often be handled within the office/minor room setting yet if unattended may develop into a larger problem (e.g., implant infection), requiring additional surgery and potentially implant removal.[9,14] If there is no plan to peg, I prefer a non-porous implant (sphere or mounded). Non-porous spherical implants can be used efficiently and effectively during a primary procedure such as enucleation or evisceration; the surgical techniques required can be mastered by most ophthalmic surgeons. Motility results are equal to that of non-pegged porous implants.[18,19,30,31,32] Non-porous implants are inexpensive and in a healthcare era in which the global expense of a patients anophthalmic socket rehabilitation should be considered, a cost-conscious primary procedure with a low incidence of complications may be particularly desirable.[27] During enucleation, it is important they be placed within a normal anatomic position and attached directly (or through a wrap) to the extra-ocular muscles to ensure stability in their position.[27]

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4:20 – 4:30 pm

How Do I Look? Prosthetic Restoration of the Anophthalmic Socket and Ideas for Aesthetic Optimization

Eric Lindsey

7 – 7:04 am

Demographic and Physiologic Factors Associated with Clinically Significant Eyelid Edema in Patients Following Upper Eyelid Surgery

Sandy Zhang-Nunes[1], Sarah Guo[2], Joy Li[2], Preeya Mehta[2], Roy Yu[2], Alice Shen[1], Christine Bokman[1,3], Anita Yau[4], Jessica Chang[1]

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Introduction: The purpose of this study was to investigate demographic and physiological variables associated with clinically significant eyelid edema in patients following upper eyelid surgery.

Methods: A retrospective chart review was performed on patients by two surgeons (SZN and JRC) who underwent blepharoplasty or external levator advancement between January 2018 and December 2020. Postoperative photos were graded by two independent graders for eyelid edema using a scale ranging from 0 (no edema) to 3 (severe edema). Clinically significant eyelid edema (CSEE) was defined as having an edema grade of 3 at any postoperative point or 1 or greater after 90 days post-operation. Patients without postoperative photos were excluded.

Descriptive statistics were used to compare characteristics between groups with and without CSEE. Median and interquartile range (IQR) were reported for the continuous variables, and frequency counts and percentages were reported for categorical variables. The Mann–Whitney U-test was used to compare continuous data. For categorical variables, a Fisher's exact test or $\chi 2$ test was used to compare groups. All analyses were conducted using SAS version 9.4 (SAS Institute Inc.). All statistical testing used a significance level of $\alpha=0.05$.

Results: Of 213 patients included in the study, 54 patients had CSEE, 159 patients did not. There was a statistically significant relationship observed between race and the incidence of CSEE ($p=0.0001$) (Table 1).

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The results from the logistic regression model relating the incidence of clinically significant eyelid edema to race are presented in Table 2. Compared to East Asian participants, the odds of having clinically significant eyelid edema are significantly decreased, 0.29 times in Hispanic participants (p=0.003), and 0.13 times in White participants (p<0.0001). Compared to Southeast Asian participants, the odds of having clinically significant eyelid edema are also decreased at 0.16 times in White participants (p=0.006).

Conclusions: In patients undergoing upper eyelid surgery, there was a statistically significant relationship between race and the incidence of clinically significant eyelid edema (CSEE). Compared to patients of both the White and Hispanic population groups, patients of the East Asian population group had significantly increased odds of CSEE. Compared to patients of the White population group, patients of the Southeast Asian population group also had significantly increased odds of CSEE.

Figure 1

Table 1. Descriptive Statistics

		All Patients (n=213)	Clinically Significant Eyelid Edema?		P-value
			No (n=159)	Yes (n=54)	
		Median (IQR)			
Age		69.9 (62.9, 76.4)	70.0 (62.9, 75.9)	69.8 (63.3, 77.9)	0.35
Height		163.0 (158.0, 173.0)	163.0 (158.0, 173.0)	162.6 (157.0, 170.2)	0.29
Weight		74.7 (62.1, 89.0)	74.2 (62.1, 88.5)	77.0 (63.5, 90.0)	0.56
Body Mass Index (BMI, kg/m²)		27.2 (23.9, 31.1)	23.7 (27.2, 30.1)	27.2 (24.5, 32.6)	0.15
		N (%)			
Race	East Asian	49 (23.0)	25 (15.7)	24 (44.4)	**0.0001**-
	Black	6 (2.8)	5 (3.1)	1 (1.9)	
	Hispanic	60 (28.2)	47 (29.6)	13 (24.1)	
	White	74 (34.7)	66 (41.5)	8 (14.8)	
	Native Hawaiian/Pacific Islander	2 (0.9)	2 (1.3)	0 (0.0)	
	Southeast Asian	14 (6.5)	8 (5.0)	6 (11.1)	
	South Asian	0 (0.0)	0 (0.0)	0 (0.0)	
	Other/unknown	8 (3.8)	6 (3.8)	2 (3.7)	
Sex	Male	80 (38.1)	54 (34.6)	26 (48.2)	0.08
	Female	130 (61.9)	102 (65.4)	28 (51.9)	
Hydralazine		4 (1.9)	3 (1.9)	1 (1.9)	0.99-
Amlodipine		45 (21.1)	33 (20.8)	12 (22.2)	0.82
Diuretics		29 (13.6)	20 (12.6)	9 (16.7)	0.45
Hypothyroid Eye Disease		26 (12.2)	21 (13.2)	5 (9.8)	0.48
Hyperthyroid Eye Disease		7 (3.3)	6 (3.8)	1 (2.0)	0.68-
Any allergies		109 (51.2)	87 (54.7)	22 (40.7)	0.06
Maxitrol		2 (0.9)	0 (0.0)	2 (3.7)	0.06-

-Wilcoxon Rank-Sum Test (Mann-Whitney U-test) was used for continuous variables that did not follow a normal distribution or had extreme outliers, and Chi-square test was used for categorical variables.

Figure 2

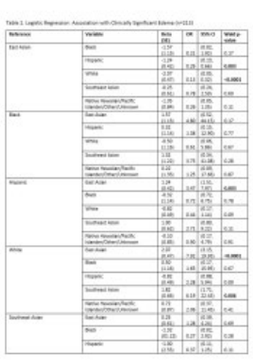


Figure 3

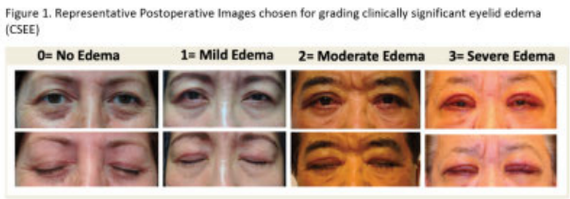
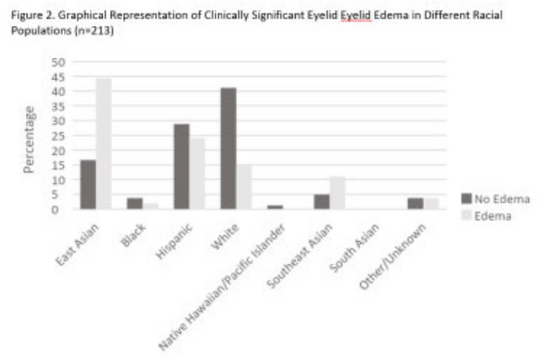


Figure 4



7:04 – 7:08 am

Chronic Anophthalmic Socket Pain Secondary to Orbital Pseudocysts

Shanlee Stevens, Michelle Maeng, Marissa Shoji, Umangi Patel, Rayan Abou Khzam, Sander Dubovy, Thomas Johnson
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Introduction: This case describes a patient with chronic anophthalmic socket pain secondary to orbital pseudocysts posterior to an orbital implant. To our knowledge, this is the first reported case of an orbital pseudocyst found posterior to an implant status post enucleation.

Methods: This is a case report of one patient to describe the clinical, radiographic, surgical, and histologic features unique to this case.

Results: An 89-year-old female presented to the clinic with two years of chronic pain and foreign body sensation in an otherwise healthy-appearing anophthalmic socket after enucleation. CT orbits was obtained, which showed several hyperdense, enhancing cystic lesions superior and posterior to the orbital implant. Orbital exploration was performed, the cysts were excised, and the implant was removed. On pathology, the cystic structures were composed of fibrocellular tissue with clear cystic spaces lined by histiocytes and multinucleated giant cells, consistent with pseudocyts. No clear epithelial lining was visualized, and no organisms were identified. Postoperatively, the patient noted resolution of her symptoms, reporting no pain or discomfort.

Conclusions: While the etiology of the orbital pseudocysts remains unclear, we hypothesize that the answer can be traced back to the original enucleation. The cysts may have encapsulated after extravasation of fluid or proteinaceous material from the eye, from glycerin remaining from the donor sclera used to wrap the implant, or possibly after introduction of foreign material during retrobulbar injection of anesthesia. Chronic pain after enucleation is an uncommon post-operative complication. While few cases of conjunctival cysts forming anterior to the orbital implant have been reported, this is the first report of pseudocysts occurring in the orbit posterior to the implant.

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Figure 1

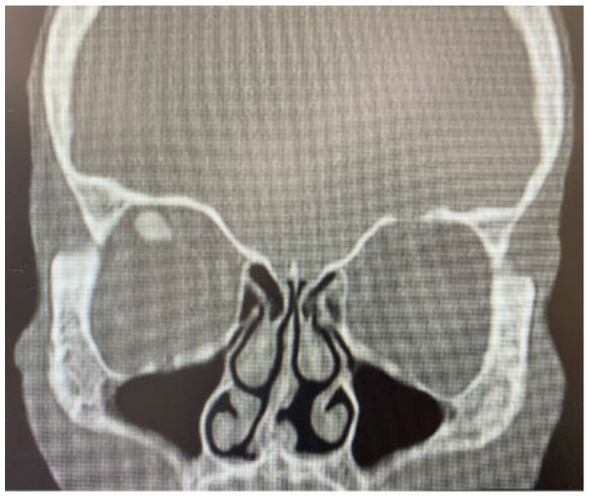


Figure 2

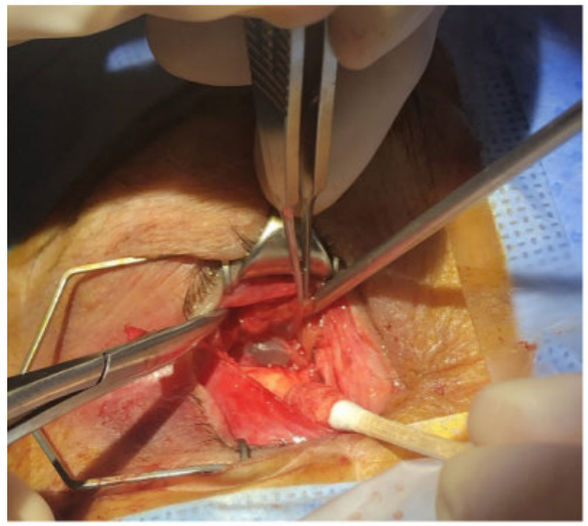


Figure 3

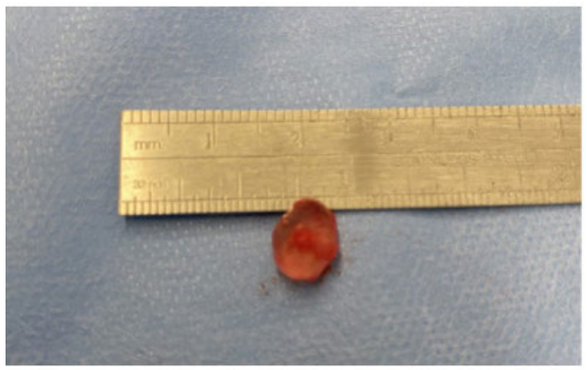


Figure 4

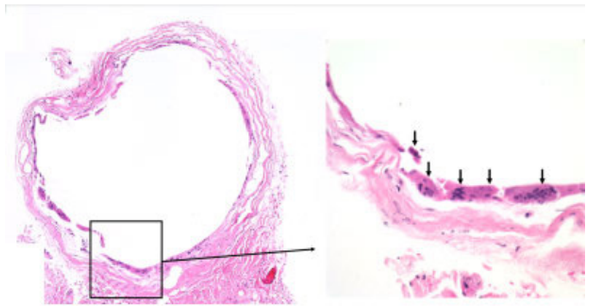
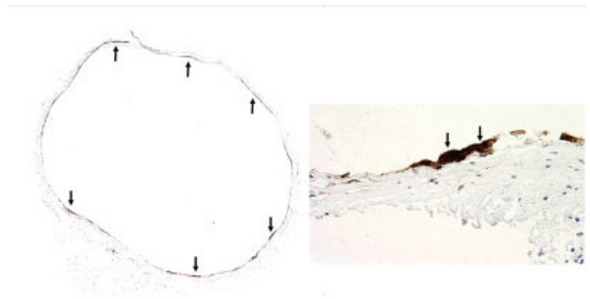


Figure 5



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7:08 – 7:12 am

Early Direct Injection of 5-Fluorouracil for the Prevention of Cicatricial Eyelid Malposition in Toxic Epidermal Necrolysis

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Introduction: Steven-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) are part of a spectrum of immune-mediated mucocutaneous diseases that cause widespread sloughing of the skin and mucosal surface.[1] SJS involves <10% of the total body surface area (TBSA), whereas SJS/TEN overlap and TEN involve 10-30% TBSA and >30% TBSA, respectively. Unfortunately, the disease is often not self-limited, with the development of late ophthalmic sequelae ranging from severe dry eye to trichiasis, distichiasis, lid margin keratinization, forniceal shortening, symblepharon, cicatricial entropion, lagophthalmos, corneal epithelial stem cell loss, and even complete visual loss. Initially developed as a chemotherapeutic agent, 5-fluorouracil can directly inhibit fibrosis by reducing selective collagen synthesis by fibroblasts.[6] Intralesional injections of 5-fluorouracil (5-FU) have been used to manage hypertrophic cutaneous scars,[2] cicatricial eyelid malposition,[3] cicatrizing conjunctival diseases,[4] and socket contracture.[5] While there is a recent study of patients with cicatrizing conjunctival disorders with pre-existing forniceal shortening, symblepharon, or cicatricial entropion treated with multiple 5-FU forniceal injections, there are no reports on the early use of 5-FU in patients with SJS/TEN to decrease the risk of and possibly avoid the development of cicatricial eyelid changes. Here, we describe a case of TEN with 96% TBSA and ocular involvement treated with early direct injection of 5-FU into the anterior lamellae of all 4 eyelids to prevent the development of cicatricial eyelid malposition.

Methods: Case report.

Results: A 16-year-old African-American female with TEN involving 96% TBSA with diffuse mucosal involvement developed significant bilateral lagophthalmos with complete exposure of the lower half of the cornea and sclera, worse on the left than the right, approximately 4 days from initial symptom onset (Fig. 1). Possible offending medications including lamotrigine, escitalopram, and buspirone were immediately discontinued, and the patient was intubated for airway protection, resuscitated with intravenous fluids, and treated with systemic cyclosporine. A skin punch biopsy confirmed the diagnosis of TEN. Over the course of the patient's hospitalization, she underwent daily ophthalmic examinations, with frequent application of topical steroid ointment, administration of oral vitamin C, and placement of moisture chambers, multiple amniotic membrane grafts, and symblepharon rings to cover the de-epithelialized ocular surface up to the lid margin and to maintain the fornices as well as a Prokera for a large epithelial defect. Due to the persistence and degree of lagophthalmos along with very slow re-epithelialization of the patient's skin including the face and eyelids, a multidisciplinary

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discussion was held to determine the safety of intradermal 5-FU injections at this juncture. Given the greater degree of exposure on the left, a total of 0.6 ml of 5-FU (50 mg/ml) was directly injected into the anterior lamella of the left upper and lower eyelid first. After 9 days of observation, with no new interval changes or worsening, the same injection was repeated on the right side. Two reversible bow-tie suture tarsorrhaphies were also fashioned over each eye to facilitate mechanical closure and provide centripetal traction through the patient's recovery process (Fig. 2). The patient then underwent rapid re-epithelialization of her skin. Approximately 6 weeks from symptom onset and 3 weeks from 5-FU injections, the patient no longer exhibited lagophthalmos on examination, but later developed trichiasis on the left. She continues to demonstrate normal eyelid position without lagophthalmos approximately 4 months from symptom onset (Fig. 3).

Conclusions: Early direct injection of 5-FU in combination with topical steroids, symblepharon rings, amniotic membrane grafts, and suture tarsorrhaphy may help to prevent the development of cicatricial eyelid malposition in patients with SJS/TEN syndrome.

Figure 1

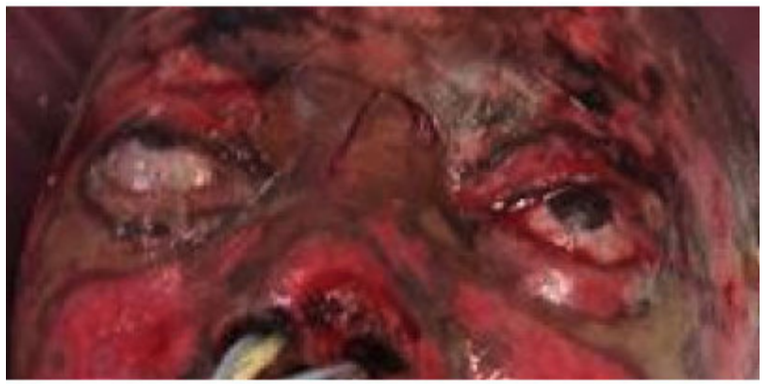


Figure 2

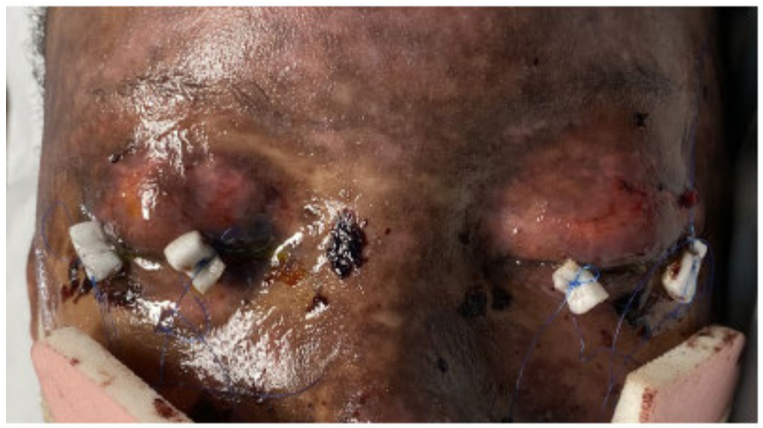
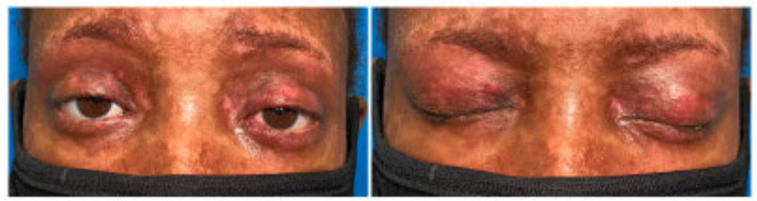


Figure 3



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7:12 – 7:16 am

Bilateral Dacryoadenitis As in the Initial Presentation of ANCA-Associated Vasculitis in a Pediatric Patient, a Case Report

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Introduction: We present a rare case of bilateral dacryoadenitis, as the initial presentation of ANCA-associated vasculitis in a 14-year-old.

Methods: The case was reviewed for clinical data and outcomes.

Results: A 14-year-old female with history of environmental allergies presented with 2 weeks of progressive right eye pain and proptosis. Initial examination was notable for a low grade fever (100.4F), relative right eye proptosis of 4mm, hypoglobus, and a palpable mass along the superior lateral orbit with mild tenderness to palpation. Slit lamp examination was notable for bilateral conjunctival petechiae (Figure 1). Of note, she was asymptomatic on the left side and the petechiae were present only on the superior bulbar conjunctiva with eversion. Imaging demonstrated bilateral lacrimal gland enhancement with a large mass involving the right lacrimal gland (Figure 2). Testing was significant for elevated inflammatory markers (Erythrocyte Sedimentation Rate 30 mm/hr, and C-Reactive Protein 7.3 mg/L, see Table 1), a normal CBC and urinalysis, and negative inflammatory workup. Biopsy of the right lacrimal gland demonstrated acute on chronic inflammation with destruction of normal glandular structures, immunohistochemical staining demonstrated polyclonal populations of lymphocytes. Flow cytometry was without predominance of either B or T cells. On repeat testing, myeloperoxidase antibody levels (MPO/p-ANCA) were elevated, indicative of an underlying immune-mediated vasculitis.

Conclusions: Anti-neutrophil cytoplasmic antibody (ANCA)-associated vasculitis refers to a heterogenous group of inflammatory disorders which affect the small to medium-sized blood vessels, and include granulomatosis with polyangiitis (GPA), microscopic polyangiitis (MPA), and eosinophilic granulomatosis with polyangiitis (EGPA)[1]. Antibodies which target myeloperoxidase (MPO) and proteinase-3 (PR3) protein result in neutrophil degranulation and initiate an inflammatory cascade. It has been documented that in the initial stages of disease, patients may be ANCA-negative, and upon evolvement of systemic vasculitis symptoms, become ANCA-positive[2]. There are also cases where the autoantibody tests continue to remain negative through the course of the disease[3]. Amongst the ANCA-associated vasculitides, ophthalmic manifestations have been described in 30-50% of patients with granulomatosis with polyangiitis (GPA), but are less common in microscopic polyangiitis (MPA) and eosinophilic granulomatosis with polyangiitis (EGPA)[4]. Ocular manifestations which have been described include conjunctivitis, episcleritis, scleritis, peripheral ulcerative keratitis, retinal vasculitis, orbital disease including mass, myositis, and dacryoadenitis, nasolacrimal duct obstruction, and neuro-ophthalmic manifestations including optic neuritis[1]. In the pediatric population, ocular manifestations associated with ANCA-vasculitis are even more

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rare[5]. Given the variable presentation of these diseases and possibility of negative ANCA autoantibody testing, they present a diagnostic challenge. Due to potentially life-threatening systemic complications of these diseases, as well as vision-threatening ocular and orbital manifestations, a high degree of suspicion for accurate diagnosis and early treatment is essential[6].

Figure 1

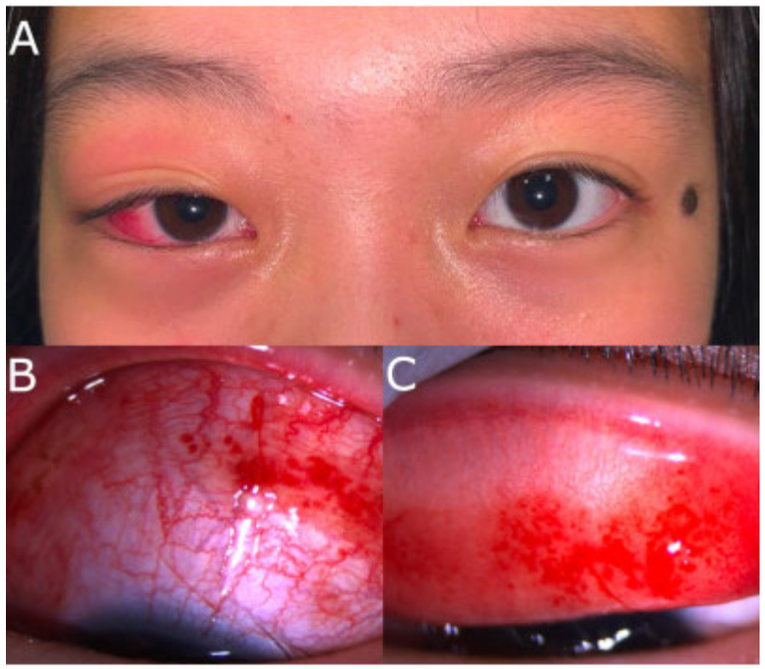


Figure 2

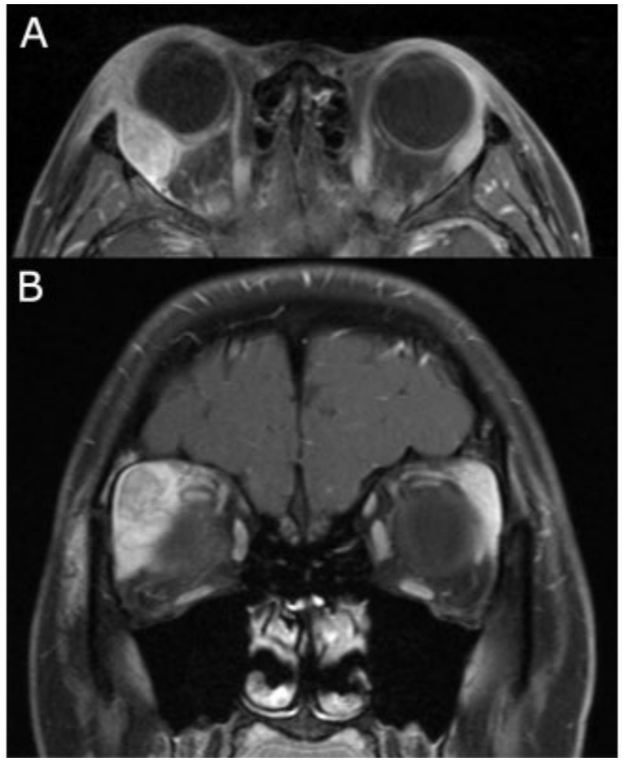
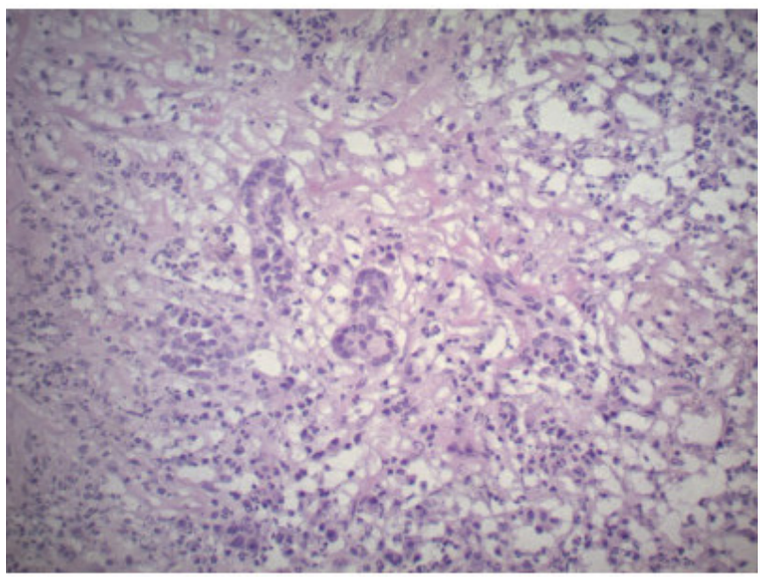


Figure 3



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7:16 – 7:20 am

Lacrimal Gland Enlargement Is a Risk Factor for Thyroid Eye Disease-Compressive Optic Neuropathy

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Introduction: Lacrimal gland (LG) enlargement can occur in thyroid eye disease (TED) secondary to antibody-mediated inflammation. Previous studies have demonstrated significant LG enlargement in patients with TED compared to normal controls.[1,2] However, no studies have specifically quantified LG volume in TED patients with compressive optic neuropathy (CON) and compared to those TED patients without CON.

Methods: A retrospective review was conducted of patients with TED treated at a single center who underwent orbital CT imaging. Patients were classified as TED-CON based on a combination of decreased visual acuity, visual field deficit, dyschromatopsia, or an afferent pupillary defect. Extraocular dysmotility was recorded as a summation of motility restriction (0 to -4) in the four cardinal gaze directions. LGs were contoured in a series of axial cuts, in line with the methodology described by Freedman et al.[3] Measurement of LG volumes was provided by an automated dose-volume histogram calculation based on the contoured outline. Comparisons were made by two-sample t-test. Pearson's correlation was used to determine the relationship between LG volume and clinical characteristics including visual acuity, color vision, dysmotility and Hertel exophthalmos.

Results: 52 patients (104 orbits) with TED-CON and 22 patients (44 orbits) with TED and no evidence of CON were reviewed. The mean age was 64.3 ± 10.8 years in TED-CON and 60.3 ± 18.5 years in TED controls (p=0.256). The majority of patients were female in both groups (61.5% vs 77.3%, p=0.191).

The differences in LogMAR visual acuity (0.24 vs. 0.12, p = 0.028), color vision (4.1 vs 5.1 out of 6 plates, p = 0.019), Hertel's exophthalmos (25.1 vs. 23.7 mm, p = 0.047) and extraocular dysmotility (-4.3 vs. -0.8, p < 0.001) between groups were statistically significant (Table 1). Mean LG volume in cm3 was 0.939 ± 0.372 for TED-CON and 0.644 ± 0.317 for TED controls (p < 0.001).

A statistically significant correlation was seen in the combined TED-CON and control study population between LG volume and extraocular dysmotility (r = 0.205, p = 0.031). Additionally, weakly positive correlations between LG volume and exophthalmos in the full study population (r = 0.1261, p = 0.202) and between LG volume and LogMAR acuity in the TED-CON group (r = 0.132, p = 0.269) were found. However neither of these relationships was statistically significant. No relationship was seen between LG volume and color vision in either group.

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Conclusions: Prior studies using both two-dimensional and three-dimensional contouring techniques found a significant increase in LG volume in patients with TED when compared to normal controls.[1,2] The present study found a statistically significant increase in LG volume in TED patients with CON when compared to TED controls. LG volume correlated positively with extraocular dysmotility. These findings suggest that despite the LG's anterior location, radiographic enlargement of the LG represents a risk factor for the presence of CON. Whether the pathologically enlarged LG directly contributes to the overall expanded orbital volume resulting in TED-CON or is solely a marker for the increased risk of apical compression is worthy of future study.

Table 1

Table 1. Patient Demographics and Results

	TED-CON	TED Controls	*P* value
n	52	22	
n orbits	104	44	
Female (%)	32 (61.5)	17 (77.3)	0.191
Mean age in years	64.3 ± 10.8	60.3 ± 18.5	0.256
Mean lacrimal gland volume in cm^3	0.939 ± 0.372	0.644 ± 0.317	**< 0.001**
Mean LogMAR visual acuity	0.24 ± 0.32	0.12 ± 0.13	**0.028**
Mean color vision (# correct plates out of 6)	4.1 ± 1.9	5.1 ± 0.13	**0.019**
Hertel's exophthalmos in mm	25.1 ± 3.9	23.7 ± 3.3	**0.047**
Extraocular dysmotility	-4.3 ± 3.0	-0.8 ± 1.4	**< 0.001**

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7:20 – 7:24 am

Eyelid Incision Sparing Lateral Wall Decompression in Pediatric Thyroid Eye Disease: A Lateral Transconjunctival Approach

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Introduction: A lateral orbital decompression may be accomplished via a conjunctival incision over the lateral orbital rim without a canthotomy or cantholysis. We describe this technique in a series of pediatric patients with disfiguring thyroid orbitopathy.

Methods: This is a retrospective chart review at a single institution over an 11-year period (2009-2020) of all patients with pediatric thyroid eye disease (TED) and disfiguring proptosis, who underwent a conjunctiva only lateral orbital incision for a lateral orbital wall decompression.

Results: 10 subjects with pediatric TED were studied: 9 female and 1 male. The average age at surgery was 14.77 years (range 9.7-18.7). All patients were in static-phase TED with disfiguring proptosis. 18 total orbits were treated with a conjunctival incision over the lateral orbital rim without a canthotomy or cantholysis. A lateral orbital wall decompression was accomplished using an ultrasonic bone aspirator. Surgical navigation was used in 3 subjects. All subjects had significant cosmetic improvement and resolution of exposure keratopathy. 1 subject had a conjunctival cyst requiring excision 3 months after surgery. There were no cases of post-operative aqueous tear insufficiency, eyelid malposition or any skin scarring with an average follow up of 1.83 years (range 0.3-4.54).

Conclusions: A lateral orbital wall decompression may be successfully accomplished in a pediatric patient with TED via a conjunctiva only incision. This spares the subject a lateral canthal scar.

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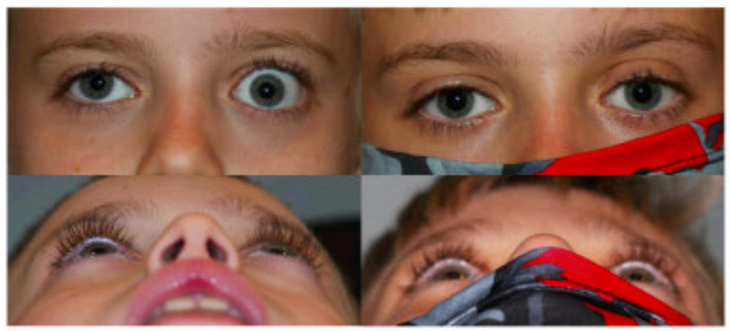
Figure 1

Figure 1. 9 year-old male with left sided proptosis and upper eyelid retraction. Top and bottom left are pre-operative images. Top and bottom right are post-operative images taken 20 months after a lateral transconjunctival lateral orbital wall decompression (an upper eyelid transconjunctival eyelid retraction repair was also performed).



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7:30 – 7:34 am

Acute Invasive Fungal Rhinosinusitis: Reversal of Immunosuppression is Critical

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Introduction: Acute invasive fungal rhinosinusitis (AIFR) is a rare and potentially lethal disease that typically affects immunocompromised patients. Early identification and intervention with systemic antifungals and surgical debridement of infected tissue is paramount. In addition, arguably more important, is the reversal of the patient's immune compromised status. The purpose of this study is to review whether reestablishment of immunity influenced survival in patients with AIFR.

Methods: A retrospective chart review was performed of patients with AIFR from January 2011 to December 2020. The primary outcome measures included identification of the etiology of the underlying immunocompromised state, whether immunosuppression was reversed, and survival to hospital discharge. Reversal of immunosuppression was defined as stabilization of blood glucose levels with concomitant reversal of ketoacidosis for diabetics, or discontinuation of chemotherapeutic and immunosuppressive treatments in patients with hematologic malignancies and solid-organ transplants, respectively. Secondary outcomes included AIFR disease management in our patient cohort with a focus on orbital interventions and preservation of vision in the affected orbit of greater than logMAR 1.0 (20/200).

Results: Thirty-four patients with histopathologically confirmed invasive fungal sinusitis were identified and included. Fungal phyla included Zygomycoses (67.6%) and Ascomycota (32.4%). Average age was 47.9 years (Range: 2-82 years). Causes of immunosuppression included diabetes mellitus (47.1%), hematologic malignancy (29.4%), and solid-organ transplantation (23.5%). All patients were treated with systemic, intravenous anti-fungal medication. A surgical intervention was performed in 94.1% of patients. Twenty-six (76.5%) patients received retrobulbar amphotericin injections. Eight (23.5%) patients underwent orbital exenteration. Four (12.5%) patients underwent conservative orbital debridement. Vision in the affected orbit was maintained at or greater to LogMAR 1.0 in 16 patients (47.1%). Reversal of immunosuppression was achieved in 79.4% of patients. The overall death rate due to infection was 31.3%. Chi-square test for independence demonstrated a statistically significant association between reversal of immune status and survival at time of hospital discharge (p=0.006). Average length of admission was 24.9 days (Range: 3-73 days).

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Conclusions: The outcomes of AIFR in immunocompromised patients depends on a complex interplay between the host's immune system, the fungal pathogen, and the treatment modalities employed.[1-2] Although rapid diagnosis, systemic anti-fungal therapy and surgical debridement of necrotic tissue assist in controlling the spread of angio-invasive fungus, this is a temporizing measure while the immune system is allowed to reestablish.[3-7] Our patient cohort demonstrates the critical role of reversing the underlying immunosuppressive etiology, and the statistically significant impact this has on survival.

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7:34 – 7:38 am

Improving the Accuracy of Pre-Operative Diagnosis in Well-Circumscribed Orbital Tumors: A Multi-Center Study

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Introduction: As many well circumscribed orbital tumors present with similar clinical findings, imaging plays an indispensable role in narrowing the diagnosis. However, radiologic differentiation of schwannomas (SCH), cavernous venous malformations (CVM) and solitary fibrous tumors (SFT) can be challenging, as there can be overlap in T1- and T2- intensity,[1,2] tumour location,[3] shape and size amongst the three groups. The purpose of this multi-institutional study is to develop a step-wise approach to differentiation of well-circumscribed orbital tumors from one another on MRI.

Methods: Patients undergoing excisional biopsy of SFT, SCH and CVM with pre-operative MRIs available for review were identified at three academic centers in the United States and Australia. Demographics, presenting clinical signs and symptoms, and histopathology were collected from the medical record and all imaging was reviewed in a systematic manner. An exploratory statistical analysis was performed to identify important radiologic features which were subsequently included in a Random Forest Model. Given the unbalances sample sizes, non-parametric statistical analysis was employed.

Results: A total of 50 cases were included with a mean age of 49.7 ± 17.1 years. There was no significant difference between the three groups with respect to the majority of presenting clinical features aside from SFT, which were significantly more likely to present with diplopia (p=0.008), and SCH which were more likely than CVM to cause a change in vision (p=0.021) (Table 1). On imaging, SFT were more likely to span both the intra- and extraconal space (83.3%) and present as isointense on T1(90.9%) and T2 (63.3%). Schwannomas were the only type to present with a biphasic pattern on T2, although this was the minority of SCH cases (28.6%). Cavernous venous malformations were universally homogenous on T1 and T2 and hyperintense on T2. These lesions were also the only to demonstrate focal early enhancement, although not universally (84.0%)(Table 2). A total of 5 imaging variables were included in the random

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forest model (in order of importance): T2 intensity, early contrast enhancement, T2 homogeneity and T2 regionality and late contrast enhancement (Figure 1). Using pseudo-bootstrapping, the models overall predicted accuracy was 83.1% (95% CI: 71.4 – 92.9%), accurately identifying 100% of CVM, 92% of SCH and 75% of SFT.

Conclusions: A hierarchical model incorporating key imaging features appears to be helpful in reaching an accurate diagnosis. Key features that aid in the differentiation of these three tumors from one another include T2 intensity, regionality, homogeneity and early contrast enhancement pattern. A combination of these imaging features predicted CVM in 100% of cases. Utilizing T2 regionality, particularly when two distinct areas are identified, in combination with vision changes (more likely) and diplopia (less likely) can be useful in identifying SCH from SFT.

Table 1

Table 1. Presenting clinical signs and symptoms of patients undergoing excision of SFT, SCH and CVM

	SFT	SCH	CVM	p-value
Diplopia	4 (57.1)	0 (0)	4 (13.3)	**0.008**
Vision change	5 (71.4)	7 (100)	15 (48.4)	**0.032**
Ptosis	2 (25)	0 (0)	2 (12.5)	0.512
Pain	3 (37.5)	2 (33.3)	3 (12.5)	0.249
Mean proptosis	3.0 ±3.0	2.0 ±2.8	3.1 ±2.5	0.053
Mean non-axial globe dystopia	0.67 ±1.12	0.50 ±0.707	0.78 ±1.7	0.598
Palpable mass	1 (12.5)	0 (0)	4 (17.4)	0.560
Inflammatory signs	1 (11.1)	1 (14.3)	0 (0)	0.150
ONH edema	2 (28.6)	3 (50.0)	5 (20.0)	0.341
ONH pallor	3 (42.9)	1 (16.7)	2 (8.7)	0.110
Choroidal folds	1 (14.3)	1 (16.7)	5 (21.7)	0.901
RAPD	4 (80.0)	4 (66.7)	9 (31.0)	0.053
Mean duration of symptoms	6.7 ±1.2	2.0 ±0.0	3.4 ±2.7	0.139

SFT = Solitary fibrous tumour
SCH = Schwannoma
CVM = Cavernous venous malformation
RAPD = Relative afferent pupillary defect

Table 2

Table 2. Radiologic features of patients undergoing excision of SFT, SCH and CVM

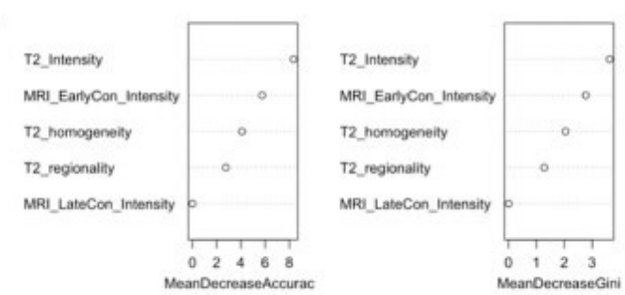
	SFT	SCH	CVM	p-value
Mean size (mm3)	68.0 ± 79.2	21.8 ± 26.7	32.8 ± 58.9	0.122
Coronal location				
Superotemporal	3 (25)	2 (28.6)	4 (12.9)	0.221
Inferotemporal	3 (25)	1 (14.3)	3 (9.7)	
Superonasal	4 (33.3)	1 (14.3)	6 (19.4)	
Inferonasal	1 (8.3)	3 (42.9)	7 (22.6)	
Centrifical	1 (8.3)	0 (0.0)	11 (35.5)	
Canal location				
Intraconal	0 (0)	5 (71.4)	20 (74.1)	<0.001
Extraconal	2 (16.7)	1 (14.3)	4 (14.8)	
Both	10 (83.3)	1 (14.3)	3 (11.1)	
Bony changes				
None	8 (66.7)	6 (85.7)	24 (77.4)	0.457
Remodeling	3 (25.0)	1 (14.3)	7 (22.6)	
Destruction	1 (8.3)	0 (0.0)	0 (0.0)	
Effect on globe				
Indentation	5 (41.7)	1 (14.3)	10 (32.3)	0.646
Modding	1 (8.3)	0 (0.0)	2 (6.5)	
No effect	6 (50.0)	6 (85.7)	19 (61.3)	
Shape				
Multilobulated	3 (25.0)	2 (28.6)	10 (32.3)	0.487
Dumbell	1 (8.3)	0 (0.0)	0 (0.0)	
Cone	1 (8.3)	2 (28.6)	3 (9.7)	
Spheroid/oval	7 (58.3)	3 (42.9)	18 (58.1)	
T1 intensity				
Hypo	1 (9.1)	2 (28.6)	15 (55.6)	0.036
Iso	10 (90.9)	5 (71.4)	10 (37.0)	
Hyper	0 (0.0)	0 (0.0)	2 (7.4)	
T1 homogeneity				
Homogeneous	8 (72.7)	5 (71.4)	25 (92.6)	0.181
Heterogeneous	3 (27.3)	2 (28.6)	2 (7.4)	
T1 regionality				
Homogeneous	8 (72.7)	5 (71.4)	27 (180.0)	0.032
Dual	2 (18.2)	2 (28.6)	0 (0.0)	
Multiple	0 (0.0)	0 (0.0)	0 (0.0)	
Extensive	1 (9.1)	0 (0.0)	0 (0.0)	
T2 intensity				
Hypo	1 (9.1)	0 (0.0)	0 (0.0)	<0.001
Iso	7 (63.3)	1 (14.3)	0 (0.0)	
Hyper	3 (27.3)	6 (85.7)	28 (180.0)	
T2 homogeneity				
Homogeneous	4 (36.4)	2 (28.6)	24 (85.7)	0.001
Heterogeneous	7 (63.3)	5 (71.4)	4 (14.3)	
T2 regionality				
Homogeneous	4 (36.4)	1 (14.3)	28 (180.0)	<0.001
Dual	0 (0.0)	2 (28.6)	0 (0.0)	
Multiple	2 (18.2)	0 (0.0)	0 (0.0)	
Extensive	5 (45.5)	4 (57.1)	0 (0.0)	
Early contrast enhancement pattern				<0.001
Focal	0 (0.0)	0 (0.0)	21 (84.0)	
Diffuse	10 (100.0)	7 (100.0)	4 (16.0)	
Early contrast enhancement				<0.001
Moderate	2 (20.0)	1 (14.3)	19 (76.0)	
Maximal	8 (80.0)	6 (85.7)	6 (24.0)	
Late contrast enhancement pattern				0.093
Focal	0 (0.0)	0 (0.0)	4 (16.0)	
Diffuse	9 (100.0)	7 (100.0)	21 (84.0)	

Dual = two distinct areas; Multiple = >2 distinct areas; Extensive = different everywhere

Figure 1

Figure 1. (A) Random forest plot of diagnostic model based on hierarchical set of radiologic features (B) validated on a random sub-set of the total cohort demonstrating 100% accuracy for predicting cavernous venous malformations.

A



B

	Predicted		
Actual	SFT	Schwannoma	CVM
SFT	2	2	0
Schwannoma	0	1	0
CVM	0	0	10

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7:38 – 7:42 am

Diffusion Weighted Imaging of the Orbit

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Introduction: Diffusion weighted imaging (DWI) evaluates the random motion of water molecules in tissues and has been traditionally used to demonstrate areas of ischemia.[1] Apparent diffusion coefficient (ADC) values can quantify the degree of diffusion. As the hypercellularity and high nucleus-to-cytoplasm ratio of malignancies allows for less diffusivity of water protons, there has been increasing interest in evaluating head and neck masses with DWI.[2] Orbital lesions may provide a diagnostic challenge because of their nonspecific characteristics on presentation, often requiring histopathology for diagnosis. DWI is a noninvasive method that may help differentiate these lesions. The purpose of this study was to use DWI to characterize various orbital pathologies and evaluate the utility of ADC values in differentiating orbital lymphoma from idiopathic orbital inflammation.

Methods: A retrospective review of patients with orbital lesions who underwent MRI with DWI at two academic institutions between 2015 and 2020 was performed with institutional review board approval. Echoplanar diffusion weighted images had been acquired using 2 or 3 b values (b=0 and 1000 or b=0, 500, and 1000) at 1.5T or 3T. Lesions with significant artifact or unsuitable for measurement were excluded. DWI sequences were analyzed by neuro-radiologists blinded to the diagnosis. The mean ADC value of a lesion was calculated from a single region of interest. An independent two-tailed t test was used to compare the ADC values of orbital lymphomas and idiopathic orbital inflammation with $p<0.05$ considered significant.

Results: The orbital lesions included 6 orbital lymphomas (Figure 1), 7 with idiopathic orbital inflammation (Figure 2), 2 with IgG4-related disease, 2 with granulomatosis with polyangiitis, 1 cavernous hemangioma, 1 with metastatic clear cell sarcoma to the orbit, 1 lacrimal sac squamous cell carcinoma, and 1 orbital squamous cell carcinoma extending from the sinus. All were histopathologically proven except the cavernous hemangioma. As represented in Figure 3, the ADC values were significantly lower for orbital lymphoma (mean 0.621 ± 0.147 x 10-3mm2/s) than idiopathic orbital inflammation (mean 1.188 ± 0.269 x 10-3mm2/s) ($p = 0.001$) with no overlap. The respective ADC values for the other orbital lesions included were mean 0.717 x 10-3mm2/s for IgG4-related disease, mean 1.546 x 10-3mm2/s for granulomatosis with polyangiitis, 1.137 x 10-3mm2/s for a cavernous hemangioma, 0.625 x 10-3mm2/s for metastatic clear cell sarcoma,

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0.741 x 10-3mm2/s for a lacrimal sac squamous cell carcinoma, and 0.563 x 10-3mm2/s for a squamous cell carcinoma extending from sinus to orbit.

Conclusions: DWI and ADC values help differentiate idiopathic orbital inflammation from orbital lymphoma. Orbital malignancies in general demonstrated lower ADC values, while inflammatory processes demonstrated higher ADC values. IgG4-related disease appears to be an exception. This study highlights a role for DWI in evaluating orbital pathology.

Figure 1

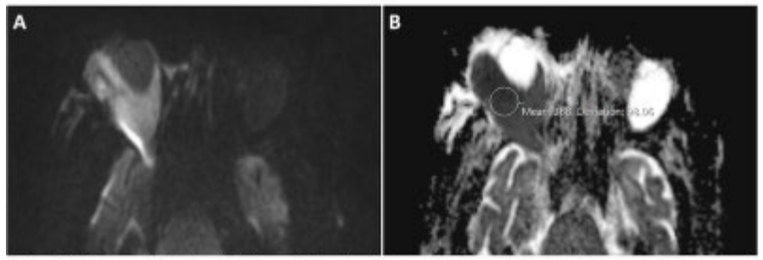


Figure 1. A 78 year old female with high grade B cell lymphoma of the right orbit. The lesion appeared hyperintense on DWI (A) and had low signal on the corresponding ADC map (B). The mean ADC value of this lesion was calculated to be 0.388 x 10^{-3} mm^2/s.

Figure 2

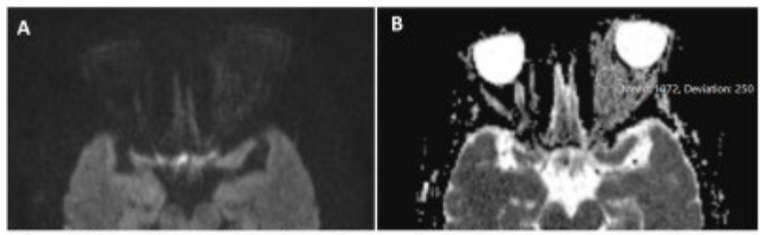
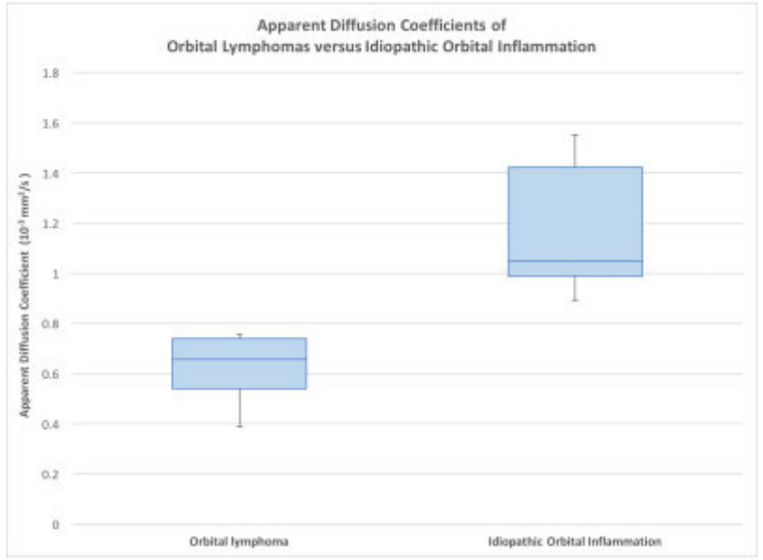


Figure 2. A 45 year old female with idiopathic orbital inflammation involving the left orbit. The lesion had minimal signal on DWI (A) and increased signal on the corresponding ADC map (B). The mean ADC value of this lesion was calculated to be 1.049 x 10^{-3} mm^2/s.

Figure 3



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7:42 – 7:46 am

Delayed-Onset Inflammatory Optic Nerve Sheath Mass and Perineuritis Following Cessation of Nivolumab Therapy

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Introduction: We describe a unique case of delayed-onset inflammatory optic nerve sheath mass and perineuritis following cessation of immune checkpoint inhibitor therapy.

Methods: Case report.

Results: A 65-year-old male with a history of clear cell renal cell carcinoma with metastasis to the lung was referred by his oncologist to the oculoplastics clinic for evaluation of an orbital mass. His oncologic history was notable for disease remission following left radical nephrectomy, right upper lobe wedge resection, and immunotherapy with ipilimumab (discontinued two years prior to presentation) and nivolumab (discontinued three months prior).

In the preceding two weeks, he had experienced right retro-orbital headaches and painless episodes of right eye vision loss lasting less than five minutes. There was no scalp tenderness, jaw claudication, weight loss, or fatigue. Magnetic resonance imaging (MRI) of the brain and orbits, revealed right optic nerve sheath enhancement and thickening with a well-defined mass extending from the temporal aspect of the sheath (Figure 1).

On initial evaluation, visual acuity was 20/20 in both eyes, with no afferent pupillary defect (APD) and normal color vision. External, anterior segment, and dilated fundus examination was normal. 30-2 static perimetry showed a few mild points of scattered depression in both eyes. Given recent nivolumab use and drug association with orbital inflammation, the patient underwent a trial of oral corticosteroid therapy. One month later, he reported complete symptom resolution, repeat MRI demonstrated marked interval decrease in the size of the enhancing lesion arising from the optic nerve sheath, and corticosteroids were tapered off over one week (Figure 2).

At one month follow-up, MRI revealed increased circumferential enhancement involving the optic nerve sheath and associated lesion (Figure 3). Given recurrence of prior radiographic findings and concern for occult malignancy, the patient underwent optic nerve sheath biopsy, which demonstrated chronic mild inflammation, without evidence of malignancy. Post-operatively, the patient demonstrated visual acuity of 20/25, new APD, mild optic nerve head edema, and generalized constriction on 30-2 static perimetry in the right eye.
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Work-up for infectious and inflammatory causes of orbital inflammation and optic perineuritis was unrevealing. He was monitored closely as high dose prednisone (80 mg daily) was re-initiated, with resolution of disc edema and mildly improved serial perimetry, and then subsequently tapered gradually over 5 months.

Six weeks after cessation of corticosteroid therapy, right eye visual acuity improved to 20/20, APD was persistent, and visual field constriction was minimally improved. The right optic disc showed mild temporal pallor, with diffuse thinning on OCT RNFL. He experienced no further episodes of headaches or vision loss.

Conclusions: Ipilimumab and nivolumab are immune checkpoint inhibitors associated with orbital inflammation and optic neuropathy. While delayed immune-related events following immunotherapy have been described, this is the first report, to our knowledge, of delayed-onset optic perineuritis with an inflammatory nerve sheath mass following cessation of nivolumab and ipilimumab therapy 3 months and 2 years prior, respectively. As checkpoint inhibitor therapies become increasingly utilized, it is key for ophthalmologists to consider possible delayed ocular immune-related events.

Figure 1

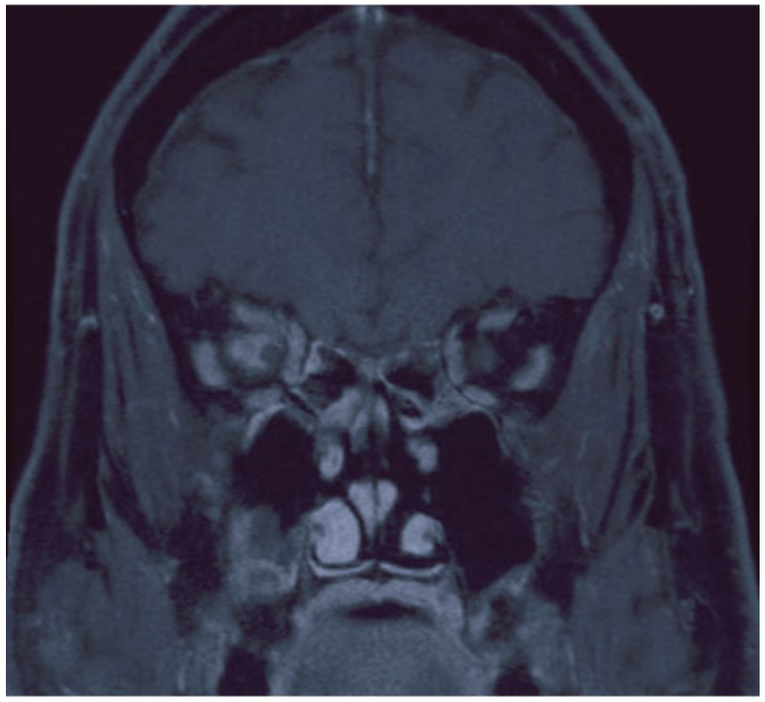


Figure 2

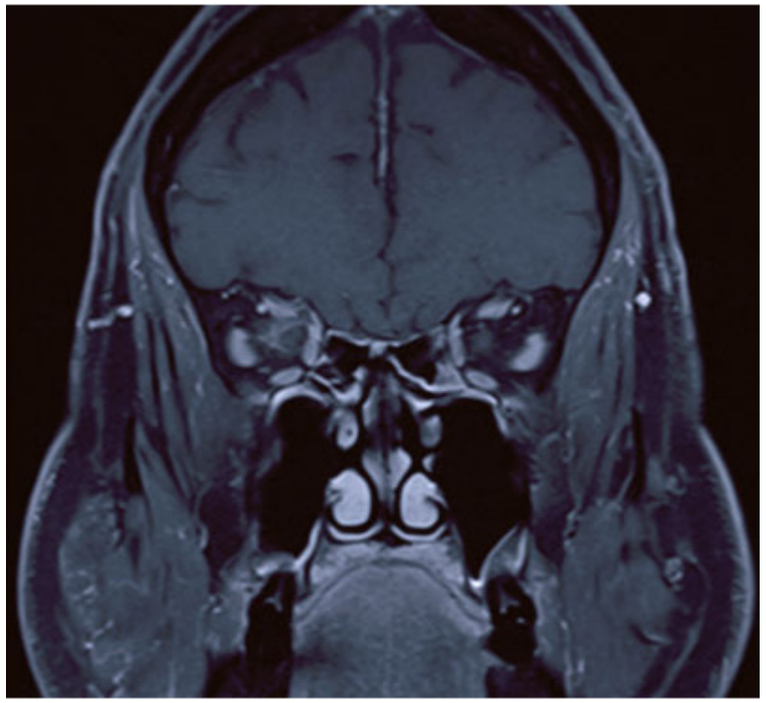
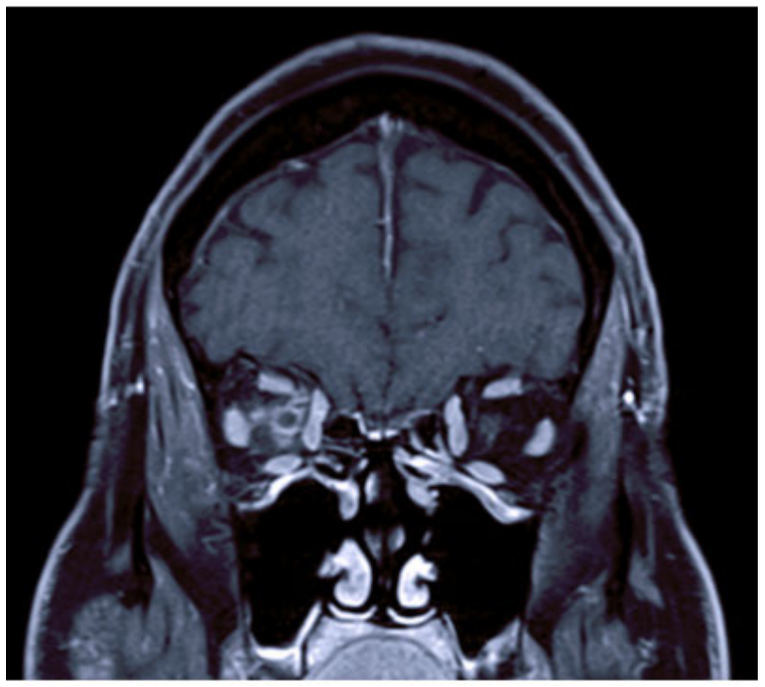


Figure 3



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7:46 – 7:50 am

Cutaneous Lymphangiosarcoma Presenting as Bilateral Periorbital Edema

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Introduction: Cutaneous angiosarcoma is a rare malignant endothelial cell tumor that most commonly involves the head and neck region. While early diagnosis and treatment are critical to minimize intradermal spread, detection is often delayed due to variable clinical presentation and histopathological appearance.

Methods: We report a case of cutaneous angiosarcoma presenting as chronic bilateral periorbital edema and highlight commonly encountered diagnostic and therapeutic challenges.

Results: A 66-year-old previously healthy man presented with 9 months of bilateral painless periorbital edema (Figure 1). He had a history of dental implant insertion 3 months prior to symptom onset and his facial edema was initially attributed to post-surgical changes. Prior to presenting to our institution, he was treated with oral doxycycline, clindamycin, and prednisone without improvement.

Physical examination showed bilateral asymmetric upper and lower eyelid edema with yellow hue (Figure 1). Central forehead contracture (Figure 2) and multiple violaceous patches scattered across the left temple and preauricular areas were noted (Figure 3). Ophthalmologic examination was otherwise normal.

Laboratory workup for systemic inflammatory, autoimmune and hereditary disease was negative. Magnetic resonance imaging revealed subcutaneous fat stranding extending to the forehead, with no focal mass or abscess. Three punch biopsies were obtained and revealed enlarged atypical vascular endothelial cells (Figure 4A-B, arrows denoting atypical endothelial cells) with diffuse D2-40 stain positivity (Figure 4C), consistent with a diagnosis of cutaneous lymphangiosarcoma.

Given the tumor extent and location, systemic treatment with pembrolizumab was initiated. The patient underwent 3 cycles of immunotherapy before discontinuing due to poor tolerance and continued local tumor expansion. He elected to forego further treatment and was transitioned to hospice care.

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Conclusions: Cutaneous angiosarcoma is a rare, aggressive tumor that comprises less than 2% of all sarcomas[1]. The majority of cutaneous angiosarcomas arise on the head and neck of elderly individuals, more commonly in men, and only rarely involve the eyelid[1,2]. Patients typically present with purple-red patches, plaques, or nodules, although presentation may mimic alternative dermal infiltrative diseases, including Morbihan syndrome, hematoma, cuatneous lymphoma, squamous or basal cell carcinoma[3]. There are only a few cases in the literature where cutaneous angiosarcoma presented as isolated periorbital edema[4].

Early diagnosis is further complicated by variable histopathology. Cutaneous angiosarcoma can microscopically vary from low-grade vasoformative channels with endothelial tufts to poorly differentiated sheets of pleomorphic cells[1]. Multiple biopsies are often required for histopathologic confirmation, given the often subtle and focal nature of disease. A variable subset of tumors with D2-40-positivity indicating partial lymphatic endothelial origin have been termed lymphangiosarcomas[5]. Tumors strictly isolated to the eyelid typically demonstrate a better prognosis, whereas those involving the adjacent facial structures carry a 57% 3-year survival rate[6].

Combination surgical resection and radiotherapy is the mainstay of treatment. For metastatic disease or tumors not amenable to resection, chemotherapy regimens of paclitaxel or doxirubicin have traditionally been used with varying levels of success[7]. Newer antiangiogenic treatments and immunomotherapy targeting the PD-1 receptor or PDL-1 ligand are less extensively studied but show promise[1,8].

Figure 1

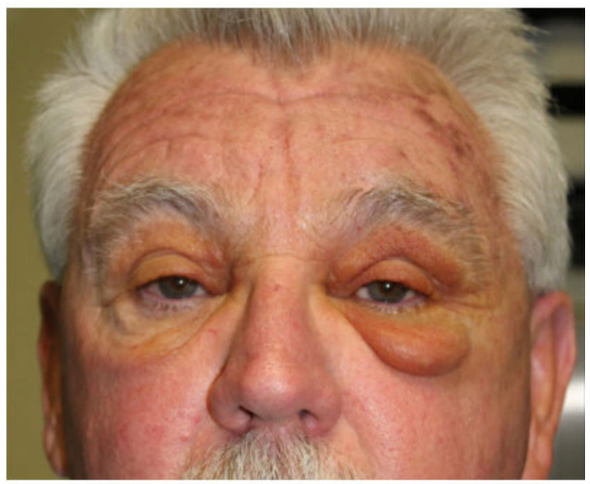


Figure 2

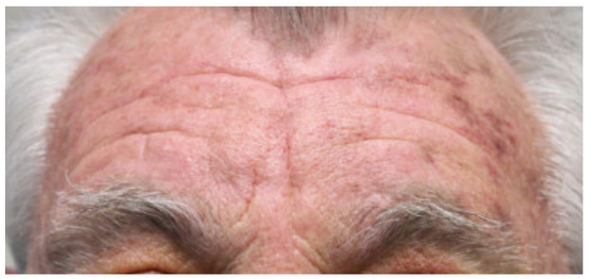


Figure 3

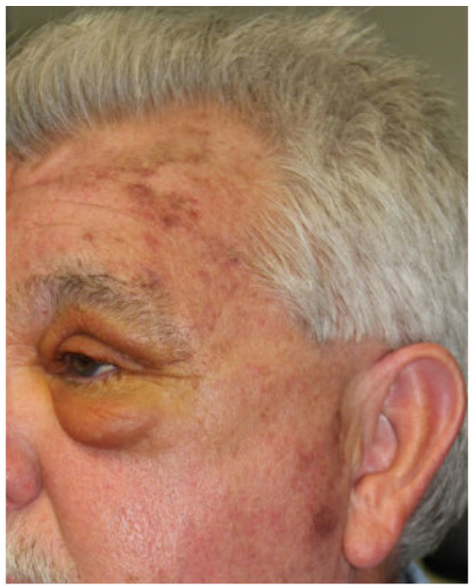
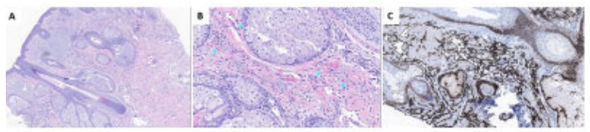


Figure 4



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7:50 – 7:54 am

Globe-Preserving Surgery Followed by Adjuvant Proton Beam Therapy for Pediatric Adenoid Cystic Carcinoma of the Lacrimal Gland: Case Series, Outcomes, and Histopathologic Characteristics

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Introduction: Postoperative radiation is often indicated in the treatment of malignant epithelial tumors of the orbit and ocular adnexa. Recent studies have described globe-preserving surgery with adjuvant therapy as an effective alternative to exenteration for orbital epithelial tumors in adults.[1-6] Few cases of pediatric adenoid cystic carcinoma of the lacrimal gland (LGACC) have been treated with globe-preserving surgery and adjuvant therapy.[3,7-9] We present the histopathologic features, clinical outcomes, and radiation-associated morbidity of three cases of pediatric LGACC treated with globe-preserving surgery and adjuvant proton beam therapy (PBT).

Methods: Three pediatric patients with a median age of 13 years (range 10-15 years) underwent globe-preserving surgery followed by adjuvant PBT for newly diagnosed LGACC. Tumor characteristics, treatment protocols, radiation-associated morbidity, and visual outcomes were obtained at subsequent follow-up.

Results: On initial presentation, American Joint Committee on Cancer (AJCC) 8th edition classification was T1N0M0 for 1 patient and T2N0M0 for 2 patients. All tumors demonstrated primarily cribriform-tubular histology with less than a 25% basaloid component (Fig. 1). The median radiation dose delivered was 59.4 Gy [range: 50-70 Gy], in 1.8 Gy fractions (33 total fractions) over 6.6 weeks (Fig. 2); 1 patient received adjuvant chemotherapy. Patients were followed for a median of 18.7 months (range: 18-20 months). Visual acuity of 20/30 or better was maintained for each treated eye. Radiation-related morbidity was limited to surface keratopathy managed with topical lubricants. At the most recent follow-up, all patients were alive with no evidence of tumor recurrence.

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Conclusions: We report 3 cases of pediatric patients with LGACC treated with globe-preserving surgery and adjuvant PBT that achieved disease control and was well-tolerated in each patient. No patient required orbital exenteration, and no patient demonstrated evidence of local recurrence or distant metastasis at the most recent follow-up. All patients demonstrated less aggressive histologic features, which may contribute to the more favorable prognosis observed in the pediatric population. Our case series adds to the growing body of evidence supporting adjuvant PBT after globe-preserving surgery for patients, specifically pediatric patients, with LGACC.

Figure 1

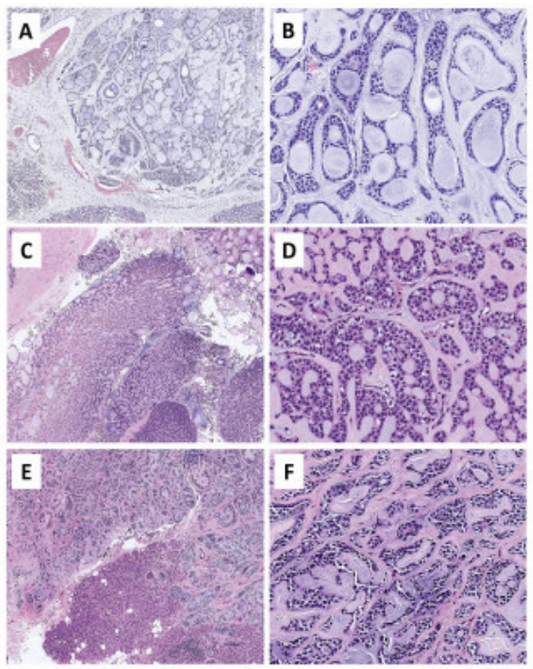
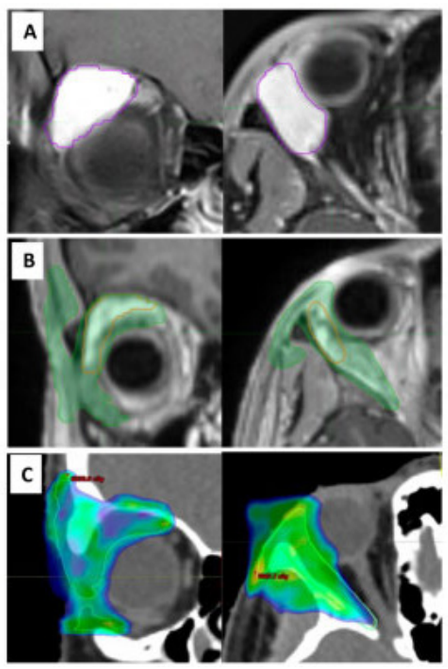


Figure 2



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8:03 – 8:09 am

Primary Treatment of Orbital Lymphoma with Intralesional Injections of Rituximab

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Introduction: Orbital B-cell lymphomas are the most common malignancy of the ocular adnexa.[1] Traditional treatment with external beam radiotherapy (EBRT) leads to local control rates over 90%; however, the ocular morbidity can be significant. The only previous study of intralesional rituximab used 5 to 10mg weekly doses and reported a partial response rate of 42.8% and complete response rate of 28.5%.[2-3] Our study sought to determine if treatment with intralesional rituximab with fewer doses at higher concentrations is an effective primary treatment of low-grade orbital lymphoma.

Methods: A retrospective chart review was conducted after the Institutional Review Board deemed the study exempt from review. Patients with biopsy-proven orbital lymphoma treated with intralesional rituximab were included, and patients with lymphoma affecting other parts of the eye or orbital adnexa were excluded. Information on demographics, clinical features, treatment regimens, response, and side effects was collected. Complete response to treatment was defined as complete tumor resolution on imaging, and partial response to treatment was defined as a decrease in tumor size by at least 50% with no new tumor growth on imaging.[4]

Results: The clinical features of seven eyes of six patients were analyzed. Five patients had low-grade mucosa-associated lymphoid tissue (MALT) lymphoma, and one patient had marginal zone lymphoma. After an incisional biopsy was performed, rituximab (50mg in 5mL) was injected into the orbital tumor. Three eyes of two patients received one monthly injection, and four eyes of four patients received two monthly injections. 71.4% of treated eyes had complete resolution of their orbital lymphoma. Three eyes of two patients had a complete response after one intralesional 50mg rituximab injection, and two eyes of two patients had a complete response after two injections. Two eyes of two patients had a partial response after two monthly 50mg rituximab injections. Of these partial responders, one elected to discontinue treatment, and the other achieved a complete response after treatment with EBRT (24 Gray in 12 fractions). No patients with complete or partial responses developed subsequent recurrence or systemic lymphoma after a mean follow-up of 25 months (range 2-56 months). The side effects were minimal and transient, including two reports each of post-injection pain,

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chills, and intermittent diplopia, and one patient report of headache, swelling, leg pain, and fluctuating vision. One patient reported no side effects.

Conclusions: Our results suggest intralesional rituximab may offer an in-office, primary treatment for low-grade B-cell orbital lymphoma. The dosing regimen of rituximab 50mg in 5mL monthly decreases the frequency of injections and leads to a complete response rate of 71.4%, significantly higher than the previous report in the literature of 28.5%. Patients demonstrated mild side effects from the injections with no long-term sequelae, and the majority of patients reached complete resolution of the orbital tumor after one or two injections without recurrence within the follow-up period. The success rate of intralesional rituximab is lower than EBRT but has the benefit of less ocular morbidity.

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8:09 – 8:15 am

Epidemiology and Survival Outcomes for Primary Conjunctival Lymphomas in the United States

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Introduction: We performed an epidemiological study of conjunctival lymphoma in the United States to determine how demographic, histologic, and treatment modalities affect survival outcomes.

Methods: Cases of conjunctival lymphoma were queried on the Surveillance, Epidemiology, and End Results (SEER) database from 1998 to 2018. Outcomes included disease-specific and overall survival (OS) with Kaplan-Meier survival curves. Cox proportional hazards regression models were used to calculate survival outcomes and identify potential prognostic factors.

Results: A total of 1066 patients were found with primary conjunctival lymphoma. Overall, the patient mean age was 59 years old, which significantly varied among histological subtypes. Mean age of marginal zone B-cell lymphoma (EMZL) was significantly younger than follicular lymphoma, diffuse large B-cell lymphoma (DLBCL), mantle cell lymphoma (MCL), and chronic lymphocytic lymphoma/small lymphocytic lymphoma ($p<0.01$). Kaplan-Meier disease-specific survival and OS curves are shown in Figure 1.

In the multivariate analysis, older age (HR 1.09, 95% CI 1.08-1.11, $p<0.001$), Indian/Alaska Native race (HR 5.20, 95% CI 1.62-16.65, $p=0.018$), Lymphoplastacytic histological subtype (HR 24.17, 95% CI 7.23-80.79, $p<0.001$), MCL histological subtype (HR 1.95, 95% CI 1.05-3.62, $p=0.036$), NK/T-Cell histological subtype (HR 30.46, 95% CI 6.89-134.72, $p<0.001$), and no surgery (HR 1.34, 95% CI 1.02-1.76, $p=0.036$) were found to be negative predictors of OS. The only positive predictor of OS was Asian or Pacific Islander race (HR 0.53, 95% CI 0.31-0.90, $p=0.018$). (Table 1).

Conclusions: To our knowledge, this study is the largest epidemiological study of conjunctival lymphomas; in addition, the SEER database is representative of the United States population. We demonstrate that age, histology, race, and treatment modality are significant predictors of survival in conjunctival lymphoma. Namely, DLBCL and MCL trend towards worse survival and this is the first study to demonstrate that MCL decreases survival with multivariate analysis. Lastly, we i that race has a significant effect on survival and that initial management that includes surgery improves survival.

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Figure 1

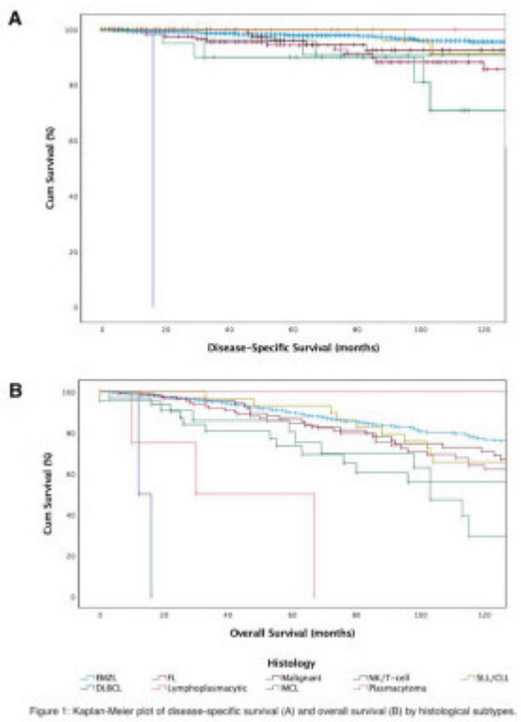

Figure 1: Kaplan-Meier plot of disease-specific survival (A) and overall survival (B) by histological subtypes.

Table 1

Characteristics	Disease-Specific Survival HR (95% CI)	p-value	Overall Survival HR (95% CI)	p-value
Age	1.08 (1.06-1.11)	**<0.001**	1.09 (1.08-1.11)	**<0.001**
Race				
White	Reference		Reference	
Black	0.59 (0.14-2.46)	0.464	0.75 (0.42-1.36)	0.345
Asian or Pacific Islander	0.72 (0.28-1.85)	0.494	0.53 (0.31-0.90)	**0.018**
Indian/Alaska Native	0.00 (0.00-0.00)	0.985	5.23 (1.63-16.76)	**0.005**
Hispanic	0.30 (0.04-2.16)	0.230	0.92 (0.52-1.61)	0.769
Histology				
Marginal	Reference		Reference	
Diffuse	1.30 (0.39-4.40)	0.670	1.12 (0.64-1.98)	0.688
Follicular	1.61 (0.79-3.28)	0.186	0.95 (0.65-1.38)	0.770
Lymphoplastacytic	0.00 (0.00-Unk)	0.992	23.59 (7.07-78.68)	**<0.001**
Malignant, NOS	1.40 (0.58-3.40)	0.428	1.19 (0.79-1.82)	0.407
Mantle	2.83 (0.97-8.26)	0.057	1.91 (1.03-3.54)	**0.042**
NK/T-Cell	36.15 (4.21-310.64)	**0.001**	29.93 (6.76-132.55)	**<0.001**
Plasmacytoma	0.00 (0.00-1.54E285)	0.976	0.00 (0.00-4.57E+121)	0.943
SLL and CLL	0.76 (0.16-3.07)	0.642	0.96 (0.53-1.74)	0.890
Surgery				
Yes	Reference		Reference	
No	1.92 (1.02-3.64)	**0.044**	1.32 (1.01-1.74)	**0.045**
Radiation				
Yes	Reference		Reference	
No	0.78 (0.44-1.41)	0.412	0.98 (0.75-1.28)	0.876
Chemotherapy				
Yes	Reference		Reference	
No	0.36 (0.18-0.71)	**0.003**	0.74 (0.52-1.07)	0.112

Table 1: Multivariate cox proportional hazard regression analysis of prognostic factors for DSS and OS of patients with conjunctival lymphomas.

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8:15 – 8:21 am

Orbital Involvement in Multiple Myeloma: A Retrospective Case Series and Literature Review

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Introduction: Multiple myeloma (MM) involves malignant proliferation of plasma cells in the bone marrow and overproduction of monoclonal immunoglobulins.[1] Ocular involvement in MM includes cornea crystals, uveal cysts, vascular occlusions from hyperviscosity syndrome, and optic nerve infiltration[1]; however, orbital involvement in MM is rare.[2-4] We present a case series to expand the existing literature on orbital involvement of MM and additionally perform a literature review on the previously published cases of MM with orbital involvement.

Methods: A retrospective chart review of medical records at a single institution between 1995 and 2021 was performed. Patients between 18 and 100 years old with diagnoses of MM and orbital involvement as confirmed by histopathology were included. Medical records were reviewed for demographics, clinical and radiographic features, histopathology, management, and outcomes. All data collection was HIPAA-compliant. An additional literature review was performed via Pubmed search for MM with orbital involvement. Primary plasmacytoma and cases without orbital imaging were excluded.

Results: Four patients met the inclusion criteria for the retrospective series. The average age was 67.5 years (Table 1). Imaging demonstrated a solid mass lesion (n=2), diffuse infiltrative process (n=1), and enlarged lacrimal gland (n=1) with evidence of extraocular muscle infiltration (n=2) and lacrimal gland involvement (n=3). Lesion histopathology confirmed orbital MM involvement. All patients underwent incisional biopsy and received orbital radiation and chemotherapy. Literature review identified a total of 77 cases of diagnosed MM with orbital involvement. Including the present 4 cases, a total of 81 cases were evaluated (Table 2). The mean age was 59.7 years with 46.7% males (n=38). Orbital involvement from MM tended to be unilateral (85.2%, n=69) as a discrete lesion most commonly located superolaterally (29.6%, n=24), but may also be diffuse (11.1%, n=9). 18.5% (n=15) had extraocular muscle involvement, and lacrimal gland involvement was seen in 6.2% (n=5). Treatment primarily included chemotherapy and radiation. 32% of patients with orbital involvement of MM (n=26) were reported as deceased on follow-up due to complications of MM.

Conclusions: This retrospective case series and literature review provide an updated summary of the existing data on orbital involvement of MM and adds four cases to further understanding of this rare disease. This case series is the third-largest reported in the literature, which is mainly comprised of case reports or series with three patients or fewer.[2-4] Based on the literature review combined with the data from this retrospective series, orbital involvement in the setting of MM tends to be unilateral and located superolaterally. The most common treatment modalities are chemotherapy and radiation; however, the prognosis remains poor.

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Table 1

Table 2

Table 2: Comparison between orbital multiple in myeloma in this series and previously reported cases

	Previously reported cases (n = 77)	This series (n=4)	Overall (n=81)
Patient Demographics			
Mean age (years)	59.0	67.5	59.7
Sex (male)	46.7% (n=36)	50% (n=2)	46.9% (n=38)
Lesion Characteristics			
Unilateral	84.4% (n=65)	100% (n=4)	85.2% (n=69)
Bilateral	15.6% (n=12)	0 (n=0)	14.8% (n=12)
Location			
Superior	9.1% (n=7)	0 (n=0)	8.6% (n=7)
Inferior	1.3% (n=1)	0 (n=0)	1.2% (n=1)
Medial	5.2% (n=4)	0 (n=0)	4.9% (n=4)
Lateral	15.6% (n=12)	25% (n=1)	16.0% (n=13)
Superolateral	28.6% (n=22)	50% (n=2)	29.6% (n=24)
Superomedial	2.6% (n=2)	0 (n=0)	2.5% (n=2)
Inferolateral	2.6% (n=2)	0 (n=0)	2.5% (n=2)
Inferomedial	1.3% (n=1)	0 (n=0)	1.2% (n=1)
Diffuse	10.4% (n=8)	25% (n=1)	11.1% (n=9)
Apex	6.4% (n=5)	0 (n=0)	6.2% (n=5)
Not specified	2.6% (n=2)	0 (n=0)	2.5% (n=2)
Extraocular muscle involvement	16.9% (n=13)	50% (n=2)	18.5% (n=15)
Lacrimal gland involvement	2.6% (n=2)	75% (n=3)	6.2% (n=5)
Treatment			
Chemotherapy	70.1% (n=54)	100% (n=4)	71.6% (n=58)
Radiation	58.4% (n=35)	100% (n=4)	48.2% (n=39)
Stem Cell Transplant	27.3% (n=21)	0 (n=0)	25.9% (n=21)
Outcomes			
Alive	49.3% (n=38)	50% (n=2)	49.3% (n=40)
Deceased	31.2% (n=24)	50% (n=2)	32% (n=26)
Unknown	19.5% (n=15)	0 (n=0)	18.5% (n=15)

Figure 1

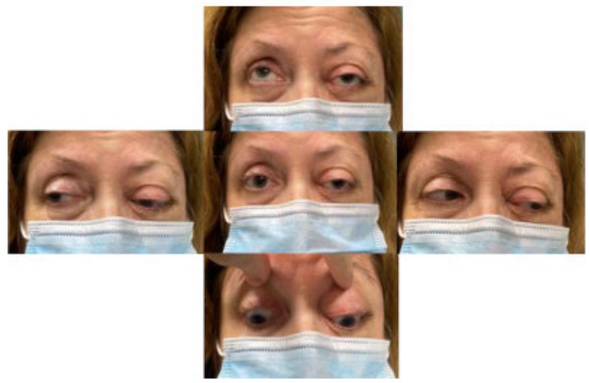


Figure 2

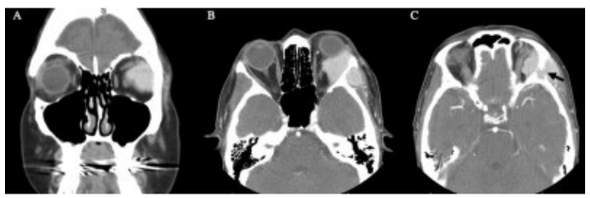
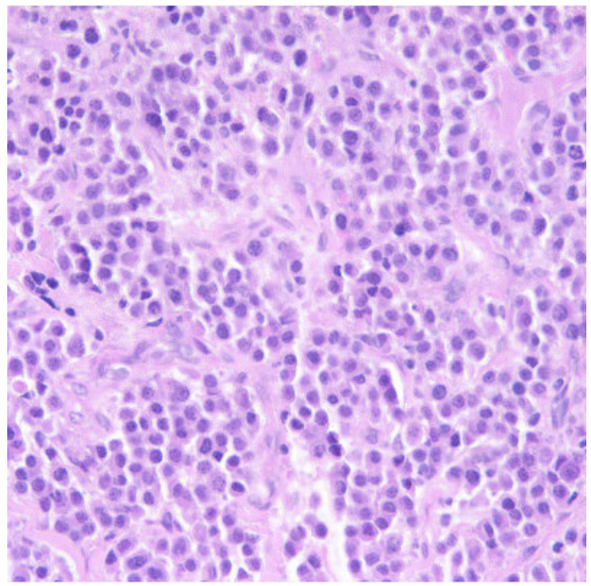


Figure 3



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8:21 – 8:27 am

Molecular Genetic Analysis of Residual Disease in Periocular Basal Cell Carcinoma Patients with Complete Clinical Response to Vismodegib Treatment: Follow Up to the VISORB Clinical Trial

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Introduction: Basal cell carcinoma (BCC) is a common skin cancer caused by deregulated hedgehog signaling. BCC is often curable surgically; however, for orbital and periocular BCCs (opBCC), surgical excision may put visual function at risk.

Methods: Molecular genetic analysis of tissue samples from a prospective clinical trial (VISORB, NCT02436408), including sequencing of mutations, in situ RNA analysis, and immunohistochemistry.

Results: Immunohistochemical analysis of tissue specimens before and after vismodegib treatment revealed keratin positive micro-lesions that were present in post-vismodegib surgical specimens. RNAScope in situ analysis revealed that the residual micro-lesions expressed Gli1 and were proliferative, indicating abnormal activation of the Hedgehog pathway. In order to correlate the residual tumors to the original tumors, tumor samples were sequenced revealing that even vismodegib-sensitive orbital BCC tumors harbored low frequency of resistant mutations (e.g. SMO mutations). In one case of a recurrent tumor, the frequency of the resistant mutation increased from 0.1 to 0.4 allele frequency, indicating that vismodegib treatment selected for resistant tumor cells.

Conclusions: The recently completed VISORB clinical trial highlighted the utility of vismodegib for preserving visual organs in opBCC patients: 67% of patients displayed a complete response histologically. However, further analysis of excision samples uncovered keratin positive, hedgehog active (Gli1 positive), proliferative micro-tumors. Sequencing of pre-treatment tumors revealed resistance-conferring mutations present at low frequency. In addition, one patient with a low-frequency SMO W535L mutation in their pre-treatment biopsy recurred two years post study, despite no clinical evidence of residual disease. Sequencing of this recurrent tumor revealed an enrichment for the SMO W535L mutation, revealing that vismodegib treatment selected for resistant cells undetectable by traditional histology. In the age of targeted therapies, linking molecular and genetic analysis to prospective clinical trials may be necessary to provide mechanistic understanding of clinical outcomes.

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8:27 – 8:33 am

Long-Term Comparison of Orbital Volumes After Unilateral Enucleation and Hydroxyapatite Implant in Retinoblastoma Patients

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Introduction: Enucleation remains the primary treatment modality for advanced unilateral retinoblastoma worldwide. Enucleation in the pediatric population presents the added challenge of ensuring continued orbital development and achieving long term cosmesis[1,2]. The purpose of our study was to compare the orbital volume between enucleated and contralateral, uninvolved orbits over a 5 year period in patients with retinoblastoma who underwent unilateral enucleation with hydroxyapatite (HA) placement by a single surgeon.

Methods: A retrospective review was performed on the clinical records and radiographic images of retinoblastoma patients who underwent enucleation with primary HA implantation from 2003- 2020 at a single institution. Orbital volume measurements were taken from the initial postoperative MRI and again at 1 and 5 years later. Differences in orbital volume were obtained by measuring the transverse and anteroposterior dimensions of enucleated and contralateral orbits, then calculated using the equation for the volume of a cone ($\pi r2h/3$) as previously described[2].

The main outcome measure was the difference in orbital volumes, $\Delta V = V_{contra} - V_{enuc}$, over time. Implant size, age at enucleation, and gender were also evaluated. A linear mixed-effect model was used for analysis.

Results: A total of 124 patients (73 males, 51 females) with HA implant following enucleation were included. There was a trend towards a positive ΔV over time, however, this was not statistically significant (β=0.002967, p= 0.1221). The median time between enucleation surgery and the initial, 1-year, and 5-year post-operative MRIs was 6 months, 17 months, and 55 months, respectively. The average age at enucleation was 2.4 years old (range: 72 days - 11 years old). Longitudinal differences in orbital volume were not affected by age at enucleation (p=0. 3766). Female gender and an 18mm (vs 20mm) implant showed a trend towards a greater ΔV over time, however, this was not statistically significant (β=0.06809 p=0.6108; β=0.07095 p=0.6802). Only one patient received a 16mm implant thus invalidating significance due to sample size effects. Ultimately there was no statistical correlation between age at enucleation, gender, or implant size, and orbital volume at any time points (p>0.05).

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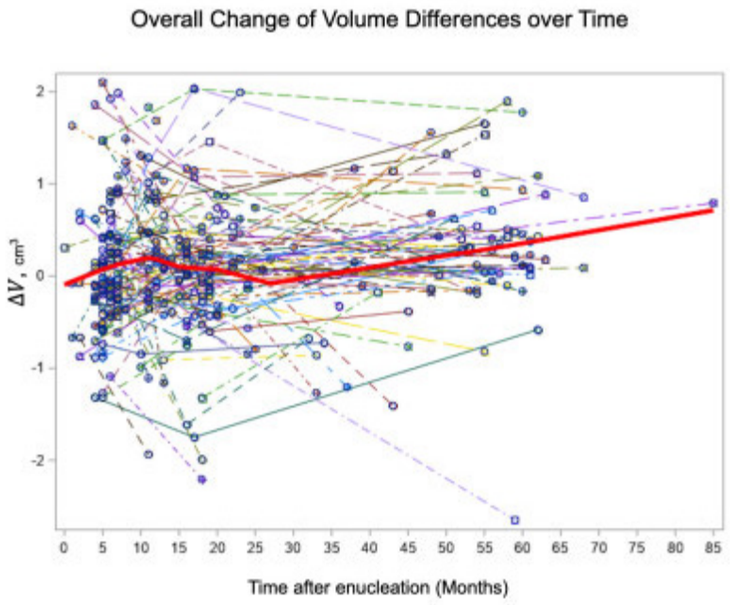
Conclusions: Patients treated with unilateral enucleation and primary HA implant placement for retinoblastoma did not display significant differences in orbital volume on 5 year postenucleation MRIs. This suggests that HA implants promotes orbital growth comparable to a nonenucleated orbit to achieve long-term cosmesis in the pediatric population.

Figure 1



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8:33 – 8:39 am

Neoadjuvant Intra-Arterial Cytoreductive Chemotherapy for Lacrimal Gland Adenoid Cystic Carcinoma: A Long-Term Follow-Up Study of a Trimodal Strategy

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Introduction: Lacrimal gland adenoid cystic carcinoma (LGACC) is a rare orbital malignancy notorious for its unpredictability and universal devastating lethality. Achieving a cure for LGACC is challenging due to the complex regional orbital anatomy and the tumor's aggressive behavior, infiltrative growth pattern, distinct propensity for perineural infiltration with retrograde intracranial extension, and hematogenous invasion.[1,2] In 1998, Meldrum, Tse, and Benedetto introduced a trimodal treatment protocol for LGACC with three integral components: chemotherapy, orbital exenteration, and radiation therapy, with neoadjuvant intra-arterial cytoreductive chemotherapy (IACC) as the core treatment element.[3] In 2013, Tse and colleagues reported the long-term outcomes for this method in a retrospective study of 19 patients from a single institution, suggesting that integration of neoadjuvant IACC was pivotal in improving overall disease-free survival and decreasing disease relapse.[4] This study aims to provide an additional eight years of follow-up data on the same cohort of patients with LGACC in the original 2013 study.

Methods: Design: Non-randomized, retrospective case series.

Participants: Nineteen consecutive patients treated with neoadjuvant IACC, orbital exenteration, chemoradiotherapy, and adjuvant intravenous chemotherapy.

Interventions: Analyses of locoregional recurrences and distant metastases, disease-free survival time, TNM tumor stage at presentation, response to IACC, and prognostic impact of positive resection margins.

Main Outcome Measures: Overall survival, disease-free survival, disease relapse, positive tumor resection margins, and tumor stage at presentation.

Results: Eight patients with an intact lacrimal artery (Group 1), seven of whom had AJCC stage T4a-c, had significantly better overall survival (87.5% vs. 14.3% at 15-years) and disease-specific mortality and recurrences (all $p < 0.001$, log-rank test) than conventionally treated patients at the same institution. Group 1 was superior to Group 2, patients lacking an intact lacrimal artery, with respect to overall survival ($p=0.042$) and recurrence ($p=0.017$), but not in disease-specific mortality ($p=0.23$). Group 2 was associated with a significantly

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lower cause-specific mortality than the institutional comparator group (p=0.039). Prior tumor resection with lateral wall osteotomy and failure to adhere to all protocol elements were poor prognostic factors. Positive tumor margins increased the risk of all-cause mortality four-fold (p=0.036, stratified Cox proportional hazards regression) and disease-specific mortality eight-fold compared to negative margins (p=0.043, stratified Cox proportional hazards regression).

Conclusions: Extended follow-up supplemented with AJCC staging data confirms neoadjuvant IACC as an integral component of a trimodal treatment strategy in patients with an intact lacrimal artery, and implementing all protocol elements as designed improves overall survival and decreases disease relapse in these patients. This long-term IACC dataset establishes a critical bar of 15 years of follow-up for assessing the efficacy of current conventional and future globe-sparing therapies.

Figure 1

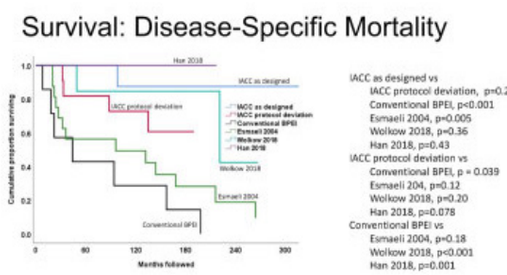

Figure 2. Kaplan-Meier survival comparison of IACC vs conventional treatment vs globe-sparing therapy with survival censored at death from causes other than ACC.

Figure 2

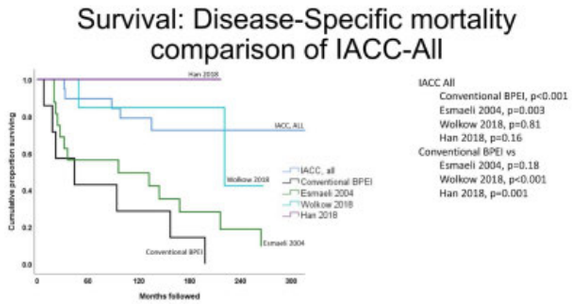

Figure 3. Kaplan-Meier survival comparison of IACC (all patients) vs conventional treatment vs eye-sparing therapy with survival censored at death from causes other than LGACC.

Figure 3

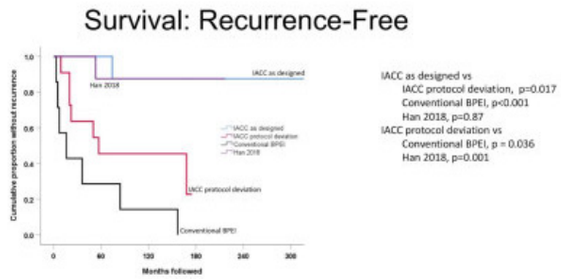

Figure 4. Kaplan-Meier comparison of recurrence-free survival. Updated from 2013.

Figure 4

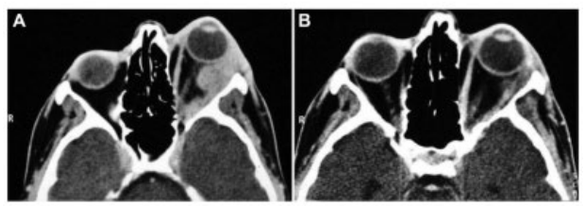

Figure 5

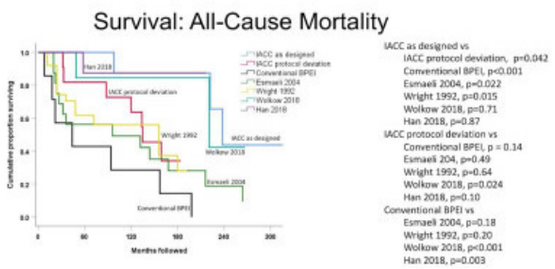

Figure 1. Kaplan-Meier survival comparison of IACC vs conventional treatment vs globe-sparing therapy.

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8:39 – 8:45 am

Long-Term Survival and Clinical Outcomes of Primary Surgical Resection of Malignant Lacrimal Sac Tumors

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Introduction: Malignant neoplasms of the lacrimal sac require coordinated multidisciplinary care to achieve cure.[1] The two prevailing protocols for managing lacrimal sac malignancies entail either upfront surgical resection followed by adjuvant radiotherapy and chemotherapy[2-5] or upfront neoadjuvant radiotherapy and chemotherapy followed by resection.[6] Due to the exceedingly low prevalence of lacrimal sac tumors[3] the optimal treatment regimen remains undetermined and a randomized clinical trial is not likely. Recommendations for optimal treatment must therefore rely on retrospective data and single-institution series. The purpose of this study is to describe the disease-free survival and long-term clinical outcomes of patients who underwent upfront surgical resection of malignant lacrimal sac tumors at a single institution where all cases were performed by an orbital surgeon in conjunction with a head and neck surgeon.

Methods: A retrospective chart review of all patients who underwent en bloc resection of lacrimal sac tumors at a single institution between 1990 and 2020 was performed. Patients with nonmalignant tumors were excluded from this study. Survival curves were constructed by the Kaplan-Meier method.[7] The 95% CI for 5-year survival was derived from Greenwood's formula.[8]

Results: Twenty-three patients (13 male, 10 female) with malignant lacrimal sac tumors were identified (Figure 1). The median age at diagnosis was 62 years (range, 33-89 years). The most common presenting symptom was epiphora (n=18) followed by palpable mass (n=16) and epistaxis (n=4). Twelve patients had squamous cell carcinoma (SCC), 5 transitional cell carcinoma (TCC), 4 adenoid cystic carcinoma, 1 mucoepidermoid carcinoma and 1 high grade poorly differentiated carcinoma. Sixteen patients underwent simultaneous orbital reconstruction of the bony defect with a contoured titanium mesh or T-plate. Two patients underwent primary orbital exenteration due to extensive orbital soft tissue involvement. Sixteen patients received radiotherapy postoperatively. The median radiation dose was 60 Gy. The median follow-up time was 46 months (range, 7-285 months). The 5-year overall survival (OS) was 100.0% (Figure 2). The 5-year progression-free survival (PFS) was 68.7% (95% CI, 42.4-84.8%). The 5-year locoregional recurrence-free survival (LRFS) was 84.8% (95% CI, 59.4-94.9%). There was no statistically significant difference in survival between patients who underwent resection alone and patients who additionally received postoperative radiotherapy (Figure 3) or across the most prevalent tumor types (Figure 4). Fifteen patients (65.2%) developed complications as a result of treatment. Twelve patients (52.2%) developed nasocutaneous

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fistulas. Other complications included dermatitis (n=5), chronic pain (n=2), medial canthal tendon dystopia (n=2) and flap dehiscence (n=1). There was no statistically significant difference in the rate of complications (42.9% vs. 75.0%, *p*=0.18) or fistula formation (28.6% vs. 62.5%, *p*=0.19) in patients who underwent resection alone and patients who additionally received postoperative radiotherapy.

Conclusions: Upfront surgical resection of malignant lacrimal sac tumors with or without postoperative radiation can result in excellent long-term overall survival and disease-free survival. Additional research is needed to identify which patients benefit from adjuvant radiation and chemotherapy.

Figure 1

Characteristics of the Patients

Variable	All Patients (n = 23)	Resection Alone (n = 7)	Resection + Radiation (n = 16)
Demographic			
Median age – yr (IQR)	62.0 (47.5-70.0)	68.0 (56.0-75.5)	59.0 (44.8-69.2)
Male – no. (%)	13 (56.5)	3 (42.9)	10 (62.5)
White race – no. (%)	20 (87.0)	5 (71.4)	15 (93.8)
Black race – no. (%)	3 (13.0)	2 (28.6)	1 (6.2)
Smoker – no. (%)	11 (47.8)	4 (57.1)	7 (43.8)
Diabetes – no. (%)	4 (17.4)	1 (14.3)	3 (18.8)
Hypertension – no. (%)	12 (52.2)	3 (42.9)	9 (56.2)
Presenting Symptoms			
Mass – no. (%)	16 (69.6)	5 (71.4)	11 (68.8)
Epiphora – no. (%)	18 (78.3)	5 (71.4)	13 (81.2)
Epistaxis – no. (%)	4 (17.4)	0 (0.0)	4 (25.0)
Lymph Node			
Positive – no. (%)	3 (13.0)	0 (0.0)	3 (18.8)
Negative – no. (%)	20 (87.0)	7 (100.0)	13 (81.2)
Tumor Type			
SCC – no. (%)	12 (52.2)	4 (57.1)	8 (50.0)
TCC – no. (%)	5 (21.7)	2 (28.6)	3 (18.8)
ACC – no. (%)	4 (17.4)	1 (14.3)	3 (18.8)
Other – no. (%)	2 (8.7)	0 (0.0)	2 (12.5)

IQR = interquartile range; SCC = squamous cell carcinoma, TCC = transitional cell carcinoma, ACC = adenoid cystic carcinoma

Figure 2

Kaplan-Meier estimates of survival. Dashed lines represent the 95% confidence intervals.

Figure 3

Treatment Outcomes

	All Patients (n = 23)	Resection Alone (n = 7)	Resection + Radiation (n = 16)
Survival			
5-yr OS – % (95CI)	100.0	100.0	100.0
5-yr PFS – % (95CI)	68.7 (42.4-84.8)	75.0 (12.8-96.1)	56.3 (26.6-78.0)
5-yr LRFS – % (95CI)	84.8 (59.4-94.9)	100.0	78.3 (46.0-92.6)
Complications			
All – no. (%)	15 (65.2)	3 (42.9)	12 (75.0)
Fistula – no. (%)	12 (52.2)	2 (28.6)	10 (62.5)

OS = overall survival, PFS = progression-free survival, LRFS = locoregional recurrence-free survival, 95CI = 95% confidence interval

Figure 4

Treatment Outcomes by Histopathological Diagnosis

Tumor Type	5-yr OS – % (95CI)	5-yr PFS – % (95CI)	5-yr LRFS – % (95CI)
SCC	100.0	64.6 (23.0-87.8)	88.9 (43.3-98.4)
TCC	100.0	80.0 (20.4-96.9)	100.0
ACC	100.0	75.0 (12.8-96.1)	75.0 (12.8-96.1)

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8:55 – 9:01 am

Justice in Ophthalmology and Oculoplastics

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Introduction: To understand the principle of justice in medical ethics and applications of justice in ophthalmology and oculoplastics.

Methods: PubMed literature review

Results: As a physician, knowledge of medical ethics offers benefits including improved patient care, better compliance with professional and legal standards, and greater understanding of healthcare reform. Justice is one of the core principles of medical ethics and is concerned with the fair and equitable treatment of individuals. The term justice may refer specifically to distributive justice, which involves the fair distribution of limited healthcare resources. There are several competing theories of distributive justice. Under a libertarian theory, healthcare resources are allocated based on individuals' ability to pay for them in the free market, while under an egalitarian theory, the state distributes such resources more equally across the population. A compromise between these theories, the theory of the right to a decent minimum argues for guaranteed access to certain essential healthcare services, with less essential services provided through the free market.[1] Other important applications of justice include improving disadvantaged groups' access to healthcare and eliminating discrimination and disparities based around race.

Promoting justice presents a number of challenges to ophthalmologists including oculoplastic subspecialists. Many Americans face limited access to ophthalmic care due to lack of insurance or low socioeconomic status (SES), and as in other fields, there are major disparities in access and outcomes based around race and ethnicity.[2] In addition, compared to other specialties, a lower percentage of ophthalmologists belong to underrepresented racial and ethnic minority groups.[3] Although there is a scarcity of research on these problems in oculoplastics specifically, individuals with low SES or from historically disadvantaged groups likely face increased barriers to accessing medically necessary oculoplastics care. Unfortunately, these same individuals may have higher demand for reconstructive surgery due to higher rates of ophthalmic trauma[4] and delayed diagnoses of malignancies including retinoblastoma.[5] At the individual

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level, oculoplastic surgeons may help patients unable to afford care by exploring alternative treatments or putting patients in touch with relevant government programs or private charities.

Conclusions: The principle of justice is concerned with the fair and equitable treatment of individuals, including the fair distribution of healthcare resources. Important applications for the oculoplastic surgeon include helping underserved patients and working to reduce racial and ethnic disparities.

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9:01 – 9:07 am

National Trends in the ASOPRS Work Force from 2012 to 2021

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Introduction: The purpose of this study is to describe temporal and geographic trends in the United States ASOPRS-trained oculoplastic surgeon training programs and workforce, as well as to correlate workforce density with United States average household income.

Methods: We obtained data from the American Society of Ophthalmic Plastic and Reconstructive Surgery website and past Fall Scientific Symposium Program Books, Kaiser Family Foundation, and United States Census Bureau. The main outcomes were ASOPRS-trained oculoplastic surgeon density, defined as the number of providers per 1,000,000 individuals and its association with number of accredited ASOPRS fellowship training programs per state and state median household income. In our subgroup analysis, we further analyzed New Jersey for county and city median household income.

Results: From 2012 to 2021, the national oculoplastic-trained surgeons increased from 561 to 716 active ASOPRS members, and the oculoplastic surgeon density increased from 1.82 to 2.16 per 1,000,000 individuals (Figure 1 and 2). The number of accredited ASOPRS fellowship training programs increased from 46 to 54. We found that there is a low correlation between ASOPRS surgeon density and the number of ASOPRS fellowship training programs in that state (R2 = 0.04). There was also a low correlation between change in ASOPRS surgeon density from 2012 to 2021 and the number of ASOPRS fellowship training programs within that state (R2 = 0.04).

However, the state median household income and ASOPRS-trained oculoplastic surgeon density are correlated (R2 = 0.23, See Figure 3). As a diverse state, with a large representation of minorities and wide range of income levels, we further evaluated New Jersey in our subgroup analysis, and found that the average median household income associated with an ASOPRS surgeon practice location is $122,823, which is $40,278 higher than the New Jersey state median household income ($82,545) and $59,644 higher than the United States median household income ($63,179). Within New Jersey, there is also a correlation between the number of ASOPRS members per county and median household income (R2 = 0.39). Further analysis other US states is ongoing.

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Conclusions: Over the last decade, the national density of ASOPRS-trained oculoplastic specialists has increased. The number of fellowship training programs offered did not have a strong correlation with the change in or the current ASOPRS-trained oculoplastic surgeon density per state, suggesting that the availability of fellowship training programs within a state does not improve the availability of ASOPRS surgeons. However, there was a correlation between the average income per household and oculoplastic surgeon density. Our subgroup analysis further indicates that there are fewer ASOPRS practice locations in low income areas. This suggests that there are populations not adequately served by oculoplastic surgeons. Going forward, there should be a concerted effort to ensure that low income patients are offered oculoplastic service in an equal manner. We plan to expand our study to investigate other states as well as to examine oculoplastic surgeon density amongst populations that are largely uninsured.

Figure 1

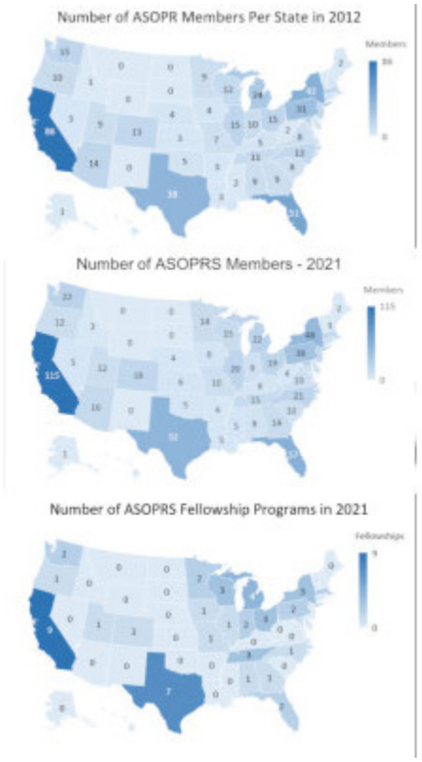


Figure 2

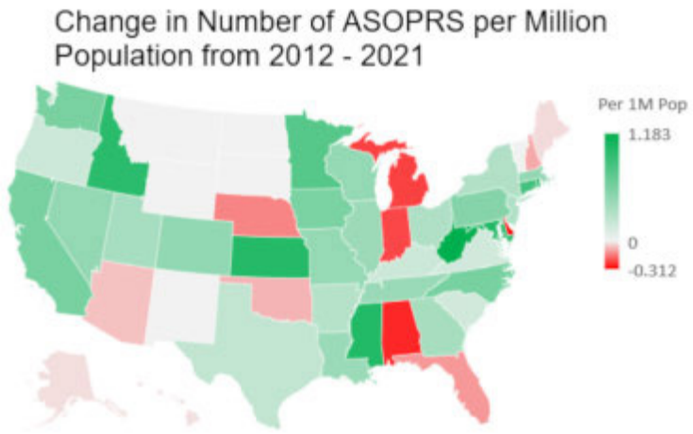
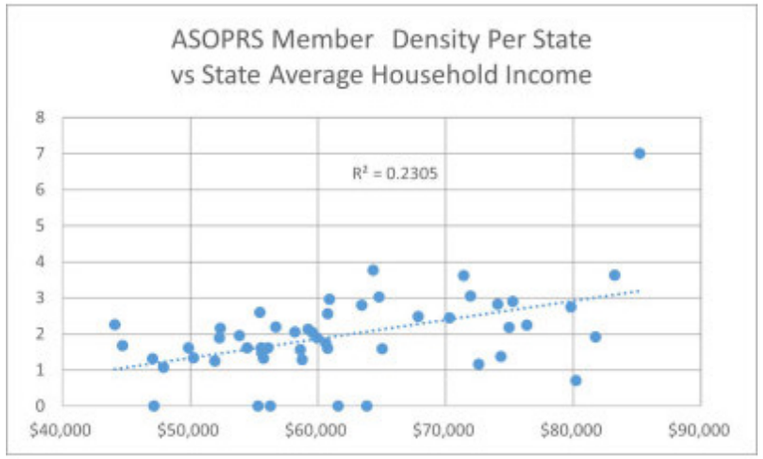


Figure 3



9:07 – 9:13 am

A Multi-Perspective Assessment of Barriers to Increasing UiM Representation in Oculoplastics

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Introduction: Groups historically underrepresented in medicine (UiM) have limited representation in ophthalmology and oculoplastics; only 6% of practicing ophthalmologists and 9.4% of oculoplastic surgeons identify as UiM.[1,2] Determination of barriers to increased UiM representation in oculoplastics may help target efforts to improve representation. The aim of this study was to illuminate the perceived barriers to increasing the number of self-identifying UiM trainees in oculoplastics, from both the fellow and fellowship program director (FPD) perspectives.

Methods: During the month of February 2021, we surveyed 54 current oculoplastics fellows and 56 FPDs nationwide using a 15-question, Qualtrics survey. Bivariate analyses were conducted using t-tests, and a p-value of <0.05 was used to determine statistical significance.

Results: Sixty-three individuals (57%) responded to the survey; 34 fellows (54%) and 29 FPDs (46%). Eighty-eight percent of fellows and 68% of FPDs identified as non-UiM (i.e. White or Asian). Within our cohort of fellows, the lowest rated considerations when applying to oculoplastics were “Racially/ethnically diverse faculty” and “Perceptions of minority candidates by fellowship programs” whereas “Likelihood of matching in program of choice” was ranked highest in considerations. (Figure 1) More women were concerned about “Program or preceptor acceptance of starting or having a family” and more men were concerned about “Financial factors related to fellowship”, but they did not quite reach statistical significance. (Figure 2) FPDs most commonly noted, “Not enough minorities applying to our program” and “The objective data (e.g. OKAPs scores, USMLE Step score, etc.) for minority applicants do not meet the threshold required to offer an interview or to be ranked to match” as barriers. (Figure 3)

Conclusions: Responses from FPDs suggest that efforts focused on recruiting UiMs to ophthalmology and oculoplastics and supporting UiM trainees to achieve competitive objective metrics may improve UiM representation in oculoplastics. Although the current fellowship pool did not rate “Racially/ethnically diverse faculty” and “Perceptions of minority candidates by fellowship programs” highly in considerations when applying to oculoplastics, these metrics may be important for recruitment of UiMs and may be ranked differently if the make-up of fellows had greater UiM representation, but further investigation is necessary.

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Figure 1

Table 1. Average Fellow Response

Question	Average Rating
Likelihood of matching in program of choice	4.24
Likelihood of matching	3.82
Likelihood of matching in location of choice	3.62
Job availability after fellowship	3.47
Perceived exclusivity of the field	3.41
Financial factors related to fellowship (e.g. loans, salary, cost of living, or cost of interviewing)	2.91
Required number of research projects /publications	2.76
Early Application	2.71
Competitiveness of OKAPs score	2.53
Required number of Honors/Awards/Distinctions	2.47
Gender diverse faculty	2.21
Length of training (i.e. additional one/two years of training)	2.12
Program or preceptor acceptance of starting or having a family during fellowship	2.03
Accessibility to mentors at home residency program	1.94
Racially/ethnically diverse faculty	1.71
Perceptions of minority candidates by fellowship programs	1.65

Figure 2

Table 2. Average Fellow Response

Question	Average Male Rating	Average Female Rating	p-value
Likelihood of matching	4.00	3.68	0.42
Gender diverse faculty	1.87	2.47	0.13
Early Application	2.53	2.84	0.50
Likelihood of matching in program of choice	4.00	4.42	0.13
Program or preceptor acceptance of starting or having a family during fellowship	1.60	2.37	0.07
Competitiveness of OKAPs score	2.67	2.42	0.54
Accessibility to mentors at home residency program	1.73	2.11	0.42
Required number of research projects /publications	2.67	2.84	0.69
Financial factors related to fellowship (e.g. loans, salary, cost of living, or cost of interviewing)	3.40	2.53	0.06
Likelihood of matching in location of choice	3.67	3.58	0.83
Perceived exclusivity of the field	3.60	3.26	0.45
Length of training (i.e. additional one/two years of training)	2.33	1.95	0.42
Perceptions of minority candidates by fellowship programs	1.60	1.68	0.78
Racially/ethnically diverse faculty	1.60	1.79	0.53
Job availability after fellowship	3.07	3.79	0.13
Required number of Honors/Awards/Distinctions	2.47	2.47	0.99

Figure 3

Table 3. Barriers Selected by Fellowship PDs

Barrier	Number of responses (%)
Not enough minorities applying to our program	24 (56)
Other perceived barrier(s) not listed above	6 (14)
The objective data (OKAPs, score, USMLE Step scores, clinical honors, AOA status, LOR) for minority applicants often do not meet the threshold required to offer an interview or to be ranked to match	5 (12)
None are applicable	4 (9)
We consistently rank minority applicants high but can never seem to match them	3 (7)
We do not have enough minority faculty	1 (2)

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9:13 – 9:19 am

Educational Exposure and Attitudes Towards Transgender Care in ASOPRS Training Programs

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Introduction: Transgender individuals face multiple barriers to gender-affirming care which can lead to significant physical and mental health issues.[1] Medical and surgical gender-affirming therapy has demonstrated improved quality of life for those with gender dysphoria.[2-4] Oculofacial plastic surgeons are likely to be involved in gender-affirming facial procedures. As this is a relatively novel topic in the medical literature, the aim of this study was to determine the current state of transgender-related education in U.S. ASOPRS training programs, and to evaluate oculoplastic attending and fellow surgeons' comfort with transgender-related care and perceptions of the importance of training in transgender care.

Methods: A web-based, cross-sectional survey was distributed from February 2021 to June 2021 to oculofacial plastic surgery attendings and fellows affiliated with ASOPRS training programs in the United States. Respondents were queried regarding demographics, transgender curricular exposure, comfort level in caring for transgender patients, and perceived importance of training in transgender patient care.

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Results: In total, 80 out of 153 ASOPRS attendings and fellows responded to the survey (52% response rate); 48% were attending physicians working primarily in academic medicine, 25% were attending physicians working primarily in private practice, and 28% were ASOPRS fellows. Respondents were variably distributed across the five standard U.S. geographic regions (30% Midwest, 24% West, 17% Southeast, 19% Northeast, 10% Southwest). Amongst attendings, 66% reported currently treating transgender patients, while 34% did not. In 62% of cases, the attending was made aware of the patient's transgender identity directly from the patient, while the remainder were informed by the medical record. Amongst attendings and fellows, 88% of respondents never received formal (i.e., didactic) education about transgender patient care during training, though 61% reported having direct exposure to care of a transgender patient at least once. Only 16% of respondents were exposed to non-surgical (e.g. gender dysphoria, hormones for transition, etc.) transgender care in the clinic or operating room, and only 27% were exposed to surgical transgender care in the clinic or operating room. Of respondents with surgical transgender care experience, 68% were exposed to facial feminization surgery and 32% to facial masculinization surgery. Outside of formal fellowship, only 13% took any continuing education courses in this topic. Sixty-two percent of respondents felt it is important for fellows to receive training in transgender care/gender-affirming surgery, and at least 45% felt gender-affirming surgery should be formally taught during fellowship.

Conclusions: A majority of ASOPRS oculoplastics attendings currently treat transgender patients, though only a minority of surgeons have had formal non-surgical or surgical training while in fellowship. Most respondents felt that it is important for fellows to receive training in transgender care/gender-affirming surgery during fellowship. Formal fellowship training in transgender patient care should be offered to help better serve the transgender community.

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9:19 – 9:25 am

Assault-Related Orbital Trauma at an Urban Level I Trauma Center: Clinical Features, Racial Disparity, and Association with Neighborhood-Level Social Determinants

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Introduction: Violence is a common cause of orbital trauma. However, there are few studies in the literature specifically examining assault-related orbital trauma and associated socioeconomic and racial/ethnic disparities. The purpose of this study was to report the demographics and clinical characteristics of assault-related orbital fractures over a seven-year period treated at a Level I urban trauma center, as well as describe and analyze the variation in assault rates across different racial/ethnic neighborhoods for patients residing in Milwaukee County.

Methods: A retrospective chart review was conducted for patients who sustained assault-related orbital fractures from January 1, 2013 through December 31, 2019 at Froedtert & Medical College of Wisconsin, in Milwaukee, Wisconsin. For patients living in Milwaukee County, we used US Census tract data to estimate a series of negative binomial regression models evaluating the association of racial/ethnic composition, poverty, unemployment, percentage female head-of-household, and education level with orbital trauma.

Results: A total of 410 patients with orbital fractures attributed to assault were identified during the seven-year period, of which 310 (76%) patients were male, 213 (52%) fractures were isolated to a single orbital wall, and 186 (46%) patients had concurrent substance use. For the 326 (80%) patients residing in Milwaukee County at the time of injury, majority Black neighborhoods (i.e. neighborhoods with >50% Black residents) have a 5.3 times higher incident rate of orbital assault compared to majority White neighborhoods (Figure 1). Majority Hispanic and majority Other-type neighborhoods have a 3.35 and 3.94 higher incident rate, respectively, compared to majority White neighborhoods. The elevated incident rates were significantly attenuated across all minority neighborhoods after accounting for neighborhood factors of poverty, unemployment, and education level. Low education had the strongest association with the incidence of assault-related orbital fractures, followed by poverty.

Conclusions: Results indicate that minority neighborhoods suffer from compounded burdens of both social and economic disadvantage as well as violent assaults. Additional resources allocated to poor minority communities are needed.

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Figure 1

Negative Binomial Regression Estimates on Orbital Trauma Rate

Characteristic	Model 1 IRR [95% CI]	Model 2 IRR [95% CI]	Model 3 IRR [95% CI]	Model 4 IRR [95% CI]	Model 5 IRR [95% CI]	Model 6 IRR [95% CI]
Neighborhood Racial/Ethnic Composition						
>50% White (reference)						
>50% Black	5.3 [3.66, 7.67]	3.77 [2.43, 5.84]	4.1 [2.66, 6.32]	5.07 [3.04, 8.45]	3.25 [2.07, 5.10]	2.64 [1.60, 4.35]
>50% Hispanic	3.35 [2.17, 5.16]	2.41 [1.52, 3.83]	2.98 [1.91, 4.66]	3.26 [2.07, 5.14]	1.08 [0.55, 2.09]	1.12 [0.58, 2.17]
>50% Minority	3.94 [2.40, 6.46]	3.09 [1.90, 5.02]	3.61 [2.19, 5.98]	3.9 [2.35, 6.45]	2.42 [1.39, 4.23]	2.27 [1.29, 4.00]
% Poor		1.2 [1.07, 1.34]				1.11 [0.97, 1.27]
% Unemployed			1.38 [1.08, 1.75]			1.19 [0.93, 1.52]
% Female headed household				1.03 [0.84, 1.27]		
% Ages 25 and older with no high school diploma (or equivalent)					1.43 [1.19, 1.72]	1.3 [1.06, 1.60]

*All models adjust for population count and tract latitude, and longitude centroids.
Estimates for % Poor, % Unemployment, % Female headed household, and % Ages 25 and older with no high school diploma reflect 10 percentage point changes.

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9:25 – 9:31 am

Social and Medical Factors Associated with Loss of Eye Using the NIH All of Us Database

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Introduction: Using the NIH *All of Us* (AoU) database, a novel nationwide data repository focused on diverse participant enrollment, we aimed to identify social and medical factors associated with loss of an eye, a highly morbid outcome.

Methods: In this case-control study, we extracted electronic health record and socio-demographic data for 231 cases of eye loss derived from AoU enrollment sites across the United States. Cases were selected from over 386,000 AoU enrolled adult participants based on procedure and condition codes relating to loss of eye (i.e. enucleation, evisceration, exenteration, anophthalmos, etc.). Controls (924 cases) were sampled from the general adult population in the AoU database and matched to the 2020 United States Census data with regards to race, ethnicity, and gender. We performed bivariate analyses as well as multivariable logistic regression using a wide range of predictors to identify medical and social determinants significantly associated with increased odds of losing an eye. Predictor variables included ocular tumors, glaucoma, ocular infection, and socio-demographic variables (i.e. race/ethnicity, gender, employment status, insurance type, annual income). Statistical significance was defined by $p<0.05$.

Results: The mean (standard deviation) age among cases who had lost an eye was 60.1 (14.4) years. Among the cases (n=231), the majority (125 [54.1%]) were male. 87 (37.7%) identified as Black, and 49 (21.2%) identified as Hispanic or Latino. Factors associated with loss of eye included: annual household income less than $25,000 (86 [37.2%]), housing instability (48 [20.8%]), and unemployment (182 [78.8%]). In multivariable analyses, risk factors such as ocular tumor (odds ratio [OR] 421.73, 95% confidence interval [CI] 129.81-1959.80, p<0.001), ocular trauma (OR 13.38, 95% CI 6.64-27.43, p<0.001), glaucoma (OR 8.33, 95% CI 4.43-15.81, p<0.001), ocular infection (OR 11.46, 95% CI 4.11-32.26, p=0.001), and diabetes (OR 2.00, 95% CI 1.16-3.42, p=0.012) were significantly associated with loss of eye. Significant social determinants include state-funded Medicaid insurance (OR 4.21, 95% CI 2.20-8.18, p<0.001) and African American race (OR 3.53, 95% CI 1.94-6.42), p<0.001) [Table 1].

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Conclusions: Identifying and addressing health disparities can minimize the progression to severe outcomes, such as loss of eye, which have a detrimental effect on patients' quality of life.[1,2] Our study utilizes the diversity and scale of the NIH *All of Us* database to identify several significant risk factors for loss of eye.[3] Patients with a history of tumors, trauma, glaucoma, and infection had a higher risk. Analyses of social determinants reveal that African American ancestry and recipients of state-funded Medicaid insurance are disproportionately affected. The results of this study emphasize the need for public health interventions to improve access to care to help prevent adverse outcomes.

Figure 1

Table 1. Multivariate odds ratios for statistically significant predictors when assessing for association with risk of loss of eye.

	OR	95% CI	P-value
Ocular tumor	421.73	129.81-1959.80	<0.001
Ocular trauma	13.38	6.64-27.43	<0.001
Glaucoma	8.33	4.43-15.81	<0.001
Infection	11.46	4.11-32.26	<0.001
Medicaid insurance	4.21	2.20-8.18	<0.001
African American race	3.53	1.94-6.42	<0.001

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9:31 – 9:37 am

Thyroid Eye Disease (TED) Manifestations in a Primarily Black and Hispanic Population

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Introduction: Clinical manifestations of thyroid eye disease (TED) are based on predominantly Caucasian populations. Fundamental studies regarding eyelid retraction, negative effect of smoking, and effect of intravenous steroid therapy were based in Caucasian and western European populations.[1,2,3] Even studies focused on effect of ethnicity on TED have predominantly Caucasian populations (77% Caucasian, 12% Asian, 11% Black).[4] To date, no study has examined the presentation of TED in a population of predominantly Black and Hispanic patients. This study is the first to examine the clinical features of TED in a borough of New York City, where the population is 56% Hispanic, 29% Black, and 9% Caucasian with the aim to describe TED manifestations in a previously understudied population.[5]

Methods: This is a retrospective, cross-sectional study of thyroid eye disease patients at an academic, specialty practice in the Bronx, New York between January 2017 and July 2018. Institutional Board Review approval was obtained and the study was carried out in accordance with the Declaration of Helsinki and Health Insurance Portability and Accountability Act. Patient demographic and disease characteristics were collected from the electronic medical record for patients evaluated between January 2017 and July 2018. The main outcome measure was the European Group on Graves' Orbitopathy (EUGOGO) 2016 severity scale.

Results: Of the 2,905 patients reviewed from the electronic medical record, 99 patients met inclusion criteria. Mean age was 51 (SD 16) years with 78% women. Ethnicity was 49.4% Black, 39.1% Hispanic, 9.2% Caucasian, 2.3% Asian. Thyroid status was 90.4% hyperthyroid, 7.5% hypothyroid, and 2.1% euthyroid. Smoking rates were 25% current smokers and 14% former smokers, values which are elevated as compared to the national average. Manifestations were proptosis (91%), eyelid retraction (81%), extraocular muscle restriction (69%), eyelid edema (34%), chemosis (17%), and optic neuropathy (13%) (See Figure 1). Disease severity was 22% mild, 65% moderate to severe, and 13% sight threatening. Statins were associated with increased severity (OR 4.28, p=0.04). Older patients had increased rates of optic neuropathy (p=0.04), while younger patients had increased rates of proptosis (p=0.02).

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Conclusions: To the authors' knowledge, this is the first study to examine TED manifestations and severity in a primarily Black and Hispanic patient population. The majority of the study cohort were women (78%) with a predominance of women to men similar to previous studies, likely due to the higher incidence of autoimmune disorders in women. Results were notable for overall higher rates of proptosis, extraocular muscle restriction, and optic neuropathy than those reported in Caucasians. Notable factors studied included socioeconomic class, symptom duration prior to presentation, and tobacco smoking habits. Understanding these differences can aid in making more swift and accurate diagnoses, thereby improving patient outcomes.

Figure 1

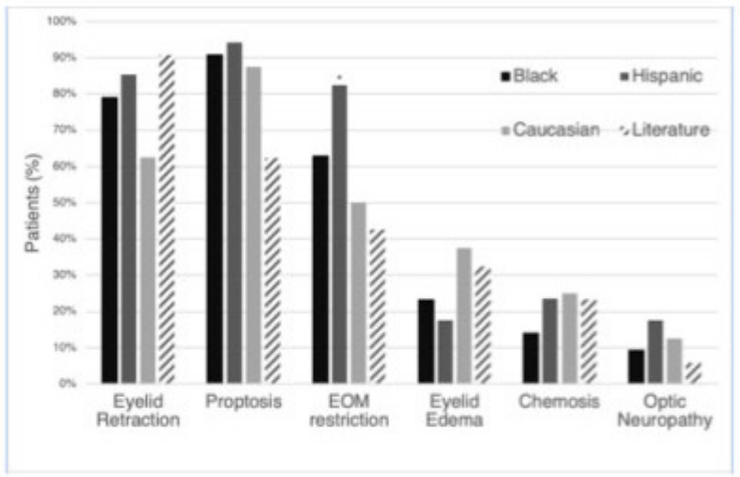

Figure 1 Title: Racial Differences Presentation of TED

Figure 1 Caption:

TED presentation in Black, Hispanic, and Caucasian patients from the study population compared with those from previously established rates in the literature..

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10:15 – 10:21 am

The Doctor Is (Virtually) In: Patient Satisfaction and Utilization Trends in Synchronous Telehealth Visits in Oculoplastic Surgery

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Introduction: Due to the COVID-19 pandemic there was a surge in synchronous telehealth visits across medical specialties including oculoplastic surgery.[1,2] The primary purpose of this study was to determine patient satisfaction with synchronous oculoplastic video visits over the past year. Secondary objectives included analyzing the utilization of video visits over time, identifying predictors for repeat video visits, and determining the most common problems addressed in these visits.

Methods: This is a cross sectional, single center study on video visit utilization and patient satisfaction in oculoplastic surgery. IRB approval was obtained. Patients with video visits from March 1, 2020 – March 31, 2021 were identified through billing codes. Emails with survey links were sent to patients who had at least one video visit within the study period through the RedCap system, and they were asked to fill out a validated eleven item telehealth satisfaction scale (TeSS), adapted from a large, national telehealth health study.[3,4] Questions were scored on a 1-4 scale, corresponding to poor, fair, good, and excellent. A total of 4 emails were sent to each patient over the course of 3 weeks. Probability of repeat visits from oculoplastic patients were analyzed via Chi-square testing. Differences in mean scores among repeat and non-repeat patients were analyzed with ANOVA testing. All analysis was done on SPSS and evaluated at $p < 0.05$ confidence level.

Results: From March 1, 2020 – March 31, 2021, the ophthalmology department conducted a total of 2330 video visits. Of these, 999 video visits (42.9%) were done by the oculoplastic division (Figure 1), representing 680 unique patients. 103 (15.1%) oculoplastic patients responded to email surveys (Table 1). Mean patient satisfaction score was 3.66 [95% CI 3.62-3.70], indicating a high degree of satisfaction. Oculoplastic patients were more likely to have a repeat visit than non-oculoplastic patients (OR 2.58, 95% CI 2.18 - 3.06, $p < 0.001$). Average survey response scores for patients with repeat visits were not significantly different than those without repeat visits. The most common conditions treated were chalazion/hordeolum (26.0%), ptosis (11.2%), and thyroid eye disease (8.5%).

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Conclusions: Video visits for oculoplastic surgery were highly utilized by patients during the pandemic and showed a high degree of patient satisfaction. Oculoplastic patients were more likely to have a repeat video visit than patients from other ophthalmic sub-specialties. As the pandemic fades, utilization of telehealth in oculoplastic surgery is likely to be driven by patient and physician satisfaction, operational necessities and efficiencies, and reimbursement trends.

Figure 1

Figure 1. Number of oculoplastic virtual encounters from March 2020 to March 2021

Figure 2

	All (n=103)	No repeat virtual visits (n=70)	Repeat Virtual Visits (n=33)
Overall Treatment	3.63	3.60	3.70
Wait time	3.55	3.49	3.70
Voice Quality	3.66	3.63	3.73
Visual Quality	3.60	3.54	3.73
Comfort	3.54	3.46	3.73
Appt Length	3.64	3.60	3.73
Explanation	3.67	3.63	3.85
Skill	3.73	3.66	3.88
Bedside Manner	3.79	3.71	3.94
Privacy	3.80	3.74	3.94
Questions	3.67	3.61	3.78

Table 1. Mean response to telehealth satisfaction scale questionnaires for virtual encounters (1= poor, 2=fair, 3=good, and 4= excellent)

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10:21 – 10:27 am

Is Third Party Payer Coverage for Blepharoplasty Justified? Quality-of-Life Impact and Cost-Effectiveness Model for Functional Blepharoplasty

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Introduction: As rising healthcare costs continue to be of national concern, increasing scrutiny is being placed on third party payer coverage of certain oculoplastic conditions which may not be deemed life- or sight-threatening. In such cases, quality-of-life and cost-effectiveness analyses may help guide physicians in providing value-based treatments.[1] This study probes the effect of symptomatic dermatochalasis on quality of life by comparison to a standard health scale (i.e., health utility value) and evaluates the cost-effectiveness of functional upper eyelid blepharoplasty.

Methods: Quality-of-life impact (i.e., Utility): A cross-sectional survey was conducted in patients with a clinical diagnosis of dermatochalasis at an academic oculoplastic clinic to determine the health utility (or quality-of-life impact) of their condition. All patients were over the age of 18 and experienced symptomatic bilateral upper eyelid dermatochalasis with superior visual field loss. Utility was assessed using the Standard Reference Gamble (SRG) method; anchor points were defined as 0 being death and 1 being perfect health, allowing the comparison of dermatochalasis to other systemic conditions.[2] This study was approved under exemption status by the Institutional Review Board and followed the tenets of the Declaration of Helsinki.

Cost-effectiveness of blepharoplasty: To evaluate the value of functional upper eyelid blepharoplasty, a Markov model was constructed to determine the incremental cost-effectiveness ratio (ICER).[3] Patient outcomes after opting for surgical intervention or no intervention in managing their symptomatic dermatochalasis were simulated using the model.[4,5] Following convention, the intervention was determined to be cost-effective if the ICER, which provides the adjusted cost of intervention in dollars per quality-adjusted life year (QALY), was below $50,000/QALY.[3]

Results: A total of 33 patients (mean age 64 years; 9 males, 24 females) were recruited for this study. The SRG utility value for symptomatic dermatochalasis was determined to be 0.88, indicating that a patient with symptomatic dermatochalasis would receive 8.8 QALYs in 10 years of life in contrast to a healthy patient who would receive 10 QALYs in 10 years. Functional blepharoplasty to treat symptomatic dermatochalasis was found to have an ICER of $2,194/QALY, making the surgical intervention cost-effective.
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Conclusions: Symptomatic dermatochalasis creates a significant quality-of-life burden on patients. Our study determined that the impact of bilateral symptomatic dermatochalasis with a SRG utility of 0.88 was comparable to moderate glaucoma with peripheral visual field loss (0.89) and early, visually significant cataracts (0.92).[6] Furthermore, functional upper eyelid blepharoplasty was determined to be a cost-effective treatment for symptomatic dermatochalasis. This study provides both clinical and economical support for functional blepharoplasty in patients with symptomatic dermatochalasis, particularly in the face of third-party payer scrutiny.

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10:27 – 10:33 am

Litigation in Orbital Surgery

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Introduction: Up to 75% of opthalmologists are expected to have a malpractice claim filed against them by the age of 65. While blepharoplasty is the most common type of oculoplastic surgery inciting litigation, work in the orbit represents a particularly high stakes type of surgery for oculoplastic surgeons. The characteristics of malpractice litigation for orbital surgery have not been previously characterized in-depth, which is the purpose of this study.

Methods: The Nexis Uni legal database (available by subscription) was queried for United States cases using the phrases “medical malpractice” in combination with the following: “and orbit and surgery,” “orbital decompression”, “orbital biopsy,” “orbital mass,” “and eye socket” and “surgery.” 123 unique cases were reviewed and data extracted from the 13 relevant cases, including outcome, reason for malpractice claim, type of surgery, surgeon specialty, and settlement amount (if available).

Results: The most commonly litigated procedure was orbital fracture repair (n =7), followed by orbital decompression (n=4). Other litigated procedures included optic nerve sheath fenestration (n=1) and orbital biopsy/lesion excision (n=1). Negligence or failure to meet the standard of care was the most commonly cited reason for lawsuit (n=5). Specific examples included need for multiple surgeries, vision loss, and other iatrogenic injury. Lack of informed consent was the second most commonly cited grounds for legal action. Defendant specialties included general plastic surgeons (n=5), ASOPRS fellowship trained oculoplastic surgeons (n=4), general ophthalmologists (n=1), neurosurgeons (n=1), unspecified (n=1), and in one case a registered nurse and hospital system. As many cases were ultimately settled out of court, limited data were available on settlement amount in this database.

Conclusions: Overall, lawsuits stemming from orbital surgery are relatively rare compared to other oculoplastics procedures, which may be somewhat counterintuitive given the complex and high stakes nature of these operations. A significant limitation of this study is lack of access to insurance claims for cases for which there is no public record.

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Figure 1

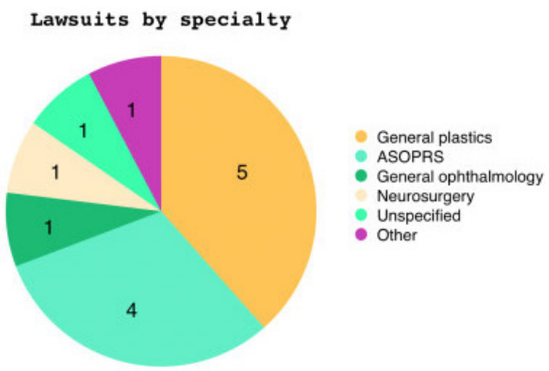
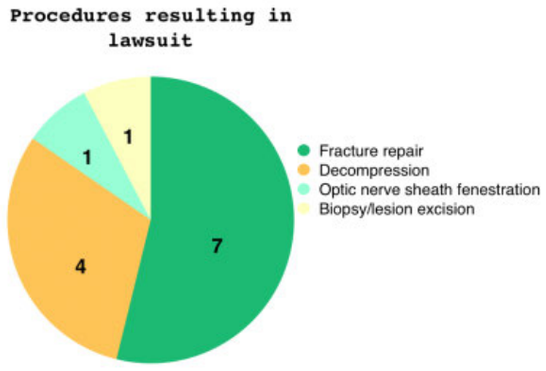


Figure 2



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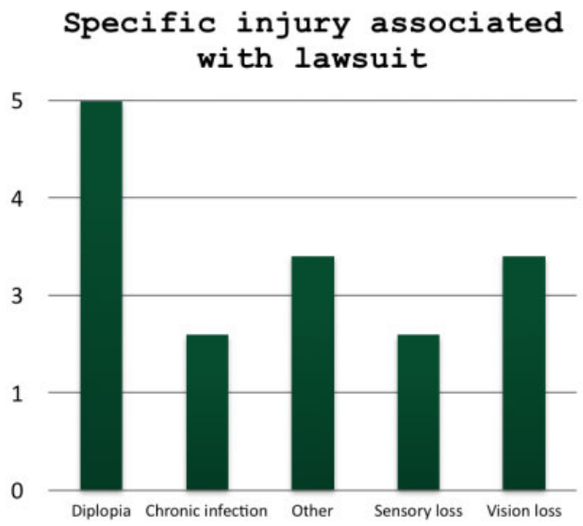

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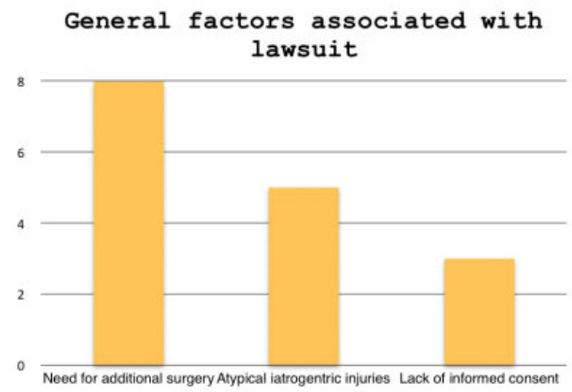

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10:33 – 10:39 am

A Comparison of Postoperative Infection Rates Following Office-Based Oculoplastics Procedures with Sterile and Clean Gloves – A Prospective, Randomized, Single-Blinded Clinical Trial

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Introduction: Sterile gloves serve many purposes, including protecting the surgeon from sharp instruments and chemical agents, increasing operative dexterity due to better fit than nonsterile gloves, and preventing postoperative infections in patients. There is debate over whether sterile gloves are superior at reducing postoperative infections compared to clean-boxed gloves. Studies on the use of sterile versus clean gloves for minor office-based dermatologic and dental procedures have not shown differences in infection rates. Here, we compare postoperative infection (PI) rates using sterile and clean gloves in office-based oculoplastics procedures.

Methods: This is a prospective, randomized, single-blinded clinical trial of consecutive patients undergoing oculoplastic procedures by a single surgeon (RS) in an office-based procedure room between October 2018 and September 2020. Exclusion criteria included patients who did not consent, age < 18, on oral antibiotics within two weeks prior to the procedure, had follow-up < 1 week, had a contaminated wound (trauma), complex reconstructions (grafts/flaps), and multiple simultaneous procedures (e.g blepharoplasty and ptosis repair). Glove type was assigned by the ophthalmic technician using a randomization chart. Patients were blinded to the glove type. For all cases, 10% iodine prep and sterile surgical instruments were used, and neither a gown nor drape were used. All patients were placed on erythromycin ointment three times a day for one week, and none were prescribed oral antibiotics. All were seen on post-operative day 7, or earlier if they had symptoms of infection. PI was diagnosed based on typical history and exam findings (pain, tenderness, erythema around the surgical site, purulence). Patients with PI were treated with one week of oral antibiotics and followed until the infection resolved. After one week, patients were followed via phone calls to assess for late postoperative infections. The frequency of PI in the two groups were compared using a Chi-square test. Data collected included patient demographics, presence of infection risk (diabetes, smoking, and immunocompromised state) and compliance to postoperative ointment.

Results: 3129 patients, 1815 (58%) of whom were women, with a mean age of 58.4 (18-102) years were included. 1570 procedures were performed with sterile gloves while 1559 were performed with clean-boxed gloves (Table 1). The patients in the two groups were similar in age, gender, and number of high-risk individuals (Table 2). One patient in the sterile glove group who underwent upper blepharoplasty (0.064%) and one patient (0.064%) in the clean-boxed glove group who had an external levator advancement developed PI (p=0.996). Neither patient had risk factors for infection, and both infections resolved after 1 week of oral antibiotics.

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Conclusions: Using sterile and clean-boxed gloves during minimally complex in-office oculoplastics procedures resulted in similar low infection rates in this large cohort. This is consistent with other studies comparing sterile and clean gloves in non-ophthalmic procedures. The cost difference between a single pair of commonly-used sterile gloves and clean-box gloves is $2.45. This can result in significant healthcare cost savings in the long term. The healthcare benefits may not outweigh the costs of using sterile gloves universally for office-based oculoplastics procedures.

Figure 1

Procedure	Sterile gloves	Clean-boxed gloves
Eyelid biopsy	588	588
Chalazion excision	384	384
Upper eyelid blepharoplasty	161*	160
Müller's muscle-conjunctival resection	134	133
Involutional entropion repair	87	87
Involutional ectropion repair	72	71
Subconjunctival orbital fat prolapse debulking	31	31
External levator advancement	21	20*
Permanent tarsorrhaphy	13	12
Temporary tarsorrhaphy	11	11
Conjunctival biopsy	11	10
Lacrimal gland biopsy	11	10
Temporal artery biopsy	9	8
Canaliculotomy	8	8
Upper eyelid weight	8	8
Upper eyelid retraction repair	7	6
Second-stage Hughes flap	5	4
Tarsal fracture for cicatricial upper eyelid entropion	5	4
Dacryops marsupialization	3	3
Direct brow lift	1	1
Total	**1570**	**1559**
Postoperative infections	1 (0.064%)*	1 (0.064%)*
P=0.996		

Figure 2

	Sterile gloves	Clean-boxed gloves	Total
Mean age (years)	58.5	58.4	58.4
Female patients	911 (58%)	904 (58%)	1815 (58%)
Smokers	118 (7%)	132 (8%)	250 (8%)
High risk*	474 (30%)	502 (32%)	976 (31%)

*Diabetes, immunosuppressed, smokers

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10:47 – 10:53 am

Estimating Age from Facial Images Using Deep Learning: The Effect of Blepharoplasty

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Introduction: Deep learning artificial intelligence algorithms have been applied to numerous domains within medicine, finding particular utility in those areas that make use of imaging data, such as radiology and pathology. In spite of such robust and well developed computer vision and deep learning methods, few studies have examined the application of these technologies to the analysis of oculofacial surgery outcomes. Using age as an outcome measure, deep learning methods were used in this study to analyze patients' predicted age before and after blepharoplasty.

Methods: A retrospective chart review of a clinical photographic database was carried out. Patients evaluated from 2013 to 2019 at an oculofacial plastic surgery practice was performed and patients who underwent upper blepharoplasty, lower blepharoplasty or both were included. Frontal preoperative and postoperative photographs were collected and analyzed using a novel deep learning algorithm, developed according to methods described below.

To create a deep learning algorithm that takes a facial photograph as input, and provides patient age as output, a dataset of 29,794 images of human faces, age 26 to 89 years old, was assembled. 20,601 facial photographs were culled from the UTKface[1] and facial-age[2] datasets, and 9,193 facial photographs collected from a clinical image repository from a tertiary care oculofacial plastic surgery practice. Faces were labeled with patient age. The dataset was randomly split in to 90% training and 10% validation sets, and the ResNet34 architecture was used to train the deep learning model.

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Results: A total of 103 patients (29 males and 74 females) met inclusion criteria, 28 of which underwent upper blepharoplasty alone, 33 underwent lower blepharoplasty alone and 42 underwent simultaneous upper and lower blepharoplasties. At the time of facial photograph capture, age ranged from 30.3 to 83.8 years old (mean 60.8 y, median 61.1 y, standard deviation 11.4 y). For all preoperative photographs included, the deep learning algorithm predicted age to be a mean 0.86 years younger than actual age at the time of photograph capture. Pearson's *r* (the correlation coefficient) between actual and predicted preoperative age was r = 0.87. Overall, postoperative patient photographs were predicted to be a mean 2.99 years younger than actual age.

Conclusions: The deep learning age prediction algorithm developed in this study demonstrated that, on average, patients after blepharoplasty were predicted to look younger than their actual age. This study is, to our knowledge, the first to use artificial intelligence deep learning methods to provides quantitative evidence of the rejuvenative effects of blepharoplasty.

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10:53 – 10:59 am

Assessing the Effects of Hyaluronidase Concentration on Clearance of Intra-Arterial Hyaluronic Acid Filler in Cadaveric Facial Arteries

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Introduction: Occlusion of a vessel following hyaluronic acid (HA) injection is a known cause of vision loss, blindness, stroke or death[1]. The current consensus suggests treatment with injections of hyaluronidase (HYAL) into affected areas. Previous work has shown the ability of HYAL to cross the vessel wall and degrade intra-arterial filler[2]; however, to date, it remains unclear whether HYAL acts in enough time for vision recovery. The purpose of this study was to determine whether HYAL in different concentrations can permeate vessels in enough time to save vision after vascular injury.

Methods: The right and left facial arteries were dissected from 8 cadavers that were donated to our institution for research purposes. The arteries were divided into 2 cm segments and tied with a 5/0 Nylon suture at each end. The ends of each artery were also glued with cyanoacrylate. Each segment was weighed whilst empty and then filled with either Restylane L, (Galderma, Lausanne, Switzerland), Juvéderm Voluma (Allergan, Dublin, Ireland), Belotero Balance (Merz, Frankfurt, Germany) or N Saline (control) using a 30G needle. Having been filled with filler or N Saline, each segment was weighed again. The segments of artery were then incubated with different concentrations of HYAL (150, 750 and 1500 units) or N Saline (control) at either 5 minutes or 30 minutes. All arteries were incubated in 5 ml tubes (Eppendorf, Hamburg, Germany) and maintained at 37°C for the duration of the experiment. There were 3 arterial segments per condition. Following incubation, each segment was allowed to air dry for 3 minutes to remove moisture on the outside of each vessel. Each segment was then weighed again. Since all commercially available hyaluronic acid fillers are constituted predominantly of water, a change in weight was considered a marker of the breakdown of hyaluronic acid. The difference between each condition was analysed using a dependent t test.

Results: There was a significant difference between the empty and filled arterial segments ($p < 0.01$). At 5 minutes with 1500 units HYAL, there was a significant decrease in weight for arteries containing Restylane ($p < 0.05$), but not in segments containing Juvéderm ($p = 0.8$) or Belotero ($p = 0.7$) when compared to controls. At 30 minutes with 1500 units HYAL, there was a significant decrease for arteries with Belotero ($p = <0.01$), but not Restylane ($p = 0.07$, though a trend towards significance was seen) or Juvederm ($p = 0.4$). There were no significant differences in weight when the arteries were incubated at 750 units or 150 units for either 5 minutes or 30 minutes.

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Conclusions: This study compares the impacts of time and HYAL concentration on filler degradation within blood vessels. The results suggest that a concentration of 1500 units has a significant impact on vessels containing Restylane and Belotero at 5 minutes. A concentration below 1500 units had no significant impact regardless of time. Finally, Juvéderm was less likely to degrade, at any concentration or time.

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10:59 – 11:05 am

Prism Particle Sizer for Fat Preparation for Oculofacial Surgery

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Introduction: Introduction: Facial fat transfer has applications for periocular rejuvenation. Several techniques have been described for preparing harvested fat for re- injection. This study describes a novel technique for fat preparation utilizing unique mechanical sizers to create a spectrum of fat particle sizes.

Methods: Methods: The prism particle sizer was used to process autogenous fat for 20 patients for periocular facial fat transfer. The device, the technique and the injection patterns are described. Fat particle size, injection pattern and total volume of fat transferred were recorded for each patient. Treatment results were assessed by a masked observer at 2 months post injection.

Results: 20 female patients underwent lower eyelid and cheek fat transfer with autologous fat processed with a mechanical filtration system (the prism particle sizer), to separate the fat into fractions ranging from 200 to 2500 microns. The surgeon can create multiple different fractions of fat particles with the device. The average total fat injected was 15.42 milliliters (range 2 to 27 ml.). The most commonly used fractions were 400 micron and 1200 micron fat. The results of fat retention at two months post treatment were photographically rated as: 12 good, 7 acceptable, 1 no change, and 0 worse than the initial consult. There were no device related complications.

Conclusions: Facial fat transfer can be used to replace periocular volume loss. Several modalities or techniques have been described for preparation of the harvested fat prior to re-injection. The prism particle sizer is a new novel device that mechanically separates the fat particles into the fractions that the surgeon chooses.

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11:05 – 11:11 am

The Brow Fat Flap

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Introduction: Age-related volume loss in the upper eyelid and brow leads to a concave shape of the eyelid-brow junction visualized by the patient as hanging skin. Medial pre-aponeurotic fat transposition at the time of upper blepharoplasty has been very successful in restoring the convexity of the upper eyelid-brow junction in the medial half of the eyelid. This technique, however, is only minimally effective on the lateral half of the eyelid and brow, with recurrent lateral hooding. This study presents a new technique of pedicle brow fat transposition that significantly improves the volume in the lateral half of the eyelid-brow junction and lifts the brow.

Methods: Video presentation of the surgical technique and retrospective chart review of the last 23 consecutive patients treated with the brow fat flap technique at the time of the fat transposition upper blepharoplasty. A group of 23 consecutive patients treated with upper blepharoplasty alone was used as control. Brow elevation was measured bilaterally on the pre and post-operative clinical pictures using Image-J 1.40J software (Wayne Rasband, NIH, USA). The horizontal white to white diameter of the right eye was used to calibrate the measurements and attributed a value of 12 mm in each photograph. Medial, central and lateral brow levels were measured as the distance between the medial canthus and the upper edge of the medial brow, the center of the pupil and the upper edge of the central brow and the lateral canthus and the upper edge of the lateral brow, respectively. A blind observer to the study was asked to grade the improvement in the eyelid-brow junction in each eye operated on a scale from 0 to 5 where 0 was given for no improvement and 5 for uniformly convex eyelid-brow junction. Paired T-test and two-way ANOVA with Bonferroni post test were used for analysis.

Surgical technique: after the skin only removal, a 2mm strip of orbicularis oculi muscle was excised over the tarsal plate with the Bovie. The orbicularis muscle above the incision was separated from the septum all the way to the superior orbital rim. The septum was incised medially and the medial pre-aponeurotic fat pad was mobilized into a pedicle and transferred laterally. An intra-galeal brow fat pad flap was raised from the lateral orbital rim with the hinge medially at the junction of the lateral 1/3 with the medial 2/3 of the brow. The brow fat pedicle was rotated medially 180° under tension and sutured to the medial pre-aponeurotic pedicle and then to the periosteum at the superior orbital rim with one interrupted 5.0 vicryl suture. The orbicularis oculi muscle was draped over the fat pedicles and the skin was closed with interrupted 6.0 plain gut sutures.

Results: All patients included in the study were very satisfied with the final cosmetic result at the last (6 months) postoperative visit. The average age was 65+/-1.5 years. The post-operative follow-up interval was 6.3+/-0.35 months. There was a 2.5+/-0.32 mm increase in the medial brow position, 3.15+/-0.35 mm in the central and 3.27+/-0.3mm in the lateral brow position with surgery (Fig.1). This contrasted

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with the 1.71+/-0.42 mm decrease in the medial, 1.53+/-0.47 mm in the central and 1.73+/-0.32 mm in the lateral brow position in the blepharoplasty only group ($p < 0.01$).

The average improvement in the convexity of the eyelid-brow junction was 4.56+/-0.08 in the brow fat flap group and 3.95+/-0.09 in the control group ($p < 0.01$). There were no major complications encountered. One patient had a minor wound dehiscence in one eye that was re-sutured in the office.

Conclusions: The brow fat flap is an effective adjuvant procedure for the fat transposition upper blepharoplasty. It redistributes the volumes in the lateral and central brow which significantly lifts the brow and restores the convexity of the eyelid-brow junction in the lateral half of the eyelid which is not corrected by the medial pre-aponeurotic fat transposition alone (Fig.2,3). In addition, it prevents lateral hooding recurrence by subtracting volume from the temporal part of the brow, situated outside of the lateral orbital rim, which becomes virtually flat. The magnitude of the brow lifting effect is equivalent to that of the endoscopic brow lift and superior to the internal brow suspension procedures[1,2]. This is likely due to both brow volume augmentation and anchoring of the rigid brow fat flap (that acts like a spring) to the superior orbital rim periosteum which improves the superior and anterior projection of the central third of the brow. This is in sharp contrast to the 1.7 mm average drop in brow position with blepharoplasty alone.

Although a larger, prospective study is warranted, this small retrospective study supports the safety and efficacy of the brow fat flap procedure. When performed at the time of fat transposition upper blepharoplasty, the brow fat flap significantly lifts the brow and improves the convexity of the eyelid-brow junction.

Figure 1

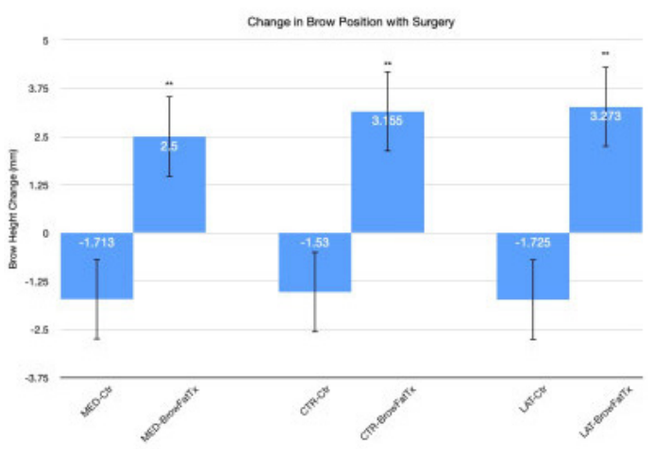

Figure 2

Figure 3

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11:11 – 11:17 am

Functional and Aesthetic Outcomes Following Suprabrow and Subbrow Excision in the Korean Patients with Lateral Hooding

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Introduction: To find out the correlation between geometric parameters of eyebrow and eyelid, and the functional and aesthetic outcomes according to the surgical methods in the patients with lateral hooding. We also investigated the factors affecting the incision length in suprabrow and subbrow excision groups.

Methods: The thirty nine cases from twenty nine patients who underwent suprabrow excision(n=16) or subbrow excision(n=23) for lateral hooding from April 2014 to May 2021 at our oculoplasty clinic were retrospectly reviewed. Surgical method was decided by patient's preference for the incision site. The elliptical excision was designed by central width 8mm. Image J program (NIH, Bethesda MD, USA) was used to measure and compare geometric parameters of the eyebrow such as brow-to-medical canthus distance(BMCD), brow-to-pupil distance (BPD), brow-to-lateral canthus distance (BLCD), vertical and horizontal length of orbital projection bordered by periorbital groove or sulcus (VLOP, HLOP) and angle of brow arch and eyelid such as margin-reflex distance 1(MRD1), vertical palpebral fissure(VPF) and horizontal palpebral fissure (HPF) by comparing preoperative and postoperative digital camera photographs of the patients.

Results: The brow geometric parameters were not different in both groups. The HLOP also showed a significant difference as 41.44±4.75mm in suprabrow excision group and 36.58±9.71mm in subbrow excision group respectively($p<0.01$). Brow length was associated with HLOP, VLOP, ΔBPD and ΔBLCD.(R=0.374, 0.284, 0.275, 0.326) Functionally MRD1 increased 1.06±1.44mm and 0.74±0.91mm in each group respectively and Δ MRD1 was associated with preoperative MRD1, VPF, HPF in both groups.(R=-0.444, -0.408, -0.376) Only in suprabrow excision group, it was positively correlated with ΔBMCD.(R=0.383) Incision length of brow was related with the brow length, while incision length was correlated with ΔBLCD in total patients.(R=0.240) Suprabrow excision raised BPD and BLCD by 1.45±3.18mm and 0.98±3.08mm, and ΔBLCD was correlated with preoperative BPD and BLCD.(R=-0.255, -0.423) However subbrow excision lowered BPD and BLCD by -0.67±1.55mm and -1.28±2.04mm, and its incision length was significantly associated with angle of brow arch.(R=-0.380)

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Conclusions: Both suprabrow and subbrow excision methods are effective in managing lateral hooding by increase of MRD1. Regarding brow position, suprabrow excision could raise central and lateral portions of the brow while subbrow excision could lower them, but it was aesthetically acceptable. Incision lengths of both groups were similar and related with brow length. But incision length depends on HPF in suprabrow excision group, while angle of brow arch in subbrow excision group.

Table 1

Table1. The demography of the patients with lateral hooding treated by suprabrow excision and subbrow excision.

	Suprabrow excision	Subbrow excision	Total	p
Number(eyes)	16	23	39	
Sex	8:8	2:13	10:19	
Age	66.4±15.2	62.5±9.5	64.1±12.1	*0.129*
HLOP	41.44±4.75	36.58±9.71	38.57±8.33	*0.004**
VLOP	37.11±7.09	36.65±7.58	36.84±7.29	*0.810*
Angle of brow arch	148.4±9.8	148.8±7.2	148.6±8.2	*0.662*
MRD1	2.20±1.14	2.61±1.28	2.44±1.22	*0.217*
Length of brow	47.23±5.28	44.62±4.30	45.69±4.84	*0.050*
Length of incision	35.39±6.80	31.91±5.71	33.34±6.33	*0.061*

HLOP: Horizontal length of orbital projection bordered by periorbital groove or sulcus
VLOP: Vertical length of orbital projection bordered by periorbital groove or sulcus
MRD1: Margin-reflex distance 1

Table 2

Table2. The geometric parameters of eyebrow and eyelid following the suprabrow excision and subbrow excision in patients with lateral hooding.

	Suprabrow excision			Subbrow excision			Total			
	pre	post	p	pre	post	p	pre	post	p	p
MRD1	2.20±1.14	3.27±0.95	*0.011**	2.61±1.28	3.34±0.90	*0.071*	2.44±1.22	3.31±0.91	*0.003**	
ΔMRD1	1.06±1.44			0.74±0.91			0.87±1.15			*0.724*
VPF	6.55±1.74	7.75±1.57	*0.035**	7.11±1.81	7.80±1.13	*0.272*	6.88±1.78	7.78±1.31	*0.030**	
ΔVPF	1.20±1.53			0.70±1.34			0.90±1.42			*0.349*
HPF	20.41±3.35	21.29±3.24	*0.491*	20.57±2.79	21.53±2.01	*0.277*	20.50±2.99	21.43±2.55	*0.206*	
ΔHPF	0.88±1.57			0.97±1.79			0.93±1.68			*0.703*
BMCD	20.44±4.10	23.42±12.35	*0.867*	18.57±2.69	17.95±3.14	*0.606*	19.34±3.42	20.19±8.56	*0.857*	
ΔBMCD	2.99±12.34			-0.62±1.31			0.86±6.02			*0.420*
BPD	17.64±4.19	19.08±3.69	*0.341*	16.99±2.78	18.31±3.20	*0.531*	17.25±3.39	17.44±3.63	*0.784*	
ΔBPD	1.45±3.18			-0.67±1.55			0.20±2.55			*0.035**
BLCD	18.11±4.87	19.08±3.20	*0.469*	18.95±3.56	17.67±3.19	*0.287*	18.61±4.11	18.25±3.27	*0.757*	
ΔBLCD	0.98±3.08			-1.28±2.04			-0.35±2.72			*0.007**

MRD1: Margin-reflex distance 1
VPF: Vertical palpebral fissure
HPF: Horizontal palpebral fissure
BMCD: Brow-to-medical canthus distance
BPD: Brow-to-pupil distance
BLCD: Brow-to-lateral canthus distance

Figure 1

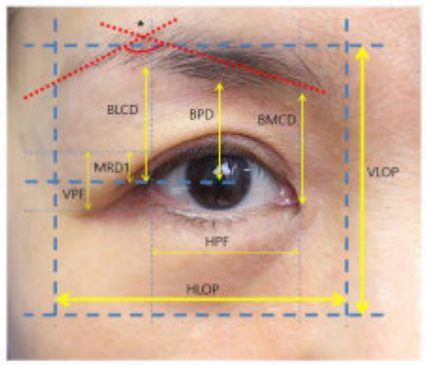

Figure1. Measurement of geometric parameters of eyebrow and eyelid. The MRD1(Margin-reflex distance 1), VPF(Vertical palpebral fissure), HPF(Horizontal palpebral fissure), BMCD(Brow-to-medical canthus distance), BPD(Brow-to-pupil distance), BLCD(Brow-to-lateral canthus distance), HLOP(Horizontal length of orbital projection bordered by periorbital groove or sulcus), VLOP(Vertical length of orbital projection bordered by periorbital groove or sulcus), MRD1(Margin-reflex distance 1), angle of brow arch(*) were analyzed by Image J Program.

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11:17 – 11:23 am

Short and Long Term Patient Satisfaction and Complications in 650 Endoscopic Forehead Lift Procedures

Mohsen Kashkouli[1], Parya Abdolalizadeh[2], Saina Mansour[2], Parisa Hamami[2], Nasser Karimi[2], Behzad Khademi[2]
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[2]Tehran, Iran, Islamic Republic Of

Introduction: The aims are to compare the short- (6 months) vs. long-term patient satisfaction (≥2 years), report the patient's perspective on temporary vs. permanent postoperative complications, analyze the effect of complications on the satisfaction, and describe an unreported intraoperative complication of intraoperative skin laceration and its management in 650 patients with endoscopic forehead lift procedure (EFL).

Methods: This is a retrospective study on all of the consecutive patients with EFL performed by one oculofacial plastic surgeon from January 2007 to June 2018. The procedure included two modifications: glabellar free fat graft and external lateral canthal tendon release. Fixation types (Fig. 1) were, in order of frequency, screw, endotine, and tissue excision. patients with previous trauma and surgery and less than 2 years follow up were excluded. Short- (6 months), and long-term (≥2 years) patient satisfaction (visual analogue score, VAS, 0-100) were recorded. Patients' perspective on temporary vs. permanent complications were also documented.

Results: Mean age and follow up were 46.4 and 7.1 (2-13) years, respectively. Long-term satisfaction (79.9) was significantly lower than the short-term (96.6). The long-term satisfaction decreased in 95.7%, increased in 2.7%, and remained the same in 1.6% of the patients. Intraoperative skin laceration (Fig.2) occurred in 3 patients (0.5%). Mean time of forehead numbness recovery was 2.3 months. Temporary complications were itching (13.7%), headache (6.3%), unilateral facial nerve palsy (5.8%) (Fig. 3), acne (3.2%), and remained staples (1.7%). Permanent complications included undercorrection (7.1%), alopecia (4.2%), forehead irregularities (2.3%), surprised look (2.2%), incision site complications (2%), and glabellar depression (Fig.4) (0.9%). Reoperation (1.2%) was performed for undercorrection and alopecia. While short-term satisfaction was significantly lower in patients with temporary facial nerve paresis, long-term satisfaction was lower in patients with undercorrection and reoperation.

Conclusions: A high satisfaction scores of 96.6 and 80 were observed in the short- and long-term follow up after the EFL (Fig.5). Frequency of temporary and permanent postoperative complications were 30.3%, and 15.8%. Reoperation rate was 1.2%.

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Figure 1: Three types of fixation technique in this study. A vertical 1.5 cm incision (a) was used for either screw (b) or endotine (c) elevation and fixation of the eyebrow with staple closure of the wound (b and d). Elliptical skin excision (1.5 X 3 cm) was used for eyebrow elevation in some subjects (e). It was then closed with subcutaneous 3-0 vicry (f) and skin staples (g).

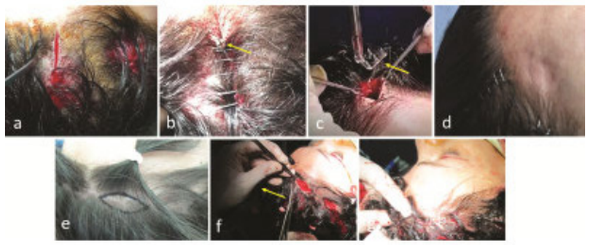


Figure 2: Patient 1 (a-c) had a left lateral canthal **s**kin laceration (a, b) during endoscopic release of the lateral canthal tissue. It was sutured (c) with no visible scar 6 months after the surgery (d). Patient 2 had right medial superior eyebrow laceration during the corrugator removal (e) which was similarly repaired and ended up with no visible scar at 2 weeks (f) and 1 year follow up (g).

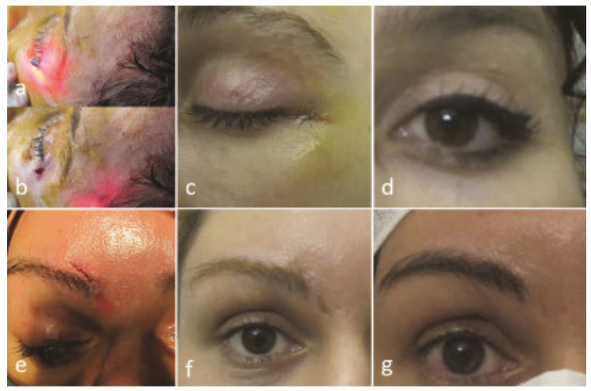


Figure 3: A 54-year-old female (a) had endoscopic forehead lift and upper blepharoplasty procedure and developed right frontal facial nerve palsy (b). It gradually improved with full recovery at 1 year (c) and 2 years (d) after the surgery.

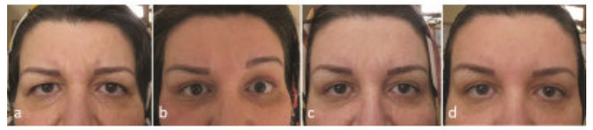


Figure 4: A 47-year-old female (a) had endoscopic forehead lift and upper blepharoplasty procedure who gradually developed glabellar depression (b,f) 6 months after the surgery. Depression was filled with hyaluronic acid gel and remained stable 2 weeks (c, g), 2.5 years (d, h) and 5 years (e, i) after the injection.

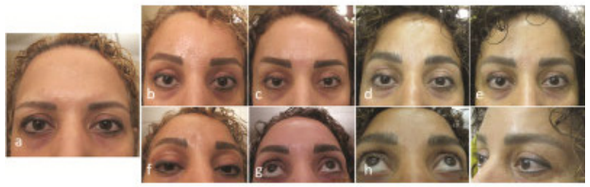
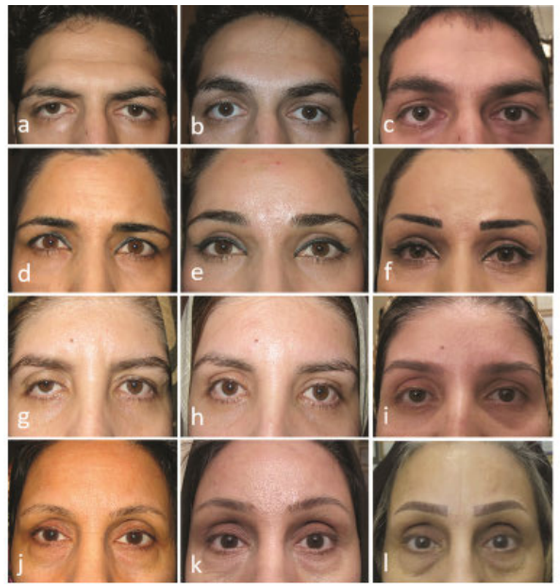


Figure 5: Long term (>5 years) **r**esults of endoscopic forehead lift procedure. Patient 1 (a) had endoscopic forehead lift procedure with postoperative results at 2 (b) and 5.5 (c) years. Patient 2 (d) had endoscopic forehead lift and upper blepharoplasty with postoperative results at 2 (e) and 6 (f) years. Patient 3 (g) underwent endoscopic forehead lift and right blepharoptosis repair with postoperative results at 2 (h) and 7 (i) years. Patient 4 (j) underwent endoscopic forehead lift procedure postoperative results at 2 (k) and 10 (l) years.



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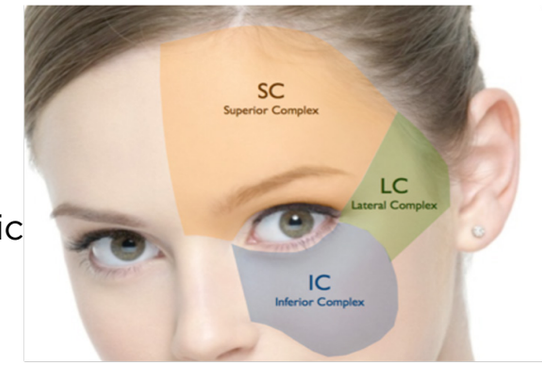
Moderator: Andrew R. Harrison

11:33 – 11:53 am

Endoscopic Lifting: Evolving from Brows to Face-Lifting

Francesco P. Bernardini

In a previous publication (Bernardini FP, Gennai A, Izzo L, Devoto MH. Minimal Incisions Vertical Endoscopic Lifting and Fat Grafting as a Systematic Approach to the Rejuvenation of the Periocular Esthetic Unit. *Ophthal Plast Reconstr Surg* 2013;29:308–315), we looked at our patient population that underwent endoscopic face lifting and fat grafting at the same time, and we found that among the 400 patients of the study our demographic was composed by 85% of female, 77% of which were aged 40 to 55. The aging process that occurs in this age-group is most seen on the center of the face, represented by the periocular region and the mouth. We feel that the aging occurring in the mandible line and the neck, which we refer to as the periphery of the face, has less impact on the aesthetic of the female face. In the same paper we have defined the concept of the periocular aesthetic unit, discussed the impact of volume loss and tissue descent in the aging process, and proposed an algorithm for its treatment. Surgeons dedicated to the periocular region should look at aging as being much wider and complicated that just the eyelids. Age-related changes of the eyelids are directly related to aging of adjacent tissue. Schematically we can define the periocular aesthetic unit as being formed by the superior complex (SC), including the forehead, the brow and the upper eyelid; the inferior complex (IC), formed by the lower eyelid and the cheek; and the lateral complex (LC), formed by the temple, the malar mound, and the lateral canthus. If we expand our view to the peri-oral unit we are now looking at the center of the face, which we feel is what should concern surgeons the most.



We have also diagrammatically represented the impact of aging in the center of the face. In the SC, descent plays a large role secondary to gravity forces and the continuous effect of the strong, synergistically acting depressor muscles: corrugator, depressor supercilii, procerus, and orbicularis oculi. Volume loss plays a relevant role, especially at the level of the brow fat, where it causes thinning of the brow, deepening of the sulcus, and loss of eyelid support with dermatochalasis. At the level of the lateral complex, the temporalis fossa, located between the temporalis crest superiorly and the zygomatic arch inferiorly, has no room to descend, and it's aging is determined exclusively by volume loss. Volume loss also plays a major role at the

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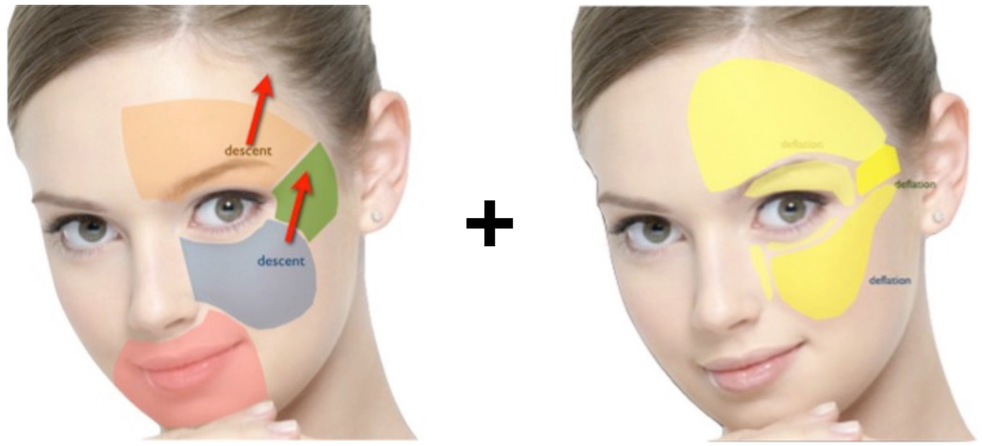
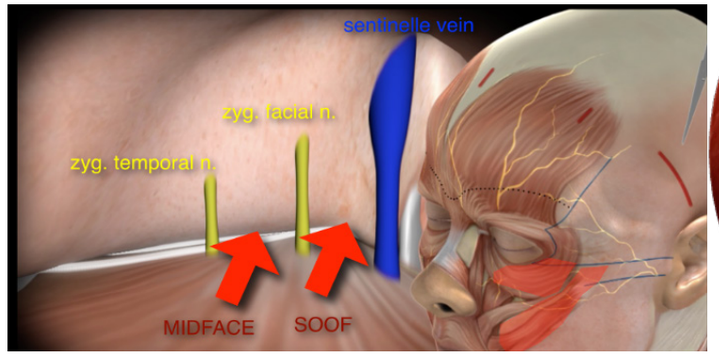
level of the IC, along with some effect of gravity on the cheek. Finally, no descent occurs at the level of the perioral unit where volume alone causes the age-driven changes. Based on these regional aging processes, in order to achieve the most natural rejuvenation we should aim at restoring the position of the descended tissues, mainly the SC and partly the IC, and restore the loss of volume in the area at the same time.

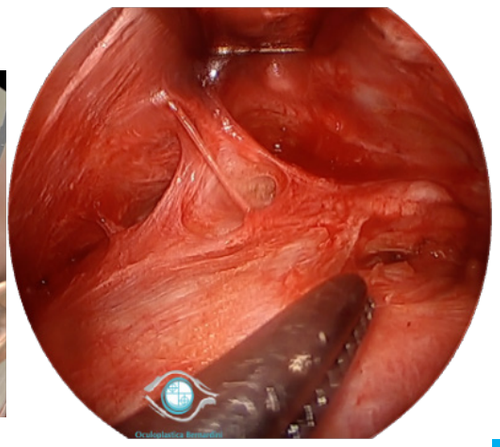


In the past, aesthetic surgeons have approached facial contouring through the periphery as opposed to the center, offering mildly satisfying results with the cost of long scars, extensive dissection, and strong horizontal traction with unnatural effects. When evaluating patients for aesthetic rejuvenation, attention is immediately drawn to the periocular aesthetic unit. Based on the patient's requests and desires, it is important to examine of all the adjacent key aesthetic units, from the forehead to the perioral area, to give an ideal final result. In contrast to surgical techniques of the past, we tend not to focus on removal of skin and fat from the eyelids, as removal of these tissues may accelerate the aging process. Vertical repositioning of the descended tissues is a more anatomically correct approach to facial rejuvenation, restoring the natural, vertical vector of aging. This is especially true for the superior complex and partially for the inferior complex. Further three-dimensional rejuvenation after tissue elevation is accomplished with volume restoration using fat grafting. Fat grafting may also lead to skin regeneration, especially with the Superficial Enhanced Fluid Fat (SEFFI) technique. Skin atrophy and volume loss have been recognized as two of the major factors involved in facial aging, contributing to the formation of facial rhytids, skeletonization, and pseudo-descent of the mid-face.

Temporal Endoscopic Dissection

While bluntly dissecting the temporal area in the plane just above the deep temporalis fascia and aiming at the lateral eyelid corner, the sentinel vein is easily identified. This is the first landmark and ideally it is left undisturbed; lateral to the sentinel vein, further blunt dissection reveals a neurovascular bundle, the zygomatico-facial nerve and vein. Lateral to this bundle is the zygomatico-temporal vein and nerve. These three structures act like electrical posts above which runs the frontal branch of the facial nerve. Once the landmarks are clearly visible, one can elect where to dissect. Lateral dissection between the sentinel vein and the zygomatico-facial bundle leads to the fat of the sub-orbicularis oculi fat (SOOF) Dissection between the zygomatico-facial and





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zygomatico-temporal bundles provides access to the midface. Medial to the sentinel vein there is the lateral retinaculum and the lateral canthal tendon. For a complete dissection, it is necessary to free the tissue across the entire length of the zygomatic arch, elevate the SOOF, and release the lateral retinaculum.

Frontal Endoscopic Dissection

The plane of dissection is subperiosteal in the frontal region with attempts to preserve the integrity of the periosteum until the orbital rim. Once the orbital rim is reached, blunt dissection elevates the periosteum from lateral to medial, and the supraorbital neurovacular bundle is encountered. All the strands of periosteum need to be elevated around the bundle. The periosteum is very strong, and even small residual bands will prevent easy forehead flap upward mobilization. Medial to the supraorbital nerve, dissection will be aimed towards the glabella to elevating and release the corrugator and procerus muscles. The supratrochlear nerve is between the fibers of the corrugator muscles.

Tips and Pearls/Expert Suggestions

In the past, too much importance has been given to the strength of the fixation, with the idea that strong fixation with bone tunnels, endotines, and screws was necessary to support the tissues against gravity. On the other hand, use of these fixations devices was associated with a limited dissection especially of the temporal area, the lateral retinaculum, and the medial frontal periosteum. The most important factor is to achieve a complete, tension-free flap that includes the forehead, temporal area, lateral retinaculum, SOOF, and zygomatic arch. Once soft tissue from the scalp to zygoma is free, fixation can be achieved with simple, safe, and affordable sutures. The role of the fixation is to help maintain dissected tissues in optimal position until re-adherance into the new position during the healing process. The time necessary to allow scar fixation is most likely less than the time of suture reabsorption. Fixation with permanent devices is not necessary, nor do we recommend excision of scalp tissue which can cause alopecia and visible scars, and does not add any value to the deep fixation. The authors have used fixation with the endotine device in more than 300 patients before switching to suture fixation, which has been now used in more than 200 patients[4]. The amount of elevation and the stability of the fixation have been comparable in the short and long terms. At the same time suture fixation reduces the risk of complications seen in the endotine group: displacement of the device from the site of implantation was observed in 11 cases, causing a visible asymmetrical result in three patients, while 8 patients experienced exposure or infection of the device. In three cases the endotine was removed: 1 upon getting exposed and infected, and 2 for prolonged (>12 months) visibility/palpability of the implant. The endotine implant was visible in front of the hairline in 15 patients, while it was palpable by the majority of the patients even after 9 months. The endotine broke at the time of implant in 6 patients, while 5 cases of bleeding related to the bone trephination were encountered. In the suture fixation group, none of the patients experienced complications or referred any complaint other than a noticeable bulging of the skin folds of the forehead in the first two weeks, of which they were informed in advance.
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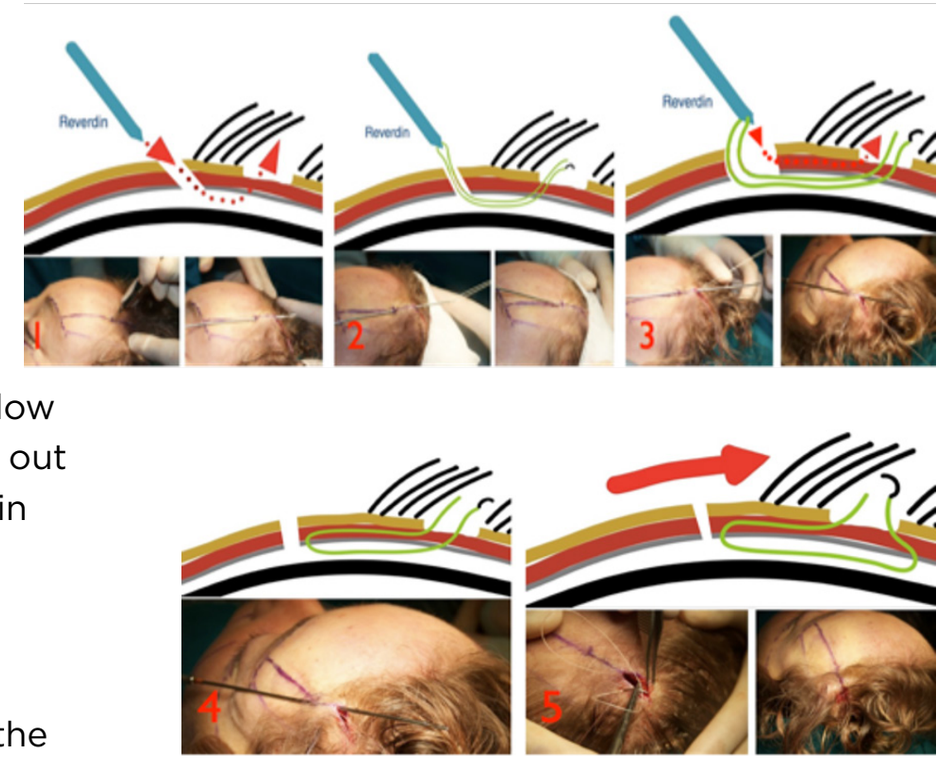
Suture Technique

Paramedian Fixation



The paramedian is utilized for paramedian fixation, which determines the highest point of the brow.Two small horizontal stab wound incisions are made in the forehead at the same level, one on each side, below the paramedian incisions and a Reverdin needle (an instrument analogous to a wright fascia needle) is passed from the forehead incision under the scalp to exit at the paramedian incision. The needle is loaded with the suture and brought back out of the forehead incision.The tip of the Reverdin needle is then used to grasp the tissue below the skin at the forehead incision and to pass the suture needle below the scalp and out at the paramedian incision again, where the suture needle is freed from the Reverdin needle, thereby recruiting soft tissue of the galea for eventual forehead elevation. The suture needle grasps the tissues deep to the skin at the posterior edge of the paramedian incision.

All the deep tissues between the two incisions are brought together by tightening the suture, thus creating a temporary fold of redundant skin between the forehead and scalp incisions.

Role of Paramedian Fixation

Once a free tension flap has been achieved, the tissue must be held in the new position. The shape of the brow can also be altered based on the fixation position. In order to achieve a natural look of the superior complex (forehead/brow/upper lid) we need to remember the different shape of the natural feminine eyebrow and carefully inspect the patient's old pictures. The aim is to raise the tail of the brow while at the same time raising the body of the brow until the final shape is a naturally arched eyebrow ending with an elevated tail. The more lateral in respect to the midline of the forehead that the paramedian fixation is placed, the greater the effect on the tail. The closer the fixation is placed to the midline, the stronger the effect on the body or the head of the brow. On average the paramedian fixation is placed at 5 cm from the midline in a female patient, and 4 cm in a male. Also, the lower the entry point on the forehead the stronger the pull of the fixation and the larger the skin fold resulting on the forehead. Therefore a heavier forehead, like a man's forehead, would require a stronger pull, resulting in a more visible skin fold.

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Deep Temporal Fixation

Temporal fixation of the deep subcutaneous tissues of the elevated flap to the deep temporal fascia is simply performed with a 3-0 Vicryl suture. This fixation elevates and lateralizes the tail of the brow, the temporo-zygomatic area, and the corner of the eyelids, thereby elongating the eyelid fissure.

Summary

A systematic approach to all esthetic facial units carries a high satisfaction rate. With the goal of rejuvenating the periocular region, the authors advocate approaching this area as a unit rather than with individual isolated techniques that can achieve only limited improvements. MIVEL is a scarless technique that respects the vertical vector of tissue descent. Along with elevation, a 3-dimensional rejuvenation of the periocular esthetic unit can only be achieved if associated with volume restoration as well. Conservative removal of skin and/or fat in the eyelids is part of this general wider approach and can be effectively incorporated when indicated.

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1 – 1:06 pm

Therapeutic Role of Bone Morphogenic Protein 7 (BMP7) in the Pathogenesis of Graves' Orbitopathy

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Introduction: We investigated a role of bone morphogenic protein 7 (BMP7), a member of the transforming growth factor (TGF)-β superfamily on pathogenic mechanism of Graves' orbitopathy (GO). The therapeutic effect of BMP7 on inflammation and fibrosis were evaluated in primary cultured Graves' orbital fibroblasts in vitro.

Methods: Expression of BMP7 and BMP receptor (BMPR) 2 gene were compared in orbital tissue explants from between GO (n=18) and control healthy (n=16) subjects using quantitative real-time PCR. Orbital fibroblasts were cultured from orbital connective tissues obtained from individuals with GO (n=3) and control patients (n=3). Cells were pre-treated with recombinant human BMP7 (rhBMP7) before stimulation with interleukin (IL)-1β, tumor necrosis factor (TNF)-α, and TGF-β. Inflammatory cytokines and fibrosis-related proteins were analysed by western blotting. The activation of signaling molecules involved in inflammation and fibrosis were also analysed.

Results: The expressions of BMP7 and BMPR2 mRNA were significantly lower in GO orbital tissues than control orbital tissues. Increased pro-inflammatory molecules including IL-6, IL-8, and intercellular adhesion molecule-1 (ICAM-1) by IL-1β or TNF-α were significantly blocked in BMP7 treated cells from both GO and non-GO subjects. Fibrosis-related proteins including fibronectin, collagen 1α, and α-SMA induced by TGF-β were significantly suppressed in both GO and non-GO fibroblasts when treated with BMP7. Phosphorylated NFκB and phosphorylated Akt were increased under IL-1β and TNF-α stimulation but were significantly suppressed when rhBMP7 was treated. BMP7 upregulated TGF-β induced SMAD1/5/9 protein expression in GO and non-GO cells.

Conclusions: BMP7 showed an inhibitory effect on production of proinflammatory and fibrotic proteins in GO cells. Our results might provide a molecular basis of BMP7 as a potential therapeutic target for GO.
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Figure 1

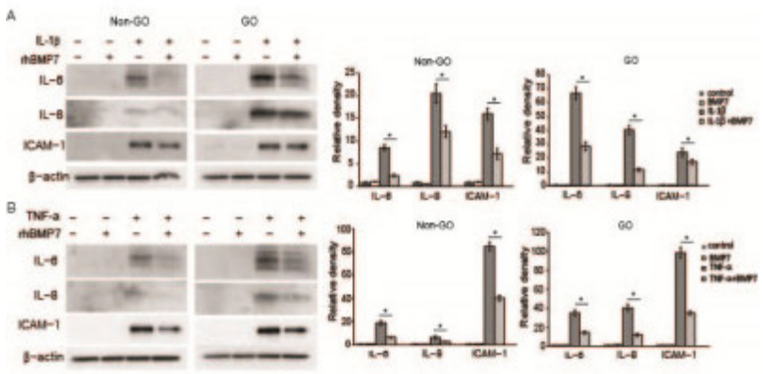
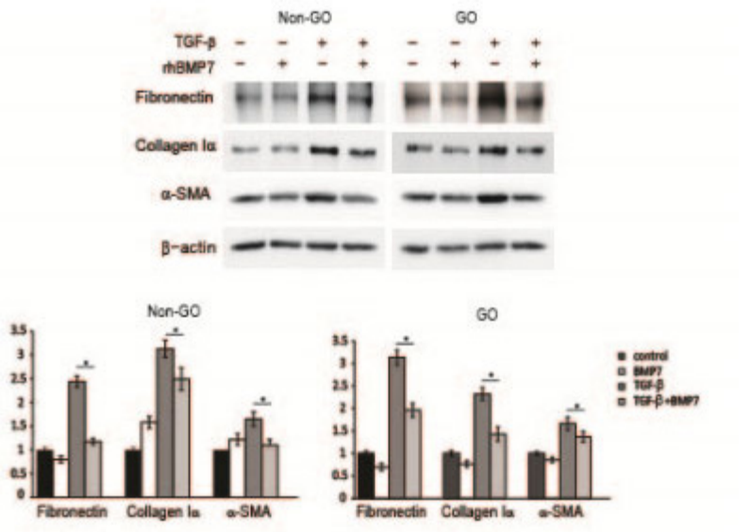


Figure 2



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1:06 – 1:12 pm

Muller's Muscle Insulin-Like Growth Factor-1 Receptor (IGF-1R) Expression in Thyroid Eye Disease

Liza Cohen, Kelsey Roelofs, Daniel Rootman
Division of Orbital and Ophthalmic Plastic Surgery, Stein and Doheny Eye Institutes, University of California, Los Angeles, Los Angeles, California, United States

Introduction: Insulin-like growth factor-1 (IGF-1) is an important mediator in the pathogenesis of thyroid eye disease (TED), as activation of the IGF-1 receptor (IGF-1R) leads to deposition of glycosaminoglycans by orbital fibroblasts.[1,2] IGF-1R has been shown to be overexpressed in orbital fibroblasts, orbital fat, and brow fat of patients affected by TED.[1,3,4] Teprotumumab, an IGF-1R antibody, has demonstrated efficacy in reducing clinical activity score (CAS), proptosis, and diplopia in patients with TED; however, studies have not demonstrated an effect on upper eyelid retraction.[5,6,7] Upper eyelid retraction is mediated by Muller's muscle, and although intramuscular fatty infiltration has been demonstrated histopathologically in patients with TED,[8] IGF-1R expression has not been investigated. The purpose of this study was to investigate IGF-1R expression and fatty infiltration in Muller's muscle in patients with TED and controls.

Methods: In this cross-sectional cohort study, patients with TED who underwent upper eyelid retraction surgery with Muller's muscle resection were identified. Patients who underwent Muller's muscle conjunctival resection (MMCR) ptosis surgery without a history of TED or systemic thyroid abnormality served as a control group. Clinical data was collected for TED patients including smoking status, duration of disease, CAS, and marginal reflex distance 1 (MRD1). Histopathologic examination was performed using Masson's trichrome to identify Muller's muscle and immunohistochemistry of IGF-1R beta (Cell Signaling Technology, Beverly, MA, USA, serial no. 3027S). The amount of IGF-1R staining of Muller's muscle, quantified as percent surface area, was analyzed using ImageJ (NIH, Bethesda, MD, USA) and compared between the two groups.

Results: Seven patients with TED (7 women, mean age 56.1 ± 9.7 years) and 5 controls (3 women, mean age 70.2 ± 5.7 years) were included in the study. The TED patient sample included 1 former smoker (no current), and the mean duration of TED was 31.6 ± 18.8 months. Positive staining of Muller's muscle for IGF-1R beta was seen in all cases, in both groups (Figure 1). There was no difference in percent surface area staining between TED patients (37.5 ± 5.8%) and controls (36.5 ± 4.7%) ($p = 0.37$) (Figure 2). All 7 TED samples contained fatty infiltration of Muller's muscle, which stained positively for IGF-1R beta; this finding was absent in all of the control samples.

Conclusions: IGF-1R is expressed in normal Muller's muscle, and the level of expression does not appear to be increased in patients with TED. Muller's muscle samples of patients with TED contain fat, which also expresses IGF-1R. These findings indicate that IGF-1R expression in Muller's muscle may be a poor indicator of TED and perhaps expected outcome of treatment with teprotumumab.

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Figure 1

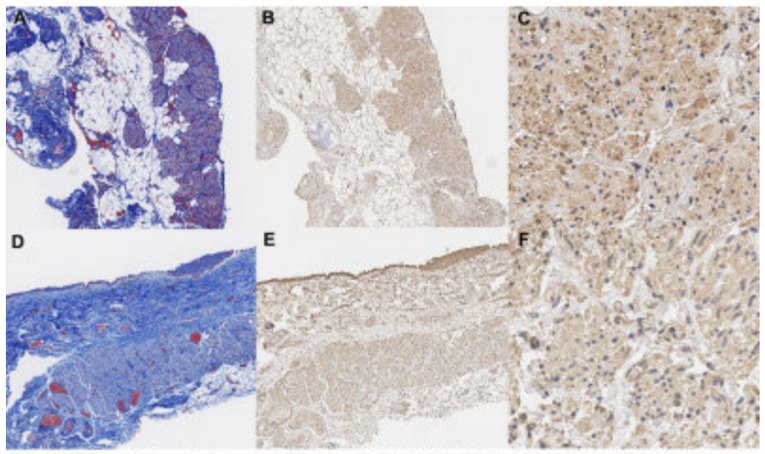

Figure 1. (A) TED patient Masson's trichrome 4X, (B) TED patient IGF-1R beta 4X, (C) TED patient IGF-1R beta 40X, (D) Control patient Masson's trichrome 4X, (E) Control patient IGF-1R beta 4X, (F) Control patient IGF-1R beta 40X.

Figure 2

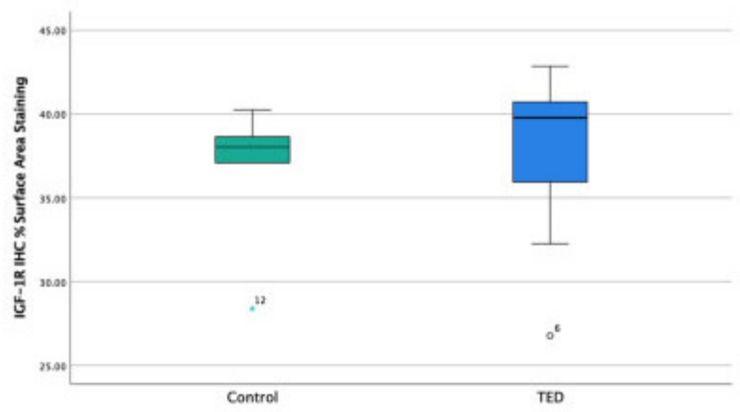

Figure 2. Boxplot illustrating percent surface area staining for IGF-1R beta on immunohistochemistry.

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1:12 – 1:18 pm

Decreasing Optic Nerve Head Vessel Density from the Graves' Disease to the Dysthyroid Optic Neuropathy; Does the Ischemic Optic Neuropathy Play a Role?

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Introduction: Amongst 6 publications on the macular1-6 and or optic disc vessel density (VD) in patients with TED, 4 have assessed either the optic nerve head (ONH) or retinal peripapillary capillary (RCP) with contradictory results. the aims of this study were to compare the RPC-VD between the 5 groups of the patients with no thyroid disease, Graves' disease without TED, mild TED, moderate-severe TED, and DON; analyze its correlation with the functional [best corrected visual acuity (BCVA), color vision, visual field perimetery (VF)] and structural [cup/disc ratio, peripapillary retinal nerve fiber layer (RNFL), and macular ganglion cell complex (GCC) thickness] tests of the optic nerve; and calculate the sensitivity and specificity of the RPC-VD in detecting the DON.

Methods: It is a prospective comparative study. Healthy volunteers (39 eyes, 20 subjects), Graves' disease without TED (26 eyes, 13 patients), mild TED (28 eyes, 14 patients), moderate-severe TED (30 eyes, 17 patients), and DON (21 eyes, 12 patients) were included from January 2018 to March 2021. Ocular and periocular examination, visual filed indices, RPC-VD (optical coherence tomography angiography), and retinal nerve fiber layer and macular ganglion cell complex thickness were recorded.

Results: Initial insignificant ($0.5<P<0.9$) rise in the pp-VD and wi-VD from the healthy subject to the Graves' disease without TED was followed by a significant ($P=0.001$) fall in the different severity grades of the TED (Fig.1). The paired comparison between the 5 groups showed that the statistically significant fall from the Graves' disease group occurred in the moderate-severe and DON groups ($0.001\leq P\leq 0.04$). No variable significantly affected the VD ($0.08\leq P\leq 0.9$). A lower wi-VD and pp-VD were significantly ($0.001\leq P\leq 0.009$) correlated with the impaired optic nerve functional and structural tests. The sensitivity and specificity of wi-VD (81% and 76%) and pp-VD (69% and 71%) for detecting the DON were significant ($P<0.001$) (Fig.2).

Conclusions: Despite an insignificant rise in the wi- and pp-VD from the healthy volunteers to the Graves' disease without TED, they showed a declining trend in the course of TED which was significant in the moderate-severe and DON groups.

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Figure 1: The linear graph shows the change in the whole image, peripapillary, and inside disc vessel densities in the 5 groups.

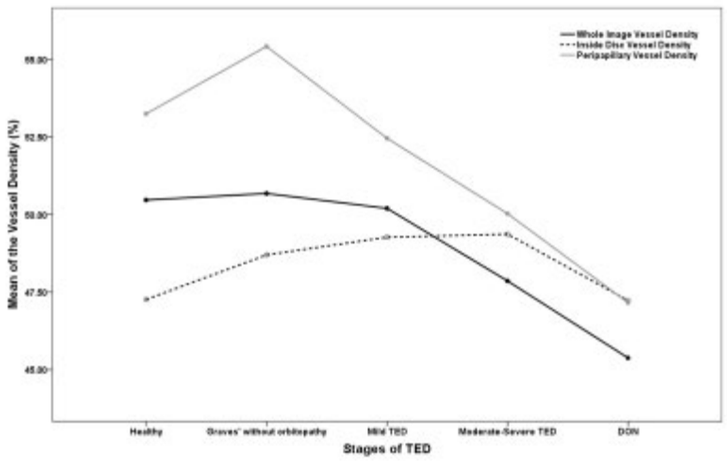
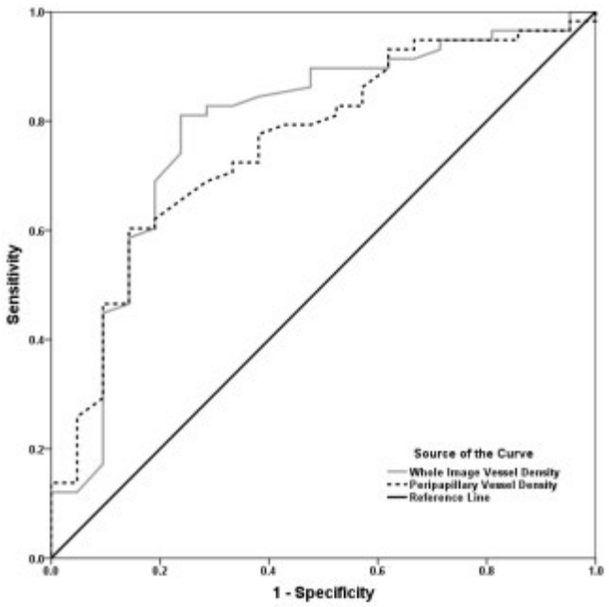


Figure 2: Area under the receiver operating characteristic curves shows the diagnostic accuracy of the whole image and peripapillary vessel density for distinguishing the dysthyroid optic neuropathy in the patients with thyroid eye disease.



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1:25 – 1:31 pm

Teprotumumab for the Treatment of Recalcitrant Thyroid Eye Disease

Connie Martin Sears[1], Linus Amarikwa[1], Clara Men[2], Roman Shinder[3], Kevin Clauss[4], Shoaib Ugradar[5], Kimberly Cockerham[6], Sara Wester[4], Raymond Douglas[6], Andrea Kossler[1]
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Introduction: Teprotumumab, an IGF-1R monoclonal antibody, is approved to treat thyroid eye disease (TED). The clinical trials excluded patients with previous orbital irradiation, surgery, glucocorticoid use (cumulative dose > 1gm), or prior biologic treatment, therefore, information is limited on the efficacy of teprotumumab in this population[1,2]. Our purpose is to characterize the response of teprotumumab for the treatment of recalcitrant thyroid eye disease (TED).

Methods: A multicenter retrospective study of all patients treated with teprotumumab for active moderate to severe thyroid eye disease (TED) after failing conventional therapy with corticosteroids, orbital radiation, tocilizumab and/or surgical decompression. Treatment failure comprised: an incomplete response to previous treatment or recurrent active disease. Only patients that received at least 4 infusions were included in the analysis. Primary study outcomes included: clinical activity score (CAS), proptosis mean reduction and Gormon diplopia score (GDS). Secondary study outcomes included: thyroid stimulating immunoglobulin (TSI) and Graves' ophthalmopathy quality of life questionnaire (GO-QOL) scores.

Results: Fifty-two patients were evaluated, 42 females and 10 males. Average age was 56.3 years (range 29-92). Mean follow up was 29.6 weeks (range 10.9 - 58 weeks). Mean reduction after 2 infusions: CAS of 2.8 ($p<0.001$), proptosis of 2.6 mm ($p<0.001$). GO-QOL increased an average of 38 points ($p = 0.004$). Mean reduction after an average of 5 infusions: CAS of 3.6 ($p<0.001$), proptosis of 4mm ($p<0.001$), and 61% of patients with baseline diplopia experienced a 1 point or better improvement in GDS. GO-QOL improved by 23 points ($p = 0.029$) overall.

Conclusions: The patients in this cohort demonstrated a significant improvement in each of the primary study outcomes. These results indicate that TED recalcitrant to conventional therapies is responsive to teprotumumab and should be considered for the treatment of recalcitrant TED.

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1:31 – 1:37 pm

Radiographic Changes in Extraocular Muscle Size in Thyroid Eye Disease Patients Treated with Teprotumumab

Lauren DeMaria[1], Ann Tran[2], Victoria North[1], Mohammed Elsayed[3], Eleanore Kim[1], Irina Belinsky[1]
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Introduction: To evaluate the radiographic improvement of extraocular muscle (EOM) size in patients with active thyroid eye disease (TED) treated with teprotumumab.

Methods: A retrospective single-center review was conducted of active TED patients treated by IB between 2020 and 2021. TED patients who underwent pre- and post-treatment CT or MRI neuro-orbital imaging were included. EOM measurements were obtained by a neuroradiologist. The transverse (TRV) and craniocaudal (CC) diameters of the four rectus and superior oblique muscles were calculated on consistent coronal T1 pre-contrast sequences. Cross-sectional area of each muscle was determined by TRV x CC dimensions. Statistical analysis was performed with a paired t-test.

Results: Sixteen orbits (8 patients) were reviewed. The mean age was 43.6 ± 16.1 years, the majority were female (62.5%), Hispanic (50%) or Black (25%), and all carried the diagnosis of Graves' disease (100%). The patients had a history of a thyroidectomy (50%), radioactive iodine (25%), methimazole treatment (25%), and active smoking at the time of treatment (12.5%). One patient (12.5%) received a trial of intravenous steroids. One patient (12.5%) had bilateral compressive optic neuropathy and underwent a course of oral steroids and bilateral three wall decompression but was given a trial teprotumumab due to persistent optic neuropathy. No patients were treated with orbital radiation.

All patients had a diagnosis of bilateral TED and were started on teprotumumab at an average time of 10.4 ± 3.4 months (range 8-13) during the active phase of the disease. The average CAS score improved from 4.63 to 0.75 upon completion of treatment ($p < 0.001$). Subjective diplopia improved in 71% of patients. The mean proptosis reduction by Hertel exophthalmometry was 2.1 ± 1.0 mm, not including the patient who underwent bilateral orbital decompression. That patient achieved an additional 2.5mm of proptosis reduction after treatment with teprotumumab.

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Post teprotumumab treatment, all patients (100%) demonstrated radiographic EOM size reduction. There was a significant reduction in the radiographic cross-sectional area of the bilateral medial recti (p= 0.001) and inferior recti (p= 0.003). Unilateral reduction in the radiographic size of the left superior rectus (p= 0.006) and the right lateral rectus (p= 0.012) was also seen. There was no difference in area reduction of the superior oblique muscles.

Conclusions: Reduction in the EOM cross sectional area was seen radiographically in TED patients treated with teprotumumab. Further studies are needed to compare the radiographic changes in EOM size to that of the natural disease progression as well as to other treatment modalities such as corticosteroids and orbital radiotherapy. A comparison of radiographic changes in orbital fat and EOM size is also worthy of further study.

1:37 – 1:43 pm

Outcomes of Patients with Thyroid Eye Disease Partially Treated with Teprotumumab

Tiffany Ho[1], Robi Maamari[1], Steven Couch[1]
Teprotumumab Interruption Study Group Teprotumumab Interruption Study Group[2]
[1]Department of Ophthalmology and Visual Sciences, Washington University in St. Louis, Saint Louis, Missouri, United States, [2]St. Louis, United States

Introduction: As a response to the coronavirus (COVID-19) pandemic, teprotumumab production was temporarily halted in the end of 2020 with resources diverted towards government mandated vaccine production. As a result of this disruption, patients with thyroid eye disease (TED) did not receive the full medication protocol of intravenous infusions every 3 weeks for a total of 8 doses. We sought to investigate the durability of teprotumumab when patients receive a shorter than 8 dose regimen as a result of treatment disruption.

Methods: In this IRB-approved, observational cross-sectional cohort study, data from 15 institutions were compiled. Participants were adult patients with active or chronic, moderate to severe TED treated with a standard teprotumumab infusion protocol. Chronic TED was defined as CAS < 4 and thyroid eye symptoms longer than 9 months. Patients were included in the review if they had completed at least one infusion of teprotumumab and had not yet completed all eight planned infusions. Patient data from prior to teprotumumab initiation, within 3 weeks of last dose of teprotumumab prior to interruption (baseline exam) and follow-up at least 4 weeks after baseline exam were extracted.

Results: The study population consisted of 70 patients, 53 women and 17 men, with a median age of 56 years (range: 21-92 years). The mean number of teprotumumab infusions completed prior to interruption was 4.2 (range: 1-7). The mean length of follow-up after last teprotumumab infusion was 9.4 weeks (range: 4-17 weeks). 60 patients had a CAS of > 4, and 10 patients had CAS of < 4. For patients with active TED and CAS > 4 at initial presentation, the mean decrease in CAS from initiation of treatment to baseline exam was 3.4, and the average CAS increased 0.1 during interruption (P=0.6). At baseline exam, 33 active patients (55%) had CAS of 0 or 1 and 35 active patients (58%) maintained this CAS level during interruption. The mean change in proptosis for active patients from initiation to baseline exam was -2.6 mm and from baseline to last interruption follow-up was -0.2 mm (P=0.2). For chronic patients, all patients maintained CAS < 4. The mean change in proptosis from initiation to baseline exam was -2.5 mm and from baseline to last interruption follow-up was -0.3 mm (P=0.01).

During teprotumumab interruption, no patients required concurrent thyroid eye disease treatments such as steroids, surgery, or radiation. No patients developed new optic neuropathy.

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Conclusions: Our study suggests that CAS and proptosis remains stable during treatment interruption. Optimal timing for teprotumumab infusions are yet to be determined.

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Relevant Financial Disclosures: Consultant for Horizon: Christopher Compton, Suzanne Freitag, Andrew Harrison, John Holds, Andrea Kossler, Wendy Lee, Amina I Malik, Daniel Rootman, Sara Wester, Dianne Schlachter, Roman Shindler, Matt Sniegowski

1:43 – 1:49 pm

Differential Effects of Teprotumumab Treatment Based on Fat: Muscle Ratio (FMR) in Thyroid Eye Disease (TED)

Michelle Ting[1], Daniel James Ozzello[1], Nicole Topilow[1], Jin Sook Yoon[1], Catherine Liu[1], Bobby Korn[1,2], Don Kikkawa[1,2]
[1]Oculofacial Plastic and Reconstructive Surgery, Shiley Eye Institute, University of California San Diego, San Diego, California, United States, [2]Division of Plastic and Reconstructive Surgery, University of California San Diego, San Diego, California, United States

Introduction: While the pivotal OPTIC study showed that 83% of thyroid eye disease (TED) patients had >/= 2mm improvement in proptosis with teprotumumab, little is known regarding the factors predictive of the degree of therapeutic response. Patients with TED can exhibit a phenotype characterized by predominantly fat compartment enlargement, predominantly extraocular muscle enlargement or a mixture of the two. Here we report the differential effects of teprotumumab on proptosis reduction in patients with varying degrees of orbital fat or muscle predominance.

Methods: A retrospective cohort study of all patients completing an 8-dose course of teprotumumab therapy for TED between January 2020 and June 2021 at a single tertiary oculoplastics center. Patients without baseline orbital imaging (CT or MRI) were excluded from the analysis. Quantitative analysis of fat-to-muscle ratio (FMR) on patients' orbital imaging was performed by manual segmentation using OsiriX software (Figures 1 and 2). The primary outcome measure was change in clinical measurement of proptosis, defined as pre-treatment proptosis (within 30 days prior to commencement of treatment) subtracted from the post-treatment proptosis (within 30 days of the completion of treatment). Analysis was carried out per patient with individual eye measurements averaged. Linear regression modelled the change in proptosis against FMR. Statistical significance was set at a level of $p<0.05$.

Results: Twenty patients (3M:17F) were included in the study with a mean age of 51.7 ±14.7 years. The FMR ranged from 1.11 to 6.54 with a mean of 3.15 ± 1.30. The data did not deviate from a normal distribution (Shapiro-Wilk test for normality, $p=0.18$). Pre-treatment and post-treatment average proptosis measurements were 21.4 ±3.2 mm and 18.6 ±2.8 mm, respectively. Univariable linear regression demonstrated a 1.05 ±0.37 mm greater reduction in proptosis for every 1 unit decrease in FMR ($p=0.011$) (Figure 3).

Conclusions: Contrary to the traditional dichotomous characterization of TED into type 1 and type 2 phenotypes, our data suggests that orbital FMR represents a continuum of disease manifestation, which more closely follows a normal rather than bimodal distribution. Patients should be conceptualized as presenting at one point along this spectrum.

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Furthermore, our data suggests that pre-treatment FMR is a strong predictor of therapeutic response to teprotumumab: those with decreased FMR have a stronger proptosis reduction from teprotumumab. Ongoing prospective data collection will evaluate the contributions of important variables, such as disease chronicity. This has potential implications regarding patient selection and counselling regarding the expected outcome of treatment.

Figure 1

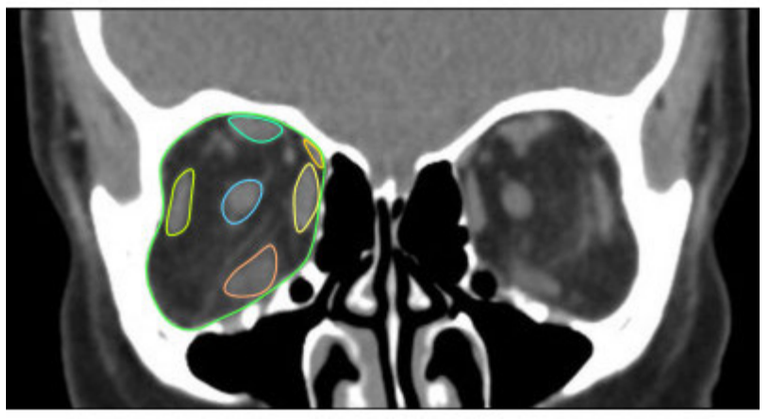


Figure 2

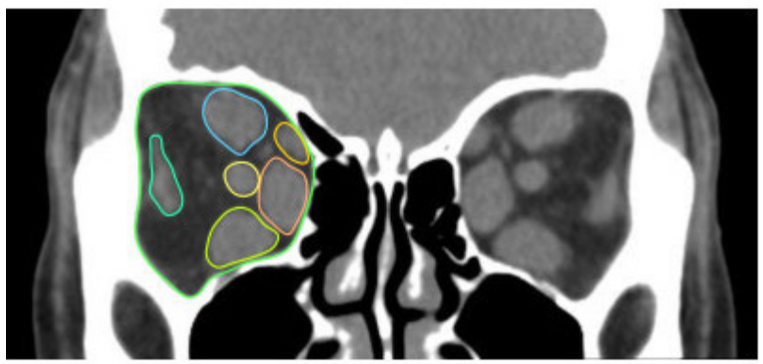
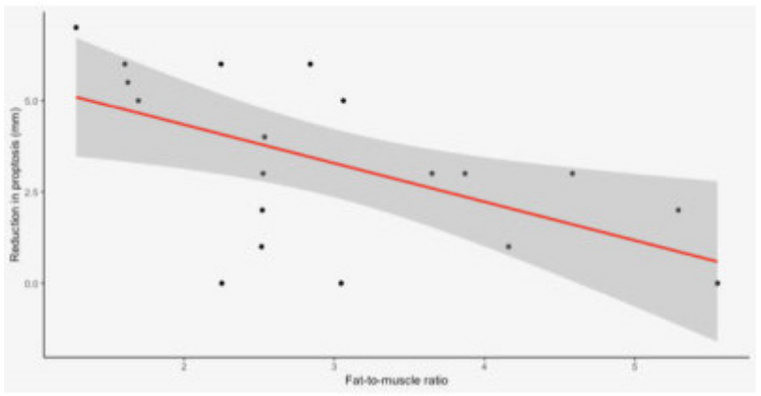


Figure 3



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FEATURED SPEAKER: KRIS S. MOE, MD, FACS

Friday, November 12

All times listed in Central Time

Moderator: Vikram D. Durairaj

1:59 – 2:19 pm

Technical Aids in Orbital Reconstruction

Kris S. Moe, MD, FACS

2:24 – 2:30 pm

A Mannequin-Based Surgical Simulator for Teaching Margin-Involving Eyelid Laceration Repair to First Year Ophthalmology Residents

Shannath Merbs[1], Meleha Ahmad[2], Jiawei Zhao[3], Andrew Fischer[1], Emily Gower[4], Roxana Fu[5], Fasika Woreta[2]

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Introduction: Ophthalmology residents are expected to perform complex eyelid laceration repairs with a high degree of autonomy early on in residency. However, no commercially-available simulation models exist to practice the skill. We previously piloted a surgical simulator for margin-involving eyelid laceration repair on Ophthalmology post-graduate year (PGY) residents years 2-4, finding this to be a cost-effective alternative to previously-utilized practice methods.[1] Based on feedback from our initial pilot data, we further developed our training system for incoming PGY2 residents.

Methods: A previously described1 mannequin-based surgical simulator for margin-involving eyelid laceration repair (Figure 1) was tested on nine first-year Ophthalmology residents from two nearby academic institutions during the first two weeks of July 2020. Following consent for participation and a pre-survey, all nine participants attended a 30-minute virtual orientation about basic eyelid anatomy and use of the simulator. Written and video-based material on use of the simulator that could be reviewed on-demand was provided after the session. Within one week of orientation, each resident completed an individual, video-recorded practice session using the simulator at their respective institution's wet lab. Videos were reviewed using a standard evaluation rubric with a maximum score of 30. Written feedback was provided by an oculoplastic surgeon (SLM). Participants given three weeks to practice, unrecorded, using the mannequin, and they were required to complete at least one unrecorded session using the mannequin. Additional practice sessions during this time could be performed at their discretion. Following the 3-week practice period, they completed a final, video-recorded practice session and a post-survey. Survey questions used a 5-point Likert scale. Pre- and post-practice videos were reviewed by two oculoplastic surgeons: SLM (unblinded to video order) and RF (blinded to video order). T-tests were used to compare metrics before and after practice sessions.

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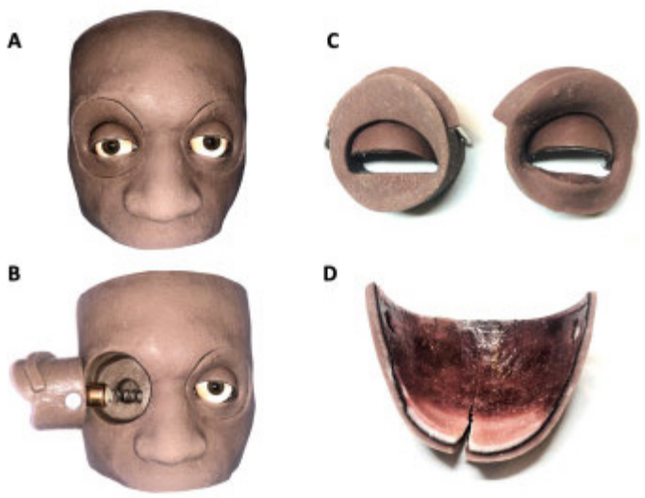
Results: Prior to the first session, two of nine residents had performed an eyelid laceration repair, and none had performed a margin-involving repair. All residents had practiced suturing on alternative materials, but satisfaction with these methods was poor (average Likert scale 2). Likelihood of using our simulator again was 4, and the majority recommended that the simulator be incorporated into the Oculoplastics curriculum. Self-reported comfort level with repair of margin-involving lacerations increased at the completion of the study (Likert 1 vs. 4, p=0.02).

Structured evaluation of pre- and post- recorded videos by the two graders (CC = 0.8) revealed a significant increase in average total grading score (13.8 vs 16.5, p = 0.048) after feedback and practice. There was an overall decreased in operative time, which did not reach statistical significance (24.7 vs 22.0, p = 0.22).

Conclusions: Introduction of our surgical simulator early on in Ophthalmology residency is an effective method for teaching margin eyelid repair to novice surgeons. Designated timing for practice using the model may encourage residents to perform more practice sessions in the future.

Figure 1. A. The mannequin-based surgical simulator for margin-involving eyelid laceration repair; B. The orbit is removable; C. The eyelid cartridge attaches to the orbit; D. A vertical incision made in the eyelid demonstrates the four layers of the simulator eyelid that mimic the primary layers of the human eyelid: skin, orbicularis muscle, tarsus and conjunctiva.

Figure 1



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2:30 – 2:36 pm

Head Rotation and the Perception of Eyelid Height and Contour

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Introduction: Eyelid symmetry is typically evaluated iteratively during the course of ptosis surgery. Studies have shown that measurement of margin reflex distance (MRD1) can vary according to head position[1] and that upright measurements seem to better predict the final eyelid height when compared to supine.[2] For this reason, surgeons often sit patients up for fine intraoperative adjustments.[3-5] It is not clear whether this procedure affects lid height by invoking gravitational forces, simulating wakefulness during anesthesia or other reasons. Another possible explanation may be perceptive, in that surgeons are better able to recognize asymmetry in the upright position.[6-9] This study investigates the latter hypothesis.

Methods: In this prospective psychometric experiment, illustrations were designed with one normal eye and the other affected by variable degrees of either ptosis (mild and severe) or eyelid contour defect (medial peak and lateral flare). An equal number of male and female faces with left and right defects were constructed (Figure 1). Face images were rotated on 8 different axes (Figure 2), resulting in 160 images encompassing all possible combinations of eyelid abnormality, laterality, gender, and rotation. Images were randomized A compilation of images was constructed with a 3:1 ratio of asymmetric:symmetric faces and presented randomly to subjects recruited via crowdsourcing. PsychoPy3 software was utilized for the experimental trials. A single trial involved presentation of one image and participants were instructed to judge whether the eyelids were symmetric or asymmetric and indicate as quickly as possible with a button click. The experiment involved presenting all images to each participant. The primary outcome measure was accuracy. Subgroup analyses were performed between the different degrees of head rotation, the side of asymmetry, the gender and the type of eyelid abnormality.

Results: The survey was completed by 196 individuals (54.6% male) with a mean (SD) age of 34.6(11.3) years, for a total of 37,632 trials. For the total pooled sample, asymmetry was most accurately judged in the upright position (0º) ($p<0.01$). Degree of rotation away from upright was associated with a lower odds of a correct response (OR for 1800 = 0.564, $p<0.001$, Table 1). This trend was linear ($P<0.001$). There was no difference in accuracy when the image was rotated towards the asymmetry or away nor for asymmetry presented on the right vs the left. The degree of asymmetry had a significant interaction with accuracy. The more severe ptosis and control (symmetric) trials did not demonstrate a linear trend of decreasing accuracy with rotation, and overall accuracy was similar for these groups

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(Figure 3). The remainder of the conditions (mild ptosis, medial and lateral peak) did demonstrate a linear trend of decreasing accuracy with increasing rotation.

Conclusions: Accurate perception of eyelid asymmetry decreases linearly as the human face is rotated away from the upright. This is particularly true with fine perceptions, in this study represented by peaking and mild ptosis. More severe defects overall are more accurately identified, and appear less affected by rotation. Comprehension of fine asymmetry may be best performed with an upright view of the human face.

Figure 1

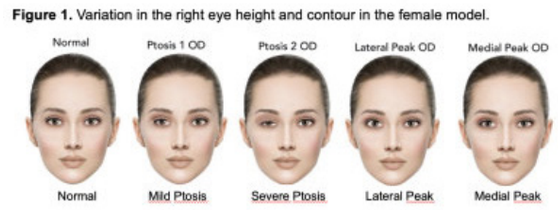

Figure 1. Variation in the right eye height and contour in the female model.

Figure 2

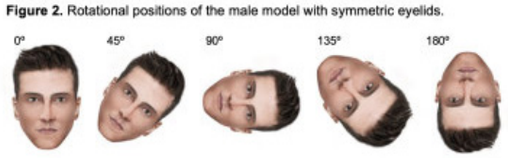

Figure 2. Rotational positions of the male model with symmetric eyelids.

Figure 3

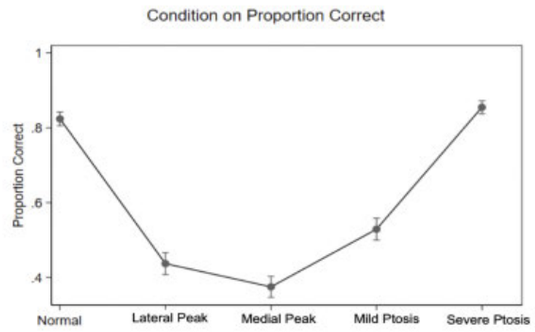

Figure 3. Proportion of images correctly classified as symmetric or asymmetric stratified by type and severity of asymmetry

Table 1

Table 1. Odds ratios (OR) for logistic regression modeling (1) proportion correct and (2) log of reaction time as a function of degrees of rotation.

Degree of rotation	OR of proportion correct (95%CI)	P-value	Reaction time (95%CI)	P-value
0	Ref	Ref	Ref	Ref
45	0.778 (0.715, 0.846)	<0.001	1.019 (0.976, 1.063)	0.395
90	0.642 (0.591, 0.697)	<0.001	1.017 (0.975, 1.062)	0.430
135	0.587 (0.540, 0.638)	<0.001	1.029 (0.986, 1.074)	0.189
180	0.564 (0.513, 0.620)	<0.001	0.972 (0.924, 1.022)	0.264

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2:36 – 2:42 pm

Systemic Steroids with Concurrent Antibiotics for Periocular Infections – an 11-Year Experience

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Introduction: Preseptal periocular infections are relatively common in the general population and may progress to orbital cellulitis and its known dreaded complications. The standard treatment of periocular infections includes antibiotics and surgical drainage when warranted. The use of steroids in the treatment of infectious conditions remains controversial. Proponents cite their anti-inflammatory effects that have been shown to reduce complications in various infections without significant adverse effects. Critics fear masking of residual disease, progression during immunosuppression or their use in cases of fungal infection. The senior author (RS) has previously published a prospective study which showed IV steroids given concurrently with antibiotics upon admission to children with orbital cellulitis were safe and hastened improvement leading to a shorter hospital stay. The utilization of steroids in the treatment of preseptal cellulitis in children has been described in a single past retrospective report. In the present study, oral steroids were administered concurrently with antibiotics to determine if adding steroids could safely speed clinical recovery in preseptal periocular infections.

Methods: Prospective single-center comparative interventional study of patients presenting with periocular infections to the oculoplastic practice of the senior author between July 2010 and January 2021. Periocular infections studied included preseptal cellulitis, preseptal abscess, dacryocystitis, and canaliculitis. All patients, excluding those with canaliculitis, were started on amoxicillin/clavulanate, or clindamycin if penicillin allergic. Regardless of disease severity, patients were offered the option of starting adjunct prednisone 1mg/kg for three days concurrently. Patients who deferred steroids served as the control group. Exclusion criteria included immunocompromise, contraindications to steroids, uncontrolled diabetes or hypertension, age 85, or follow-up < 1 month. Preseptal and lacrimal sac abscesses were universally drained. Canaliculitis was treated with canaliculotomy and the patient started on tobramycin/dexamethasone eyedrops for 1 week. Patients were followed daily as outpatients until they achieved clinical resolution. Time to resolution in each group was compared using unpaired T-tests with Graphpad Prism 5.0 (Graphpad Software, Inc., La Jolla, CA).

Results: 368 patients, 254 (69%) of whom were female, with a mean age of 66 years (range 18-85) were studied. Diagnoses included dacryocystitis (184 patients, 50%), preseptal cellulitis (86, 23%), canaliculitis (72, 20%), and preseptal abscess (26, 7%). 187 (51%) patients received steroids and antibiotics while 181 (49%) received antibiotics alone. Patients who received steroids had a significantly shorter disease course for all diagnoses (Table 1, Figs 1-4). Side effects included mood change in 29 (8%) patients, increased appetite in 26 (7%), insomnia in 15 (4%) and headache in 15 (4%). All side effects were mild and did not require discontinuing therapy. All patients in the steroid group returned to baseline health with no cases of progression of disease, ophthalmic complications, or recurrence with a mean

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follow up of 1.2 months (range 1-4 months).

Conclusions: The current study provides evidence to the relative safety and efficacy of a short course of systemic steroids used concurrently with antibiotics for preseptal periocular infections including preseptal cellulitis, preseptal abscess, dacyrocystitis, and canaliculitis. To the authors' knowledge, this is the first study examining the role of steroids for these conditions in adults. Patients treated with steroids had a shorter disease course than those treated with antibiotics alone with only rare and mild side effects. Clinicians may wish to consider the short-term use of oral steroids concurrently with antibiotics in the management of preseptal periocular infections.

Table 1

Table 1: Clinical Outcomes of Study Patients

		Steroids + Antibiotics	Antibiotics Alone	p-value
Dacryocystitis	Patients	89 (48%)	95 (52%)	-
	Time to resolution (Days)	3.8	8.1	**<.01**
Preseptal Cellulitis	Patients	48 (56%)	38 (44%)	-
	Time to resolution (days)	1.7	3.1	**.012**
Canaliculitis	Patients	38 (53%)	34 (47%)	-
	Time to resolution (Days)	2.1	5.9	**<.01**
Preseptal Abscess	Patients	12 (46%)	14 (54%)	-
	Time to resolution (Days)	5.2	8.7	**<.01**

Figure 1

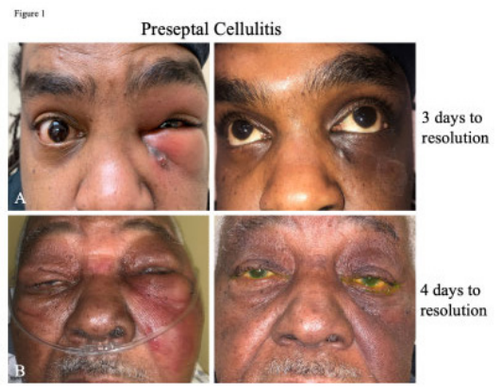


Figure 2

Figure 3

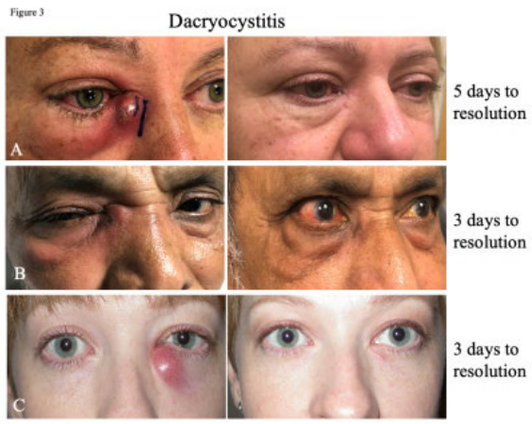
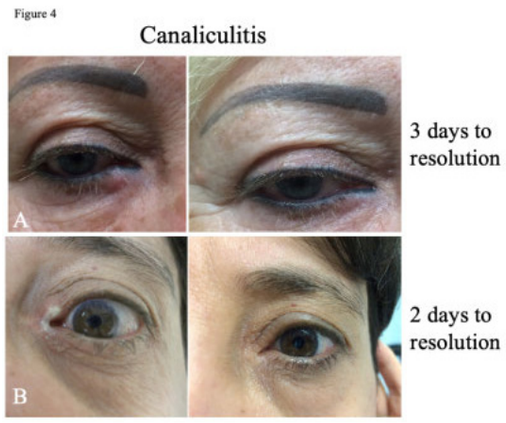


Figure 4



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2:42 – 2:48 pm

Outcome Comparison of Transconjunctival Müller's Muscle Recession with Levator Disinsertion to Gold Weight Implantation in the Treatment of Paralytic Lagophthalmos

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Introduction: Upper lid gold weight implantation has been often used to address the lagophthalmos from facial paralysis.[1] Transconjunctival Müller muscle recession with levator disinsertion has been shown to be effective in the treatment of eyelid retraction from thyroid-related orbitopathy.[2] This study aims to compare clinical outcomes of transconjunctival Müller muscle recession with levator disinsertion to the traditional gold weight implantation in patients with paralytic lagophthalmos.

Methods: A retrospective review was performed of patients who underwent surgery to address paralytic lagophthalmos from January 2016 to May 2021. Patients were identified that underwent either gold weight implantation or transconjunctival Müller muscle recession with levator disinsertion surgeries. The main outcome comparisons were measurement changes in lagophthalmos, minimal reflex distance (MRD), visual acuity, and cornea exam. Complication and reoperation rates were also compared. Exclusion criteria included patients with thyroid eye disease, prior upper eyelid trauma, or inadequate follow-up visits.

Results: Twenty-six cases of gold weight implantation and ten cases of Müller muscle recession with levator disinsertion surgeries were identified. As shown in Table 1, the average age, gender distribution, pre-operative MRD1 (3.7+/-1.7 mm vs 3.6+/-1.9 mm), pre-operative lagophthalmos (6.3+/-2.5 vs 5.6+/-2.5 mm), and cornea exam findings were comparable. Lower eyelid ectropion repair (46% vs 50%) and lateral permanent tarsorrhaphy (46% vs 40%) were the two most common concurrent surgeries performed with no differences between the groups. Both groups of patients had improved corneal exams following surgery. There was no statistically significant difference between the two groups with respect to postoperative lagophthalmos, MRD1, visual acuity, complications, and reoperations rates ($p>0.05$).

Conclusions: The transconjunctival Müller muscle recession with levator disinsertion is as safe and effective as the gold weight implantation to improve inadequate eyelid closure from paralytic lagophthalmos without the implant-related complications.

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Table 1

Table 1: Outcome Comparison of Transconjunctival Müller Muscle Recession with Levator Disinsertion to Gold Weight Implantation.

	Age	Male/Female	Visual Acuity Change (logMAR)	Lagophthalmos Changes (Pre Op – Post Op)	MRD1 Changes (Pre Op – Post Op)	Permanent Tarsorrhaphy †	Lower Eyelid Ectropion Repair †	Follow up (days)	Complications	Reoperations
Gold weight implantation (N= 26)	57.7 +/- 16.0	10 (38.5%) /15 (57.7%)	-0.10 +/- 0.48	3.77 +/- 3.92	2.17 +/- 2.22	12 (46%)	12 (46%)	291.6 +/- 437.3	4 (15.4%)	3 (11.5%)
Transconjunctival Müller muscle Recession with Levator Disinsertion (N=10)	60.7 +/- 14.8	4 (40%) /6 (60%)	+0.4 +/- 0.22	3.22 +/- 0.84	3.33 +/- 0.58	4 (40%)	5 (50%)	117.4 +/- 86.0	2 (20%)	2 (20%)
P value (two tailed t-test*) (fisher exact test**) (p<0.05 as significant) † Concurrent Surgeries	NS*	NS*	NS*	NS*	NS*	NS**	NS**	NS*	NS**	NS**

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2:48 – 2:54 pm

The Köllner Tarsoconjunctival Flap for Lower Eyelid Reconstruction: Historical Perspective and Surgical Outcomes of 140 Cases

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Introduction: While Wendell Hughes popularized the tarsoconjunctival flap for lower eyelid reconstruction, most modern procedures are derived from the technique described by Köllner in 1911. Hughes' original operation (1937) involved a tarsoconjunctival flap developed through a marginal incision. "Eyelashes" were transplanted in a second stage, followed by later pedicle division. In contrast, Köllner maintained the integrity of the eyelid margin, creating the flap through a tarsal incision located 2mm above the margin. This study reviews the history, techniques, and outcomes of a large series of patients undergoing lower eyelid reconstruction with a modified Köllner tarsoconjunctival flap.

Methods: In this observational cohort study, medical records and photographs were reviewed in patients who underwent lower eyelid reconstruction with a tarsoconjunctival flap between 2005-2020. Patients with incomplete records or follow up <1 month after pedicle division were excluded. Patient demographics, complications, secondary interventions, and outcomes were evaluated.

Results: Among the 140 patients in the study, horizontal marginal defect size ranged from 12-41mm. The tarsoconjunctival flaps were usually developed with a tarsal incision placed 4mm above the margin. Müller's muscle was released until vertical traction on the flap was relieved. Lower eyelid conjunctival advancement flaps were used to augment the posterior lamella in 46% of cases. The anterior lamella was reconstructed using a skin graft (n=86), skin flap (n=10), or combined graft and flap (n=44). Pedicle division was usually (73%) performed 4-6 weeks after primary repair. Subsequent interventions were needed in 24% of patients (steroid injection [n=10]; cryotherapy [n=10]; marginal erythema treatment [n=9]; upper eyelid retraction repair [n=6]). Lower lid thickening from contracture of the transferred tarsus was noted in 28 patients. Symptoms at last visit included: asymptomatic (79%), dryness/irritation (10%), tearing (6%), blurred vision (3%). Patients with defects >20mm wide were more likely to be symptomatic (36.8%) than those with smaller wounds (12.0%) (p=0.0008).

Photographic review demonstrated a good-excellent functional result in 94%. Patients with defects ≥30mm in width (p=0.0001) or canthal involvement (p=0.0734) were more likely to have a reduced outcome. A good-excellent cosmetic outcome was achieved in 85% (Figure 1). Non-upper eyelid skin graft donor sites (p=0.0001), defects ≥30mm in width (p=0.0001), and wounds extending to the canthal angles (p=0.0158) were associated with a poorer cosmetic appearance.
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Conclusions: The modified Köllner tarsoconjunctival flap is a highly successful technique for repairing moderate-large marginal lower eyelid defects, achieving good cosmetic and functional results in the majority of patients. Factors associated with reduced outcomes include surgical defects greater than 30mm in width, wounds involving the canthi, and skin grafts harvested from non-upper eyelid donor sites.

Figure 1

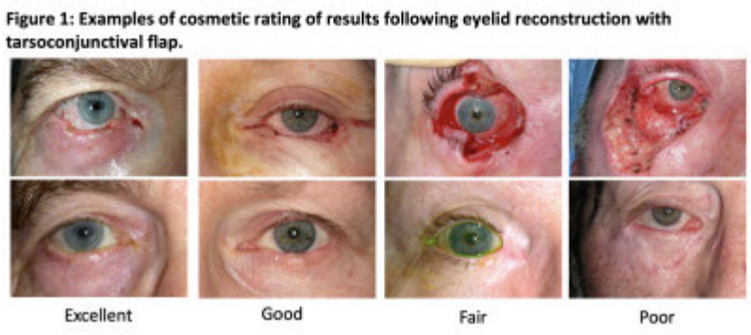

Figure 1: Examples of cosmetic rating of results following eyelid reconstruction with tarsoconjunctival flap.

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3:32 – 3:38 pm

The Use of Intra-Lesional Bleomycin for Peri-Ocular, Low Flow, Vascular Anomalies – Establishing the Rules of the Game

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Introduction: Management of Vascular anomalies of the head and neck region using Intralesional bleomycin sclerotherapy has been done in the past. Various treatment options are available such as intralesional sclerotherapy, lasers, embolization, and surgical excision. But a defined method of intervention is not yet established in the literature. This study aims to define a protocol for the management of extraoral head and neck vascular anomalies using intralesional bleomycin sclerotherapy.

Methods: A Prospective interventional study was carried out comprising of 10 patients aged between 18-65 years presenting with extra-oral vascular anomalies of head and neck region that have not been treated previously. Each vial containing 15 units of bleomycin solution (Bleocip; Cipla) was reconstituted with 2 ml of 0.9 % Normal Saline using BD 1 cc insulin syringe and a total of 30 Units reconstituted bleomycin solution was prepared. Reconstituted bleomycin solution was then injected 0.2 ml per site; 1 cm apart and simultaneous palpation of the regional vessels was performed. A total of 4 ml of 30 Units of bleomycin was injected intralesionally on each visit. A similar procedure was performed 4 weeks apart up to a minimum of 4 sessions for each patient. After 4 sessions, the reduction in the size was measured. Additional sessions were performed at multiple sites on the face when required. For the patients where the lesion was still present after 4 sessions, additional sessions were given. The maximum number of sessions for the study population was 8 sessions. The ice pack was applied for 15 minutes post-procedure and changes such as bruising and local rise in temperature, pain, and pigmentation were observed. Postoperatively photographs were taken and also repeated during each visit.

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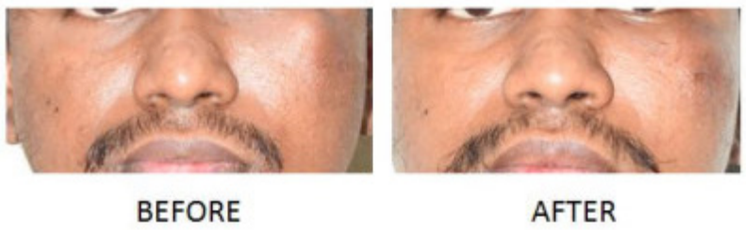
Results: The mean age of patients was 38 years; presenting with Low flow Arteriovenous Malformation, lymphangioma, and hemangioma. A mean of 4 sessions was performed in all the patients. The reduction in size noted was approximately 45.83%. Additional 2 sessions were done in 3 patients and the reduction in the size of the lesion noted was 66.66%. In 1 patient, a total of 8 sessions were done and the reduction in size was 85%. The mean reduction between the 4th and 8th sessions was found to be 39.17% (p=0.0001). Side effects noted were bruising and pigmentation. No adverse complications or recurrence were encountered.

Conclusions: Intralesional bleomycin sclerotherapy provides a safe, outpatient, and nonsurgical method for the management of the extra-oral vascular anomalies of the head and neck. This study provides a defined protocol that was not established till now. It gives a quantifiable approach with a significant reduction in the size within a mean of 4 sessions. It also dissipates the need for surgical intervention in such patients and it works well in patients who have had a recurrence post-surgery as well.

Figure 1



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3:38 – 3:44 pm

An Orbit Based Flap for Total Ocular Surface Reconstruction Following a Severe Facial Burn

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Introduction: Traditionally, local eyelid flaps have been derived from tissue that receives its blood supply from the external carotid circulation. The levator aponeurosis and inferior oblique muscles have their blood supply from branches of the ophthalmic artery, and ultimately the internal carotid circulation.[1] The authors encountered a situation in which the majority of periocular soft tissue and musculature was not viable, thus prompting an unconventional flap from the orbit that utilized previously untapped blood supply for reconstruction.[2,3] This case details a novel surgical technique that was used to reconstruct the eyelids and protect the cornea in a patient with severe facial burns resulting in total loss of the upper and lower eyelids.

Methods: A previously healthy man in his thirties was involved in an explosive motor vehicle accident and sustained over 70% total body surface area burns, including third degree burns to his face and ocular adnexa. His facial burn was extensive, with loss of tissue viability of his midface and scalp, including the temporoparietal tissues (Figure 1). Despite management with serial debridement and grafting of urinary bladder matrix, his upper and lower eyelids continued to necrose with complete tissue loss to the level of the orbital rim. Attempts were made to maintain the ocular surface with aggressive lubrication, weekly amniotic membrane placement, and a Gunderson flap by the Cornea service. These measures failed to protect the globe, however, resulting in total corneal melt in the left eye. The decision was made to eviscerate this eye. The right eye sustained severe corneal and limbal thinning which continued to progress despite the noted interventions. Given the extent of the burns and resultant loss of tissue viability, a temporoparietal flap and pericranial flap were unable to be fashioned.

Results: To cover the entire ocular surface, three orbital flaps were fashioned. From the superior orbit, Whitnall's ligament was disinserted from the lateral orbital rim. The orbital component of the levator muscle was dissected using a freer elevator from the orbital roof. A horizontal incision was made through the lateral half of the orbitally-based levator muscle, leaving the central and medial component of the muscle to act as a vascular pedicle. The levator muscle was then rotated anteriorly and inferiorly to cover the superior cornea. Inferomedially, the inferior oblique muscle was disinserted from the orbital rim and transposed anteriorly and superiorly. Intraorbital fat from the inferotemporal orbit was mobilized and transposed anteriorly. A bucket handle flap fashioned from upper cheek tissue and was mobilized superiorly. The various flaps were then anchored to one another, covering the entirety of the ocular surface with vascularized tissue (Figures 2 and 3). A six-layer urinary porcine bladder matrix was then placed over the reconstructed tissues. The flap maintained excellent perfusion without necrosis and complete globe coverage for two months until the patient expired (Figure 4).

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Conclusions: In the setting of total upper and lower eyelid loss, one can consider fashioning a flap from the obrit with the use of the levator aponeurosis and inferior oblique muscles for ocular surface coverage.

Figure 1

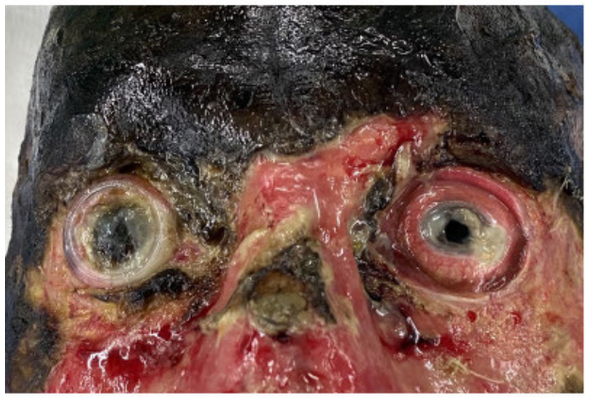


Figure 2

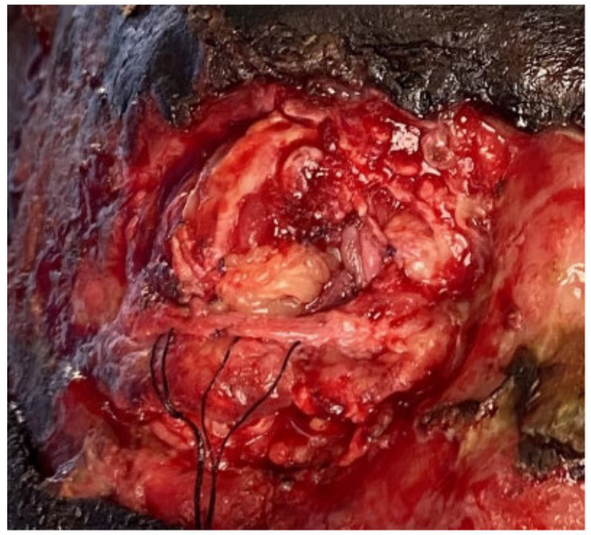


Figure 3

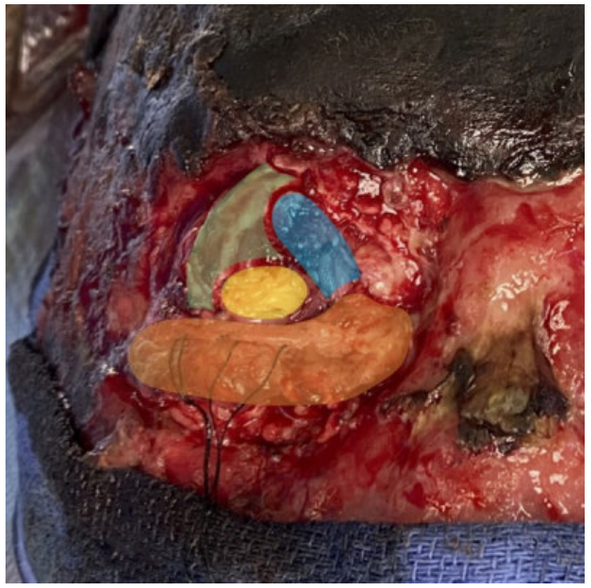
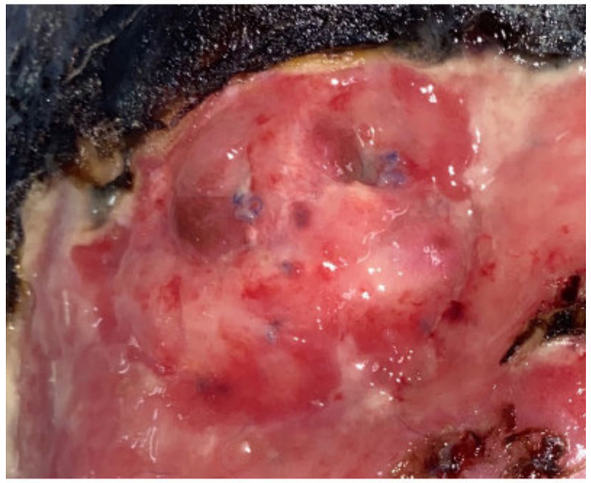


Figure 4



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3:44 – 3:50 pm

A Comparison of Primary and Secondary Eye Removal after Ruptured Globe Injury: A Multi-Center Study

Mark Krakauer[1], Erin Jennings[2], Lalita Gupta[3], June Si[4], Daohai Yu[5], Xiaoning Lu[5], Mark Prendes[3], Hassan Shah[4]
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Introduction: The purpose of this study was to describe the preoperative characteristics and surgical outcomes of patients who underwent primary eye removal surgery after ruptured globe trauma, and to compare them to patients who underwent eye removal surgery following ruptured globe repair.

Methods: This was an IRB-approved retrospective review of subjects who underwent eye removal surgery at three Level 1 trauma centers in three U.S. cities between July 2014 and July 2020. A search of the electronic medical records for the Current Procedural Technology Codes for enucleation and evisceration was performed, and pertinent data was extracted from the medical records. Criteria for inclusion were a history of ruptured globe within three months of the eye removal surgery. Differences between the two groups were compared for statistical significance (p-value < 0.05) using SASTM, and the Wilcoxon and Fisher exact/Chi-Square test for the continuous and categorical variables, respectively.

Results: 39 patients met criteria for inclusion in the study, and these patients were divided into two groups: 19 underwent primary eye removal, defined as evisceration or enucleation without prior repair of the ruptured globe, and 20 underwent secondary eye removal, defined as evisceration or enucleation within three months of ruptured globe repair. Patients in the first group underwent eye removal surgery because the globe was deemed unrepairable, while patients in the second group underwent eye removal surgery for recalcitrant pain or to reduce the risk of sympathetic ophthalmia in the fellow eye. In total, 84.6% of eyes were eviscerated and 15.4% were enucleated. An implant was placed 92.3 % of the time. There was no statistically significant difference between the groups for these data. The most common mechanism of trauma in patients who underwent primary eye removal was gunshot injury (84.2% vs. 20.0%), and these patients were more often male (89.5% vs. 60.0%), when compared to the secondary eye removal group. Other notable, statistically significant differences were: patients in the primary eye removal group had longer hospital stays; were more likely

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discharged to another care facility rather than home; had facial fractures; had intracranial injury; and were unable to consent themselves for surgery. Both groups had a low complication rate with one case of socket contracture in each group.

Conclusions: The standard of care for a ruptured globe is prompt repair, but there are occasions when the globe is so damaged that it is deemed unrepairable. Few prior studies have described this group of patients, and there is no standard of care as to when and whether to place an implant, and what outcomes can be expected.[1-4] Our study found that globes that required primary eye removal because they were unrepairable were more likely to be due to gunshot wounds, and that there was greater morbidity associated with these injuries. The authors' preferred surgical approach was evisceration with placement of a silicone sphere. When comparing primary removal to secondary removal, this method was found to be safe, with a low complication and infection rate

Table 1

Table 1. Primary vs. Secondary Eye Removal Patient Characteristics

Variable	*Primary (n=19)*	*Secondary (n=20)*	*p-value*
Surgery Type, N (%)			
enucleation with implant	3 (15.8%)	2 (10.0%)	
enucleation without implant	1 (5.3%)	0 (0.0%)	
evisceration with implant	13 (68.4%)	18 (90.0%)	
evisceration without implant	2 (10.5%)	0 (0.0%)	
Gender, N (%)			0.048
F	2 (10.5%)	8 (40.0%)	
M	17 (89.5%)	12 (60.0%)	
Age, N	19	20	0.052
Mean (SD)	31.1 (14.5)	44.0 (20.8)	
Median (IQR)	28.0 (20.0, 36.0)	41.5 (25.5, 59.5)	
Median (Range)	28.0 (13.0, 65.0)	41.5 (17.0, 87.0)	
Days To Removal, N	19	20	0.002
Mean (SD)	10.0 (20.0)	23.9 (20.4)	
Median (IQR)	6.0 (3.0, 7.0)	19.5 (9.5, 31.5)	
Median (Range)	6.0 (0.0, 91.0)	19.5 (2.0, 83.0)	

Table 2

Table 2. Mechanism of Injury and Associated Morbidity

Variable	*Primary (n=19)*	*Secondary (n=20)*	*p-value*
Mechanism, N (%)			
BB gun	0 (0.0%)	1 (5.0%)	
Firework injury	0 (0.0%)	1 (5.0%)	
GSW	16 (84.2%)	4 (20.0%)	
Knife	1 (5.3%)	0 (0.0%)	
auto	1 (5.3%)	1 (5.0%)	
blast injury to face	1 (5.3%)	0 (0.0%)	
blunt trauma/assault	0 (0.0%)	7 (35.0%)	
fall	0 (0.0%)	3 (15.0%)	
paintball	0 (0.0%)	3 (15.0%)	
Mechanism GSW, N (%)			<.0001
GSW	16 (84.2%)	4 (20.0%)	
Other	3 (15.8%)	16 (80.0%)	
Facial Fractures, N (%)			0.006
N	1 (5.3%)	9 (45.0%)	
Y	18 (94.7%)	11 (55.0%)	
Intracranial Injury, N (%)			<.0001
N	3 (15.8%)	18 (90.0%)	
Y	16 (84.2%)	2 (10.0%)	
Consent Self, N (%)			<.0001
Other	14 (73.7%)	1 (5.0%)	
Self	5 (26.3%)	19 (95.0%)	
Days Admitted, N	19	20	0.0002
Mean (SD)	17.6 (9.9)	6.8 (9.9)	
Median (IQR)	17.0 (10.0, 22.0)	4.0 (2.0, 8.0)	
Median (Range)	17.0 (6.0, 42.0)	4.0 (1.0, 46.0)	
Discharged Home, N (%)			0.012
Home	9 (47.4%)	17 (85.0%)	
Other	10 (52.6%)	3 (15.0%)	

Figure 1

Figure 2

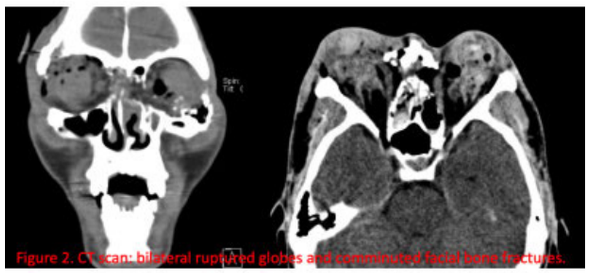
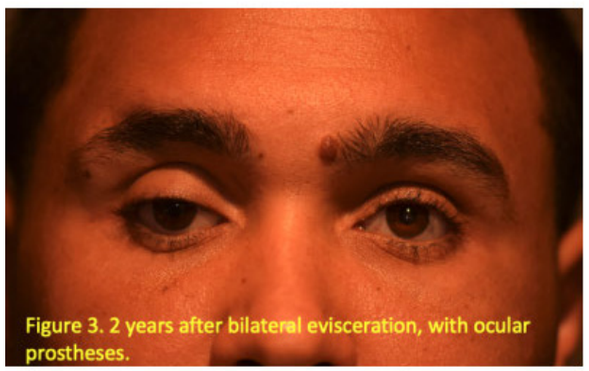


Figure 3



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Moderator: Kenneth E. Morgenstern

4 – 4:30 pm

Administrative Leadership Panel Discussion

Panelists:
Sophie D. Liao, Gary J. Lelli, Don O. Kikkawa, Pete Setabutr, Keith D. Carter

Administrative Roles within Academic Ophthalmology

Gary J. Lelli, Jr.

Lessons:

- Say ‘yes’ most of the time
- Make it your own
- Give 100%
- Leave something for someone else

Use your strengths to set yourself up for success in projects.

Leadership training can be helpful. It will offer insights into things like negotiation strategies and navigating change. Additionally, it will give you administrative opportunities and mentors.

Be a mentor.

Last words:

- Stay grounded
- Seek balance
- Build strong teams
- Lead by example
- Seek challenges

4:31 – 4:34 pm

Orbital Compartment Syndrome in Severe Burns: Predictive Factors, Timing and Complications of Intervention

E. Lacey Echalier[1], Ryan D. Larochelle[2], Jennifer L. Patnaik[2], Anne Wagner[3], Benjamin R. Echalier[4], Eric M. Hink[5], Prem S. Subramanian[6,7], Sophie D. Liao[2]

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Orbital compartment syndrome (OCS) in burn patients and its management is incompletely understood. A survey was distributed through ASOPRS and NASAOS and of the 54 responses, there was wide variability in practice patterns managing OCS in burn patients. This work aims to determine risk factors for OCS, the timing of evaluation and outcomes.

A chart review on patients admitted to a tertiary care burn unit from 2009 to 2018 was performed. Of the 3,207 patients identified, 107 met the inclusion criteria of total body surface area (TBSA) >20%, Ophthalmology consultation, and thermal, chemical, or radiant energy related burn. Clinical variables were collected that may predict OCS, the timing of intraocular pressure rise, and outcomes. Logistic regression with backward variable selection was used to identify predictors of lateral canthotomy and cantholysis (LCC).

Of the 107 included patients, 22 required LCC. Renal failure, inhalation injury, eyelid burns, higher TBSA, elevated lactate, increased number of escharotomies and total fluid required in the first 24 hours were found to be significant. The most important factors in predicting need for LCC were eyelid involvement, OR= 8.0 ($p<0.0001$), and total fluid required in the first 24 hours, OR=1.2 per 10 cc/kg ($p=0.009$). LCC was performed between 5 and 34 hours, with an average of 15.8 hours post burn. Patients who received LCC had higher rates of eyelid retraction (55% vs. 1%), exposure keratopathy (45% vs. 9%), and corneal ulceration (9% vs. 0%). No cases of optic neuropathy due to OCS were seen.

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Burn patients expected to receive >125mL/kg in the first 24 hours or with periocular burns should be monitored for OCS for 24 to 48 hours as this is the highest risk period. The decision for LCC should be weighed against increased risk of complications from facial contractures.

Figure 1

Figure 1. IOP max and time of IOP max since burn by canthotomy or no canthotomy.

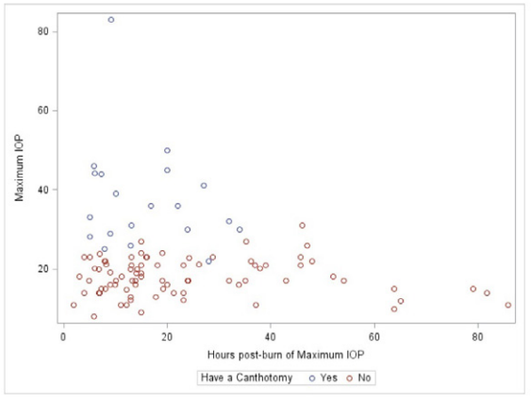

Table 1

Table 1. Rates of canthotomy by select demographic and clinical characteristics.

	Rate of Canthotomy n/N (%)		p-value
Total	22/107 (20.6%)		-
Gender	**Male** 16/84 (19.0%)	**Female** 6/23 (26.1%)	0.459
Drug-related	**Yes** 2/14 (14.3%)	**No** 20/93 (21.5%)	0.730
Self-immolation	**Yes** 5/13 (38.5%)	**No** 17/94 (18.1%)	0.136
Renal Failure	**Yes** 15/46 (32.6%)	**No** 7/61 (11.5%)	0.007
Inhalation Injury	**Yes** 13/34 (38.2%)	**No** 9/73 (12.3%)	0.002
Alcohol	**Yes** 3/21 (14.3%)	**No** 19/86 (22.1%)	0.427
Full thickness	**Yes** 22/103 (21.4%)	**No** 0/4 (0%)	0.579
Face/Scalp	**Yes** 22/99 (22.2%)	**No** 0/8 (0%)	0.202
Eyelids	**Yes** 19/59 (32.2%)	**No** 3/48 (6.2%)	0.001
Resuscitation after 24 hours required	**Yes** 20/102 (19.6%)	**No** 2/5 (40.0%)	0.272
	Canthotomy		
	Yes	**No**	**p-value**
	Mean (SD)	**Mean (SD)**	
Age	40.0 (16.4)	38.8 (15.4)	0.625
TBSA (percentile)	62.5 (24.4)	36.1 (14.6)	<0.0001
IOP max (mm Hg)* (n=103)	37.2 (13.0)	18.0 (4.6)	<0.0001
Lactate (n=103)	6.4 (3.4)	3.8 (1.9)	0.0008
Albumin (n=100)	2.8 (0.8)	3.1 (0.8)	0.190
Total Fluid 24hrs (mL/kg) (n=105)	270.9 (113.8)	150.4 (69.0)	<0.0001
Escharotomies (n=104)	15.9 (11.0)	4.7 (7.6)	<0.0001

*IOP max occurred between 2-86 hours with a mean of 22.4 (18.2) and median of 15 hours. For patients with e/e IOP max occurred between 5-34 hours with a mean of 15.8 (9.5) and median of 13 hours.

Table 2

Table 2. TBSA, Total fluid, and IOP max categorized into tertiles.

	Rate of Canthotomy n/N	Odds Ratio (95% CI) p-value	p-value
IOP max (mm HG)			
<17	0/31 (0%)	Cannot model because zero events in the first two categories	
17-<22	0/32 (0%)		
22+	21/40 (52.5%)		0.0001
TBSA (percentile)			
<25	2/21 (9.5%)	Reference	-
25-<50	4/53 (7.6%)	0.78 (0.13-4.59)	0.7793
50+	16/33 (48.5%)	8.94 (1.79-44.7)	0.0076
Total Fluid (mL/kg)			
<125	2/34 (5.9%)	Reference	-
125-<200	4/41 (9.8%)	1.73 (0.30-10.1)	0.5422
200+	15/30 (50.0%)	16.0 (3.24-79.1)	0.0007

Table 3

Table 3. Univariate and multivariable logistic regression model with canthotomy as outcome and significant explanatory variables as potential predictors.

	Univariate model		Multivariable model*	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**
TBSA	1.07 (1.04-1.10)	<0.0001		
Total Fluid in first 24 hours**	1.15 (1.08-1.23)	<0.0001	1.16 (1.08-1.24)	<0.0001
Lactate	1.50 (1.21-1.86)	0.0002		
Escharotomies	1.12 (1.06-1.18)	<0.0001		
Renal Failure	3.73 (1.37-10.1)	0.0098		
Inhalation	4.40 (1.65-11.8)	0.0031		
Eyelids	7.12 (1.96-25.9)	0.0029	8.00 (1.69-37.8)	0.0087

*Backward variable selection was used to identify variables that remained significant in the multivariable logistic regression model. **per 10 mL/kg change.

Table 4

Table 4. Rates of complications and outcomes.

	Rate if had Canthotomy	Rate if did not have c/c	Odds Ratio (95%CI)	Fisher's exact p-value
Retraction	12/22 (54.6%)	1/85 (1.2%)	100.8	<0.0001
Exposure	10/22 (45.4%)	8/85 (9.4%)	8.0	0.0003
Ulceration	2/22 (9.1%)	0/85 (0%)	NA	0.041
APD	1/22 (4.6%)	0/84 (0%)		0.208
Optic Neuro	1/22 (4.6%)	1/84 (1.2%)		0.374
Tarsorrhaphies				
None	19/22	85/85 (100%)		
One	1/22	0		
Five (4 in one eye; 1 in other)	1/22	0		
Six (4 in one eye; 2 in other)	1/22			
Reconstruction				
None	17/22	85/85 (100%)		
One	2/22	0		
Two (in one eye)	1/22	0		
Two (one in each eye)	1/22	0		
Four (two in each eye)	1/22			

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4:34 – 4:37 pm

5-Fluorouracil with Microneedling Modulates Wound Healing in a Murine Model: An Immunohistochemical Analysis of Mechanism and Dose Efficacy

Natalie A. Homer[1], Mahmoud S. Hanafy[2], Susan C. Baer[3], Alison H. Watson[4], Marie Somogyi[5,6], John W. Shore[6], Sean Blaydon[5,6], Vikram D. Durairaj[5,6], Zhengrong Cui[2], Tanuj Nakra[5,6]

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Introduction: The efficacy of combination treatment with intradermally administered 5-Fluorouracil (5-FU) via microneedling technology for early wound augmentation was explored in a pilot study.[1] We sought to determine the dose-dependent relationship of 5-FU in this combination therapy at an intermediate timepoint with enhanced immunohistochemical analysis.

Methods: This was a prospective experimental study performed in a murine model. Twelve SKH-1 Elite hairless mice were randomized into four treatment groups for post-incisional wound treatment: microneedling with topical saline, or 5-FU at concentrations of 25 mg/ml, 50 mg/ml or 100 mg/ml.[2] Two parallel incisions were created on the mouse cranial dorsum and closed with 6-0 polypropylene suture (Figure 1), removed at post-incision day 7 (Figure 2). Combination wound treatments were performed on post-operative days 14 and 28. Cutaneous biopsies were obtained on day 56, and slides processed with hematoxylin and eosin (H&E), collagen type IV and smooth muscle actin stains. Specimens were analyzed by a dermatopathologist, blinded to treatment group, for collagen thickness, lymphocytic infiltration and histiocytic response. Immunohistochemical slides were analyzed for sub-epidermal basement membrane zone thickness and myofibroblast quantity. Statistical analyses were performed using two-sample two-tailed t-tests.

Results: Combination treatment with saline or 5-FU was performed on six incisions (three mice) per treatment group. No post-surgical or treatment complications were observed. Histopathologic evaluation of biopsy tissue specimens with H&E stain showed significantly thicker collagen deposition in the 100 mg/ml treatment group, compared to controls ($p = 0.0209$). There was no statistical difference in deposition between the saline and 5-FU treatments at the 25 mg/ml and 50 mg/ml concentrations ($p = 0.0734$ and $p = 0.1739$). A trend toward increasing lymphocyte density was observed in the 5-FU treatment groups, peaking at the 50 mg/ml concentration, which did not reach statistical significance. A trend towards higher granuloma density was seen in the 5-FU treatment groups, also peaking at a 5-FU dose of 50 mg/ml. The degree of granulomatous inflammation was statistically higher in the 50 mg/ml treatment group, as compared to the controls ($p = 0.0325$) (Figure 3).

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Immunohistochemical analysis revealed a trend toward thicker basement membranes with higher concentrations of 5-FU used, reaching statistical significance between controls and those treated with 100 mg/ml 5-FU ($p = 0.0493$) (Figure 4). Smooth muscle actin stain quantification of myofibroblast density demonstrated a trend toward decreasing myofibroblasts with increasing doses of 5-FU (Figure 5).

Conclusions: Our results reconfirm that microneedling is an effective topical subepithelial drug delivery system, and further suggest a beneficial dose-dependent immunomodulatory effect of 5-FU on intermediate wound healing when used in combination with microneedling. Wounds treated with topical 5-FU and microneedling exhibit decreased myofibroblast proliferation, and robust regeneration of the basement membrane, both known correlates of optimized aesthetic healing.[3-8] Treatment with topical 5-FU and microneedling enhanced key inflammatory processes necessary for optimal wound healing, including selective lymphocytic infiltration and granulomatous wound cleansing.[9-11] Granuloma and lymphocytic prominence were maximized at a 50 mg/ml 5-FU dose, while collagen and basement membrane regeneration and myofibroblast diminution were optimized at a 100 mg/ml dose. We thus recommend use at a mid-range 50 mg/ml concentration to simultaneously maximize efficacy and minimize complication risk.

Figure 1

Figure 2

Figure 3

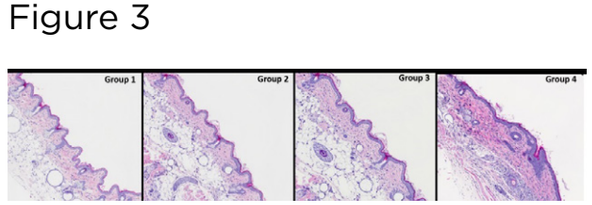


Figure 4

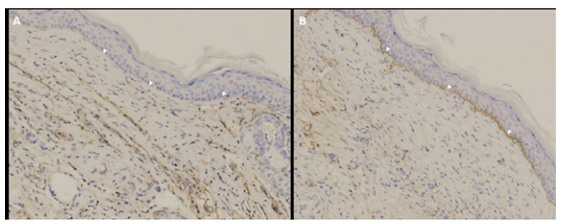
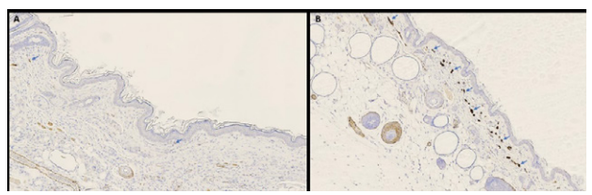


Figure 5



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4:37 – 4:40 pm

The Effect of Oculofacial Surgical Drape Choice on Airborne Particle Exposure

Mark Krakauer[1], Josh Hansen[2], Azam S. Husain[1], Vinay K. Aakalu[3], Asad Chaghtai[4], Eyas Amr[4], Marc Melendez[4], Jeffrey D. Henderer[1], Tina Felfeli[5], Efrem D. Mandelcorn[5], Erkan Tuzel[2]

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Introduction: Oculofacial surgery presents particular challenges with regard to respiratory particle exposure: many surgeries are performed with the patient awake; the surgeon and surgical assistants are in close proximity to the patient's mouth and nose; and at least the upper face needs to be exposed. Surgeons have a variety of draping techniques from which to choose. We sought to examine the effect of varied surgical draping techniques on droplet exposure under hypothetical office and operating room procedure conditions, using a novel cough simulator.

Methods: A cough simulator was designed to eject air from a nozzle placed in a manikin's mouth, at a pressure of 350 kPa through a mist of nebulized saline running at 7 L/min (Figures 1 and 2). The simulations were performed in an operating room with the manikin supine. An optical particle counter was placed at the surgeon's working distance and measured the number of particles for 60 seconds after a simulated cough. Drapes tested included a surgical towel, 1000 drape, and 1020 fenestrated drape, which were placed over the manikin's lower face. In the simulated office procedures, the tests were run with and without a face mask, and for operating room procedures, with and without suction placed by the manikin's mouth (Tables 1 and 2). Each condition was tested three times. The particle counter data were analyzed using the statistical program, R.

Results: The cough simulator produced a predictable and repeatable jet of air containing various particle sizes that traveled at approximately 10 m/s. With each cough, the increase of particle counts in each size increment was inversely proportional to particle size. There was a large and statistically significant difference between the negative control of no drape compared to any drape, but no meaningful differences between drape types or when a procedure mask was on the manikin. Suction modestly reduced particle exposure when there was no drape, but produced no statistically significant differences when a drape was present. When comparing similar draping techniques across in-office procedure and operating room procedure simulations, there was a modest reduction in particle exposure in the operating room procedure simulations, which points to a benefit in tucking the edges of the facial drape underneath a U-drape.

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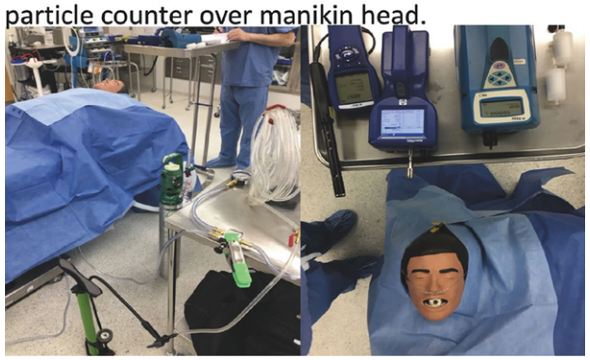
Conclusions: The placement of any tested covering over the mouth and nose of the supine manikin significantly reduced particle exposure from a simulated cough.

Figure 2. Cough simulator system with optical particle counter over manikin head.



Cough simulator block diagram

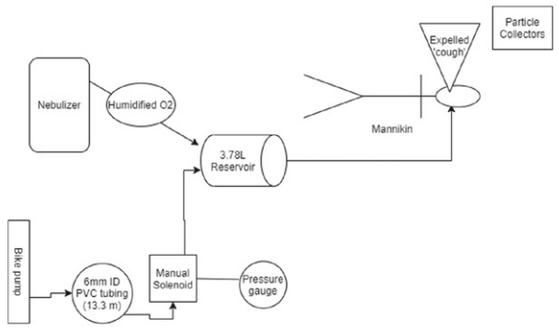


Table 2. Operating room procedure experimental groups (with nasal cannula oxygen at 4 L/min; U-drape around head; no face mask)

No suction	Suction
No drape	No drape
Surgical towel	Surgical towel
1000 drape without slit at chin	1000 drape without slit at chin
1000 drape with slit at chin	1000 drape with slit at chin

Table 1. Office procedure experimental groups

No face mask	Face mask
No drape	No drape
Surgical towel	Surgical towel
1000 drape	1000 drape
1020 (fenestrated) drape	1020 (fenestrated) drape

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Management and Outcome of Congenital Anophthalmos and Severe Microphthalmos

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Introduction: The management of congenital contracted socket due to anophthalmos and microphthalmos is challenging. This study was done to evaluate the surgical-prosthetic management and outcome of congenital anophthalmos and severe microphthalmos.

Methods: Retrospective, interventional study of 25 eyes of 25 patients over 8 years. Outcome was favourable if a well-fitting prosthesis with good cosmesis could be achieved.

Results: 25 consecutive patients, 6 anophthalmos and 19 microphthalmos, M:F 15:10, and a mean age 12 y (1m-37y) were included in the study. Baseline vertical palpebral fissure (VPF) was 3.9 (1-8) mm and horizontal palpebral fissure (HPF) 20.7 (10-28) mm. Management included socket expansion (with graduated conformers until VPF and HPF and at least 75% of normal or stable for 3m with no further expansion) in 11, followed by surgery and primary surgery in 14. Of 6 with orbitopalpebral cyst, 5 had aspiration and sclerotherapy. Overall, 13 had enucleation + implant, 3 evisceration + implant, 2 mucus membrane graft, and 3 dermis fat graft. There was an average increase of 6mm in VFH and 13 mm in HPF. At the last follow-up at a mean of 2.7y, 15 (60%) had a favourable outcome.

Conclusions: Sustained efforts at sequential socket expansion, surgery and prosthetic management results in favourable outcome in about two-thirds of patients. Despite considerable socket expansion by prosthetic and surgical measures, and increase in the size of the palpebral fissure, a well-fitting prosthesis with good cosmesis could be achieved in 60% of patients.

Figure 1

Figure 1: Figure 1: A. Clinical photograph of a 6-month-old child with severe microphthalmos who underwent enucleation with implant, B. Child at 8-years of age with a well fitted custom ocular prosthesis

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Nocturnal Observations and the Etiology of Floppy Eyelid Syndrome

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Introduction: The purpose of this report is to elucidate the etiology of floppy eyelid syndrome and its association with sleep apnea. Culbertson and Ostler in their 1981 seminal paper named and described the Floppy Eyelid Syndrome.[1] They hypothesized that the affected eyelids spontaneously everted during sleep but admitted the etiology evaded explanation. Other proposed etiologies include local tarsal ischemia due to poor ventilation from sleep apnea.[2]

Methods: Case series — Clinical examinations and sleep histories of more than 50 patients referred to our clinic with floppy eyelid syndrome (FES) explain the etiology of this phenomena. Convincing photographic evidence for a mechanical etiology resulted when FES patients were photographed during sleep by partners or during sleep lab studies.

Results: Our clinical observations suggest the cascade of events that lead to FES as follows. A subset of mainly obese patients with sleep disordered breathing sleep face down with an arm, pillow, or both elevating the upper face away from the bedding allowing the mandible to descend toward the bedding, opening the airway and thus reducing the number of sleep apnea episodes. Rather than spontaneously evert, the floppy eyelid is the result of years of sleeping in such a position with the upper lid chronically stretched by such a position. The other associated findings; lash ptosis, mucous discharge, papillary conjunctivitis, orbit fat herniation unilaterality or bilaterality are all a consequence of this sleep positioning. Sleep photographs documenting the stretch of the eyelid due to such sleep positioning prove to be the “piece de resistance”.

Conclusions: Face down sleep positioning to reduce sleep apnea episodes in patients with sleep disordered breathing leads to chronic traction/stretching of the upper eyelid away from the ocular surface during sleep. The chronicity of this condition leads to the development of FES and its associated findings. The first order of treatment for FES should be diagnosis and treatment of the sleep disordered breathing before surgical eyelid intervention is considered.

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Figure 1

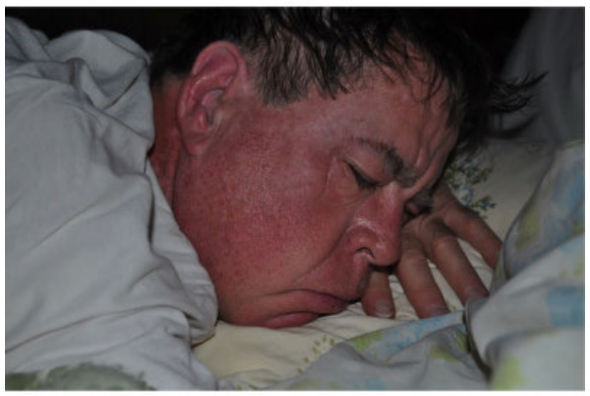


Figure 2

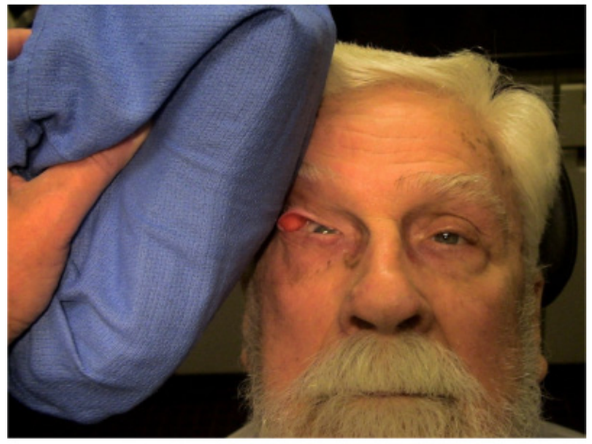


Figure 3

Figure 4

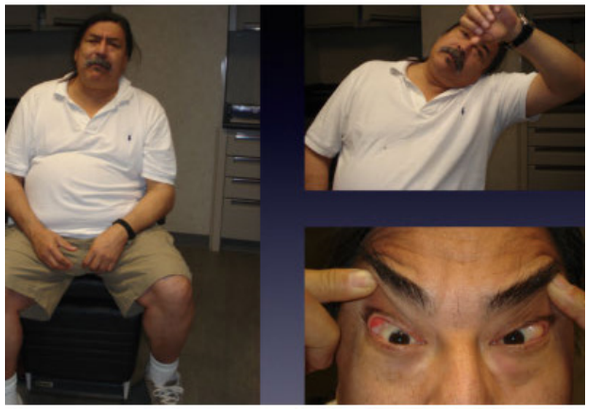
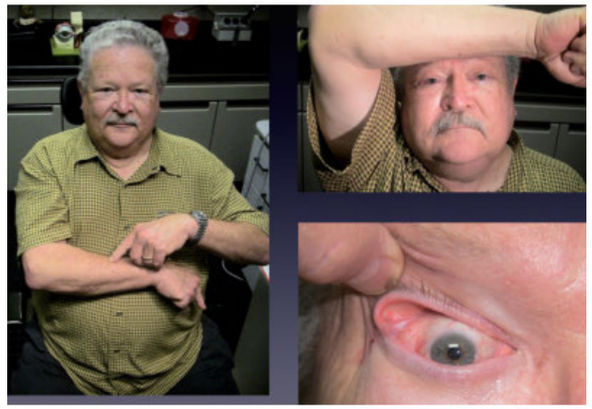


Figure 5



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Reliability of Ptosis Diagnosis on Assessment Via Video Consultation

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Introduction: To examine the reliability of adult ptosis assessment in video consultation and to propose a systematic ptosis assessment on video consultation.

Methods: This is a retrospective, comparative, case series. The surgical waiting list for ptosis surgery between August 2020 – January 2021 was checked and only cases listed for surgery via video consultation assessment without any previous face-to-face consultation, were included.

The following was collected for patients who underwent video consultation before surgery: demographic data, date of video consultation, level of experience of clinician (Consultant/ Fellow/ Resident), side of ptosis, estimated levator function, Cogan's twitch sign, fatigability test, eye motility, presence of lagophthalmos, questions ruling out Myasthenia Gravis or other myopathies, if the surgery was performed/cancelled, date of surgery, type of procedure, side and surgeon experience.

Results: 176 patients underwent ptosis surgery between Aug20 and Jan21. From them, 45 patients (25.6%) had only video assessment prior to surgery when ptosis was diagnosed and patient was listed for surgery. Video consultation was done by: Consultant: 30 cases (67%); Fellow: 15 cases (33%). 36 patients (80%) eventually underwent ptosis surgery. Surgery was cancelled in 9 cases (20%). In only 2 cases (4.44%) the surgery was cancelled due to misdiagnosis of ptosis (confirmed on the day of surgery during pre-surgical face-to-face assessment). Although ptosis was confirmed in the other 7 cases (15.55%) surgery was cancelled for other reasons. Reliability of ptosis assessment via video consultation was correct in 43 cases (95%) (p_value=0.156, chi_ square). In most of the cases ptosis assessment in video included: estimation of levator function, eye motility and lagophthalmos check but not all cases had Cogan's twitch sign, fatigability test and questions to rule out Myasthenia Gravis performed.

Conclusions: The single published study on video assessment for ptosis dates 20 years. This updated study has shown that modern video consultation is an efficient and reliable way to assess patients with ptosis. Although an accurate and more thorough ptosis assessment is advised there was no difference between accuracy of diagnosing on those who did not do the full suggested assessment.

Upper Eyelid Elevation in Acquired Ptosis with Once Daily Oxymetazoline 0.1% Administration in Patient Subgroups Defined by Severity of Baseline Visual Field Deficit

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Introduction: Acquired ptosis is a common condition of the upper eyelid that can negatively affect appearance and cause clinically meaningful superior visual field deficits. The July 2020 FDA approval of a topical oxymetazoline 0.1% solution has introduced a novel treatment option for acquired ptosis in adults, and clinical reports have demonstrated its overall efficacy and safety. Because clinical practices can benefit from a more detailed understanding of the effectiveness of this pharmacologic treatment option in patients with varying degrees of ptosis, the present analysis evaluated upper eyelid elevation following RVL-1201 administration in clinical trial participant subgroups defined based on the severity of their baseline superior visual field deficit.

Methods: In two randomized phase 3 clinical trials, a total of 304 subjects used RVL-1201 or placebo (vehicle solution) once per day in both eyes, for 42 days. Three participant subgroups were defined based on the number of points detected at baseline in the superior visual field of the Leicester Peripheral Field Test, which is a modified Humphrey visual field test (≤15 points [most severe deficit; n=120 participants]; 16-20 points [n=95 participants]; and ≥21 points [least severe deficit; n=89 participants]). The change from baseline in upper eyelid elevation (assessed via measurement of marginal reflex distance 1 [MRD-1]) in these subgroups was analyzed on treatment days 1 and 14.

Results: In comparison to vehicle, RVL-1201 produced a significantly greater mean increase in MRD-1 at 2 hours post-instillation on treatment days 1 and 14 across all three superior visual field deficit subgroups (all $p<0.01$). Similarly, significantly greater mean improvement with RVL-1201 was observed at 6 hours post-instillation on both days in participants with the most severe (≤15 points seen) and least severe (≥21 points seen) baseline deficits ($p<0.05$ vs. vehicle). In the 16-20 baseline points group, a numerical but not statistical improvement was observed at 6 hours on both treatment days evaluated.

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Conclusions: Among other factors, the presence of a measurable superior visual field deficit provides functional justification for acquired ptosis treatment. This analysis expands on previously reported efficacy findings, revealing a significant effect of RVL-1201 on eyelid elevation in patients with acquired ptosis and various degrees of functional superior visual field impairment. These findings further support the clinical use of RVL-1201, demonstrating the efficacy of this topical solution in patients with both mild and more severe superior visual field impairments due to acquired ptosis.

Intralesional Rituximab Treatment for IgG4-Related Dacryoadenitis

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Introduction: IgG4-related disease (IgG4-RD) is characterized by tumefactive lesions that can involve various anatomical structures. Serum IgG4 levels may be elevated and histopathology reveals a lymphoplasmacytic infiltration, fibrosis and obliterative phlebitis. Typical orbital disease (IgG4-ROD) include dacryoadenitis, enlarged orbital nerves (commonly the infraorbital), orbital fat involvement, and extraocular muscle infiltration. Corticosteroids have thus far been the mainstay of treatment. While the initial response is often excellent, relapse is frequently (50%) seen upon tapering or stopping the medication, and steroid toxicity is well established for chronic usage. Rituximab is typically well tolerated and has shown a favorable response as a second line agent in the treatment of idiopathic orbital inflammation and IgG4-ROD. Intralesional rituximab has recently been reported in the treatment of ocular adnexal lymphoma. Here we report our experience in treating IgG4-related dacryoadenitis with intralesional rituximab as a first line agent.

Methods: Retrospective interventional study of 11 consecutive patients treated with intralesional rituximab for isolated IgG4-related dacryoadenitis between 12/2015 – 10/2020. Diagnosis was made based on history, exam, radiography and histopathology. To meet inclusion criteria biopsy samples had to show IgG4:IgG >50% and > 100 IgG4 cells per high power field. Patients were given a 1ml intralesional dose of rituximab (50 mg/1mL) transconjunctivally into the palpebral lobe of each involved lacrimal gland and followed for at least 6 months. All patients were followed with serial systemic surveillance, clinical exams, IgG4 serology and MRI imaging. Exclusion criteria included: age < 6 months. The IgG4-RD Responder Index (IgG4-RD RI) was used to measure disease activity prior to and after treatment. Pre- and post-treatment values were compared with a paired T-Test with significance threshold set at $p<0.05$.

Results: A summary of patient data is illustrated in Table 1. Six females and 5 males had a mean age of 41.3 (range, 31-58). Average duration of disease prior to treatment was 2.58 months (range, 1-4). Six (67%) of the patients had elevated serum IgG4 levels. All patients had bilateral disease. All patients showed clinical and radiographic resolution within 4 weeks of treatment. There was one case of relapse 7 months after treatment that was successfully treated with repeat injection. The mean follow-up was 23.3 months (range, 10-44). The mean IgG4-RD RI values declined steeply after treatment (222.4 to 74.4, $p<0.01$). Serum IgG4 levels normalized for all patients that began at high levels prior to treatment. No patients experienced side effects of rituximab, nor did any patients develop systemic IgG4 disease.

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Conclusions: Intralesional rituximab appears to be a well-tolerated and effective treatment option for IgG4- related dacryoadenitis. The authors believe this to be the first report describing intralesional rituximab used for this diagnosis. Clinicians may wish to consider its use in such cases.

Table 1

Case #	Age	Sex	Duration of Disease (months)	Blood IgG4 level (mg/dl, nml 4-86)	IgG-4RD Responder Index score	IgG-4RD Responder Index score post treatment	Results of Treatment	Relapse	Follow-up (months)	Side Effects
1	37	M	2	High 220	244	76	Resolution	None	39	None
2	42	M	4	High 186	282	64	Resolution	None	34	None
3	58	F	3	Normal 48	196	58	Resolution	None	44	None
4	39	F	4	High 226	198	120	Resolution	None	34	None
5	46	M	2.5	High 266	202	60	Resolution	None	28	None
6	31	F	1	Nml 60	228	88	Resolution	None	27	None
7	43	F	2.5	High 202	204	66	Resolution	None	16	None
8	39	F	2	High 190	240	72	Resolution	None	14	None
9	37	M	2.25	Nml52	208	66	Resolution	None	13	None
10	36	F	3.25	Nml48	222	92	Resolution	yes	10	None
11	41	M	1.5	High 224	248	72	Resolution	None	13	None

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Peripunctal Mass Lesions: Clinicopathological Analysis and Outcomes – A Multicentric Series

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Introduction: Peripunctal tumors are uncommon lesions with a reported incidence of 6.3% of all punctal anomalies and 0.27% of all surgical oculoplastic patients. The spectrum of reported peripunctal lesions include pigmented nevi, epithelial inclusion cysts, non-pigmented compound nevi, squamous and verrucous papilloma, lymphangioma, sebaceous gland carcinoma, squamous cell carcinoma, pyogenic granulomas, oncocytomas and pseudoepitheliomatous hyperplasia

Methods: Multicentric retrospective case series involving 6 centers. All cases of peripunctal masses with histopathological diagnoses and minimum follow-up of 3 months were included. Demographic data, clinical photographs, objective assessments of clinical improvement were assessed before and after treatment.

Results: A total of 50 patients were included. The mean age was 46.4 years (range: 12-76 years). The mean duration of complaints was 27.4 months (range: 1-120 months) and mean follow-up period after surgery was 15.8 months (range: 3-120 months). The most common presenting complaints were a mass lesion/cosmetic concern (82%), followed by epiphora (48%) and foreign body sensation (16%). The most common lesion was melanocytic nevus (19/50; 38%), followed by squamous papilloma (8/50; 16%), hidrocystoma (7/50; 14%) and epidermoid cyst (7/50; 14%). Three cases of malignant tumors were diagnosed: two cases of sebaceous gland carcinoma and one case of squamous cell carcinoma. In all, 21/50 (42%) cases underwent excision with the placement of a Mini-Monoka® stent, whereas the remaining 29 cases underwent only excision. At final follow-up, a healed punctal opening was visible in 46/50 (92%) of the cases; 2(4%) cases had a slit-like punctum and in one case (2%), a stenosed punctum was visible. However, only one case (2%) reported epiphora at follow-up.

Conclusions: Peripunctal masses are largely benign and present most commonly on the lower eyelid. Melanocytic nevus is the most common peripunctal mass lesion**.** In our series, stent placement did not play a significant role in the functional outcome.

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Figure 1

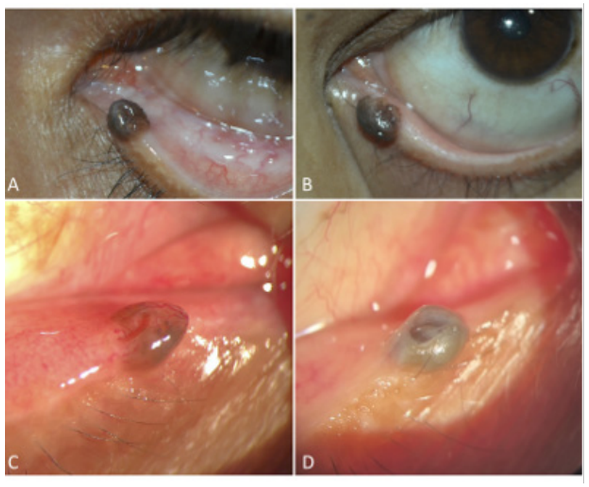
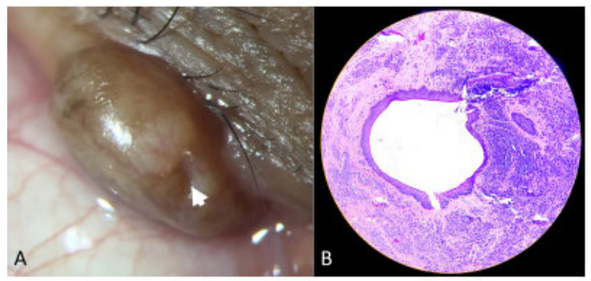


Figure 2



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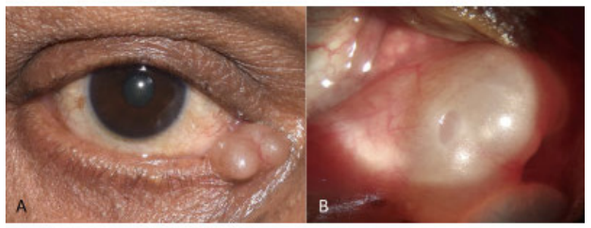

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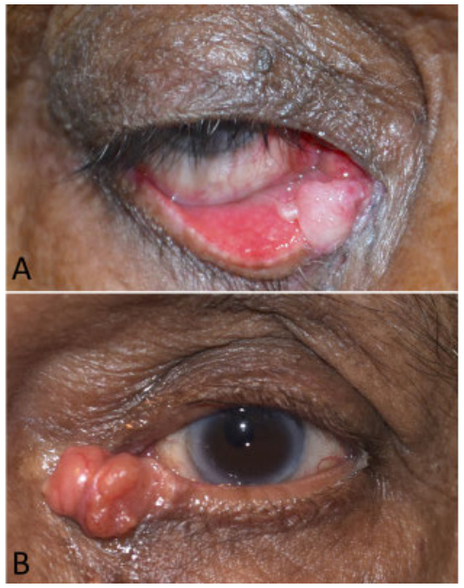
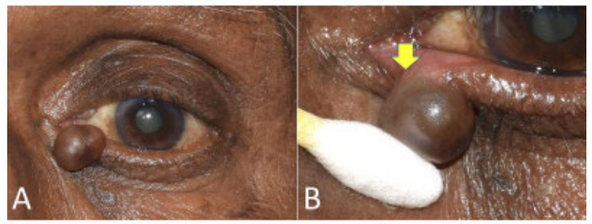


Figure 5



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Hiding in Plain Sight: Periocular Sebaceous Cell Carcinoma Masquerading as Lash Misdirection

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Introduction: Two patients with periocular sebaceous cell carcinoma presenting as lash misdirection without madarosis, an uncommon presentation of this potentially aggressive malignancy.

Methods: Case report.

Results: Case 1: An 80-year-old female with 1 year history of foreign body sensation of right eye originally diagnosed as trichiasis presented with right medial upper eyelid thickening and entropion with lash-cornea touch (Figure 1). On eyelid eversion, there was no scarring of the palpebral conjunctiva or thickening of the tarsal plate. Initial right upper lid medial entropion repair was recommended, but patient elected serial focal epilation with close monitoring. Three months later she agreed to surgery, consisting of tarsotomy with tarsal biopsy. Pathology demonstrated acute and chronic conjunctivitis without malignancy. Post-operatively she did well but at month 4 developed recurrent medial entropion. A subtarsal scar was present from prior biopsy without other tarsoconjunctival abnormality. Full thickness right upper eyelid wedge resection with direct closure was performed. Histopathology revealed sebaceous cell carcinoma with malignant cells invading into the superficial stroma and extending to the resection margin (Figure 2). Immunostaining was strongly positive for cytokeratin 7, androgen receptor, adipophilin, and moderately positive for BerEp4, altogether consistent with sebocytic lineage (Figure 3).[1] A systemic workup revealed no metastasis. She underwent wide local excision with negative permanent margins at the eyelid and conjunctival map sites followed by reconstruction via semicircular flap and stent placement.[2,3] At post-operative month 1 she was found to be healing well (Figure 4).

Case 2: An 81-year-old male presented with a 1 year history of recurrent trichiasis of the left upper eyelid. His past ocular history was notable for glaucoma suspect for which he was using betaxolol and travoprost OU. Patient endorsed presenting to an optometrist for epilation every 6 weeks over 1 year before referral to the oculofacial plastic service. On exam, left upper eyelid thickening, central entropion and trichiasis, and conjunctival injection were noted (Figure 5). He underwent tarsal and conjunctival map biopsy. Pathology demonstrated sebaceous cell carcinoma with diffuse spread to the bulbar conjunctiva. Tumor board recommendation was exenteration with sentinel node biopsy over topical mitomycin C therapy.[4] Unfortunately, patient was thereafter lost to follow-up with family reporting his passing 3 months later from an acute coronary syndrome.

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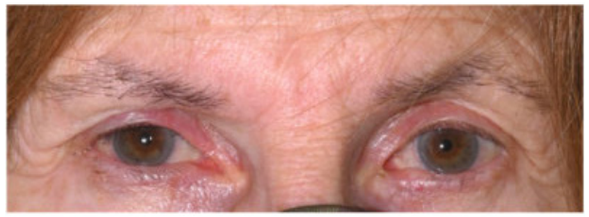
Conclusions: Madarosis is a classic finding seen in destructive malignancies of the eyelid.[5] In these two cases, lash misdirection was the presenting finding. The first case presented as focal entropion with no macroscopic signs of malignancy. In the second case, entropion and trichiasis were predominant but masked by prostaglandin induced hypertrichosis. These two cases highlight that sebaceous cell carcinoma does not necessarily present with madarosis and stays true to its moniker as the great masquerader.

Figure 1



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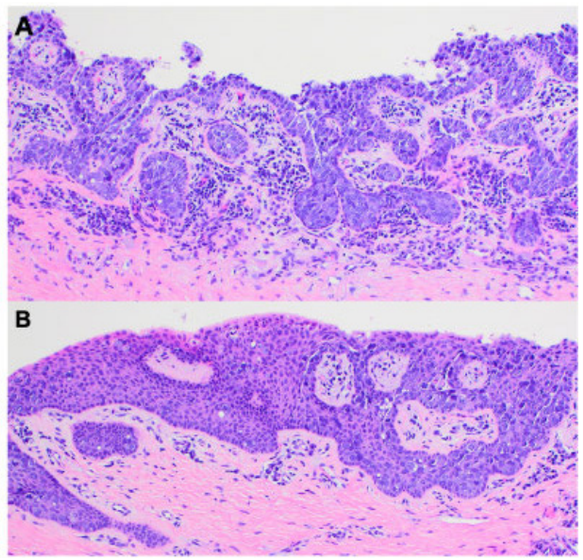

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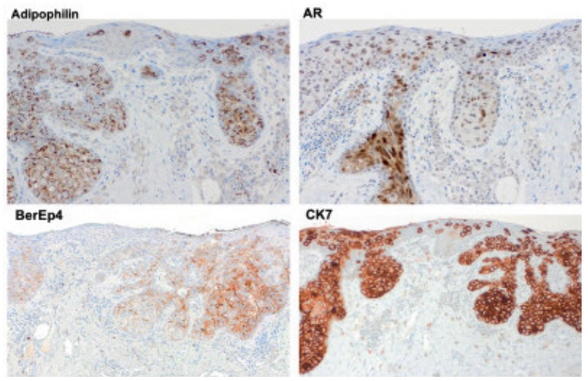

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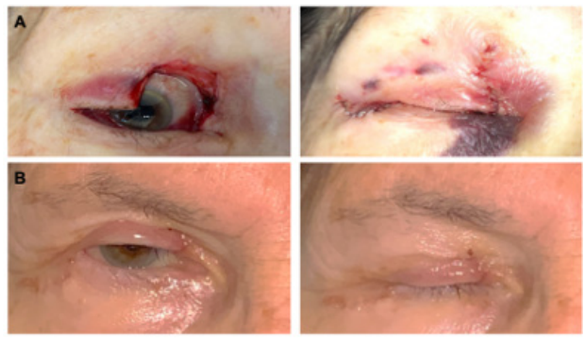

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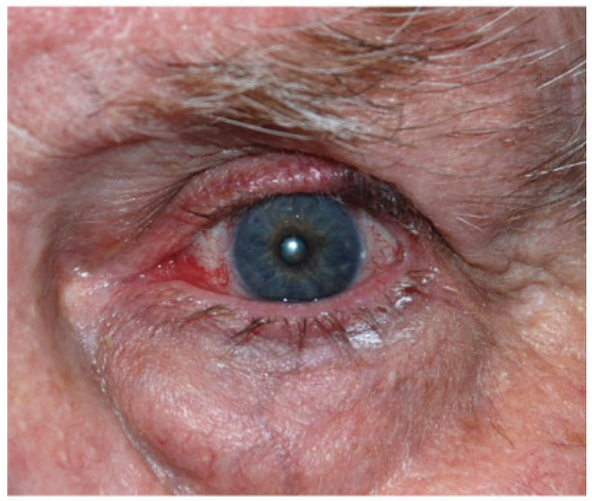

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Orbital Liposarcoma: A Surveillance, Epidemiology and End Results (SEER) Database Study

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Introduction: Orbital liposarcoma is a challenging tumour to treat due to a high rate of local recurrence, and the role of both radiotherapy and chemotherapy remain unclear.1 While liposarcoma is a common soft tissue sarcoma elsewhere in the body, primary[1] and/or metastatic[2] involvement of the orbit is rare. Analysis of big data may improve our overall understanding of orbital disease and role of adjuvant therapies.

Methods: Data was extracted from the Surveillance, Epidemiology and End Results (SEER) Research Plus database from 1975 – 2017. All patients with a diagnosis of liposarcoma (ICD-O3 codes 8850-8858, 8869-8862, 8870, 8880, 8881) were included. Cases were divided into three groups by primary site: orbit, retroperitoneal and other.

Results: A total of 16,241 patients were included. Patients with orbital involvement were younger (Figure 1) and more likely to be female (Figure 2) ($p<0.05$). Amongst orbital lesions, myxoid liposarcoma was the most common histologic subtype (6/19; 31.6%) followed by well differentiated (5/19; 26.3%). This differed from the distribution of histologic subtypes encountered elsewhere, for which well-differentiated liposarcoma was the most common (retroperitoneum = 976/3106; 31.4%, other sites= 3963/13,116; 30.2%, $p<0.05$). Patients with orbital liposarcoma had lower disease specific mortality (4/19; 21.1%) compared to those with retroperitoneal disease (1120/3106; 36.1%) ($p<0.05$) (Figure 3). All locations were combined, myxoid liposarcoma was associated with the most favourable prognosis (Figure 4) and there was no difference in survival for males and females.

Conclusions: Patients with orbital liposarcoma tend to be younger, are more likely to be female and appear to have a better prognosis, likely owing in part to the higher incidence of myxoid tumors in this sub-group.

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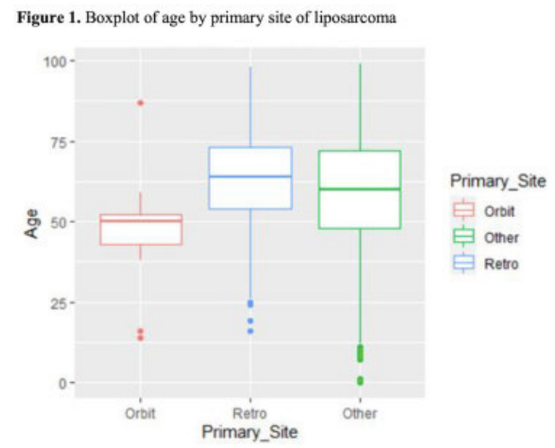
Figure 1



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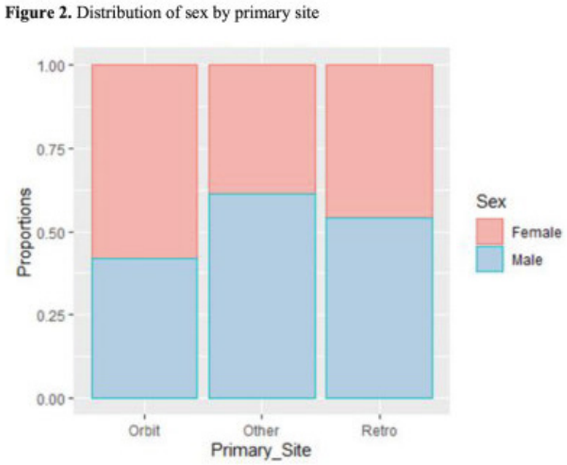

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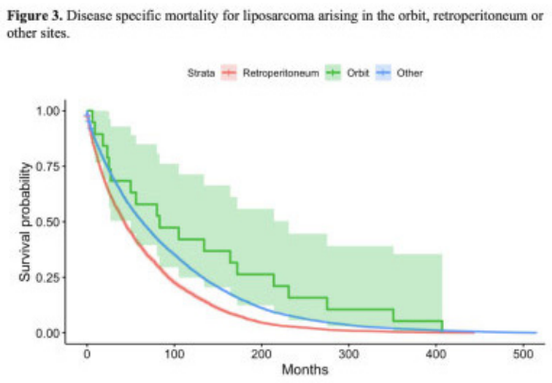

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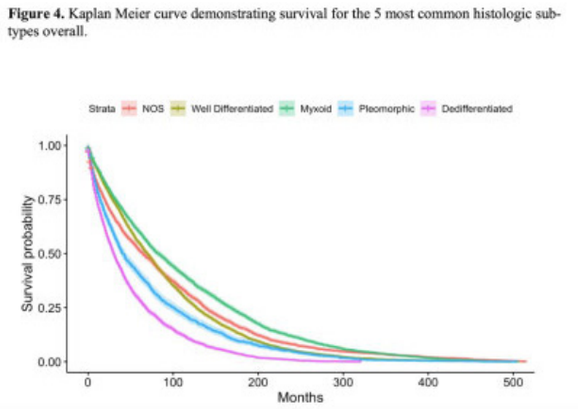

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Orbital Solitary Fibrous Tumor – Clinical Manifestations, Management and Outcome

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Introduction: Orbital Solitary Fibrous Tumor (SFT) is a rare mesenchymal tumor. Considering the rarity of the disease it is appropriate to understand the clinical manifestations, radiological correlation, histopathology and optimal management of SFT.

Methods: Retrospective, interventional, consecutive case series over 25 years.

Results: 35 patients with SFT constituted 1% of all orbital tumours. Median age was 34 (range 14-63) years with male predominance M:F 3.3:1. Chronic proptosis (mean 10 months) in 33 (94%) was the main presenting feature. Palpable mass was present in 21 (60%), located anteriorly 12 (34%) or supero-medially 8 (23%), with restricted motility in 2 (5%). Excision biopsy in 33 (94%) and incisional biopsy in 2 (6%), histopathology and immunohistochemistry confirmed the diagnosis. Adjuvant radiotherapy was given 14 (40%). Recurrence occurred in 10 (38%), more 9 (35%) in the group that did not receive radiotherapy (p=0.02). Re-excision and radiotherapy for recurrence achieved local tumor control in all. At a mean follow up of 10.9+6.9 years, all were alive and well.

Conclusions: Even though rare, orbital SFT has an aggressive course. Accurate diagnosis, meticulous surgical handling and complete excision, with expert histopathological analysis to categorise risk and well-planned adjuvant therapy are recommended to reduce the chances of local tumor recurrence and metastasis to ensure life salvage.

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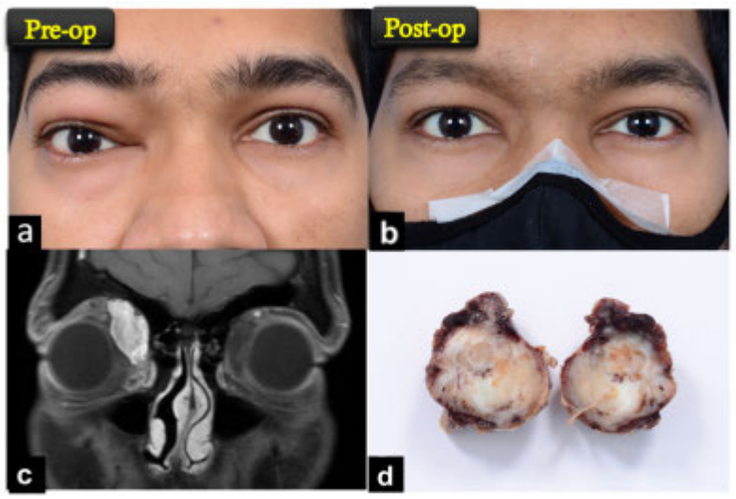
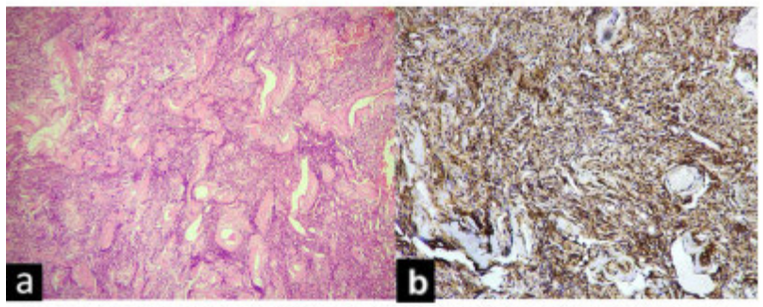
Figure 1



a: Pre-operative clinical picture of a 26-year-old boy who presented to us with the complaint of right upper eyelid swelling with a palpable mass. b: OD Orbitotomy followed by EBRT was performed and post-operatively at 9 months the patient showed excellent cosmesis. c: MRI showed an extra-conal hyperintense heterogenous lesion with post-contrast enhancement. d: Gross specimen showing cut-section of the lesion.

Figure 2



a: Light microscopy at 10x (Hematoxylin and Eosin) showing pattern-less growth pattern with myxomatous stroma. b. Immunohistochemistry revealed positive staining with CD 34 suggestive of solitary fibrous tumor.

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Adult Xanthogranulomatous Disease – A Misdiagnosed Rarity

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Introduction: Orbital and adnexal mass lesions can often result in a clinical dilemma. The purpose of our study is to define the clinical features, management and outcome of adult xanthogranulomatous disease (AXD).

Methods: Retrospective interventional case series of 14 patients presenting with orbital mass lesions and evaluated the clinical features, systemic associations, histopathology and outcome of AXD.

Results: There were 14 patients, 10 bilateral and 4 unilateral, with a mean age of 45.9 (20-66) y. Referral diagnosis was thyroid eye disease in 4, pseudotumor and infection in 2 each and lymphangioma in 1. Two patients had adult-onset asthma. Rubbery mass in the upper eyelid with a yellowish hue was seen in all. All underwent biopsy, 13 incisional/debulking and 1 complete excision. Histopathology showed aggregates of foamy histiocytes mixed with touton giant cells with CD68+ histiocytes and S100- on immunohistochemistry was confirmatory. None of our patients had systemic manifestations upon screening. Further treatment depending on the residual disease and severity included observation in 5, oral prednisolone tapered over 3 months in 2, and pulsed intravenous methyl prednisolone X 6 + oral azathioprine in 7. Of two who had recurrence, one received rituximab, and another was managed with radiotherapy. At the final follow-up of 15months, 7 (50%) showed stable regression, and 7 (50%) showed stable partial residual disease with no functional deficit.

Conclusions: AXD is a rare entity and is often misdiagnosed. Eyelid mass with yellow hue is clinically diagnostic, but histopathology is confirmatory. Systemic manifestations should be looked for but are rare. Excision, where possible, seems curative. Systemic steroids and immunomodulation help in regression or stability where complete excision is not feasible.

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Figure 1

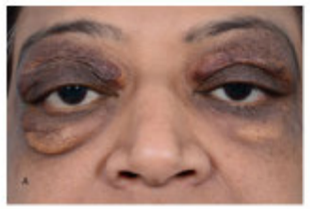

Figure A. Clinical photograph of 55 year old lady status post bilateral upper eyelid blepharoplasty elsewhere was diagnosed with adult onset xanthogranuloma following incisional biopsy.

Figure 2

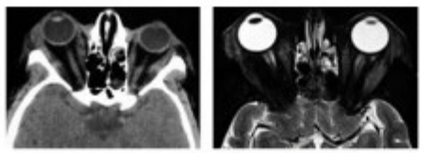

Figure B. Axial CT and MRI orbit showing proptosis of right eye, global thickening and moth-eaten appearance of the extra ocular muscles.

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Effect of Orbital Decompression on the Upper Eyelid Contour in Graves Orbitopathy

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Introduction: Eyelid retraction and lateral flare in TED is classically addressed after decompression. However some studies have suggested that MRD1 does not change significantly with decompression surgery[7] and subsequent reports propose simultaneous surgery as an viable option based on these findings.[3-6] Despite the documented stability of MRD1 with decompression, there is little available information regarding the effect of this surgery on eyelid contour and lateral flare.[8] This study aims to understand the relationship between decompression and eyelid contour in TED.

Methods: In this longitudinal cohort study, consecutive surgery naïve patients undergoing decompression for TED were included. Control volunteers without eyelid or orbital disease were additionally recruited. Demographic, clinical and surgical data were extracted. Photographs were obtained before decompression and 3 months after for TED patients and at presentation for controls. The eyelid contour was assessed in a manner previously described[9] and patients were divided in 3 groups based on this measurement: positive flare (F+), negative flare (F-) and control. For each image, Bézier lines were fit and a horizontal line bisecting the pupil was drawn along the y-coordinate zero. Nine midpupil-eyelid distances (MPD) were subsequently measured as vertical distances perpendicular to this line. The central line corresponded to the margin reflex distance (MRD1), and the eight additional measurements were equally distributed medially and laterally at 20% distance intervals (Figure 1). Change in each MPD with decompression as well as the association between proptosis reduction and MPD was assessed.

Results: The sample included 103 eyes of 66 patients (57 females) with a mean(SD) age of 48.3(11.8) years. Eyelid flare was noted in 61.16% of the cohort. In this group, all MPDs decreased after decompression ($p<0.05$). The measurements lateral to the pupil decreased to a greater extent than the comparable medial heights (all $p<0.001$, Figure 1). After decompression, lateral flare persisted in 60.3% of the patients (Figure 2). In the no-flare cohort, MPDr decreased significantly in the far lateral region only (Figure 1) ($p<0.05$). Patients included in the F+ cohort had greater reduction in MRD1 ($p=0.005$) and all lateral MPDr ($p<0.003$) as compared to F-. Proptosis reduction for the sample was 3.9(2.1)mm. There was no significant correlation between any MPD and proptosis reduction in either the F+ or F- groups. Deep lateral wall was approached in 69% of the cases, either alone or as part of a 2 or 3 wall procedure. Patients who
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underwent lateral wall decompression had a significantly greater reduction of all the lateral MPDr ($p<0.01$) as compared to the patients undergoing medial or infero-medial approach only.

Conclusions: In patients with quiescent TED, decompression alone appears to have a net reductive effect on eyelid retraction. This is more pronounced in patients presenting with significant lateral flare and independent of the decompressive effect. Lateral wall decompression imparts a greater reduction in lateral eyelid flare. These results suggest that a significant proportion of patients may not require eyelid retraction surgery after lateral decompression and it may be ideal to stage these procedures.

Figure 1

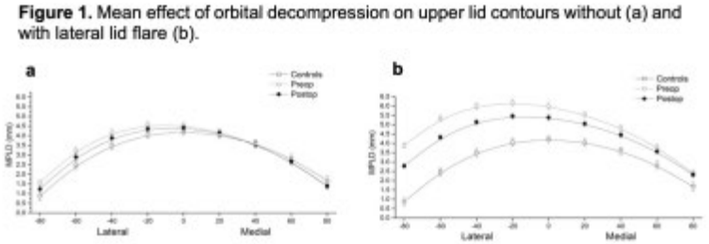

Figure 1. Mean effect of orbital decompression on upper lid contours without (a) and with lateral lid flare (b).

Figure 2

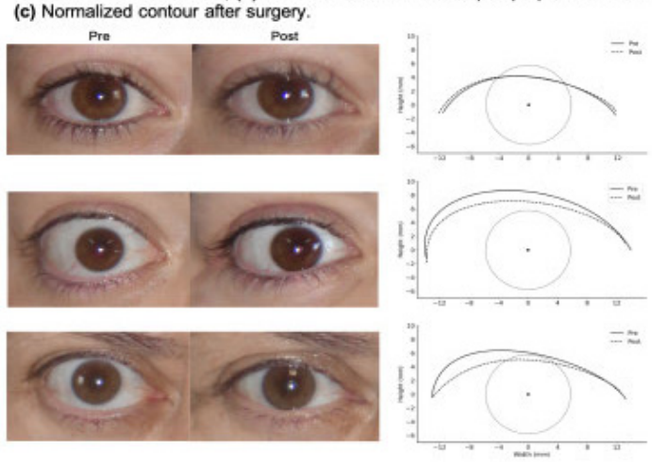

Figure 2. Variable effects of orbital decompression on upper lid contour. **(a)** No effect on a normal contour; **(b)** Persistence of lid flare despite proptosis reduction; **(c)** Normalized contour after surgery.

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Innovative Curriculum to Train Novices on Lateral Canthotomy and Cantholysis

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Introduction: Utilizing an interactive orbital compartment syndrome (OCS) model developed by Sonalysts Inc. (Waterford, CT) novices were trained to promptly recognize OCS and competently perform a lateral canthotomy and full-thickness cantholysis (LCC) as determined by standardized criteria.

Methods: 31 participants were screened to ensure they had no experience performing LCC. Pre and post-tests were administered to evaluate knowledge on identification and management of OCS. Following the pre-test, participants watched a pre-recorded video to learn about OCS and step-wise instruction on how to perform the LCC. Full-thickness cantholysis was chosen as the teaching modality because of ease of performance of procedure and evidence of greater successful completion in novices.

Participants then observed an instructor properly identify OCS and perform the LCC in a standardized fashion, followed by hands-on practice with direct mentoring. After three consecutive successful performances, the participants were tested under supervision of an independent subject matter expert in a simulated austere environment (Figure 1 & 2).

In the testing environment, one eye with OCS and one normal eye were presented. Trainees were expected to correctly identify the eye with OCS and perform a LCC within 3 minutes (Figure 3). Participants who did not attain 100% proficiency with required steps were remediated before retesting. Scoring was conducted in real time using an evaluation checklist (Figure 4) and head-mounted video recording, which was reviewed by a second masked grader for score validation. A confidence survey was measured before and after completion of the training.

Results: The participants had a first-time pass rate of 80.6% in the practical test; five participants required a second attempt, and one participant needed a third attempt which was attributed to device error. The majority of failures involved the inferior cantholysis step where participants failed to fully complete the cantholysis.

The average pre-test score was a 46.54 compared to post-test 67.74 (p-value <0.001). Questions regarding the clinical presentation of OCS, common mechanisms of trauma, and understanding need for emergent management prior to imaging showed significant improvement in scores. When viewing the post-course confidence survey, all questions showed marked improvement in confidence with a p-value <0.001.

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Conclusions: Orbital compartment syndrome (OCS) may cause permanent vision loss as early as 60-100 minutes.1 Our study confirms that, given appropriate training and simulation, a novice medical provider can be trained to promptly assess and address the vision-threatening complications of orbital compartment syndrome with the full-thickness LCC procedure.

The utility of this study provides the medical community with a framework for training that would allow them to provide rapid, vision-saving intervention. There is a correlation that is appreciated in the literature between visual impairment and quality-adjusted life years- the knowledge gained in this course has the ability to train others to take immediate action and avoid future morbidity in this patient population.[2]

Figure 1

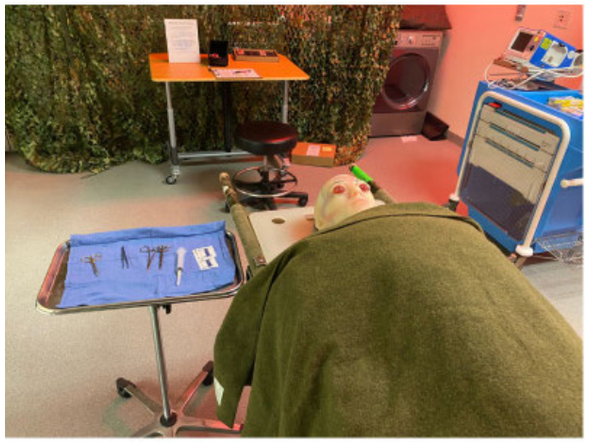

Figure 2

Figure 3

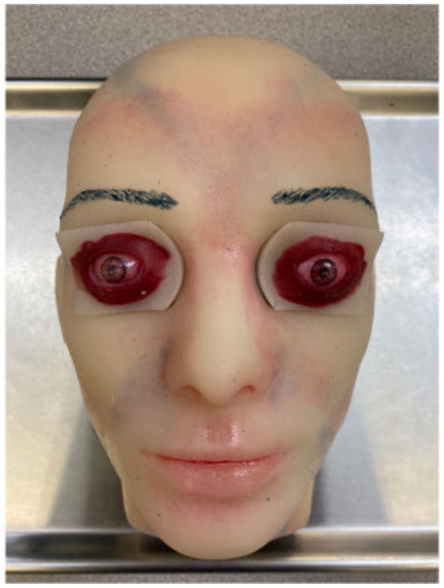

Figure 4

Section 1: Initial Evaluation/Diagnosis of Eye	Skill Met		Grader Notes
Palpate periorbital region for tense proptosis/Resistance to retropulsion	P	F	
Correctly identify the eye in need of Lateral Canthotomy and Cantholysis	P	F	
2nd Attempt at correctly identifying the eye			
3rd Attempt at correctly identifying the eye			
Intial Evaluation/Diagnosis Score (2 points):			

Section 2: Injection/Preparation	Skill Met		Grader Notes
Clean periocular region/eyelid skin (START TIMER AT THIS STEP)	P	F	
Inject 1-2% Lidocaine with Epinephrine along the canthus from margin to rim	P	F	
Crush lateral canthus with straight hemostat, jaws reach lateral fornix & orbital rim	P	F	
Injection/Preparation Score (3 points):			

Section 3: Lateral Canthotomy	Skill Met		Grader Notes
Horizontal cut made to the bony orbital rim	P	F	
Scissors used effectively (one in/one out, no more than 2 cuts to complete)	P	F	
Using scissors, complete a horizontal cut to the bony orbital rim	P	F	
	P	F	
Lateral Canthotomy Score (1 points):			

Section 4: Cantholysis	Skill Met		Grader Notes
Tactile feedback used (visible strumming of tendon?)	P	F	
Eyelid appropriately grasped and eyelid everted with Advon Forceps	P	F	
Scissors pointed toward the lateral oral commisure/nasal ala	P	F	
Full thickness cut of the lower eyelid performed to complete cantholysis (lid can be pulled away from orbit)	P	F	
Verification of completion (Palpation) (STOP TIMER HERE AFTER VERIFICATION)	P	F	
No advertent injury to the Globe	P	F	
Time to completion of procedure LESS THAN 3 minutes	Y	N	
Cantholysis Score (6 points):			
REAL TIME of procedure:	____ : ____ (min) (sec)		Time from when subject cleanses periorbital region to when subject verbalizes DONE
Final Score (12 points total)			

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Microbial Patterns in Orbital Cellulitis

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Introduction: We sought to determine the prevalence and types of pathogenic organisms found in children with orbital cellulitis, in order to help inform and update strategies for choice of empiric antibiotic coverage.

Methods: Retrospective consecutive cohort study of children admitted to a tertiary children's hospital over an 8-year period with a clinical diagnosis of orbital cellulitis confirmed by orbital imaging. Primary outcomes were the prevalence and types of organisms grown by culture. Secondary outcomes included polymicrobial infection, defined as the growth of 2 or more organisms from sources other than blood, mixed aerobic-anaerobic infection, and effect of patient age on culture results.

Results: Two-hundred thirty seven children with orbital cellulitis were studied. Cultures were obtained from 124 (52%) children, of whom 55 (44%) had surgical intervention. The remainder of children with orbital cellulitis (113, 48%) were managed without a culture of any kind. Among the 124 children who were cultured, culture sources included 67 (54%) blood, 63 (51%) sinus and/or nose, 48 (39%) orbital, 11 (9%) ocular surface, 10 (8%) brain, and 5 (4%) eyelid/skin abscess, with some children having multiple culture sources. The prevalence of positive cultures was 58% (72 children); while cultures from 53 (42%) children had no growth. With regard to organism species, 41 (34%) grew streptococcus, 18 (15%) staphylococci sensitive to methicillin, 8 (6%) methicillin-resistant Staphylococcus aureus (MRSA), 6 (5%) other aerobic species, 16 (13%) other anaerobic species, 3 (2%) fungal species, and 29 (24%) were reported as normal respiratory or skin flora. With regard to number of organisms, 30 (24%) cultures showed polymicrobial infection and 41 (33%) monomicrobial infection. Polymicrobial status did not differ significantly with age from ages 1 to 14 years, ranging 41 % to 57%. Similarly, the rates of positive anaerobic cultures did not vary with age from ages 2 to 14 years, ranging 20% to 31%.

Conclusions: The most common microbes cultured from children with orbital cellulitis are streptococcus and methicillin-sensitive staphylococci species, though there is a large variety of specific organisms. Despite widespread concern about MRSA infections, only 6% of cultures were MRSA positive, suggesting that initial empiric coverage for MRSA is not indicated for orbital cellulitis. Prior research has suggested that children above age 9 years are more likely to have polymocrobial or mixed aerobic-anaerobic infections; however, we found consistent rates of polymicrobial and mixed aerobic-anaerobic infections across all ages in children with orbital cellulitis.

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Radiologic Predictors of Response to Teprotumumab

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Introduction: Clinical trials studying the use of teprotumumab in thyroid eye disease (TED) only included patients affected by active stage and moderate grade disease,[1,2] but as more real-world experience is gained, data on its effect in inactive stage and milder grade disease is being published.[3] From these studies, worse baseline clinical features (higher CAS, greater proptosis) have been associated with greater improvement (reduction in CAS and proptosis) following treatment with teprotumumab. Radiologically, treatment with teprotumumab appears to decrease both EOM and orbital fat volume,[4] yet it is unclear whether there may be baseline imaging characteristics that are predictive of response to teprotumumab.

Methods: Patients undergoing treatment for TED with teprotumumab were reviewed and all cases with pre-treatment imaging (CT and/or MRI) were included. All patients were assessed according to the VISA classification system at each patient visit. Clinical data was extracted regarding clinical signs and symptoms immediately prior to treatment with teprotumumab and at last follow up. Radiologic studies were reviewed and volumetric analysis was performed using 3D slicer (https://www.slicer.org/) (Figure 1). Additionally, maximal diameter of each rectus muscle was measured and scans were assessed for T2 hyperintensity within extraocular muscles (EOM), fatty infiltration and medial wall bowing. Primary outcome was defined as ≥2mm reduction in proptosis. Only the more proptotic eye, or a random eye if there was no asymmetry in measurements, was included in the analysis.

Results: A total of 25 patients with a mean age of 62.2 ± 11.8 years were included. Onset of TED occurred a median of 25.4 ± 28.0 months (range: 4 – 120 months) prior to initiation of teprotumumab. The primary outcome was achieved in 68% (17/25) of patients. This group had significantly greater medial rectus ($p<0.001$), inferior rectus ($p=0.044$) superior rectus ($p=0.038$) and total rectus volume ($p=0.002$) (Table 1). There was no significant difference in medial wall bowing ($p=0.662$), T2-hyperintensity of extraocular muscles ($p=0.076$) or presence of fatty infiltration ($p=0.913$) between patients who achieved the primary outcome and those who did not. There was no correlation between total extraocular motility restriction and total rectus volume ($p=0.403$). On multivariate analysis, total rectus

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volume was the only significant predictor (p=0.009) of ≥2mm reduction in proptosis following treatment with teprotumumab. Total rectus volume was also predictive of change in exophthalmometer as a continuous variable (p=0.027).

Conclusions: Total rectus volume is the most significant radiologic predictor of proptosis reduction following treatment with teprotumumab. There was no significant correlation between total rectus volume and extraocular motility restriction. Presence or absence of medial wall bowing, T2-hyperintensity and fatty infiltration of extra-ocular muscles was not predictive of response to teprotumumab.

Figure 1

Figure 1. (A) Two-dimensional and (B) 3-dimensional representation demonstrating orbital segmentation. All six extra-ocular muscles were segmented individually, as were the globe, optic nerve and orbital fat.

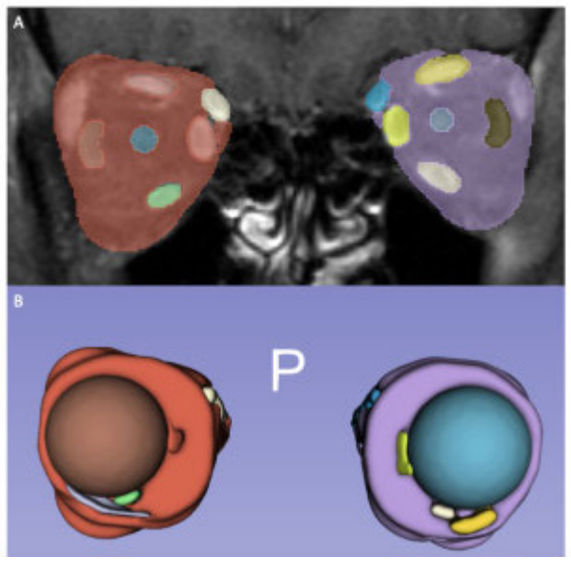

Table 1

Table 1. Univariate analysis of radiologic predictors for ≥ 2mm reduction in proptosis following treatment with teprotumumab.

	≥ 2mm reduction in proptosis	< 2mm reduction in proptosis	p-value
Superior Rectus Volume (mm³)	1469.4 ± 700.3	839.4 ± 393.5	**0.038**
Medial Rectus Volume (mm³)	1296.8 ± 646.0	638.0 ± 83.3	**<0.001**
Inferior Rectus Volume (mm³)	1356.2 ± 468.7	746.4 ± 397.4	**0.044**
Lateral Rectus Volume (mm³)	1067.1 ± 480.5	840.9 ± 277.1	0.234
Total Rectus Volume (mm³)	5247.0 ± 1695.0	3769.6 ± 1171.0	**0.002**
Orbital Fat Volume (mm3)	18972.3 ± 8561.3	17236.2 ± 14936.7	0.835

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Reduction in Extraocular Muscle Cross-Sectional Area Following Teprotumumab Treatment

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Introduction: Thyroid eye disease (TED) is known to cause inflammation, expansion, and fibrosis of the extraocular muscles and connective tissue of the orbit. Teprotumumab has been shown to cause a significant reduction in proptosis.[1,2] We report preliminary results of patients with TED showing marked reduction in extraocular muscle (EOM) volume and proptosis following treatment with teprotumumab.

Methods: Cases from one ophthalmic plastic surgeon were identified who had a diagnosis of TED and completed treatment with teprotumumab. Pre- and post-treatment computed tomography (CT) images were reviewed by an experienced orbital radiologist blinded to the patients' clinical condition. Reformatted oblique coronal images were created for each orbit in a plane perpendicular to the axis of the optic nerve, and an axial scan was used to mark a reference point 10 mm anterior to the optic canal using a method previously described.[3] The cross-sectional area (CSA) of the orbit, and of each muscle complex (superior, inferior, medial, lateral) was calculated at this reference point (Figure 1). The ratio of each muscle group to orbit CSA was calculated. Univariate analysis using two-sample independent t-tests was performed to compare pre- and post-treatment CSA ratios within patients and across patients. Statistical significance was set at $p<0.05$.

Results: To date, six orbits of three patients with TED following completion of teprotumumab treatment were analyzed (an additional 30 patients are anticipated to be included in this study prior to meeting presentation). CT imaging was obtained 3 months following treatment completion. For each patient, the ratio of each muscle group to orbit CSA was calculated pre- and post-treatment. A paired t-test was used to assess the difference between pre- and post- treatment both within patients and across patients. Within patients, there was a reduction in the mean of all muscle group to orbit CSA ratios post-treatment for all three patients (Table 1). This difference was statistically significant in patient 1 ($p=0.009$). Across patients, there was a statistically significant reduction in mean total muscle to orbit CSA ratio following treatment completion ($p=0.0008$) (Table 2).

Conclusions: Our findings demonstrate that extraocular muscle CSA is markedly reduced following treatment with teprotumumab, likely contributing to the proptosis reduction demonstrated in clinical trials.[1,2]

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Figure 1

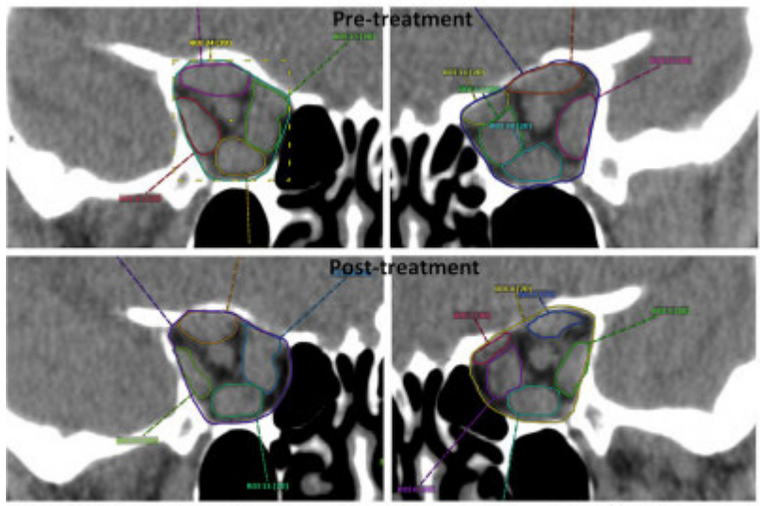

Figure 1. Reformatted oblique coronal images perpendicular to the axis of the optic nerve, with cross-sectional areas (CSA) of the orbit and of each muscle complex encircled. Representative pre-treatment (top) and post-treatment (bottom) images from one patient.

Table 1

	Left orbit CSA ratios (mm^2)				Right orbit CSA ratios (mm^2)				
	SMC/O	LR/O	IR/O	MR/O	SMC/O	LR/O	IR/O	MR/O	P-value
Patient 1 Pre	0.1304	0.1428	0.1209	0.2163	0.1714	0.1447	0.1364	0.1931	**0.009**
	0.0868	0.1081	0.1243	0.1719	0.1445	0.0746	0.1409	0.1805	
Patient 2	0.1172	0.1329	0.2893	0.1801	0.1103	0.1264	0.0910	0.2266	0.059
	0.0947	0.0930	0.1748	0.2280	0.0887	0.1093	0.0916	0.1358	
Patient 3	0.2340	0.0741	0.1354	0.2328	0.3167	0.0412	0.0449	0.1711	0.078
	0.1534	0.0685	0.1360	0.1856	0.1808	0.0153	0.0631	0.1847	

Table 1. Paired t-test comparing the difference between pre- and post-treatment muscle group CSA. to orbit CSA ratio on average across muscle groups for each patient.
CSA = cross sectional area; SMC = superior muscle complex; O = orbit; LR = lateral rectus; IR = inferior rectus; MR = medial rectus

Table 2

	Mean total muscle CSA/orbit CSA (mm^2)			P-value
	Patient 1	Patient 2	Patient 3	
Pre-treatment	0.1570	0.1591	0.1562	0.0008
Post-treatment	0.1290	0.1270	0.1259	

Table 2. Paired t-test comparing the difference in mean total muscle CSA to orbit CSA ratio pre- and post-treatment on average within each patient, across patients.
CSA = cross sectional area

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Rhino-Orbital Mucormycosis Following COVID-19 in Previously Non-Diabetic, Immunocompetent Patients

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Introduction: There has been a recent increase in the number of cases of Rhino-orbito-cerebral Mucormycosis (ROCM) during the global COVID-19 pandemic. These cases of mucormycosis following COVID-19 infection were typically seen in patients with diabetes mellitus (DM) especially the ones with poorly controlled DM and severe or critical COVID-19.

Methods: Retrospective, multicentric, non-comparative study.

Results: A total of 127 patients of COVID-19 associated Mucormycosis (CAM) were evaluated at four ophthalmic centers in India. Most of these patients were known diabetics with poor glycemic control. However, 13/127 (10.2%) immunocompetent patients of CAM, were those who developed new-onset uncontrolled diabetes mellitus (DM) following COVID-19 infection. The mean age in this cohort was 35.9 years (range: 20 – 51 years) and the mean duration from diagnosis of COVID-19 to the diagnosis of mucormycosis was 14.2 days. While 7/13 (53.8%) of the patients received corticosteroids during the course of their treatment for COVID-19, the other 6/13 patients received no steroids or immunomodulators. During the treatment for COVID-19, 12/13 (92.3%) patients received oral azithromycin; 5/13 (38.4%) patients received supplemental oxygen; 3/13 (23%) received the anti-viral drug remdesivir; 2/13 (15.4%) received oral ivermectin; and none of the patients received tocilizumab, an anti–interleukin-6 receptor monoclonal antibody. In terms of outcomes, life salvage was possible in 100% of the cases; globe salvage was possible in 42.8% (6/14 eyes). None of the patients had intracranial/cerebral involvement and life salvage was 100%.

Conclusions: There is evidence to suggest that new onset diabetes mellitus may be precipitated by COVID-19. In addition, COVID-19 induced altered nasal mucosal immunity may also contribute to development of post-COVID-19 mucormycosis. There is a subset of patients of new onset diabetes mellitus following COVID-19; in whom the presenting feature of undetected diabetes is rhino-orbital-mucormycosis.

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Teprotumumab-Related Adverse Events in Thyroid Eye Disease

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Introduction: Thyroid eye disease (TED) is an autoimmune inflammatory disease which can be sight-threatening and debilitating. Teprotumumab, a human monoclonal antibody against the IGF-1 receptor, is an effective therapy for active moderate to severe TED.[1,2] Phase 2 and 3 studies reported a favorable safety profile, however, 74 and 85% of patients experienced an adverse event (AE) and 12 and 5% of patients experienced a serious adverse event (SAE), respectively.[1,2] Our purpose is to characterize the rate, onset and severity of adverse events (AEs) in thyroid eye disease (TED) patients treated with teprotumumab.

Methods: Patients treated with teprotumumab for TED were evaluated in a multicenter observational study. Monitoring for AEs occurred at baseline, throughout and after treatment. AEs were graded according to the common terminology criteria for adverse events (CTCAE) scale. Additionally, AE duration, onset, resolution, relation to teprotumumab and related interventions were tracked for each AE. Patient demographics including age, gender, and ethnicity, were collected. Charts were reviewed for smoking history, thyroid status, previous thyroid and TED treatments, medications, and past medical history.

Results: One hundred and seven patients were included in the study, 86 females and 21 males. Mean age was 56.1 (range 15 – 93). Mean number of infusions was 7 with average follow up of 29.4 ± 11 weeks. AEs occurred in 82% of patients, with musculoskeletal (57.9%), integumentary (41%), gastrointestinal (39.2%), constitutional (37.4%), otologic (30.8%), genitourinary (14.9%), neurologic (14.0%), and ophthalmic (7.5%) symptoms appearing most commonly. 95.5% of these events were considered teprotumumab related. Of these, 95% were grade 1 (mild) and did not require treatment alteration or interruption. 5% were grade 2 (moderate) or worse and required treatment interruption or cessation (4.4%). The most common causes of interruption or cessation were poor glycemic control and hearing loss. The mean number of adverse events per patient was 3 ± 2.5. Mean time to initial AE onset was 6.1 weeks (range 1 – 15 weeks) and mean duration was 9.3 weeks. The majority of adverse events (52%) resolved or improved, and 48% remained at last follow-up.

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Conclusions: These results indicate that AEs are common with teprotumumab. Our study found that the incidence of each type of AE was higher in all categories than previously reported. Additionally, patients who experienced AE's, typically experienced more than 1 type. While most AEs were mild to moderate and reversible, a small percentage required interruption or cessation of therapy and a proportion of AEs were persistent at last follow up. Hearing loss and poor glycemic control were the most common causes of treatment cessation. Protocols for screening, prevention and management of AEs are therefore advised. Long term studies are needed to better understand the reversibility of AE's and risk factors.

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Transcutaneous Retrobulbar Amphotericin-B (TRAMB) Injections for the Management of Post- SARS-CoV-2 Rhino-Orbital-Cerebral Mucormycosis (ROCM)

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Introduction: Post SARS-CoV-2 opportunistic fungal infections, such as rhino-orbital-cerebral mucormycosis (ROCM), have seen a steep rise across the world. Until now, the standard treatment for orbital involvement in ROCM was exenteration, an extremely disfiguring and life-changing procedure for the patient. We aim to explore other non-radical treatment options for such cases. The purpose of our study is to evaluate the utility of transcutaneous retrobulbar amphotericin-B (TRAMB) injections in the management of patients with post SARS-CoV-2 ROCM with orbital involvement in a multi-disciplinary setting.

Methods: Non-randomized controlled clinical trial involving patients with ROCM with gross orbital involvement (Stage 3c or worse)[1]. Inclusion criteria were visual acuity worse than counting fingers at 3 meters; clinical features of eye involvement, such as ophthalmoplegia and orbital cellulitis; and orbital involvement on imaging. All patients were treated systemically with standard management protocols and underwent some form of sinus debridement and maxillectomy. Decision regarding orbital debridement/ exenteration was taken during surgery depending on the extent of orbital soft tissue involvement, seen either from oral route after removal of orbital floor or after orbital exploration through a subconjunctival incision. Control group included patients undergoing standard systemic therapy and surgery. Patients in the intervention group were additionally administered three doses of TRAMB injections on alternate days before surgery. One ml of liposomal amphotericin-B diluted with 5% dextrose at a concentration of 5mg/ml was injected using a 26G needle via the transcaruncular or cutaneous route in the orbital quadrant most involved on imaging. Primary outcomes were preservation of eyeball, need for orbital debridement during surgery and progression to intracranial spread.

Results: Forty-five patients fitting the inclusion criteria were included in the study with 25 in the control group and 20 in the intervention group. Follow- up ranged between 10 to 45 days. The median age of the patients in the control and intervention groups was 63 (42-73) years and 58 (46-68) years ($p>0.05$) respectively. Eight patients required orbital exenteration in the control group versus none in the intervention group ($p<0.0001$). Five had to undergo orbital debridement at the time of surgery in the intervention group as compared to 18 in the control group ($p<0.05$). None of the patients showed further progression to or worsening of intracranial disease in the

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intervention group as opposed to 4 patients in the control group ($p<0.05$). One patient died during follow up in the control group. None of the patients in the intervention group developed worsening of inflammation after TRAMB.

Conclusions: The utility of TRAMB in ROCM has been described earlier in case reports[2,3] but data for larger groups was lacking. We conclude that TRAMB can prove to be an excellent alternative to exenteration surgery in most patients with orbital involvement in ROCM post-SARS-CoV-2 infection. Our study is limited by a short follow-up period and non-randomization of the study groups.

Figure 1

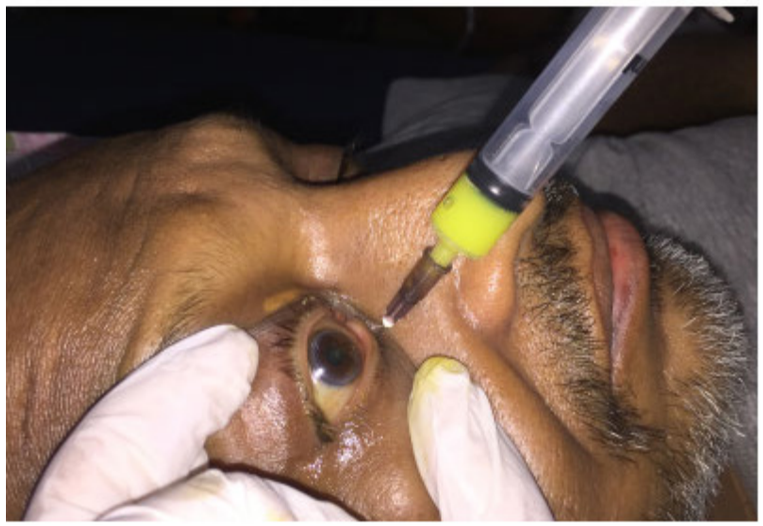
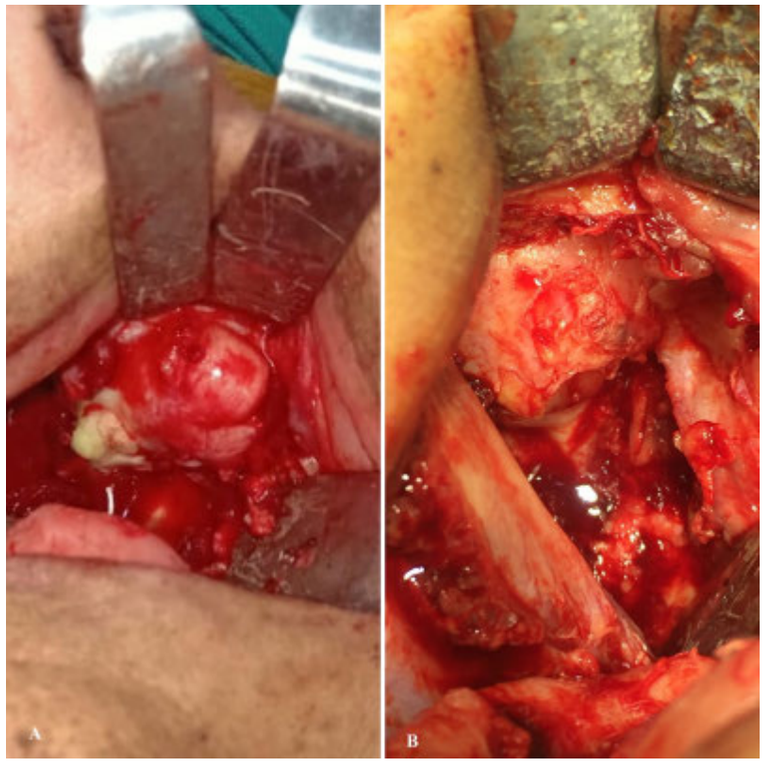


Figure 2



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Good Anaesthetic for Good Aesthetic: Blocks in Oculoplasty

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Introduction: A good anesthesia not only makes the patient comfortable during a surgery but also has a huge impact on the post-operative recovery.

Methods: In this video, we describe the anatomy, surface marking, the technique of regional anaesthesia including peribulbar, retrobulbar and subtenon block and of nerve blocks, specifically of facial, frontal nerve and its branches, infraorbital, nasociliary, infratrochlear and dorsal nasal nerves with their application in ocular plastic surgery.

Results: The methods of giving regional and nerve blocks are described thoroughly so as to enable the practitioners to achieve a good intra-operative and post operative success.

Conclusions: The art of giving a good local anesthesia is to be learnt and practiced.

Pigmented Lesions of the Conjunctiva: The Sheep and the Wolf

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Introduction: Pigmented lesions in the conjunctiva can be baffling to both the patients and the treating ophthalmologist because of their varied range of presentation and overlapping clinical features.

Methods: Retrospective analysis of patients who presented with pigmented lesions in the ocular surface was done.The various differentiating clinical features and any associated systemic features were studied, co-related and manangement options analysed. Here we present a crisp and precise video of the good, the bad and ugly pigmented lesions of the conjunctiva highlighting their specific clinical features important for the diagnosis and their management.

Results: The pigemnted lesions of conjunctiva range from incidental pigment deposition such as mascara and complexion associated melanosis to malignant melanoma which poses a risk to life. Similarly, the management ranges from observation at regular intervals to aggressive surgery like exenteration.

Conclusions: This video describes the myriad of pigmented conjunctival lesions, their diagnostic characteristics and management based on oncological principles.

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Turning the Corner: A Novel Surgical Approach to Prevent Lateral Canthal Webbing in Lower Blepharoplasty Combined with Lateral Tarsal Strip

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Introduction: The authors describe a novel surgical technique to avoid web formation of the lateral canthal angle following lower blepharoplasty combined with lateral tarsal strip.

Methods: A retrospective review of 50 consecutive cases of lower blepharoplasty with lateral tarsal strip in 28 patients was performed. All cases were performed by a single surgeon. The primary outcome was formation of lateral canthal skin web following lower blepharoplasty with lateral tarsal strip combined with a novel skin closure technique as judged by the surgeon. Secondary surgical outcome measures were patient satisfaction and need for surgical revision of the lateral corner. The primary surgical technique addressed the problems of horizontal lower lid laxity, lower lid dermatochalasis, and prolapsed orbital fat[1]. This was done using a swinging eyelid approach to resect or transpose the inferior orbital fat pads, combined with a skin-pinch lower blepharoplasty, and horizontal tightening with a lateral tarsal strip canthoplasty. The novel addition to this technique provided a method for approximating the inferolateral blepharoplasty incision to the canthotomy incision in such a way as to prevent web formation post-operatively (see corresponding figures).

Results: In the post-operative period, none of the patients developed a lateral canthal web following lower blepharoplasty with lateral tarsal strip combined with the novel skin closure technique. Additionally, there were no patient complaints or adverse cosmetic outcomes, and no patients required surgical revision.

Conclusions: A novel surgical technique to approximate the skin at the lateral canthus following lower blepharoplasty with lateral tarsal strip prevented lateral canthal web formation post-operatively and resulted in excellent cosmetic outcomes for patients.

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Figure 1

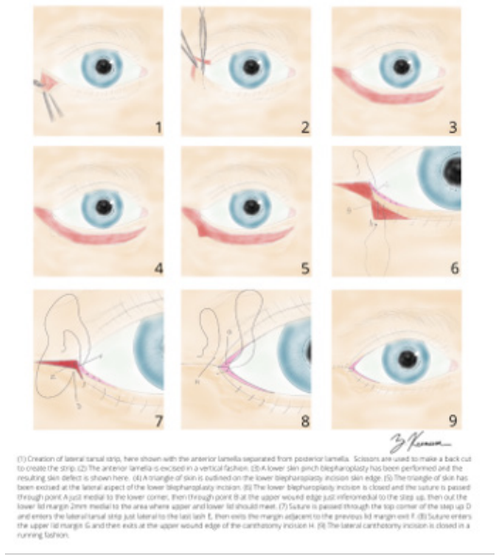

Figure 2

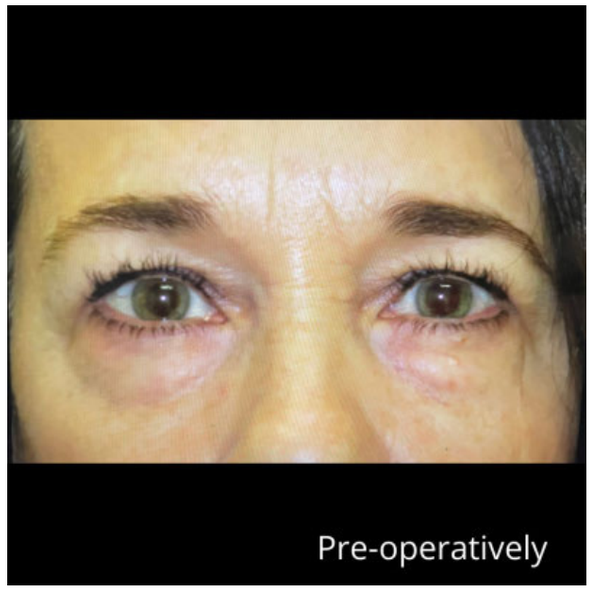

Figure 3

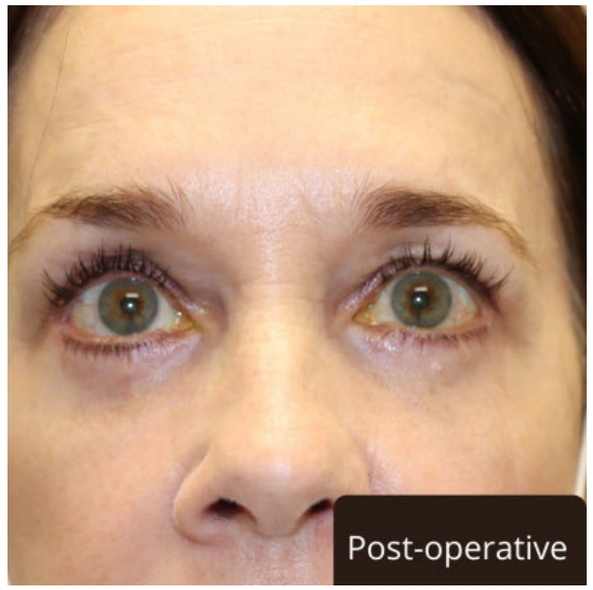

Figure 4

Figure 5

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Modification of the Single Suture Mueller Muscle Conjunctival Resection with Improved Hemostasis

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Introduction: Ptosis repair is one of the most commonly performed surgeries by oculofacial plastic surgeons with Mueller's muscle conjunctival resection (MMCR) being one of the preferred surgical techniques. After being first described by Putterman and Urist in 1975[1], there have been published modifications[2,3] including a single suture Muellers muscle conjunctival resection (ssMMCR) approach as described in 2019.[4] This approach is technically easy to perform, reduces operating time, and provides comparable results to a traditional MMCR. We describe further modification of this technique with improved hemostasis utilizing cautery assisted excision of conjunctiva and Mueller's muscle to exclude the central single suture, reduced risk of corneal abrasion, and preservation of eyelid contour.

Methods: Surgical technique

Results: Herein the authors describe the surgical technique. After infiltration of local anesthetic and standard surgical prepping and draping, the eyelid is everted over a Desmarres retractor. The amount of desired resection is marked from the superior tarsal border using a caliper. Two locking forceps are used to grasp conjunctiva and Mueller's muscle and the Putterman ptosis clamp is placed grasping the tissue. A 3-4 mm horizontal mattress suture, is placed centrally beneath the clamp, with both ends of the 5-0 plain gut suture externalized. Monopolar or high temp cautery is used to excise conjunctiva and Mueller's muscle both medially and laterally to the suture, beneath the clamp (Figure 1). A #15 blade is used to excise the remaining tissue within the ptosis clamp. Both ends of the suture are secured to the orbicularis muscle, if a concurrent blepharoplasty is performed, or to the skin after ensuring that it is intact.

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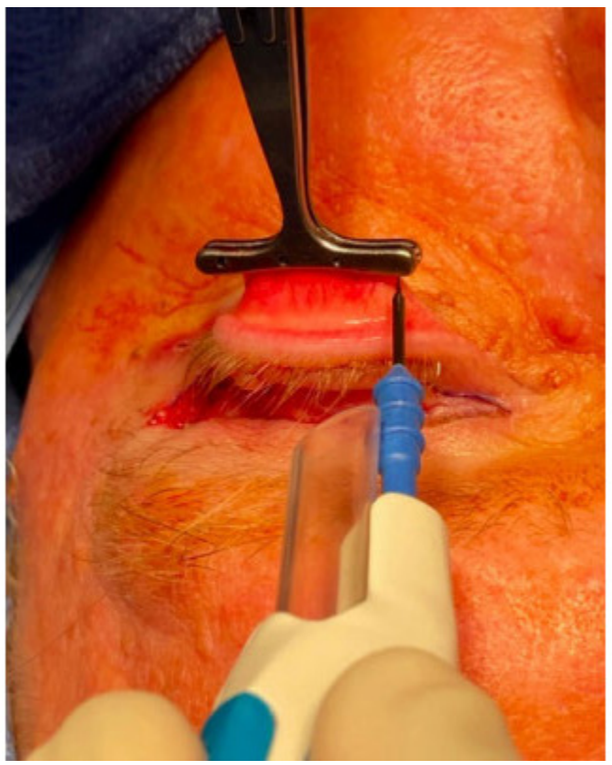
Conclusions: The ssMMCR procedure, as described by Ediriwickrema et al. has advantages by reducing operating time and adequately raising the upper eyelid. In the authors' experience, prolonged bleeding intra-operatively commonly occurred using this technique given the lack of suture tamponade of the conjunctiva and Mueller's muscle along the area of tissue resection. With many of our adult patients taking blood thinners, this is an important consideration given the potential risk involved with intraoperative and postoperative inadequate hemostasis. Our technique involving cautery assisted resection of conjunctiva and Mueller's muscle improves intra-operative hemostasis. The cauterization is performed swiftly to reduce thermal damage to surrounding tissues, and caution is taken to avoid cauterization of the clamp. Another modification utilized in our technique is the externalization of the suture compared to the suture knot remaining on the palpebral conjunctival surface as described by Ediriwickrema et al. With externalization of the suture, the risk of corneal abrasion is reduced. The central 3-4 mm horizontal mattress suture in our technique in thoughtfully placed in order to preserve eyelid contour. The authors commend Ediriwickrema et al. on their description of the ssMMCR procedure, and advocate for the incorporation of our modifications, which most importantly provide improved hemostasis, reduced risk of corneal abrasion, and preservation of eyelid contour.

Figure 1



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Palpebare Leviosa: Jones Procedure Revisited

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Introduction: Entropion is the inward rotation of the eyelid towards the globe and it can cause functional disabilities. The horizontal and vertical eyelid laxity and the overriding of the preseptal orbicularis over the preseptal component are underlying causes responsible for lower eyelid entropion.

Methods: This video illustrates the pathogenesis, clinical features and the clinical tests to diagnose lower eyelid entropion. Jones procedure, first described in 1972, essentially reattaches the lower lid retractors to the tarsus. In this video we also describe the surgical steps of a modification of the Jones procedure to correct involutional entropion.

Results: Jones procedure is a simple surgery that addresses vertical eyelid laxity and overriding of the preseptal orbicularis oculi to correct involutional entropion. It can be done for primary or recurrent cases and gives gratifying functional and cosmetic outcomes.

Conclusions: Different surgeries have been described to address mechanisms responsible for lower lid entropion. Jones procedure has undergone several modifications and still remains one of the most preferred surgeries. This video shows pathophysiology of involutional entropion and the Jones procedure.

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Video Based Kinematic Analysis for Objective Assessment of Suturing Performance

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Introduction: The purpose of this study was to describe and validate the use of a video motion analysis software program as an objective assessment tool for suturing performance in order to facilitate surgical skills training.

Methods: Seven participants of varying experience levels were recorded while performing simple interrupted sutures and a simple running suture. All participants were standardized to identical suture pads, suture types, and instruments, and all recordings were anonymized and obtained via standardized filming procedures (Figure 1A). For the purposes of data analysis, participants were grouped by level of surgical experience (*novice* = resident who has not completed a full oculoplastics surgical rotation, *intermediate* = resident who has completed the full oculoplastics rotation, and *expert* = ASOPRS senior fellow or faculty). The recorded videos were analyzed using a 2D motion analysis software to extract needle driver position over time (Figures 1B-D). Path length, instantaneous velocity, suturing time, and number of sudden extreme movements (defined as more than 1cm change in position between frames at a speed of 25 frames per second) were calculated. Statistical analyses were performed using GraphPad Prism 8.4.3 (San Diego, CA) and included one-way analysis of variance (ANOVA), student's t-test, and least squares linear regression.

Results: There was a statistically significant difference in both total suturing time (interrupted p=0.012; running p=0.003) and total path length (interrupted p=0.014, running p=0.008) based on level of participant experience (Figure 2). When comparing experts to novice and intermediate trainees, they had lower median needle driver velocity (interrupted p=0.018; running p = 0.033) (Figure 3) and less sudden extreme movements (interrupted p=0.021; running p = 0.0081) (Figure 4).

Conclusions: Software-based kinematic analysis can be used to calculate metrics which correlate with level of surgical expertise and therefore has potential to facilitate surgical skills training and assessment.

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Figure 1

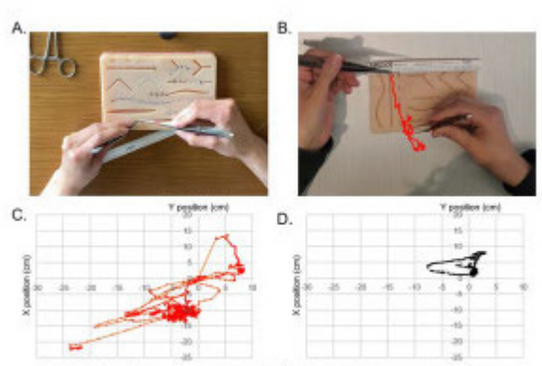

Figure 1. (A) Participants were given standardized suturing tasks that were recorded in a standardized manner. (B) Representative image of needle driver position over time (C, D) Representative x-y trajectories of a novice trainee (C) and an expert (D) performing a simple interrupted suture.

Figure 2

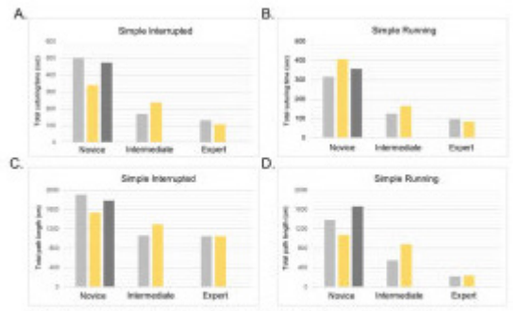

Figure 2. Total suturing time (A, B) and total path length (C, D) correlated with participant experience level for both simple interrupted (A, C) and simple running sutures (B, D), with each bar representing a single participant.

Figure 3

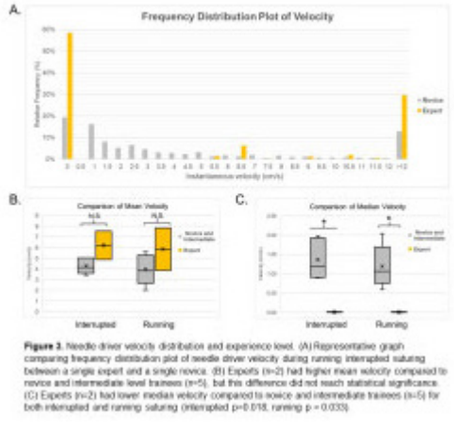

Figure 3. Needle driver velocity distribution and experience level. (A) Representative graph comparing frequency distribution plot of needle driver velocity during running interrupted suturing between a single expert and a single novice. (B) Experts (n=2) had higher mean velocity compared to novice and intermediate level trainees (n=5), but this difference did not reach statistical significance. (C) Experts (n=2) had lower median velocity compared to novice and intermediate trainees (n=5) for both interrupted and running suturing (interrupted p=0.018, running p = 0.033).

Figure 4

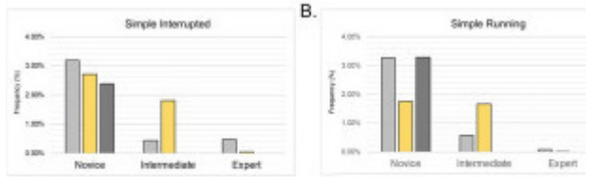

Figure 4. Frequency of sudden extreme movements, defined as greater than 1.0 centimeter change in position between consecutive frames, and experience level for (A) simple interrupted (p=0.021) and (B) simple running suturing (p = 0.0081).

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Endoscopic Dacryocystorhinostomy Performed under Local Anesthesia without IV Sedation in Patients with Primary Acquired Nasolacrimal Duct Obstruction

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Introduction: Endscopic DCR is usually performed under general anesthesia or local anesthesia with IV sedation. Our aim was to evaluate the feasibility and the surgical outcome of endoscopic dacryocystorhinostomy (DCR) performed under local anesthesia (LA) and without intravenous (IV) sedation in patients with primary acquired nasolacrimal duct obstruction (NLDO).

Methods: We included all consecutive patients who underwent primary endoscopic DCR under LA and without IV sedation in a two-year period by a single oculoplastic surgeon (GBS). The main outcome measure was surgical success defined as marked improvement in tearing and an open ostium on nasal endoscopy. The patients were queried about the level of discomfort.

Results: Twenty-three patients were included in the study group's final analysis. Success was achieved in 17 of them (73.9%) after a mean follow-up of 8.2 months. Rhinostomy was performed using a bone rongeur in 19 (82.6%) cases, and a power drill was needed to extend the bony ostium in only 4 patients (17.4%), probably due to a thicker bone or too narrow a space for the Kerrison rongeur. The surgery was combined with a preliminary septoplasty performed by the otolaryngologist (AY) in 5 patients (21.7%). Patients with no history of dacryocystitis achieved a higher success rate than those with a history of dacryocystitis (84.6% vs 60.0%**,** respectively, $P = 0.3$). The patients' self-reported level of discomfort was acceptable in all but one patient.

Conclusions: Endoscopic DCR can be successfully performed solely under LA and without IV sedation. The patients' level of discomfort is acceptable, and the approach had the advantage of avoiding the risks of general anesthesia. Our success rate was slightly lower than those reported for endoscopic DCR in the literature, however this approach may be safely considered in patients not suitable for general anesthesia.

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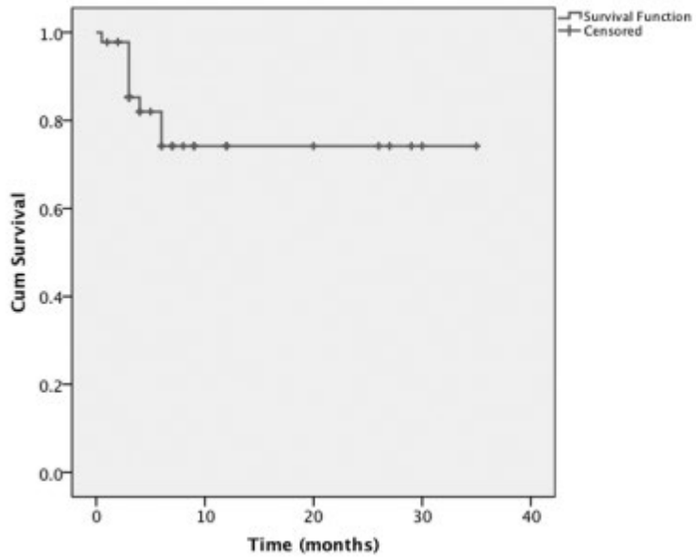
Figure 1



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Simulating Endoscopic Dacryocystorhinostomy in Ophthalmology Trainees Using a 3D Printed Model: A Pilot Study

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Introduction: To evaluate the utility and efficacy of a 3D printed model for simulation of endoscopic dacryocystorhinostomy (endoDCR) in ophthalmology trainees.

Methods: This was a prospective pilot study of the experience of one ASOPRS oculoplastics fellow and one 3rd year ophthalmology resident utilizing a novel model for simulating endoscopic DCR. Participants had no prior exposure to endoDCR previously and were asked to prepare for the training as though it were a real patient. Participants' first and final trial runs were graded based on four parameters: surgical time; size of bony ostomy created; number of times requesting guidance during trial; and clinically significant errors as judged by a recent ASOPRS graduate. Participants were unaware of the parameters on which they would be measured. Additionally, participants were given a five-item questionnaire before the first and after the final trial runs to assess comfort and confidence in performing endoDCR.

The model was created starting with a high-resolution CT scan (0.5mm slices) of the orbits which was read as normal. The Digital Imaging and Communications in Medicine (DICOM) data was processed to select bony anatomy only, spanning from slightly above the superior orbital notch down to the palatine process of the maxilla, and posteriorly to the vertical plane of the optic canal. This file was printed using Polyamide 12 (PA 12) material. Mucosal anatomy overlying the bony print was reconstructed using modeling putty, and the nose was made of latex foam.

Results: Neither participant successfully created a bony ostomy in the lacrimal sac fossa on the initial trial. The ASOPRS fellow's first and final trial run results: time improved from 37.5 minutes to 24.2 minutes; ostomy size improved from 0mm to 13mm x 8mm; requests for guidance lessened from 16 to four; and six significant errors were made initially compared to zero on final run.

The ophthalmology resident's first and final trial run results: time improved from 25.6 minutes to 17.7 minutes; ostomy size improved from 0mm to 11mm x 7mm; requests for guidance lessened from 22 to six; nine significant errors were made initially compared to two on final run.

Responses to questionnaires improved significantly on scores of comfort performing endoDCR, handling and using an endoscope, setting up for endoDCR, knowledge of intranasal anatomy, and independence.
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Conclusions: In this small study, the use of a 3D printed model significantly improved fellow and resident comfort and performance with simulated endoDCR.

Figure 1: Endoscopic DCR simulation model. A. Instrument set up, including model, endoscope, Kerrison rongeurs, Love-Gruenwald rongeurs, and Tenzel periosteal elevator. B. Model with soft tissue nose in place. C. Bone only model, without mucosa or soft tissue. D. Oblique view of bony model demonstrating lateral nasal wall and middle and inferior turbinates

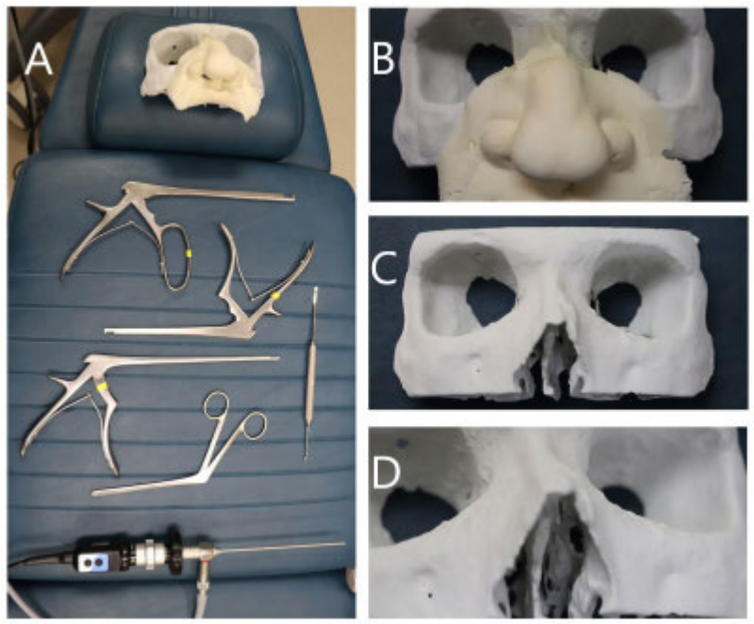
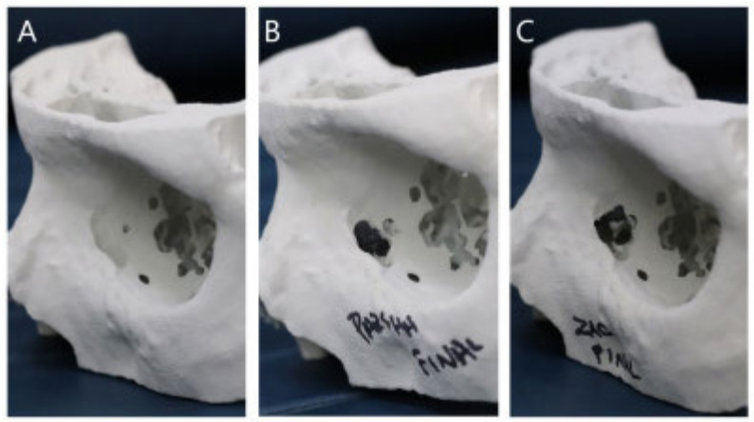


Figure 2: Comparison of participants' osteotomy on final run via oblique view of lacrimal sac fossa. A. Unused model. B. Third year resident. C. ASOPRS fellow.



Eyelid Nocardiosis after Lower Blepharoplasty

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Introduction: *Nocardia* species are rare aerobic pathogens characteristically found in soil and water.[1] Approximately 60-75% of cases reported have been among immunocompromised patients.[1-2] Cutaneous infections by *Nocardia* pathogens usually manifest as cellulitis, lymphocutaneous syndrome, or mycetoma. Three cases of *Nocardia* infection of the eyelid in immunocompetent adults have been previously described in the literature.[3-5] All cases of reported eyelid Nocardiosis developed following traumatic injury with manifestations of preseptal cellulitis, lymphadenopathy, fluctuant abscesses, and/or erythema and edema of the ocular adnexa. To date, no reported cases of eyelid Nocardiosis following blepharoplasty have been described in the literature. Herein, we present a case of a 72-year-old immunocompetent female who developed a *Nocardia asteroides* abscess of the left lower eyelid following bilateral lower eyelid transconjunctival transposition blepharoplasty.

Methods: The collection and evaluation of protected patient health information complies with the Declaration of Helsinki. A 72-year-old female patient underwent bilateral upper eyelid conjunctivo-muellers muscle resection with blepharoplasty, bilateral transconjunctival transposition lower blepharoplasty with externalized transposition sutures, and periorbital fractionated CO2 laser resurfacing at an outpatient ambulatory surgical center. Post-operatively, transposition sutures were removed 4 days after surgery, and the early postoperative course was unremarkable. The patient then presented on post-operative day 19 with a firm left lower eyelid nodule in the area of the previously placed transposition sutures (Figure 1A). At that time, an inflammatory granuloma versus atypical mycobacteria infection was suspected, and patient was subsequently started on oral clarithromycin and doxycycline. Five days later (POD#24), the nodule was noted to have increased in size and was fluctuant and tender to palpation (Figure 1B). Incision and drainage with culture of the left lower eyelid abscess was performed. Four days later, culture results reported *Nocardia* species. Given the culture results, doxycycline and clarithromycin were discontinued and the patient was started on oral trimethroprim-sulfamethoxazole double strength for a five-week course. The speciation and sensitivities of the culture ultimately resulted several weeks later as *Nocardia asteroides*, which was sensitive to trimethroprim-sulfamethoxazole.

Results: At five weeks following incision and drainage of the left lower eyelid nocardia abscess and a five week treatment course of oral trimethroprim-sulfamethoxazole, there was no evidence of residual infection or recurrence on examination, and the patient was otherwise healing well with excellent eyelid position and contour (Figure 2).

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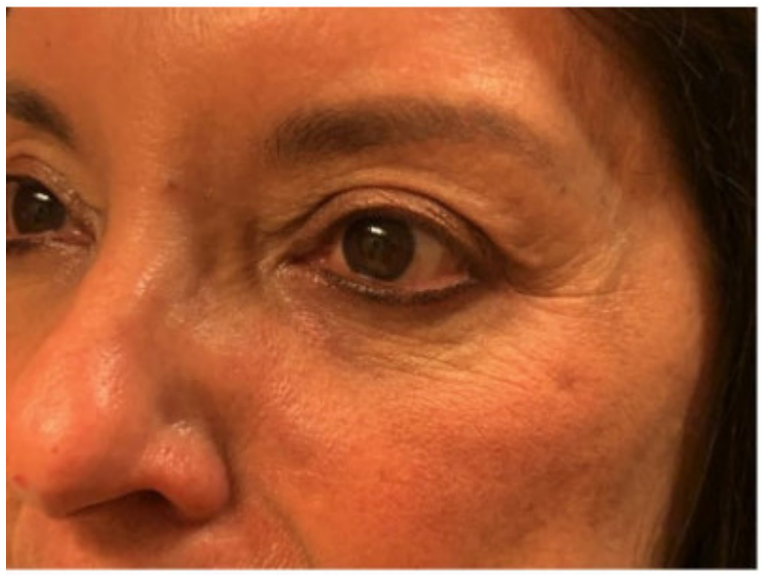
Conclusions: This is the first described case of eyelid Nocardiosis in an immunocompetent patient following lower blepharoplasty. Given its rarity and myriad manifestations, *Nocardia* infections are often difficult to diagnose clinically. The authors hope to highlight a rare manifestation of *Nocardia asteroides* infection following standard lower transconjunctival transposition blepharoplasty, which was successfully treated with incision and drainage as well as oral trimethroprim-sulfamethoxazole. Given the rising incidence of this pathogen, it is important for blepharoplasty surgeons to recognize and effectively treat this infection following lower eyelid blepharoplasty.

Figure 1

Figure 2



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A Minimally Invasive Endoscopic Transnasal and Trans-Orbital Approach to Sinonasal Tumor Resection

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Introduction: Biphenotypic sinonasal sarcoma (BSNS) is a rare, slow growing sarcoma of the sinonasal tract that predominantly affects middle-aged women (2:1).[1,2] It typically presents as a large, locally destructive tumor with approximately 25% extending into the orbit and 10% intracranially.[2,3] We present a case of BSNS accompanied by a surgical video demonstrating a combined endonasal and transorbital endoscopic approach to excision.

Methods: Case presentation and surgical video of a patient with BSNS, managed surgically utilizing a combined endoscopic and transorbital approach.

Results: A 35-year-old woman with chronic rhinosinusitis presented after two prior endoscopic sinus surgeries elsewhere for presumed polyposis with 1 year of worsening left eye pain and proptosis. Ocular exam was notable for 7 mm of left proptosis, 5 mm hypoglobus, 4 mm lateral globe dystopia, and 2+ resistance to retropulsion. Nasal endoscopy demonstrated a large mass filling both nasal cavities. On MRI, the lesion was homogeneously hypo/iso intense on T1 (Figure 1A) and hyperintense on T2 (Figure 1B). There was significant contrast enhancement, and evidence of obstructive sinusitis illustrated by fluid-fluid levels and mucosal thickening (Figure 1 C and D). On CT, there was evidence of bony destruction with a large defect in the left orbital roof communicating with the right frontal sinus (Figure 2A). Hyperostosis near the anterior skull base and a defect in the frontal intersinus septum was identified (Figure 2B). An endoscopic biopsy was performed, and pathology demonstrated dual neural and myogenic differentiation consistent with low grade BSNS (Figure 3).[4] PET scan showed no evidence of distant metastasis, and the decision was made to proceed with excision.

Three minimally invasive port sites were used to create an interconnected, fluid approach to tumor resection. The left orbit and frontal sinus were approached via an upper eyelid crease incision, and the well-circumscribed orbital component was transected and removed. A 1cm right sub-brow incision was made, and a small osteotomy was created through the anterior table of the right frontal sinus. The endoscope was inserted through the window and tumor delivered to the opposite orbit. The endoscope was then passed transorbitally

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on the left, and dissection was performed through the bone defect in the floor of the frontal sinus to extirpate the tumor. The remaining sinonasal component was managed endoscopically with a Draf III approach to the frontal sinuses (Figure 4).

Conclusions: This case of BSNS removed via both direct and endoscopic techniques, transnasally and transorbitally, highlights the value of a multi-disciplinary team and utility of combining endoscopic and trans-orbital techniques to resect extensive sinonasal tumors through minimally invasive approaches.

Figure 1

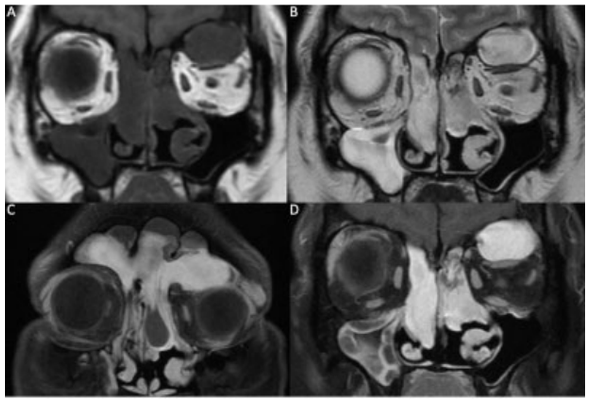


Figure 2

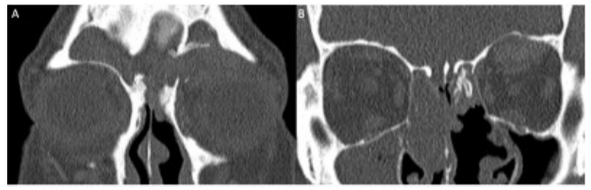


Figure 3

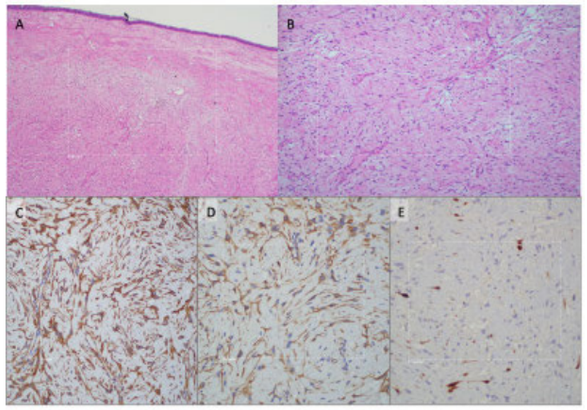
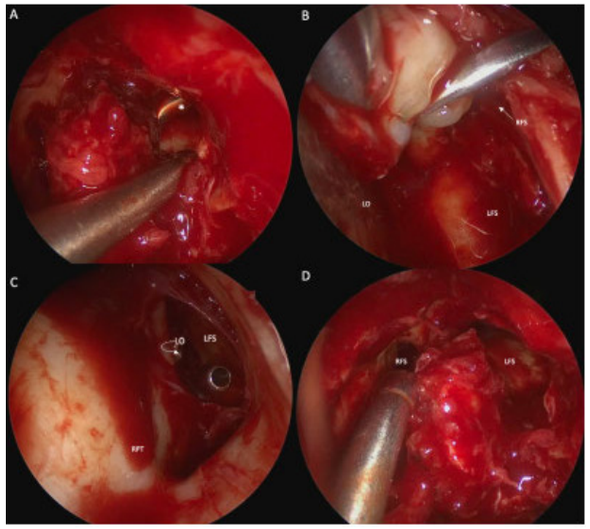


Figure 4



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Interpretation of MRI – The Eye Sees what the Mind Knows

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Introduction: In 1978, the advent of Magnetic Resonance Imaging (MRI) was a remarkable volte-face in the world of diagnostics. Employing the phenomenon of nuclear resonance enables us to exploit the properties of differential protons in living tissue. The ability of providing higher and variable contrast and the absence of ionizing radiations, makes it superior to Computed Tomography (CT). Being the diagnostic tool of choice, it is an indispensable part of assessment of the location and characteristics of different ocular and orbital pathologies (vascular, inflammatory and neoplastic).

Methods: In this video, we shall be displaying the anatomical, clinical and radiological aspect of MRI with an overlap to make it easier to understand the implications of this miraculous invention.

Results: The intrinsic and extrinsic properties of MRI provide multi-parametric imaging, making it of paramount importance in ophthalmological evaluation. Also, MRI-dynamic colour mapping provides non-invasive and quantitative assessment of soft tissues in motion. An in-depth knowledge of the basic principle and technique of MRI aids in diagnosing as well optimal planning of surgical interventions.

Conclusions: A good understanding of MRI analysis makes the ophthalmologists independent and helps in ruling out the differential diagnoses, exact extent and invasion, precise surgical planning and therefore, avoiding tragic outcomes.

A Novel Device to Quantify Resistance to Ocular Retropulsion

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Introduction: Resistance to retropulsion is typically assessed by manually depressing the globe into orbital tissues through closed eyelids. This permits qualitative evaluation of orbital compliance in clinical conditions such as thyroid eye disease, orbital neoplasms, and retrobulbar hemorrhage or edema. However, retropulsion tests depend on an individual clinician's subjective perception and cannot be generalized or tracked over time. Previous efforts to develop objective methods of measuring retropulsion have involved contraptions that harnessed fixed weights to posteriorly displace the eye via contact lenses or goggles.[1] None of these, however, have been widely adopted for general use due to the complexity and time-intensive setup required to obtain a single measurement.[2] Here, we present quantitative measurement of retropulsion via an intelligent platform for comprehensive evaluation of orbital soft tissue compliance.

Methods: In order to neutralize forces in the vertical dimension, the platform contains a vertical translational motor stage affixed to a resistance sensing load cell (Figure 1), which in turn interfaces with the ocular surface via vacuum-assisted suction (Figure 2). With the patient in supine position, vertical motion of this motor stage, which is software-controlled, retropulses the globe over a fixed distance. A graph plotting the distance of globe displacement against the resistance measured by the load cell allows for rapid, qualitative measurement of resistance to retropulsion.

To test the device, we utilized a cadaveric model previously described by our group. An inflatable neonatal sphygmomanometer bladder was inserted in the lateral extraconal orbit via a temporal lid crease incision (Figure 3), allowing for repeated manual adjustments of the orbital compliance with pressure monitoring via an aneroid gauge.

Results: The suction cup was placed over the eye in the cadaveric model. With the sphygmomanometer bladder fully deflated, the vertical translational motor stage was engaged to depress the globe smoothly by 3 millimeters, then immediately returned to its starting position. The pressure readouts during this motion were recorded (Figure 4A, units in load cell voltage output). The sphygmomanometer bladder was then inflated. The motor stage was engaged in an identical motion as above, with the pressure readouts recorded again (Figure 4B). Comparing the two pressure readouts demonstrates quantitative differences in resistance to retropulsion when orbital compliance is manipulated.

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Conclusions: Our updated platform for the evaluation of orbital soft tissue compliance allows for quantitative characterization of resistance to retropulsion, which can assist in the workup of pathological processes that result in axial globe displacement or altered orbital compliance. This device addresses the lack of inter- and intraobserver reliability of manual retropulsion tests. As with other device functions, individual patient measurements can be compared to the contralateral side as well as to a normative database. We believe that quantitative assessment of orbital compliance will ultimately permit the development of more precise clinical algorithms for orbital decompression and enophthalmos repair, which ultimately depends not only on bony subtraction or augmentation but also on the soft tissue response to these changes.

Figure 1

Figure 1. Functional prototype of our device, including the vertical translational motor stage (red arrow) and load cell for detecting resistance to vertical motion (blue arrow).

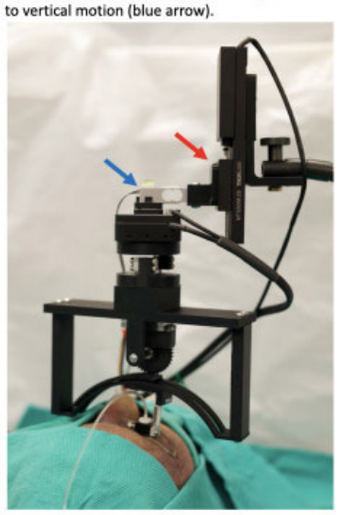


Figure 2

Figure 2. Close-up of suction cup interfacing with surface of globe.

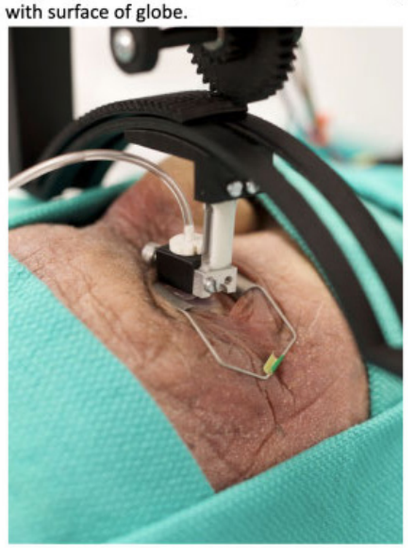


Figure 3

Figure 3. To create a cadaveric model allowing for manipulation of orbital compliance, a neonatal sphygmomanometer bladder is inserted into the lateral extraconal orbit via a temporal lid crease incision.

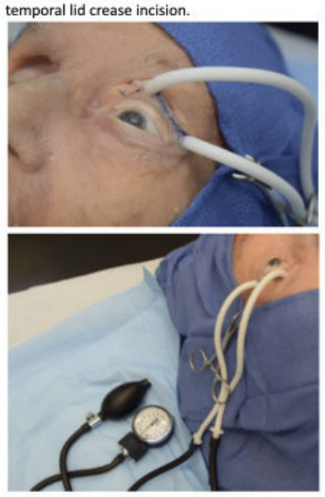
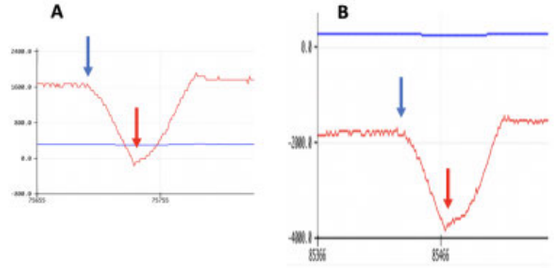


Figure 4

Figure 4A & 4B. Graphs of pressure output against time for resistance to retropulsion with sphygmomanometer bladder deflated (A) and inflated (B). Blue arrows indicate initiation of downward motion of vertical motor; red arrows indicate return of motor to baseline position. Amplitude of change in load cell pressure output corresponds to resistance. Y-axes of graphs are scaled to facilitate visual comparison of differences in measured resistance.



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Optic Nerve Sheath Fenestration Simulation: A Cadaveric Proof of Concept

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Introduction: Optic nerve sheath fenestration (ONSF) is a decompressive surgical technique to preserve or recover vision in patients with papilledema in the setting of elevated intracranial pressure (ICP), most often seen with idiopathic intracranial hypertension (IIH)[1]. In a retrospective case series of 158 eyes that underwent ONSF for IIH, 148 (94%) had stable to improved visual acuity[2]. While generally an effective and safe procedure, rare severe complications may result in devastating vision loss from inadequate decompression or occlusion of the central retinal artery, posterior ciliary arteries, or cilioretinal artery[4]. A recent survey of ASOPRS members revealed that 150 of 236 (64%) of respondents had not performed an optic nerve sheath fenestration in the preceding year[5]. For this reason, we seek to create a realistic surgical cadaveric training model with physiologic CSF flow to teach new surgeons and to help maintain this skill.

Methods: A lateral orbitotomy with lateral bone window removal was performed. The lateral aspect of the optic nerve was exposed. The subarachnoid space was cannulated with a butterfly cannula. The space was pressurized to approximately 25 cm H20 with a hydropneumatic pressure tank (Figure 1). The inferior half of the tank contains pressurized air while the superior half contains water, with the two halves separated by a diaphragm. The tank valve was connected to a catheter filled with trypan blue dye. Pressurization through the catheter was controlled with stop valves. The overlying skin incision was closed (Figure 2), priming the platform for ONSF.

Results: To validate the cadaveric platform, a medial transconjunctival approach to ONSF was performed. After exposing the optic nerve (**Figure 3**), the stop valves on the hydropneumatic pressure tank were opened, pressurizing the optic nerve. An incision was made in the optic nerve sheath, immediately upon which trypan blue began flowing through the incision, indicating successful decompression of the subarachnoid space.

Conclusions: Due to the relatively infrequent need for and delicate nature of ONSF, it is difficult for trainees to obtain adequate early career experience and even for seasoned oculoplastic surgeons to maintain this skill. We describe a cadaveric model that closely simulates ONSF with immediate feedback to its success or failure. We look forward to studying the utility of this model further by using it in conjunction with other surgical approaches to the optic nerve and testing this model with surgical trainees.

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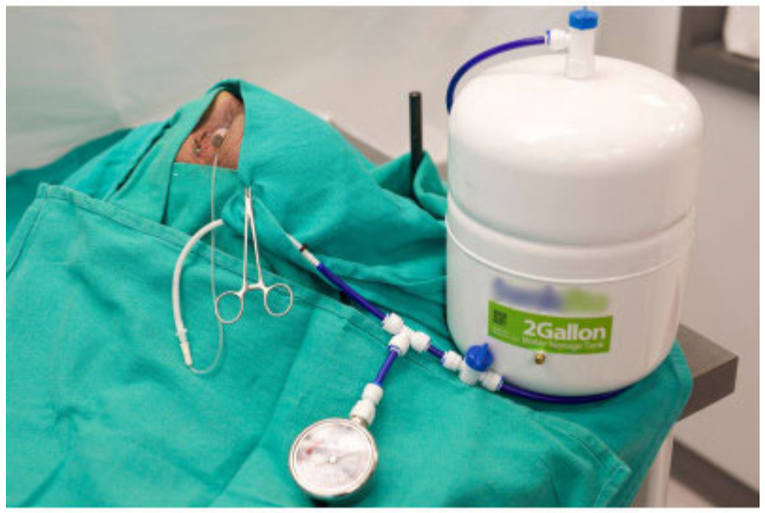
Figure 1



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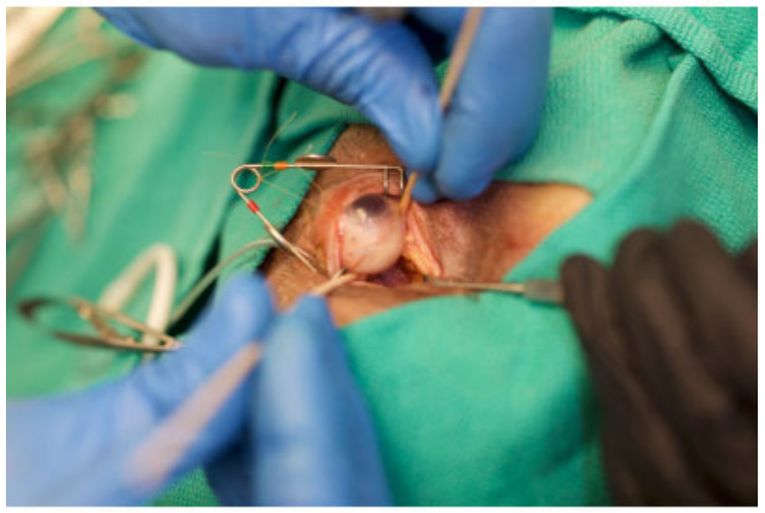

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The Orbital Guarding Reflex (OGR): An Indication for Early Orbital Fracture Repair

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Introduction: To describe an examination finding that may be seen with acute orbital floor and/or medial wall fractures that should prompt consideration of early orbital fracture repair.

Methods: This is a retrospective case series of patients with a newly described examination finding following orbital trauma. All patients suffered acute, blunt, non-penetrating trauma to the orbit and presented with fractures of the orbital floor, medial wall, or both. All patients were evaluated by the on-call ophthalmology service. During the ocular motility exam, each patient demonstrated an orbital guarding reflex (OGR). We describe this phenomenon as an involuntary reflex during ductions directed in the field of gaze or opposite field of gaze toward or away from the site of fracture, resulting in hesitancy, pain, and a rapid movement back to primary gaze, accompanied by grimacing, blepharospasm, and head jerk. Patients were included in the series if the reflex was noted both at initial evaluation and on outpatient follow-up within one week of the injury. CT imaging revealed soft tissue herniation into the fracture defect in each case, but without radiographic signs of a trapdoor with extraocular muscle incarceration.

Results: Three patients met the inclusion criteria. One patient was male and two were female. Age ranged from 15 to 74 years. In addition to orbital fractures, one patient had a mild retrobulbar hematoma that was observed. All patients were monitored on telemetry during motility testing; none developed bradycardia or hypotension suggestive of a significant oculocardiac reflex. No patients had an orbital compartment syndrome or optic neuropathy. No patients had any additional significant intraocular injuries from the trauma. All three patients underwent orbital fracture repair within two weeks of their injury. Intraoperatively, each patient had restricted forced ductions in the direction opposite the site of fracture performed prior to repair. After repair, forced ductions showed improvement of restriction. Post-operatively, all three patients noted reduced pain with resolution of their orbital guarding reflex.

Conclusions: In acute orbital floor and medial wall fractures, the indications for and timing of surgical repair are a matter of debate. In this series, we describe the involuntary orbital guarding reflex. The cause of this reflex is unknown. Afferent feedback may be secondary to limitation of movement of the extraocular muscle sheath from fracture fragments, leading to a mild vagal or oculocardiac reflex without bradycardia, hypotension or syncope. Presence of this reflex was consistent with positive forced ductions and should prompt consideration of early orbital fracture repair.

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Figure 1

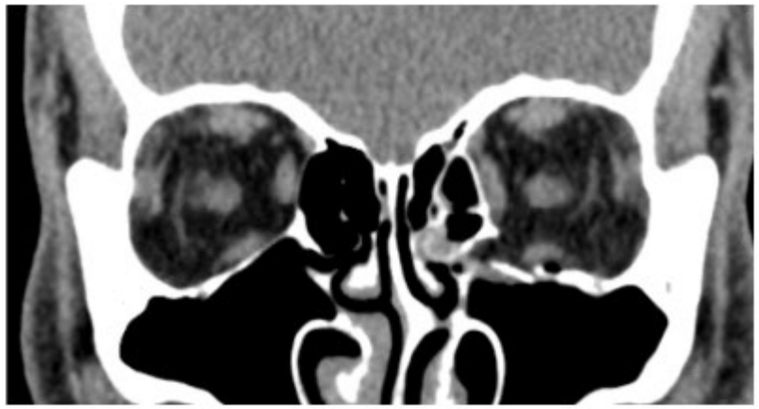

Fig. 1. Coronal computed tomographic images of a 15-year-old patient with blunt trauma to the left face presenting with an orbital guarding reflex and imaging demonstrating a left orbital floor fracture without trapdoor incarceration of the inferior rectus muscle.

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Virtual Reality and Simulation in Oculoplastic Surgery Training

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Introduction: Virtual reality (VR) is an emerging technology with broad applications in the medical field. The purpose of this feasibility study is to explore the potential role of VR in oculofacial plastics fellowship training.

Methods: In this single-center feasibility study, magnetic resonance imaging (MRI) and computed tomography (CT) were used to create virtual clones of patients with orbital masses and/or lesions. Using a VR headset, surgeons were able to manipulate the clones pre-operatively (rotate, magnify, and minimize) to localize a lesion or foreign body. Post-operatively, the clone was compared to pre-operative expectations based on neuroimaging and to intraoperative findings in terms of the most efficient surgical approach and localization of the lesion.

Results: In the first case, MRI suggested that a retained wood foreign body was located just posterior to the insertion of the medial rectus; however, the VR clone identified the object just anterior to the muscle in the subconjunctival space. A conjunctival peritomy approach failed to find the object near the muscle, but subsequent exploration in the conjunctiva immediately yielded the foreign object (Figure 1). In the second case of an orbital tumor, the surgeon initially planned for a transconjunctival floor approach based on MRI. The VR clone localized the lesion between the insertions of the inferior and medial recti muscles. The surgeons chose to perform a conjunctival peritomy and identified the mass in the exact location suggested by VR (Figure 2, Figure 3). In the third case, MRI showed an expansile lesion in the region of the inferior rectus; based on this, the surgeons prepared for a transconjunctival approach. However, the VR clone identified the lesion enveloping the inferior rectus. The surgeons subsequently performed a conjunctival peritomy and identified the mass in the location suggested by the VR clone (Figure 4). In a fourth case of a large pleomorphic adenoma, CT suggested that there was a focal dehiscence of the orbital roof; the VR clone was able to accurately reproduce this and the defect was identified intraoperatively (Figure 5).

Conclusions: Three-dimensional reconstruction combined with VR technology appears to be highly effective at localizing foreign bodies and tumors, thereby optimizing surgical exploration and minimizing surgical time.[1,2] VR appears to be particularly valuable in guiding trainees in determining the best surgical approach: in all four cases, the VR clones more closely approximated the location of the lesion of interest and altered the surgical approach. Furthermore, VR appears to have good correlation with bony anatomy and can identify small defects. VR may help trainees develop surgical planning skills while also improving overall surgical outcomes.

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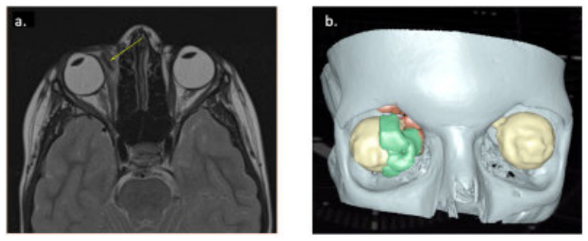
Figure 1



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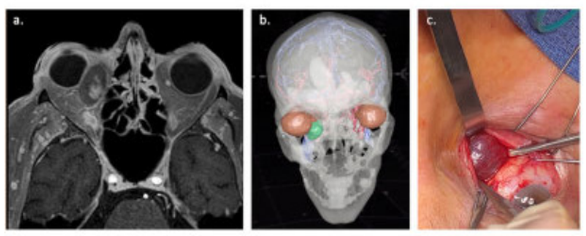

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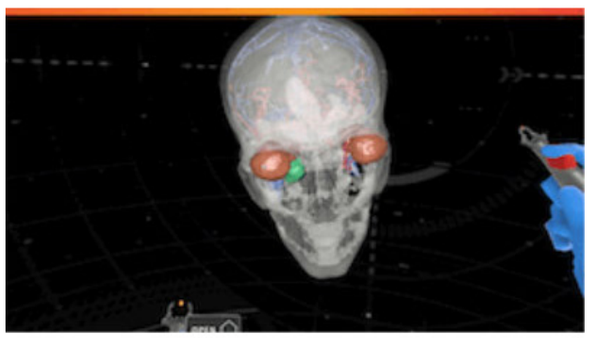

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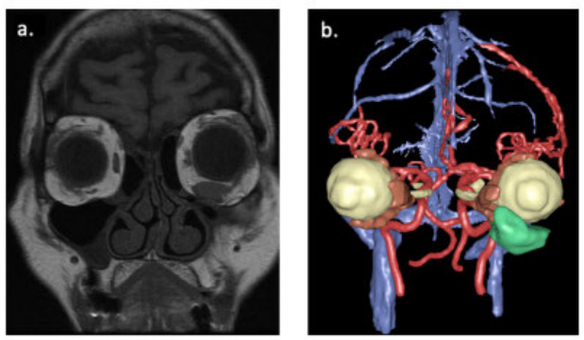
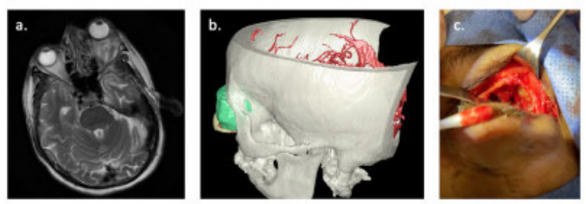


Figure 5



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Impact of the COVID-19 Pandemic on American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) Fellow Case Volume

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Introduction: The cessation of elective surgical cases during the COVID-19 pandemic is thought to have had a substantial impact on surgical trainees in Oculoplastics but this effect has not yet been quantified.

Methods: We performed a retrospective study of ASOPRS fellow case volume during the COVID-19 pandemic compared to case volumes during the preceding years. Surgical case log records of 175 clinical fellows from 69 ASOPRS fellowship programs from July 2016 to December 2020 were reviewed. Cases in which the fellow was recorded as “surgeon” were included. Total case numbers and trends were compared both monthly and quarterly to account for any normal seasonal variation in cases. Student t-tests and analysis of variance (ANOVA) were used to analyze differences in case volume at various time points.

Results: Between 2017 and 2019, ASOPRS fellows logged a mean of 604 cases per year (range: 618-649) with no significant differences in yearly cases logged over this time period ($p=0.87$). During the year 2020, ASOPRS fellows logged a mean of 568 cases (95% confidence interval (CI): 475, 660) which was lower, but not significantly so, compared to each of the three previous years ($p=0.8$, $p=0.43$, $p=0.58$, respectively).

Quarterly variation in mean case volume from July 2016 to December 2020 is shown in Figure 1. Number of logged cases followed a predictable pattern between the third quarter (Q3) of 2016 and Q4 of 2019, with annual dips in the number of logged cases in Q3 of each year, likely corresponding to the new fellow start date of July 1st. The first unexpected decrease in case volume occurred in Q2 of 2020, the lowest quarterly case volume in the study period. There was, however, no significant difference in mean quarterly case count in Q2 of 2020 compared to those in Q3 of 2017, 2018 and 2019 ($p=0.53$, $p=0.53$, $p=0.60$, respectively).

Monthly variation in mean case volume for 2019 and 2020 is shown in Figure 2. The mean number of cases logged in March 2020 was 31% lower than the number logged in March 2019 (60 vs. 87, $p<0.001$), and this difference rose to its peak of 73% in April 2020 (26 vs. 97, $p<0.001$). There was no significant difference between the mean numbers of cases logged for the other months in 2020.

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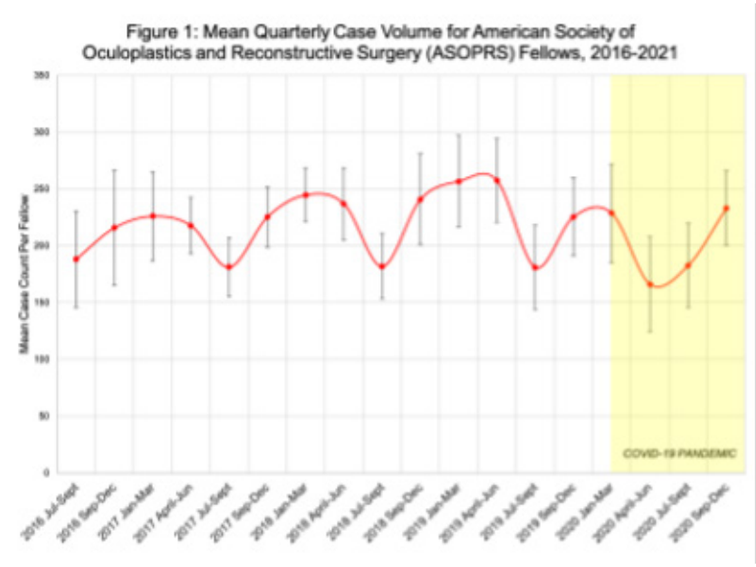
Conclusions: We found a significant drop logged surgical cases for ASOPRS fellows during the initial two months after elective surgery was paused. This was followed by a remarkable recovery in case numbers, resulting in an overall similar mean number of yearly cases logged in 2020 compared to 2019. This finding parallels a recent survey which showed that over 90% of ASOPRS fellows and fellowship directors predicted that the COVID-19 crisis would have a "mild" or "moderate" impact on fellowship training,[4] and could possibly also reflect an increased interest in elective plastic surgery procedures during the pandemic.[5] Limitations of this work include a bias towards greater logging after the onset of the pandemic, and no analysis of case type.

Figure 1



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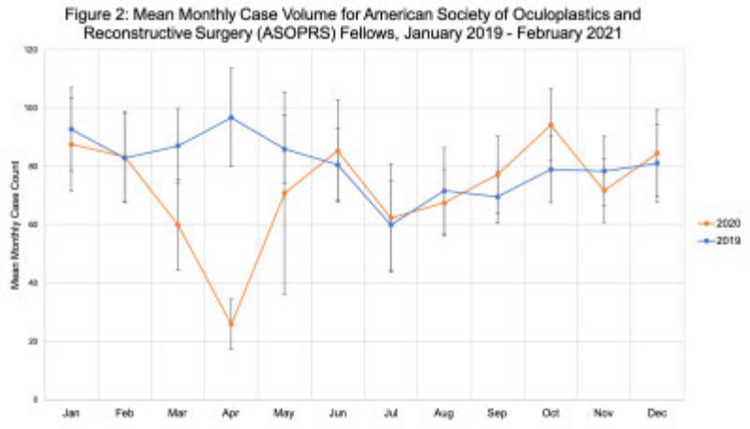

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Cosmetic Neurotoxin and Facial Filler Injection Training: A Blueprint for ASOPRS Fellowship Programs

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Introduction: As oculofacial plastic surgery experts, ASOPRS surgeons are expected to offer injectable cosmetic services. There are barriers to achieving cosmetic injectable competency during fellowship.[1] Any training gaps may adversely affect patient safety and satisfaction after completion of training.[2,3]

Methods: To identify available resources and describe our approach to injectable cosmetic training for the ASOPRS oculofacial plastic and reconstructive surgery fellowship at the University of Tennessee Health Science Center Hamilton Eye Institute. Educational grants were obtained through Allergan and Galderma which provide donated cosmetic Botox and Dysport neurotoxin and Juvederm and Restylane fillers. An internal and "word of mouth" referral system was utilized to populate the monthly training clinic to avoid conflicts with community referring physicians. All patients were evaluated and treated by the fellow under supervision by a preceptor. The number of patients scheduled was based on the amount of neurotoxin and filler syringes that were received by each company per month. Patients were charged a flat injection fee.

Results: Starting in 2016-2017, a total of 49 patients (56 neurotoxin injections, 49 filler injections) were treated which increased to 95 patients (184 neurotoxin injections, 103 filler injections) in 2018-2019. Both 2019-2020 and 2020-2021 had less patients (47 and 67 respectively) due to COVID-19 clinic cancellations and lack of available product. Figures 1 and 2 show a comparison of our fellow injection totals against the mean ASOPRS fellow injection totals for the corresponding training period. With the exception of neurotoxin injections in the 2017-2018 academic year, UTHSC fellows had more injections than the ASOPRS mean injections for each injection type in each academic year.

Conclusions: While ASOPRS fellowships have a required minimal number of aesthetic injections, there are barriers to training including product inventory and patient preferences. To promote patient satisfaction and avoid potential ocular complications, aesthetic injection competency is imperative.[2,3] We provide a blueprint to increase fellow competency through a hands-on training aesthetic injection clinic.

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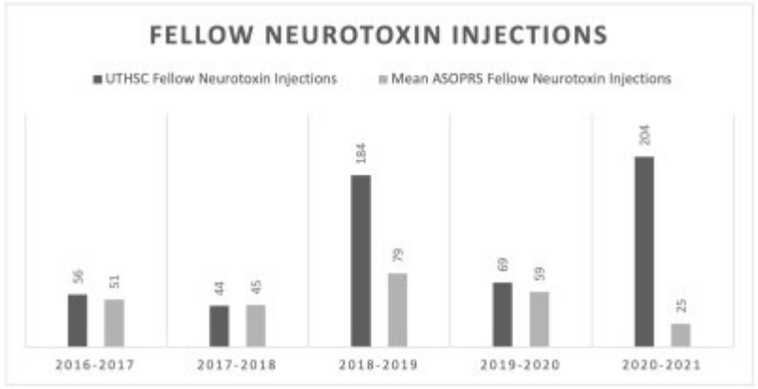
Figure 1



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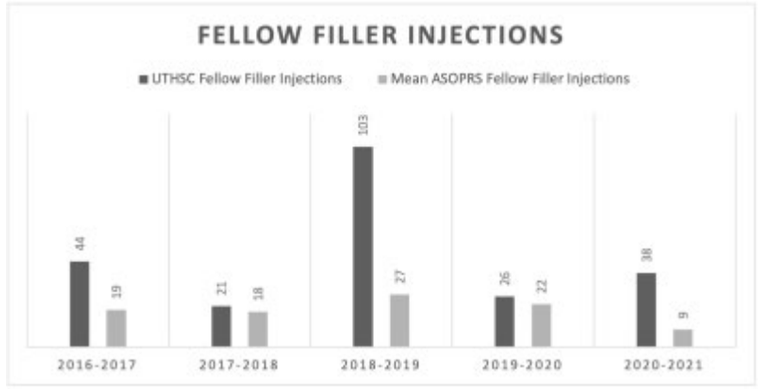

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Cosmetic Outcomes of Bilateral Lower Blepharoplasty in Patients with History of Facial Trauma: A Case Series

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Introduction: Lower eyelid asymmetry is a potential long-term complication of facial trauma, surgical repair of facial trauma, or a combination of the two. In our case series, we look at the cosmetic result of bilateral lower blepharoplasty to improve symmetry in patients with history of facial trauma repair.

Methods: Retrospective chart review of three patients with history of unilateral face trauma and surgical repair who underwent bilateral lower blepharoplasty, either alone or in conjunction with other procedures, with one surgeon. Demographic data, preoperative diagnosis, surgical procedures, and pre- and post-operative photos were collected.

Results: The mean age of the three patients was 67.3 years old with one female and two male patients. Two patients had a history of unilateral orbital fracture repair, and one patient had a history of Mohs defect repair of the right face and right lower eyelid. All three patients had lower lid ectropion and dermatochalasis with a chief complaint of lower eyelid asymmetry. All patients were more unhappy with their nontraumatic side as compared to the traumatic side as their traumatic side had lower lid fat flattening compared to the nontraumatic side[1-2]. Surgery performed inculded bilateral lower blepharoplasty and unilateral ectropion repair in all patients, unilateral retraction repair in two patients, and bilateral upper lid blepharoplasty in one patient. At their last follow up visit (mean of 350 days, range of 68-783 days), all patients were satisfied with lower eyelid symmetry and final outcome.

Conclusions: In our small case series of lower eyelid asymmetry after unilateral trauma and repair, excellent cosmetic results were achieved after bilateral lower blepharoplasty in conjunction with other procedures.

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Figure 1: Patient with history of right orbital blowout fracture status post repair in 2019. A: Preoperative photo demonstrating right lower eyelid retraction and bilateral lower eyelid dermatochalasis with left lower eyelid dermatochalasis more prominent than the right. B: Postoperative month 16 photo of same patient status right lower lid retraction and ectropion repair and bilateral lower blepharoplasty

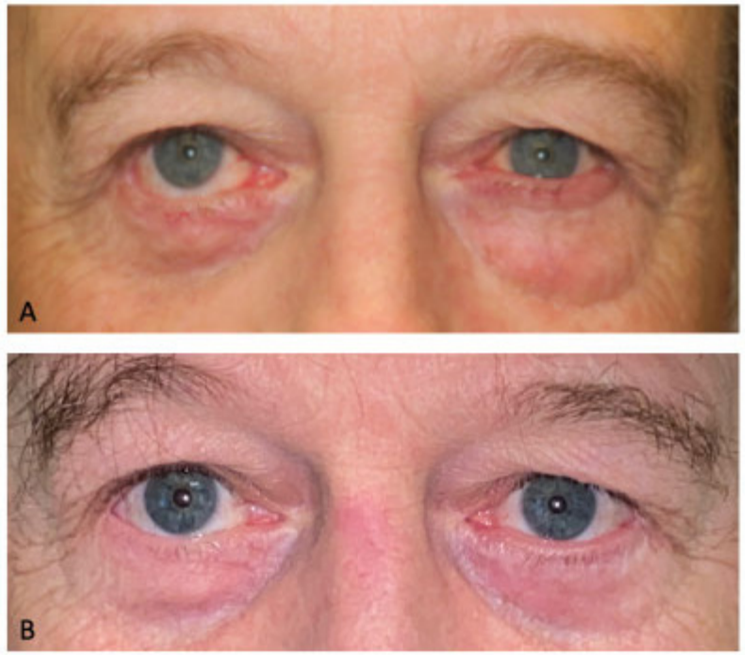

Figure 2: Patient with history of right orbital blowout fracture status post repair in 2020. A: Preoperative photo demonstrating right lower eyelid retraction and bilateral lower eyelid dermatochalasis with left lower eyelid dermatochalasis more prominent than the right. B: Postoperative month 16 photo of same patient status right lower lid retraction and ectropion repair and bilateral upper and lower blepharoplasty.

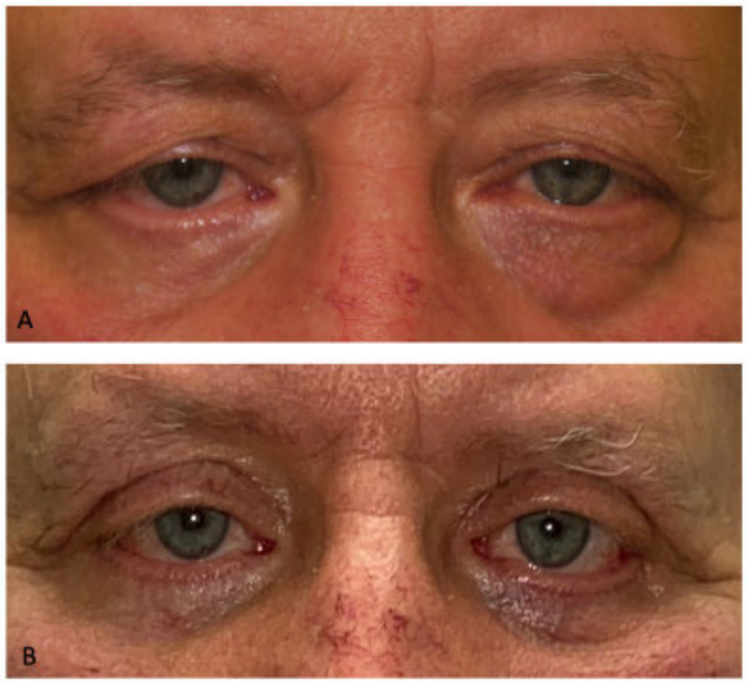

Figure 3: Patient with history of Mohs defect repair of the right lower eyelid and cheek in 2018. A: Preoperative photo with bilateral lower lid ectropion and lower eyelid dermatochalasis with left more prominent than the right. B: Postoperative week 6 photo of the same patient status post bilateral lower lid ectropion repair and bilateral lower blepharoplasty.

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Creating Almond Shaped Eyes in the Asian Indian Population – A Unique, Easily Reproducible, Surgical Technique

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Introduction: The shape of the eyes can significantly alter the way a person's face looks. With the proliferation of the internet, more and more people desire cosmetically appealing eye shapes. Cosmetic lateral canthoplasty is a procedure to change and enhance the shape of the eyes. It is becoming a common esthetic procedure performed for creating almond-shaped eyes. The technique involves a lateral tarsal strip canthoplasty and canthopexy to create an upward slant of the lateral canthal region. It differs in Asians and Caucasians in terms of the technique used. Here we present 30 Asian Indian patients treated with our unique version of the lateral tarsal strip and Canthoplasty technique, to create symmetrical, almond shaped eyes.

Methods: 30 patients between the years March 2015 to April 2020 were treated to cosmetically change the way their eyes looked. They presented with complaints of not being happy with the symmetry and the shape of the eyes. Their ophthalmic examination was done to rule out any vision abnormality prior to surgery. All the patients underwent bilateral cosmetic canthoplasty surgery with the lateral tarsal strip technique. Post-operatively, the evaluation of the eyes was performed.

Results: 30 patients (10 males; 20 females) were treated to alter the shape of the eyes. The mean age of the patients was 25.5 years. The follow-up periods ranged between 6 months to 2 years. All the patients presented satisfactory and aesthetically acceptable results. The bilateral symmetry of the eyes was maintained. The pre-operative underwrite scleral show, if present, was also corrected and symmetrized in between the eyes in all the cases where present.

Conclusions: Lateral Tarsal Strip and Canthoplasty in the Asian Indian ethnic population is a unique procedure that makes the eyes appear almond-shaped. It helps give the eyes a softer look by creating almond-shaped eyes and thereby makes the face look more attractive. The authors think this procedure is a good and convenient method to perform and can be done as an outpatient procedure. Precision in surgical technique is essential to have cosmetically pleasing results. We describe a unique technique to create almond-shaped eyes in the Asian Indian population.

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Figure 1

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Demographic Variations in Eyelid Skin Epidermis and Dermis Thickness and Associations with Postoperative Edema: A Histological Analysis

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Introduction: Upper eyelid skin epidermis and dermis is the thinnest skin of the face. Little is known about demographic variations in eyelid skin thickness in terms of ethnicity, age, and gender. Clinically, there are variations in postoperative eyelid edema after upper blepharoplasty and eyelid skin thickness may play a role. The purpose of our study was to histologically analyze eyelid skin epidermal and dermal thickness in patients who underwent eyelid surgery and associations with patient demographics and postoperative edema.

Methods: Upper eyelid samples were fixed and stained via histochemical techniques. All images were obtained with an inverted fluorescence phase contrast microscope. Using ImageJ software, three high-power fields per section were randomly selected. The epidermis and dermis thickness in microns were measured at three different points per slide and averaged. Postoperative photos were evaluated for eyelid edema using an established scale ranging from 0 (no edema) to 3 (severe edema). Clinically significant edema (CSE) was defined as either having an edema grade of 3 at any time point postoperatively or any grade that was non-zero 90 days post-operatively. Variables were analyzed by Chi-square test, one-way ANOVA, and a student's t-test.

Results: There were 18 patients in total who underwent upper eyelid blepharoplasty for which tissue was collected and histologically analyzed. Of the 18 patients, 9 were Asian and 9 were non-Asian (including Hispanic, Caucasian, and Other/Unknown). In the Asian group, average thickness of the epidermis and dermis were greater than the non-Asian group, however these results were not statistically significant (37.73 um versus 34.28 um epidermal thickness in Asian patients and non-Asians, respectively [p=0.22]; 1126 um versus 1096 um dermal thickness in Asian patients and non-Asians, respectively [p=0.43] (Figure 1). There was also no statistically significant difference in epidermis and dermis thickness in terms of age, gender, and BMI. Patients with CSE had thinner epidermis and dermis compared to patients without CSE, but these results were also not significant (35.23 um versus 37.22 um epidermal thickness in CSE and no CSE, respectively [p=0.32]; 1073 um versus 1172 um dermal thickness in CSE and no CSE, respectively [p=0.30] (Table 1).

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Conclusions: While Asian patients had thicker eyelid epidermis and dermis and patients with CSE after upper eyelid surgery had thinner epidermis and dermis, these results were not found to be significant. Eyelid epidermis and dermis thickness showed no correlation with age, gender, or BMI.

Figure 1

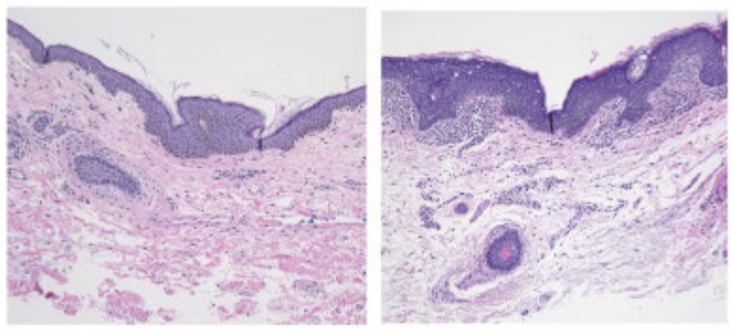

Figure 1. Histology of upper eyelid skin from a non-Asian patient (left) and from an Asian patient (right) [hematoxylin and eosin; original magnification, x10]

Figure 2

Table 1. Demographics and Clinically Significant Edema (CSE) Correlates with Epidermis and Dermis Thickness

	Correlation Coefficient – Epidermis	P value – Epidermis	Correlation Coefficient – Dermis	P value – Dermis
Age	-0.1458	0.5637	0.1208	0.6330
Gender	-0.6758	0.7899	0.1727	0.8651
Ethnicity	0.1908	0.4482	0.0459	0.8563
BMI	-0.1041	0.6809	0.3217	0.1930
CSE	-0.1073	0.6719	-0.1496	0.5536
Epidermis/Dermis (um)	0.4760	0.0459*	0.4760	0.0459*

*Statistically significant ($p<0.05$)
**Gender: 1=male 2=female; Ethnicity: 0=non-Asian 1=Asian, CSE: 0=no edema 1=edema

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Evaluation of an Updated 6 MHz Radiofrequency Skin Tightening Platform on the Eyelids, Face and Upper Neck

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Introduction: Noninvasive skin tightening is a challenging clinical goal. Numerous technologies are utilized in an effort to achieve this outcome. Despite these efforts, the goal remains somewhat elusive. The purpose of this study was to evaluate clinical outcomes when the most current version of a previously well-established platform for noninvasive skin tightening was applied to the eyelids, face, and upper neck. This platform is the only energy based device with an FDA indication specifically for treatment of the eyelids.

Methods: The protocol was approved by the New England IRB and all requirements of the Declaration of Helsinki were met. 25 subjects Fitzpatrick skin type I-VI with mild to moderate laxity of the eyelid, face, and neck skin were enrolled. All subjects were treated with a 900 pulse, 4cm2 tip on the face and neck; the eyelids were treated with a 450 pulse, 0.25cm2 tip. Treatment was performed in the standard manner titrating energy to a subjective discomfort of 2-3 on a 2-3 on a 4 point scale. Plastic corneoscleral protective lenses were used when the eyelids were treated. Standardized photographs were obtained at baseline and 1, 3, and 6 months post treatment. Treatment outcomes were assessed at each visit by Subject Global Assessment Improvement Scale (SGAIS), Physician Global Assessment Improvement Scale (PGAIS) and by blinded assessment of subjects by an independent reviewer using the Fasil (Facial Skin Laxity) scale. Subject satisfaction was measured using the Likert scale.

Results: All enrolled subjects completed the treatment and all follow up visits. The treatments were well tolerated and there were no complications or adverse events. PGAIS scores at 6 months follow up (0 = No Improvement, 1= Minor/Mild Improvement (0-25%), 2 = Moderate Improvement (26-50%), 3 = Marked Improvement (51-75%), 4 = Very Significant Improvement (76-100%)) were 2.31 +/- 0.55. SGAIS scores 6 months post treatment were 2.96 +/- 0.75. Facial skin laxity scores (0-4 scale) were 0.85 +/- 0.99 for the upper face, 0.92 +/- 1.0 for the middle face, 1.2 +/- 0.83 for the lower face, and 1.48 +/- 0.9 for the upper neck. Subject satisfaction as assessed by scores (1= very dissatisfied, 5= very satisfied) were 4.38 +/- 0.86

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Conclusions: The radiofrequency platform evaluated in this trial for treatment of the eyelids, face, and upper neck lead to significant improvement in skin laxity as assessed as assessed by both subject and investigator GAIS scores 6 months post treatment. Fasil scores were less conclusive with high standard deviations but trended toward indicating that the lower face and neck responded particularly well. Subject satisfaction was excellent. Overall the platform used in this trial produced clinically significant improvements and high subject satisfaction scores. Limitations of this trial include the relatively small number of subjects and the lack of more objective scales to assess clinical outcomes.

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Multiple Cases of Facial Disfigurement from Filler Use and One Injector

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Introduction: To present a case of facial disfigurement from a permanent filler and describe the consequences to patients exposed to the same injector (common source outbreak).

Methods: Retrospective observational study describing a clinical case and discussing the common source outbreak in which a group of persons are all exposed to the same injector and develop complications years after polymethylmethacrylate facial filler usage.

Results: A 39 year old, biologically male professional transvestite model who is transitioning to female underwent polymethylmethacrylate facial filler injections to the lips, cheeks, and chin in 2018. A year later, the patient awoke with facial swelling and difficulty breathing and was rushed to the ER. Since the injections, the patient has had four surgeries elsewhere to remove the filler and scar tissue and is on chronic low dose steroids. Upon questioning the patient, five friends are now suffering from similar facial swelling years after injection by the same injector. The injector cannot be located.

Conclusions: Care must be taken in giving all facial fillers, particularly permanent ones, with a careful discussion of the risks and benefits. When one source patient is identified, questioning the patient's knowledge on others affected is critical to help manage an epidemic problem and report a rogue injector.

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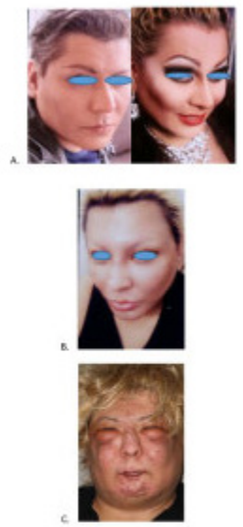
Figure 1

Figure



39 year-old transvestite model, before Artefill (A), immediately after Artefill to lips, cheek and chin (B), and 2 years after inflammatory reaction and 5 chin surgeries done elsewhere (C).

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Platelet-Rich Plasma (PRP) with Microneedling for Periocular Hyperpigmentation

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Introduction: Platelet-rich plasma (PRP) with microneedling of the skin is a minimally invasive procedure that uses hypodermic needling to finely puncture the epidermis. The creation of these dermal micro-channels stimulates the release of growth factors and induces collagen production. Treatment of the periocular hyperpigmentation and scarring often proves difficult. We describe a case of periocular PRP microneedling for hyperpigmentation and “dark circles.”

Methods: A healthy patient was treated with one session of PRP with microneedling. Ten milliliters of the patient’s own blood was drawn using a 24-gauge butterfly needle and placed into a 15mL vial, which was subsequently spun using a standard protocol centrifuge at 3000 RPM for 10 minutes. During this time, 22% compounded topical lidocaine was applied twice to the face, including the lower eyelids. The autologous PRP was applied in a layered fashion to the skin prior. Micro-needling was then administered using 27-gauge 38 millimeter cannulas to the full face over an 15 minute session. By keeping the skin taut, we carefully took slow passes just superiorly to the inferior orbital rim at a depth of approximately 0.5 millimeters. The PRP was left in place and allowed to naturally slough off over the next 2 days.

Results: On her follow up one month later, the patient noted a significant improvement in the appearance of her periocular acne scars, hyperpigmentation, and fine lines. Photographic documentation was reviewed. No complications were noted.

Conclusions: PRP with microneedling to the periocular region appears to be an overall effective and safe treatment modality. Larger controlled trials are needed to provide more data on the use of microneedling in periocular skin and aesthetic conditions.

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Figure 1

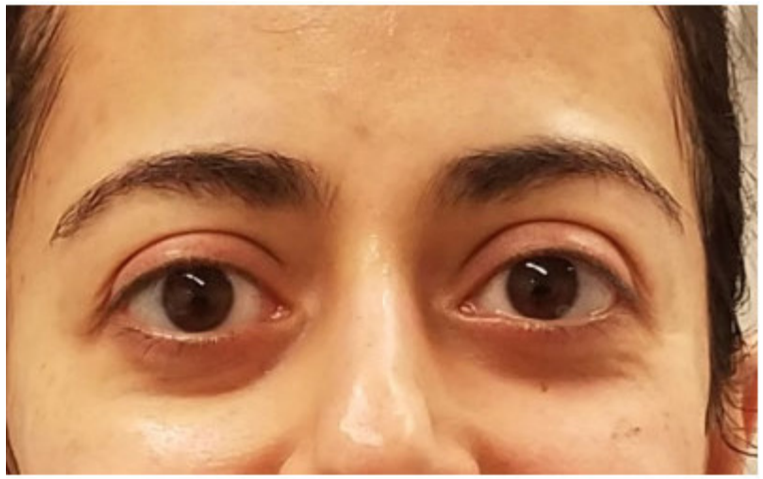


Figure 2

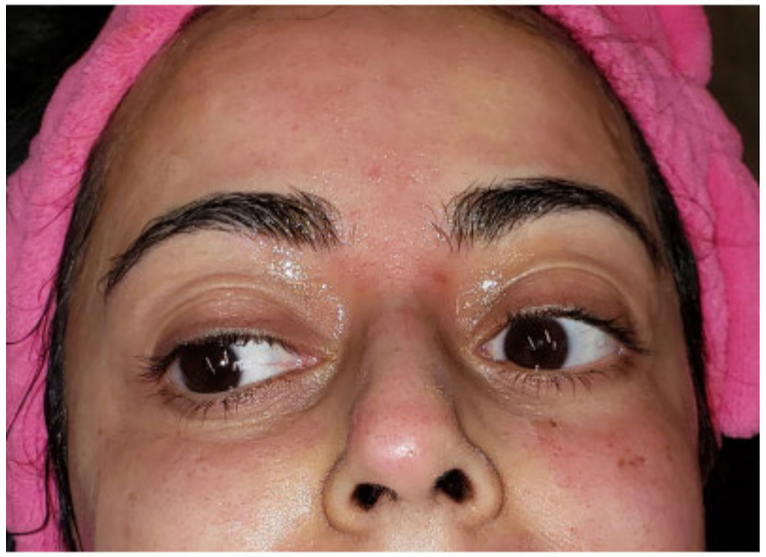
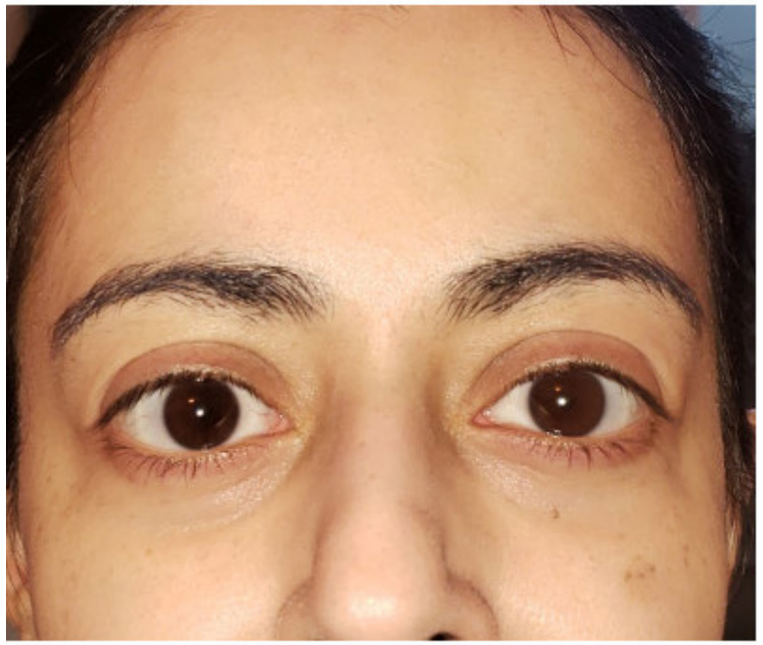


Figure 3



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Surgical Factors associated with Clinically Significant Eyelid Edema in Patients Following Upper Eyelid Surgery

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Introduction: The purpose of this study was to investigate surgical factors associated with clinically significant eyelid edema in patients following eyelid surgery.

Methods: A retrospective chart review was performed on patients by two surgeons (SZN and JRC) who underwent blepharoplasty with or without additional external levator advancement, lid crease formation, brow ptosis repairs, or lower eyelid surgery between January 2018 and January 2021. Postoperative photos were graded for eyelid edema by two independent graders using a scale ranging from 0 (no edema) to 3 (severe edema). Clinically significant eyelid edema (CSEE) was defined either as having an edema grade of 3 at any point postoperatively or any grade that was 1 or greater after 90 days post-operatively. Patients without postoperative photos were excluded.

Descriptive statistics were used to compare surgical characteristics between groups with and without clinically significant edema. Mean and interquartile range (IQR) were reported for the continuous variables, and frequency counts and percentages were reported for categorical variables. The Mann–Whitney U-test was used to compare continuous data. For categorical variables, a Fisher's exact test or $\chi 2$ test was used to compare groups. All analyses were conducted using statistical software. Statistical significance level was defined as $\alpha=0.05$.

Results: Of 217 patients included in the study, 54 patients had CSEE. Additional eyelid crease formation surgery was associated with CSEE ($p<0.0001$). The addition of other surgical procedures such as levator advancement surgery, brow ptosis repair, and lower eyelid surgery did not show a significant relationship with CSEE. Thirty-six patients required some kind of lid crease formation, consisting of (1) incorporating levator aponeurosis into the skin closure with either polypropylene suture or plain gut sutures, or (2) using 6-0 or 7-0 buried polyglycolic acid suture, or (3) using externalized 6-0 silk suture removed at postoperative week 1 (POW1). Of these patients who underwent lid crease formation surgery, 59.4% of patients had CSEE. In contrast, of 97 patients who underwent levator advancement surgery without lid crease formation, only 29% of patients had CSEE.

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Of those who had lid crease formation, 71.9% were Asian, but even when controlling for race, there was a statistically significant relationship between lid crease formation surgery and CSEE. When adjusting for race, patients who underwent lid crease formation were 4.0 times more likely to have CSEE than those who did not undergo lid crease formation (p=0.0018). Of the 7 patients who had buried polyglycolic acid suture, 100% had CSEE, and of the 6 patients who had removable silk suture, none had CSEE. Buried vicryl was found to be significantly associated with CSEE when compared to externalized silk (p<.01).

Conclusions: In patients undergoing upper eyelid surgeries, lid crease formation was significantly associated with CSEE, even after adjusting for race. Buried vicryl suture was significantly associated with CSEE compared to externalized silk sutures.

What's in a Pinch: A Closer Look at Lower Eyelid Pinch Blepharoplasty

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Introduction: The lower eyelid pinch blepharoplasty technique was described in the early 1970s[1] and has been widely adopted given its simplicity, efficiency and purportedly smaller risk of post-operative eyelid malposition.[2] The technique is thought to spare the pretarsal orbicularis, reducing risk of regional orbicularis weakness or paralysis with ensuant abnormalities in eyelid function. The purpose of this study was to assess for the presence and quantity of muscle excised during routine pinch blepharoplasty.

Methods: Specimens were collected from patients undergoing cosmetic lower eyelid blepharoplasty with skin pinch. A microscopically oriented histologic surgery (MOHS) technique was employed to allow for assessment of the entire deep margin of the specimen. Each specimen was divided into four quadrants with the orientation marked using ink (Figure 1). Hematoxylin and eosin slides were examined for the presence of skeletal muscle. When identified, it's dimensions were measured to calculate a percentage of the total surface area containing muscle fibres.

Results: A total of four pinch blepharoplasty specimens were examined. The mean surface area of each quadrant was 24.9 ± 6.7 mm2 totaling a mean of 99.4 ± 23.9 mm2 per pinch blepharoplasty specimen. While three quadrants (3/16; 18.8%) had no evidence of muscle (Figure 2A), the majority of quadrants (11/16; 68.8%) demonstrated ≥ 1 area of muscle (Figure 2B). The mean surface area of muscle per pinch blepharoplasty specimen was 6.2 ± 4.8 mm2. On average, 6% ± 4% (range 1 – 9%) of the total surface area contained muscle (Table 1).

Conclusions: While muscle was identified in all pinch blepharoplasty specimens examined, the percentage of total surface area was negligible in the majority of cases. Pinch blepharoplasty does appear to include some orbicularis, although the amount in terms of surface area and depth is small. These findings will be better characterized with a larger data set.

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Figure 1

Figure 1. Depiction of the sectioning technique employed to allow for complete assessment of the deep margin.

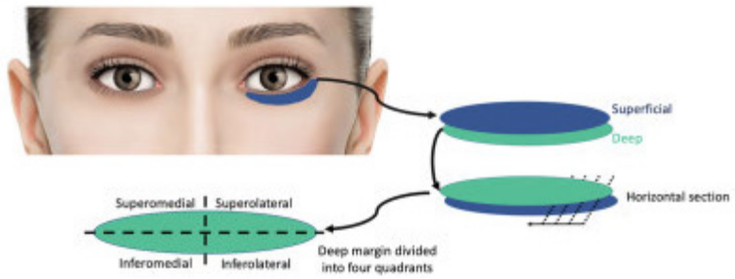

Figure 2

Figure 2. Representative photographs of hematoxylin and eosin stained pinch blepharoplasty specimens (A) without any evidence of muscle and (B) showing three discontinuous areas of orbicularis (asterix).

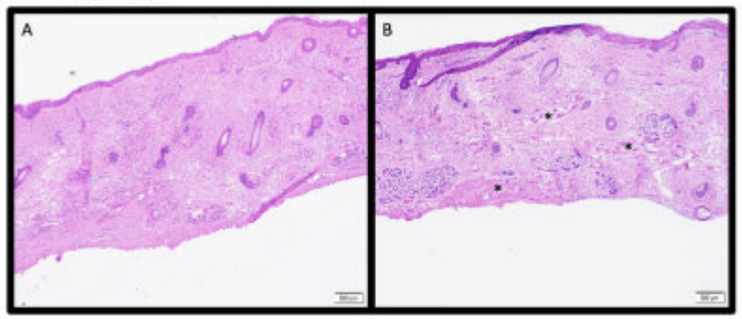

Table 1

Table 1. Quantification of blepharoplasty specimen area and amount of muscle present.

Specimen	Quadrant	Quadrant surface area (mm^2)	Muscle present	Surface area muscle present in quadrant (mm^2)	Total blepharoplasty specimen surface area (mm^2)	Total surface area of muscle (mm^2)	Proportion of total surface area with muscle present
1	SL	29.8	N	-	107.2	7.09	7%
	IL	28.8	Y	0.17			
	SM	24.0	Y	3.24			
	IM	24.7	Y	3.69			
2	SL	26.0	N	-	128.10	12.10	9%
	IL	35.1	Y	0.30			
	SM	34.0	Y	3.00			
	IM	33.0	Y	8.80			
3	SL	13.3	Y	0.01	72.03	0.51	1%
	IL	18.9	Y	0.10			
	SM	23.0	Y	0.39			
	IM	16.9	N	-			
4	SL	31.5	Y	5.00	90.36	5.28	6%
	IL	22.0	Y	0.03			
	SM	18.9	Y	0.03			
	IM	18.0	Y	0.22			

SL = superolateral
IL = inferolateral
SM = superomedial
IM = inferomedial

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A Case Series of Facial Palsy Following Administration of COVID-19 Vaccine

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Introduction: This is a case series report of four patients who developed facial nerve (Bell's) palsy after receiving mRNA COVID-19 vaccination.

Methods: The demographics and natural history of four patients are described below.

Results: Four patients (male sex, n=1; age range 33-76 years) presented to the ophthalmology clinic with unilateral facial nerve palsy shortly after immunization against COVID-19. There was no previous history of autoimmune disease, vaccine reaction, or prior infection with COVID-19 among any of the patients. Three patients received the Moderna vaccine; one patient received Pfizer-BioNTech. The majority (n=3) of patients developed facial palsy after the second dose; one patient was affected after the first dose of the Moderna vaccine. All three patients who received the Moderna vaccine developed Bell's palsy in one day or less, whereas the patient who received the Pfizer vaccine did not develop facial weakness until eight days after injection. Symptoms ranged from none (n=2, status-post Moderna vaccination) to headache, facial pain, epiphora, claudication, hyperacusis, and impaired taste severe enough to warrant work-up for giant cell arteritis. The two patients inoculated with the Moderna vaccine who were asymptomatic at presentation showed complete resolution of lagophthalmos (one patient received early antivirals and the other patient was not treated). The remaining two patients showed only mild improvement in lagophthalmos at two-months of follow-up, despite both receiving initial treatment with systemic steroids and antivirals (Figure 1).

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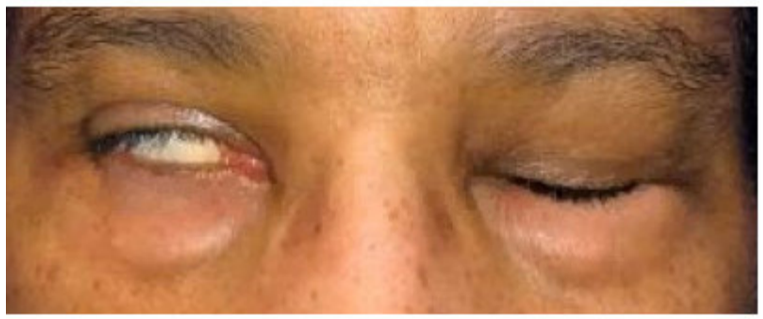
Conclusions: Isolated facial paralysis after vaccination has been reported with almost all viral vaccines, and is thought to be immune-mediated or induced by viral reactivations. The World Health Organization Pharmacovigilance Database found that the reporting rate of facial paralysis after mRNA COVID-19 vaccination is not higher than that observed with other viral vaccines.[1,2] Treatment of post-vaccination Bell's palsy remains challenging. One current recommendation is early empiric corticosteroid and/or antiherpetic therapy.[3] However, our data shows that the majority of treated patients do not improve after two-months. It may be the case that severity of symptoms at onset correlates with likelihood of resolution. Further data is needed to determine the efficacy of corticosteroid and antiviral treatment in this subset of patients. Finally, there was no correlation between different vaccine formulations and risk of developing facial palsy. Although facial palsy may confer significant morbidity, timely access and administration of vaccines should remain a priority.

Figure 1



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A Modified Suture-Suspended Brow Lift

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Introduction: We present an original description of a minimally-invasive brow-lifting technique originally developed in 2007 and described in 2011, with further modification and analysis of outcomes.

Methods: Patients with moderate eyebrow ptosis were selected to undergo a modified suture-suspended brow lift through four or five forehead stab incisions and a separate blepharoplasty incision. The procedure was done under either local anesthesia with MAC sedation or general anesthesia, and was completed within 1.5 to 2 hours. Pre- and post-operative photos of sixteen patients who underwent the procedure by the same surgeon were analyzed. Patient age, sex, and timing of post-operative follow-up were recorded. The change in Margin Reflex Distance 1 (MRD1) and Brow-Reflex Distance (BRD) were calculated. Post-operative complications and time to resolution, if applicable, were recorded.

Description of procedure: A standard blepharoplasty incision is made in the eyelid to create a preseptal dissection plane to the superior orbital rim. The periosteum is incised 2 millimeters above the orbital rim with additional care around the supraorbital nerve medially (Figure 1). Next, the periosteum is further separated from the underlying frontal bone 30-40 millimeters superiorly. The orbital ligament is severed and lateral forehead dissection is continued. A relaxing periosteal incision is made lateral to the course of the supraorbital nerve, followed by blunt dissection deep to the neurovascular bundle. The corrugator muscle is transected to release the medial brow. Four or five forehead stab incisions are made 40-50 millimeters from the orbital rim. Double-armed 5-0 polypropylene sutures are placed through the superior orbital periosteum at the and at the level of the lateral raphe. Each suture end is passed superiorly under the periosteum with the aid of an 18-gauge needle and tied deeply within the respective stab incisions prior to skin closure (Figure 2).

Results: Outcomes of 16 cases were analyzed. The average patient age was 67 years (range 51-77 years), and included 11 male and 5 female patients. Post-operative measurements and photos were documented an average of 8 weeks after surgery. The average change in MRD1 was 2.26 ± 1.04 millimeters, and the average change BRD was 3.87 ± 1.75 millimeters. Complications included cases of transient forehead paresthesia and one hematoma in the setting of post-operative anticoagulant use that resolved without surgical intervention. One patient had partial recurrence of brow ptosis, but chose not to undergo further surgical correction.

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Conclusions: This data compares favorably with that of other well-established brow lift procedures. The minimal use of complex and costly equipment, short operative time, minimal post-operative pain, reproducibility, and long-term safety profile of this procedure support its use as an effective, minimally invasive option for patients with significant brow ptosis.

Figure 1

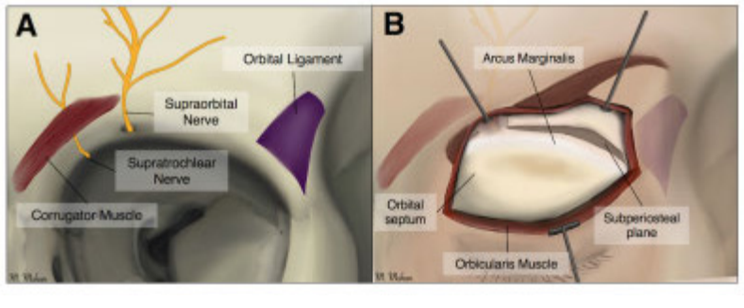
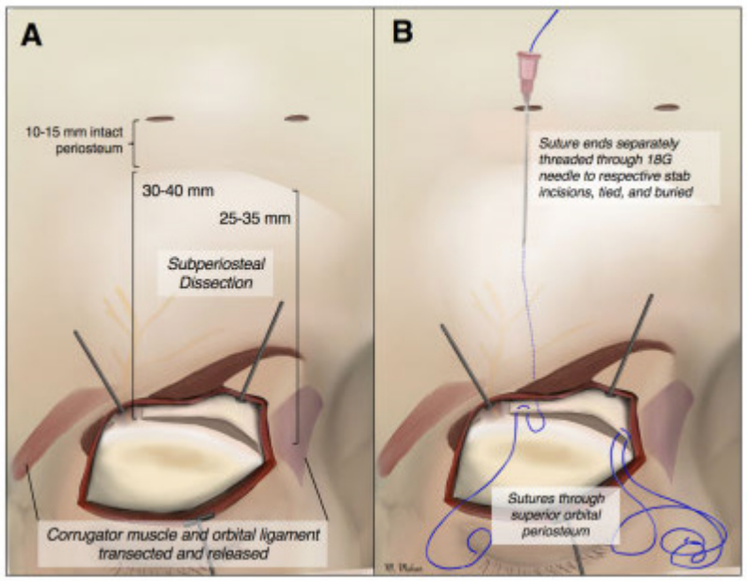


Figure 2



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A Systematic Review of the Use of Tranexamic Acid to Reduce Bleeding, Edema, Or Ecchymosis from Facial Plastic Surgeries

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Introduction: Tranexamic acid (TXA) is an antifibrinolytic agent that is FDA approved for menorrhagia and hemophiliac patients undergoing tooth extraction. Studies have shown TXA reduces bleeding in a variety of settings such as orthopedic[1], trauma[2], and obstetric surgeries[3]. The authors aim to characterize the evidence on the efficacy of TXA in reducing bleeding, edema, or ecchymosis in facial plastic surgeries.

Methods: A review of the literature was performed in March 2021. PubMed, Cochrane database, and Embase were queried using the following search terms: "tranexamic acid OR TXA OR antifibrinolysis OR anti-fibrinolysis" AND "oculoplastic OR blepharoplasty OR periorbital surgery OR rhinoplasty OR facial surgery OR rhytidectomy." Included studies were randomized controlled trials comparing TXA with placebo or no TXA in patients undergoing facial plastic surgeries.

Results: The search resulted in 104 unique articles, of which 9 met criteria for analysis. Types of surgeries in the included studies were blepharoplasty (11.1%), rhinoplasty (55.5%), septoplasty (11.1%), septorhinoplasty (11.1%), and rhytidectomy (11.1%). The mean sample size was 75 participants (range of 34-176). Publication year ranged from 2015-2020. Administration routes of TXA included IV (66.6%), oral tablets (22.2%), or local injection (11.1%). TXA was administered either pre-operatively (44.4%), post-operatively (11.1%), or both (44.4%).

Intraoperative blood loss was calculated in 7 of 9 included studies. The methodologies used to measure blood loss was heterogenous. Five of 7 studies noted statistically significantly decreased intraoperative blood loss in the TXA treatment group while the other 2 studies showed no statistical difference between the groups. Postoperative edema and ecchymosis were reported in 4 of the 9 studies. Three studies showed significantly decreased edema and ecchymosis on post-operative day (POD) 1 in the TXA treatment group. Two of those three studies also showed significantly decreased edema and ecchymosis on POD 3 and 7 as well. The other study assessing edema and ecchymosis, reported significantly decreased surgeon-rated ecchymosis averaged over POD 1, 6, and 9. However, there was no statistical difference in patient-rated ecchymosis, patient-rated edema, or surgeon-rated edema averaged over the same time period. One study reported only post-operative ecchymosis on POD 1 and 7 and showed no significant difference between the two groups.

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Conclusions: The current evidence that TXA reduces bleeding, edema or ecchymosis with facial plastic surgeries is equivocal. High quality prospective, randomized studies are needed to establish the role of TXA in facial plastic surgeries.

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Analysis of Surgeon Gender of Upper Blepharoplasty Performed in the United States

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Introduction: Gender disparities persist amongst surgical specialties in compensation, leadership roles, and career advancement opportunities.[1-6] This disparity is evident in ophthalmology: female ophthalmologists in 2021 perform fewer cataract surgeries on average than male counterparts, even controlling for clinical volume and physician experience.[1] In this study, we surveyed the surgical volume of male and female surgeons performing upper blepharoplasty on Medicare beneficiaries to determine if a similar inequality exists within the field of oculofacial plastic surgery in the United States.

Methods: The 2018 Medicare Provider Utilization and Payment Data: Physician and Other Provider dataset, specifically narrowed by provider and service, was queried for blepharoplasty surgeries utilizing the Current Procedural Terminology Code 15283. All Medicare claims filed under ambulatory surgical services and centers were excluded, so as only to include claims filed under individual providers. Surgeons were identified by their National Provider Identification numbers and subsequently matched to the Physician Compare National Downloadable File, from which physician characteristics including sub-specialty and reported gender were attained. The American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) Membership Directory was queried to identify ASOPRS-certified surgeons within the dataset. Gender differences in regards to total surgical volume were assessed. Additionally, gender differences in regards to ASOPRS certified surgeons' average surgical volume compared to non-ASOPRS certified surgeons were also identified. Welch two-sample t-tests were performed to determine significance between the number of blepharoplasties performed by male and female surgeons among all specialties, ophthalmologists, and ASOPRS-certified surgeons. All analyses were performed in R version 4.0.3 (R Foundation for Statistical Computing, Vienna, Austria). This study was exempted by the University of Texas at Austin Dell Medical School Institutional Review Board and adhered to the Declaration of Helsinki.

Results: Altogether, 38,611 blepharoplasty procedures performed by 1,085 surgeons were assessed. 834 (76.9%) male surgeons performed 30,248 (78.3%) blepharoplasty surgeries as compared to 251 (23.1%) female surgeons who performed 8,347 (21.6%) blepharoplasty procedures. On average, blepharoplasty procedures per surgeon were 36.3 for men, versus 33.3 for women (95% confidence interval [CI] -6.97 - 0.94, p = 0.135). When specifically assessing ASOPRS-certified providers, 264 male providers performed 12,368 blepharoplasty surgeries, with an average of 46.85 procedures per provider, in comparison to 83 female surgeons who performed 3,326 surgeries, with an average procedure per provider rate of 40.07 (95% CI, -14.37 – 0.82; p = 0.0800). Amongst

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non-ASOPRS-certified ophthalmologists, males performed an average of 32.68 procedures per provider versus 30.11 procedures per female provider (95% CI, -7.24 - 2.09; p = 0.279).

Conclusions: More functional upper blepharoplasty in the United States is performed by male as compared to female surgeons. However, when analyzing procedures performed per surgeon, no statistically significant gender differences were noted in any of the three groups: aggregate, ASOPRS-certified surgeons, and non-ASOPRS ophthalmic surgeons. While the ASOPRS-certified group trended towards more procedures performed by males, this was not significant. While this parity data is reassuring, continued awareness and analysis of gender disparity across surgical specialties is recommended.

Figure 1

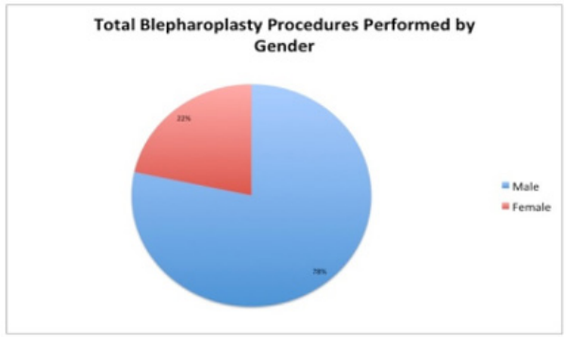

Figure 2

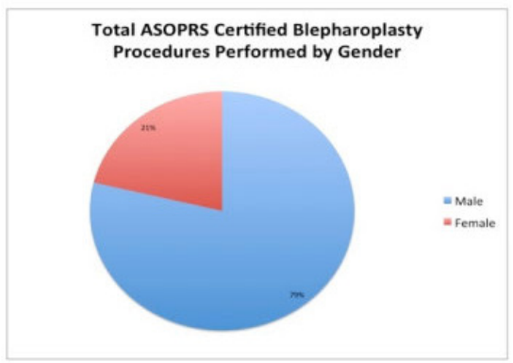

Figure 3

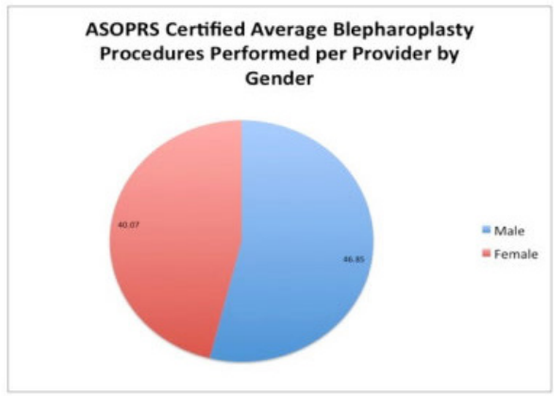

Figure 4

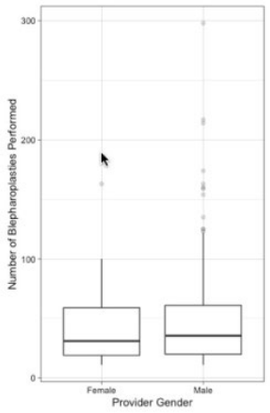

Figure 5

Gender	Count	Mean Blephs Done	Standard Deviation	Minimum	Maximum
Male	264	46.8	38.8	11	298
Female	83	40.1	27.5	11	163

Table 1. Number of functional upper blepharoplasties performed by male and female ASOPRS-certified surgeons.

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Chalazion Excision via 11-Blade Dissection Technique: 10 Year Experience of 2647 Chalazia

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Introduction: Chalazia are common lipogranulomatous eyelid lesions resulting from blockage of sebaceous glands. Some can resolve spontaneously with conservative therapy, but recalcitrant lesions are common and can be cosmetically bothersome, cause ptosis or blurred vision from astigmatism. Described treatment strategies include steroid injection, surgery or a combination of the two. Intralesional triamcinolone leads to resolution in 60-73% of patients, however multiple injections may be needed and there is a risk of depigmentation, fat atrophy, ocular hypertension, anterior segment ischemia and globe rupture. Surgeries described include transconjunctival incision and curettage (I&C) using scalpel, needle, or Wescott scissors; transcutaneous I&C; and complete excision. Surgical success rates range from 60-92%, allow histologic diagnosis, and may be performed on larger chalazia. Drawbacks include recurrence from retained capsular fragments, excessive bleeding, lacrimal outflow trauma, and harm to posterior lamellar structures. Herein we describe the preferred chalazion excision technique by the senior author (RS) utilizing an 11-blade dissection technique.

Methods: 2647 eyelids of 2598 patients that underwent chalazion excision between July 2010 - July 2020 were included. All patients had > 4-week duration despite conservative therapy. Exclusion criteria included < 1-month follow-up, small marginal chalazia, sebaceous carcinoma histology, and active infection. Anesthesia is given and chalazion clamp everts the lid. An 11-blade vertical incision is made through the lesion center (Fig 1A). Cotton tipped applicators express all interior contents. Forceps grasp the medial (Fig 1B) and lateral (Fig 1C) capsule while the 11 blade creates a fine dissection plane between the capsule and adjacent normal tissue. The 2 capsule halves are excised with Wescott Scissors (Fig 1D, 1E, 1F). The clamp is removed, pressure applied, and antibiotic ointment given. Patients returned post-operative week 1 and post-operative month 1 (POM1) and asked to document the day of resolution. Success was defined as resolution and lack of symptoms at POM1. Pearson bivariate correlation was used to assess influence of age, duration, and time to resolution. Differences in gender, primary versus recurrent disease, and presence of rosacea or blepharitis on outcome were compared using independent sample T-Test.

Results: Table 1 summarizes mean cohort data. 2607 (98.5%) lesions resolved 2.7 days postoperatively on average. 40 (1.5%) recurrences required repeat excision using the same technique that resulted in resolution in all cases. Side effects included button hole in 21 (0.8%) cases that was allowed to heal by secondary intention, and excessive bleeding in 8 (0.3%) cases that was managed with patching. Success was similar for both primary and recurrent cases with regards to age, sex, and presence of rosacea or blepharitis. No correlation was detected for age or duration for time to resolution.
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Conclusions: Conventional I&C of chalazia have reported success rates of 60-92%. Recurrence may be attributed to retained capsular remnants when dissection utilizes Wescott scissors. The described technique had a high success rate of 98.5%, which we attribute to fine capsule dissection with the 11-blade allowing complete capsular excision. The technique is fast, safe, cost effective, leads to speedy resolution and has a quick learning curve.

Figure 1

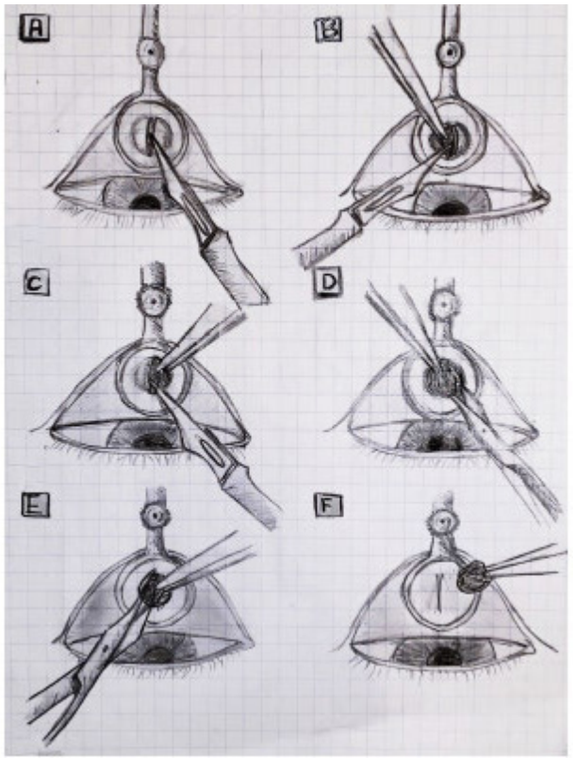

Table 1

Table 1.

Mean Age (years)	47 (range, 2-92)
Sex	
male	1247 (48%)
female	1351 (52%)
Location	
upper lid	456 (55%)
lower lid	1191 (45%)
Related conditions	
blepharitis	1800 (68%)
acne rosacea	476 (18%)
Presentation	
primary	2568 (97%)
recurrent	79 (3%)
Size (vertical x horizontal, mm)	6.8 x 6.2 (range, 3-16 x 4-13)
<1 cm diameter	1535 (58%)
1-1.5 cm diameter	1059 (40%)
>1.5 cm diameter	53 (2%)
Duration of symptoms (weeks)	9 (range, 4-114)
Success	
resolution	2607 (98.5%)
recurrence	40 (1.5%)
Time to resolution (days)	2.7 (range, 1-13)
Side effects of excision	
full thickness button bole (<1mm)	21 (0.8%)
excessive bleeding	8 (0.3%)

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Comparative Methods of Lower Eyelid Margin Reconstruction

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Introduction: Various procedures can be used to reconstruct the lower eyelid margin. This retrospective study was performed to compare indications and surgical results of 5 different techniques for lower eyelid margin repair after Mohs surgery:

- Primary closure
- Semicircular flap
- Dermal matrix sandwich graft
- Sliding tarsal flap
- Tarsoconjunctival flap

Methods: Medical records and photographs were reviewed in patients undergoing surgery between 2005–2020. Exclusion criteria included: defects medial to the punctum or involving the lateral canthus, extensive coexisting skin defects or cicatricial ectropion, follow-up.

Results: Figure 1 shows the distribution of procedures and widths for 178 defects included in the study. There was a trend for a younger average age in patients undergoing dermal matrix grafts (63.5yr) compared to when treated with semicircular (70.5yr, p=0.0604) or sliding tarsal flaps (69.8yr, p=0.0722). Wounds repaired with semicircular flaps were on average smaller than with dermal matrix grafts (p=0.0017) or sliding tarsal flaps (p=0.069). Excluding pedicle division, more patients with tarsoconjunctival flaps (≤18mm defect) required subsequent interventions than among other groups (p<0.00001).

Functional result was rated as good-excellent in all patients. Table 1 lists visible postoperative deformities and cosmetic outcomes. A good-excellent rating was given to 87.1% of results when observers were masked to the defect photographs, and 98.3% when they considered the defect appearance. The majority (90.4%) of patients were asymptomatic at last visit. Intermittent dryness-irritation was the most common reported symptom (6.7%).

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Conclusions: The choice of procedure to repair lower eyelid margin defects is usually determined by extent of the wound and amount of adjacent tissue laxity. The sliding tarsal flap can be used to repair shallow defects and is perhaps the most versatile technique for wounds of varying widths. The semicircular flap is effective for medium sized wounds that cannot be closed primarily. It allows creation of a continuous lash line, although with a higher incidence of lateral canthal deformities and horizontal palpebral fissure shortening. The single-staged dermal matrix sandwich graft can be used for deeper moderate (13-18mm) wounds when there is sufficient tissue laxity to create conjunctival and skin flaps, with results similar to the tarsoconjunctival flap.

Subsequent interventions were more frequently needed after the tarsoconjunctival flap than the other methods. All patients achieved a good-excellent functional result and the majority exhibited a good-excellent cosmetic result. Intermittent dryness was the most common postoperative symptom.

Figure 1

Figure 1: Surgical technique vs horizontal width of eyelid margin defect.

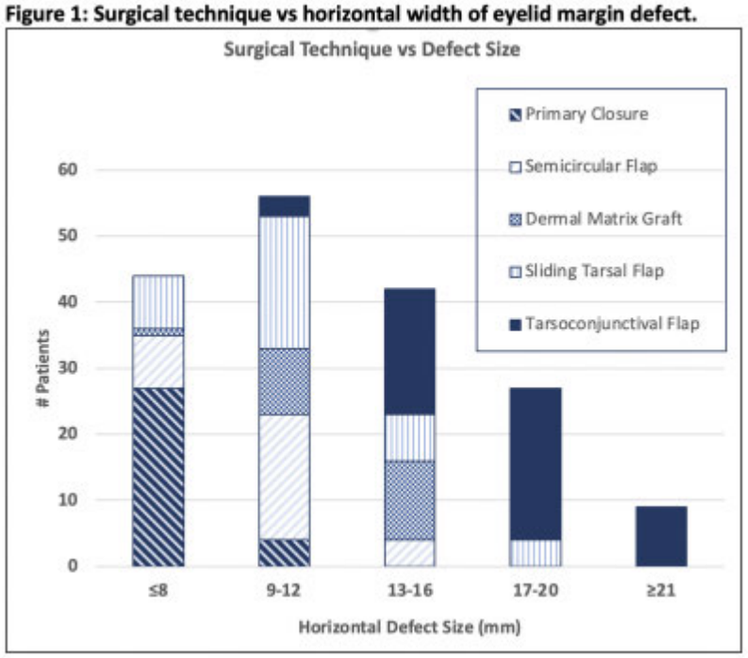

Table 1

Table 1: Postoperative results following lower eyelid margin reconstruction.

Procedure	N	Horizontal Wound (mm)	Postoperative Interventions*		Postoperative Deformities					Overall Cosmetic Result (Good, Excellent)	
			Patients	Ave per Case	Margin Contour	Lateral Canthus	Short Fissure	Lash Line	Poor Lid Position	Blinded to Defect	Consider Defect
Primary Closure	31	4-10 (Ave: 6.8)	7.2%	0.03	3.2%	3.2%	9.7%	25.8%	22.60%	100.0%	100.0%
Semicircular Flap	31	7-15 Ave: 10.0	12.9%	0.13	0.0%	64.5%	32.3%	9.7%	32.30%	100.0%	100.0%
Dermal Matrix Graft	23	6-16 (Ave: 12.3)	17.4%	0.17	4.3%	8.7%	17.4%	91.3%	26.10%	78.3%	91.3%%
Sliding Tarsal Flap	39	6-18 (Ave: 11.2)	10.3%	0.10	5.1%	7.7%	20.5%	74.4%	33.30%	94.9%	97.4%%
Tarsoconjunctival flap: Total	54	12-33 (Ave: 18.3)	55.6%	0.69	7.4%	13.0%	11.1%	90.7%	33.30%	70.4%	100.0%%
≤18mm Defect	32	12-18 (Ave: 15.5)	56.3%	0.75	3.1%	6.3%	6.3%	87.5%	28.1%	78.1%	100.0%
Total	178	4-33 (Ave: 12.5)	24.2%	0.58	4.5%	18.5%	17.4%	61.8%	30.7%	87.1%	98.3%

* Excluding tarsoconjunctival flap pedicle division. Minor: steroid injection, treatment trichiasis (repeated epilation, cryotherapy, electrolysis), treatment inflamed lid margin, pyogenic granuloma excision, suture abscess, punctal rotation. Major: retraction/ptosis/wound repair.

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Effect of Antibiotics Use, Sling Material, and Closure Technique on Frontalis Sling Surgical Outcomes

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Introduction: Frontalis suspension with sling material is an effective treatment for blepharoptosis with poor levator function. In a prior study, the strong correlation between perioperative antibiotic use and eyelid closure technique made it difficult to interpret their individual roles in preventing complications. There is currently no consensus regarding the optimal sling material, eyelid and eyebrow incision closure techniques, and use of perioperative systemic antibiotics.

Methods: This is a retrospective chart review. Cases were identified through CPT code for frontalis sling surgery between 01/01/2010 - 12/01/2020. Inclusion criteria included age 0 to 65 years and follow-up greater than one month. Demographics, sling material, primary vs. repeat surgery, eyelid closure technique, eyebrow closure technique, perioperative systemic antibiotics use, and complications were collected. Statistical analysis was performed using chi-square and Fisher's exact tests. The study was approved by the Institutional Review Board and all data collection was HIPAA compliant.

Results: 287 frontalis sling surgeries from 181 patients met the inclusion criteria. 185 were first surgeries; 102 were repeat surgeries. Statistical analysis was restricted to first surgeries and one randomized eye per patient. A total of 134 frontalis sling surgeries were included in analysis. Sling materials include supramid (n= 64), fascia lata (n=10), and silicone (n=60). Complications occurred in 13 of 134 (9.7%) surgeries and included sling exposure, suture granulomas, inflammatory eyelid swelling, and wound abscesses. There was no significant difference in complication rates between the sling materials (p=0.095). Eyelid closure techniques were skin only in 114 cases (85%), skin incorporating levator and tarsus in 16 (12%), and skin incorporating sling material in 4 (3%). There was no significant correlation between eyelid closure technique and complication rate (p = 0.477). There was, however, a trend for higher complication rates with closures incorporating tarsus, levator or sling material. Brow closure was skin only in 76 cases (57%), skin closure after deep tissue closure in 58 cases (43%). There was no significant difference (p = 0.558) in complication rates between brow closure techniques. There was, however, a trend for lower complication rates in multi-layer closures. Perioperative antibiotics were given in 13 of 134 cases and were not associated with a lower complication rate (p = 0.615). Average time to onset of complications was 5.5 months post-operatively.

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Conclusions: There was no significant correlation between brow closure technique and complication rates, but a general trend towards lower complication rates with layered closure was noted. While there was no significant correlation between eyelid closure technique and complication rate, the trend towards higher complication rates with closures incorporating sling material, tarsus or levator may support skin only eyelid closure. Results of the present study do not support routine use of perioperative antibiotics in frontalis sling surgery.

Figure 1

Brow Closure Technique	n	Complication Rate $p = 0.558$
Skin Only	58	12.1 %
Skin + Deep Tissue	76	7.9 %

Figure 2

			Eyelid Closure			Brow Closure	
Sling Material	n	Complication Rate (%) $p = 0.095$	Skin Only	Skin + Levator/Tarsus	Skin + Sling Material	Skin only	Skin + Deep Tissue
Supramid	64	4.7 %	63	0	1	30	34
Fascia Lata	10	20.0 %	5	2	3	8	2
Silicone	60	13.3 %	46	14	0	20	40

Figure 3

Eyelid Closure Technique	n	Complication Rate $p = 0.477$
Skin Only	114	8.8 %
Skin + Levator and Tarsus	16	12.5 %
Skin + Sling Material	4	25.0 %

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Effectiveness of Intraoperative Lagophthalmos Formula in Levator Resection for Congenital Ptosis

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Introduction: To validate the effectiveness of intraoperative lagophthalmos formula (IOLF) in leavtor resection for congenital ptosis, and to investigate the optimal preoperative conditions for satisfactory surgical outcome.

Methods: This is a prospective, single center cohort study of patients who underwent unilateral or bilateral levator resection using IOLF for congenital ptosis from Jan 2015 to July 2020 and followed up more than 6 months. We evaluated preoperative values (age at operation, margin reflex distance-1 (MRD1), and Levator function (LF)) and postoperative MRD1 at 1, 3, and 6 months postoperatively. The effectiveness of IOLF was assessed by surgical success rates at 6 months post operatively under the definition as follows; satisfactory correction as postoperative MRD1 ≥ 3mm in each eye and difference in MRD1 ≤ 1mm between eyes, over-correction as difference in MRD1 > 1mm between eyes, and under-correction as postoperative MRD1 < 3mm. To investigate the optimal preoperative conditions for satisfactory surgical outcome, we first evaluated the correlation between the preoperative values and 6 months postoperative MRD1. Thereafter only for the statistically significant preoperative values influencing postoperative MRD1, we analyzed in which range they are correlated with successful surgical correction.

Results: A total 24 eyelids of 17 patients were included. The average age was 4.80 ± 0.87 years (range: 3~6 years), follow-up period was 11.95 ± 4.29 months (range: 6~50 months). The average preoperative MRD1 was 0.60 ± 1.21 mm (range: -2.00~2.47 mm) and LF was 5.31 ± 1.78 mm (range: 3 ~ 8 mm). The average postoperative MRD1 was 3.26 ± 0.72 mm (range: 1 ~ 4.45 mm) and difference in MRD1 between eyes was 0.77 ± 0.62 mm (range: 0.08 ~ 2.63). IOLF showed 87.5% (n=21) of satisfactory correction, while 8.3% (n=2) of under-correction and 4.2% (n=1) of over-correction. Among preoperative values, only MRD1 and LF showed significant positive correlation with postoperative MRD1 (r=0.277 p=0.022, r=0.173 p=0.038, respectively). Moreover, preoperative MRD1 ≥ 0 mm and LF from 5 to 8 mm were significantly correlated with satisfactory surgical correction (x2= 4.681, p=0.03 for MRD1 and x2= 7.839, p=0.005 for LF).

Conclusions: Intraoperative lagophthalmos formula (IOLF) produced 87.5% of success rates in levator resection for congenital ptosis. Especially the patients with preoperative MRD1 ≥ 0 mm and LF from 5 to 8 mm are more likely to have satisfactory surgical outcome.

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Evaluation of Dermoscopy as a Tool in Oculofacial Plastic Surgery

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Introduction: Dermoscopy, or epiluminescence microscopy, allows the clinician to observe and analyze skin lesions without the obstruction of skin surface reflections.[1-2] Dermoscopy has been noted to increase the sensitivity for skin cancer detection, decrease biopsy of benign lesions, and enable diagnosis of thinner malignancies[3-10]. Dermoscopy literature of eyelid margin tumors are mostly case reports; however, eyelid margin lesion dermoscopy was described in the dermatologic literature by Cinotti E et al.[11] However, this study did not assess dermoscopy's effect on treatment decision-making and surveyed larger tumors averaging 4.7mm. In addition to lesions, the utility of dermoscopy in analyzing non-periocular scar healing, vascularity and pigmentation has been demonstrated.[12-16] In this study, we aimed (1) to analyze eyelid margin tumors from an oculofacial plastic surgery perspective, with assessment of dermoscopy's effect on decision-making, and (2) to evaluate dermoscopy as an objective assessment tool to indicate periocular scar maturation vascularity, pigmentation, and depth to better inform treatment.

Methods: Sequential patients presenting to an oculofacial plastic and facial cosmetic surgery practice with periorbital lesions and scars were evaluated with and without the assistance of dermoscopy. Standardized photographs were taken with the dermoscope. Specific factors, including depth, vascularity, pigmentation, ulceration, margin destruction, madarosis/poliosis, and content components (if applicable) were assessed by the surgeon initially without, and then with the assistance of a dermatoscope. Specific factors that either aided or altered the decision-making process were assessed. This study was exempted by the University of Texas Dell Medical School Institutional Review Board and adhered to the Declaration of Helsinki.

Results: A total of 50 periocular lesions and 50 scars were evaluated. Overall, surgeons found the dermatoscope to be superior to the naked eye in identifying depth, pigmentation, and vascularity of periorbital lesions and facial scars. Furthermore, vascularity and dermoscopic patterns were more apparent compared to slit-lamp exam. Madarosis, poliosis, and ulceration were not found to be significantly different in comparison to standard ophthalmic examinations. In regards to scars, specific factors found to be most useful for management decisions were depth and vascularity of the scar. The ability to obtain high-quality magnified photographs directly from the dermatoscope and upload the images into the patient's electronic medical record (EMR) was noted to be beneficial.

Conclusions: Dermoscopy is an affordable and portable device that may be easily implemented in clinical practice, and it offers additional insights beyond slit-lamp examination. Dermoscopy is a valuable tool that can aid the clinician in highlighting features of

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periorbital lesions and scars that may inform treatment implementation. Finally, the ability to upload high-quality magnified images directly into the patient's EMR is advantageous, particularly for serial scar progress monitoring with lesion surveillance.

Figure 1

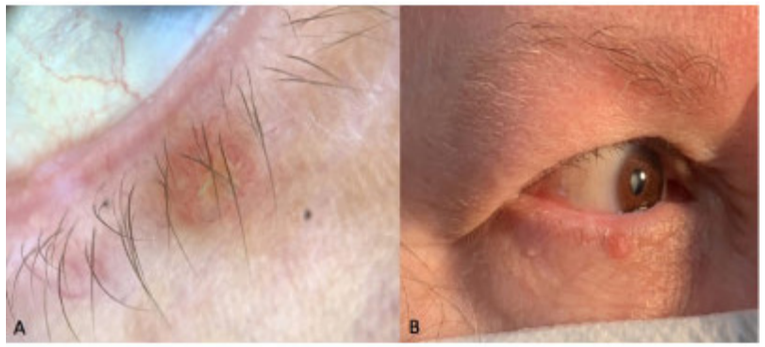


Figure 2

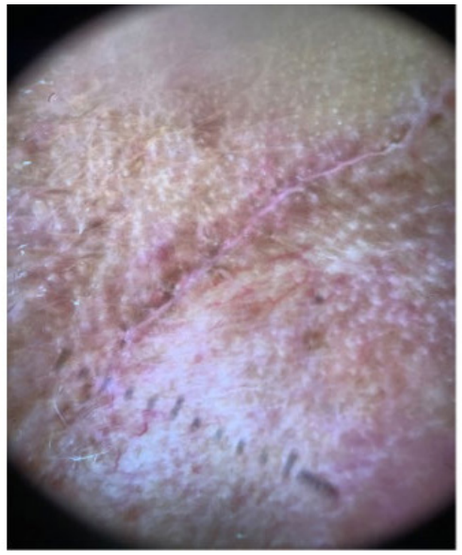
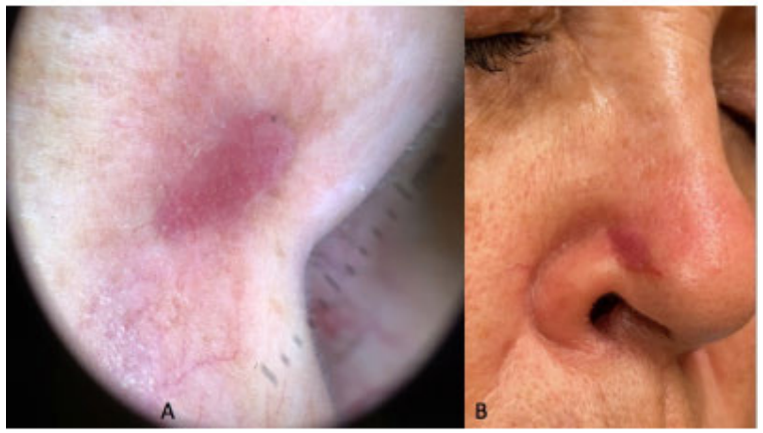


Figure 3



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Hemorrhage Following Muller's Muscle Conjunctival Resection: Description and Case-Control Study

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Introduction: Muller's muscle conjunctival resection (MMCR) is a common approach to ptosis surgery. In general, it is safe with rare complications including undercorrection, overcorrection, and corneal abrasion.[1] Occasionally, the authors have noted that postoperative hemorrhage can occur within the first week after surgery, a phenomenon which has not been previously described. Attempting to predict who may experience this complication would allow for more appropriate preoperative patient counseling. The purpose of this study was to report a series of patients with postoperative hemorrhage after MMCR surgery and compare risk factors and outcomes with a control population.

Methods: In this case-control study, patients who underwent MMCR surgery over a 5-year time period were identified. All records were screened for a history of postoperative hemorrhage occurring >24 hours after surgery and significant enough to warrant patient reporting at a postoperative visit, call to the physician, and/or an additional visit. Controls were derived from the same MMCR surgical database in a 4:1 ratio and were matched for age and sex. Clinical data collected included demographics, medical history, medications, and subsequent surgery. Preoperative and 3-month postoperative marginal reflex distance 1 (MRD1) were measured digitally using ImageJ (NIH, Bethesda, MD, USA). Data for the hemorrhage cases was reported using descriptive statistics. The hemorrhage and control groups were compared using Fisher's exact tests for categorical variables and independent samples t-tests for continuous variables.

Results: The hemorrhage group contained 4 women and 6 men with a mean age of 66.4 ± 18.5 years. The control group consisted of 40 age and sex-matched controls. Of 350 charts reviewed, there were 10 cases of postoperative hemorrhage, equating to an incidence of 2.9%. A summary of cases is depicted in Table 1. Hemorrhage occurred a mean 4.2 ± 1.3 (range 2-7) days after surgery and lasted for a mean 29.3 ± 19.1 (range 12-72) hours. Bleeding prompted an emergency room visit in 3 patients, office visit in 2 patients, and phone call in 3 patients. In all 10 cases, the bleeding resolved with conservative measures including compression, head elevation, and rest. There was no difference between the hemorrhage and control groups in terms of risk factors, including medical conditions, blood thinners, and subsequent ptosis surgery (Table 2). Preoperative, postoperative, and change in MRD1 did not differ between the hemorrhage and control groups (Table 3).

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Conclusions: Hemorrhage occurs approximately 4-5 days postoperatively in a small percentage of patients undergoing MMCR surgery. This is likely related to absorption of the primary platelet clot and failure of the collagen matrix to lay down in a stable manner.[2] It is generally mild and self-limited, though it can create distress for the patient. This investigation did not identify any consistent risk factors, and outcomes in this patient population appear no different than controls. Awareness regarding this idiosyncratic phenomenon may allow clinicians to appropriately counsel patients both preoperatively and when bleeding occurs.

Table 1

Table 1. Cases with postoperative hemorrhage after Muller's muscle conjunctival resection.

Case	Age	Sex	Surgical eye	Hemorrhage eye	Timing (postop day)	Duration (hours)	Visit type	Subsequent ptosis surgery
1	63	M	OS	OS	3	72	Routine	No
2	92	F	OU	OS	4	12	Office	No
3	61	F	OD	OD	5	24	Phone	No
4	59	F	OD	OD	4	24	ER	Yes
5	85	M	OU	OU	7	12	ER	No
6	57	M	OU	OU	4	24	ER	No
7	75	M	OU	OU	5	Unknown	Routine	No
8	72	M	OU	OD	2	24	Phone	No
9	25	F	OS	OS	4	48	Office	No
10	75	M	OU	OU	4	24	Phone	No
Mean (SD)	66.4 (18.5)				4.2 (1.3)	29.3 (19.1)		
Range	25-92				2-7	12-72		

OD: right eye; OS: left eye; OU: both eyes; ER: emergency room

Table 2

Table 2. Risk factors for postoperative hemorrhage after Muller's muscle conjunctival resection.

	Hemorrhage patients (n=10)	(%)	Control patients (n=40)	(%)	P-value
Medical conditions					
Diabetes	5	(50)	10	(25)	0.14
Cerebrovascular accident/coronary artery disease	1	(10)	2	(5)	0.50
Atrial fibrillation	1	(10)	3	(7.5)	1.00
Coagulopathy	0	(0)	0	(0)	1.00
Hypertension	7	(70)	24	(60)	0.72
History of smoking	5	(50)	11	(28)	0.26
Medications					
Aspirin	4	(40)	10	(25)	0.44
Warfarin/low molecular weight heparin	0	(0)	1	(2.5)	1.00
Apixaban	0	(0)	3	(7.5)	1.00
Non-steroidal anti-inflammatories	1	(10)	1	(2.5)	0.36
Clopidogrel	1	(10)	4	(10)	1.00
Any blood thinner	5	(50)	18	(45)	1.00
Subsequent ptosis surgery	1	(10)	4	(10)	1.00

Table 3

Table 3. Marginal reflex distance 1 in hemorrhage and control patients after Muller's muscle conjunctival resection.

	Hemorrhage patients (n=10)	Control patients (n=40)	P-value
Preoperative MRD1 mean (SD) (mm)	0.99 (0.57)	1.08 (1.31)	0.74
Postoperative MRD1 mean (SD) (mm)	2.26 (0.88)	2.59 (1.21)	0.35
Change in MRD1 mean (SD) (mm)	1.04 (0.73)	1.29 (0.99)	0.56

MRD1: marginal reflex distance 1

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Klebsiella Pneumoniae Mucopurulent Follicular Conjunctivitis and Tarsal Cysts Associated with COVID-19 Infection

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Introduction: Reports of various ocular infections have been reported to be associated with COVID-19, such as keratitis, conjunctivitis, endophthalmitis, and orbital inflammation. This is a case report of a patient with recent COVID infection, who developed *Klebsiella pneumoniae* mucopurulent follicular conjunctivitis and tarsal cysts. *Klebsiella pneumoniae* conjunctivitis is more commonly seen in neonates or infants as a variant of ophthalmia neonatorum, and has not been typically been reported in healthy adults, or in adults with COVID-19.

Methods: Case report and review of published literature.

Results: A 46 year old healthy female tested positive for COVID-19, and a week later developed significant upper and lower eyelid edema and erythema. She described constant mucopurulent discharge, crusting of the eyelids, and eye pain and irritation. There were no ill contacts, recent hospitalization, or trauma. Exam demonstrated 3+ eyelid edema on the right upper and lower eyelids, 2+ conjunctival injection, and numerous upper and lower eyelid tarsal cysts that were dark brown-gray in color (Figure 1). She was treated with various topical antibiotics and steroids over 2 months, with only limited improvement and return of symptoms. Biopsy and cultures of the lesions demonstrated tarsal cysts and follicular conjunctivitis associated with *klebsiella pneumoniae* and *stenotrophomonas maltophilia* organisms. Prolonged treatment with a fluoroquinolone slowly improved the infection and lesions.

Conclusions: Mucopurulent follicular conjunctivitis with multiple dark-colored tarsal cysts should alert the physician to the possibility of *klebsiella pneumoniae* infection, as well as recent exposure to COVID. Prompt and appropriate diagnosis of this unusual etiology can help prevent severe sequelae of fulminant *klebsiella pneumoniae* disease that may rarely lead to corneal perforation or endophthalmitis.

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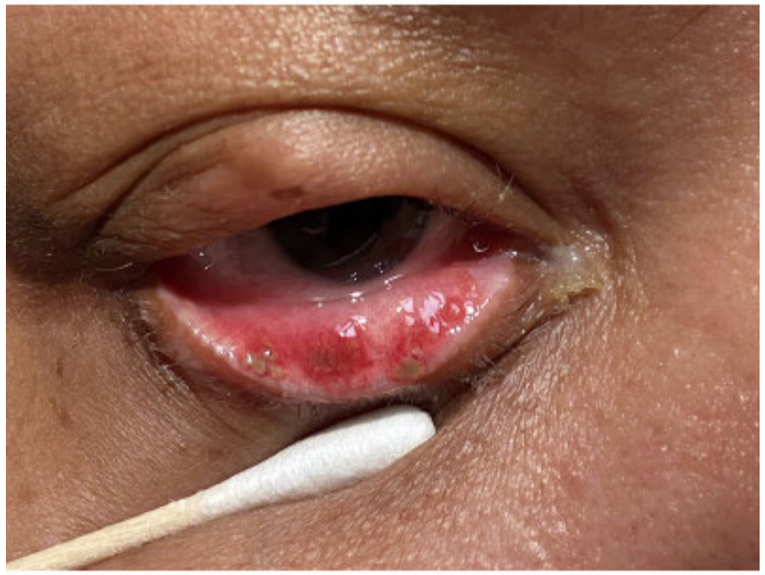
Figure 1



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Mechanical Lower Eyelid Entropion Due to Large Conjunctival Cyst

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Introduction: Lower eyelid entropion is usually classified as congenital, involutional, cicatricial, or spastic[1]. It has also been reported that mechanical forces from enlarged malar soft tissue in morbidly obese patients can push the lower eyelid margin inward[2]. We present a case with a unique mechanism of mechanical entropion. A 62-year-old female with right eye irritation was found to have lower eyelid entropion caused by a large conjunctival cyst. She underwent surgical excision of the cyst with immediate correction of the eyelid position and resolution of her symptoms.

Methods: A 62-year-old woman presented with several months of irritation, redness, and tearing of the right eye. She had no prior ocular history, including eye trauma, foreign bodies, or surgery. Her systemic medical history was unremarkable. On examination, she had bilateral upper eyelid involutional ptosis, right lower eyelid entropion with lash-corneal and lash-conjunctival touch, 1+ conjunctival injection of the right eye, and no corneal epithelial changes (Figure 1). Right lower eyelid eversion revealed a large conjunctival cystic lesion in the inferior fornix (Figure 2). No other masses were noted. She did not have lower eyelid laxity, conjunctival scarring, or orbicularis spasm. The rest of the examination was unremarkable. She underwent excision of the conjunctival lesion via a transconjunctival approach. The lower eyelid was distracted away from the globe to expose the lesion, and an incision was made through the conjunctiva overlying the lesion. The conjunctiva was dissected off of the lesion (Figure 3). The lesion was removed and sent for histopathologic analysis. The conjunctiva was closed with buried 6-0 plain gut suture.

Results: The eyelid position was immediately noted to be corrected at the completion of the case (Figure 4). At follow up one week post-operatively, the patient reported resolution of her irritation, redness, and tearing. Her right lower eyelid entropion had completely resolved (Figure 5). Pathology results reported a benign conjunctival cyst.

Conclusions: Lower eyelid entropion is typically due to one of four mechanisms described in the literature: congenital, involutional, cicatricial, or spastic1. This case demonstrates that entropion can have a mechanical etiology from a conjunctival cyst. Conjunctival cysts are common, yet a literature search did not reveal other instances resulting in entropion, suggesting this is a rare circumstance. We propose that in this particular patient, both the location and size of the cyst were important factors in the lower eyelid malposition. Significant outward pressure on the inferior tarsus or the tissue just inferior to it may result in inward rotation of the superior tarsus and eyelid margin. Surgical removal of the cyst removed that pressure and rotational force, restoring the eyelid margin to its appropriate

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position. It is important to be aware of conjunctival or forniceal masses as a possible cause of entropion, and it highlights the importance of the conjunctival exam in the evaluation of these patients.

Figure 1

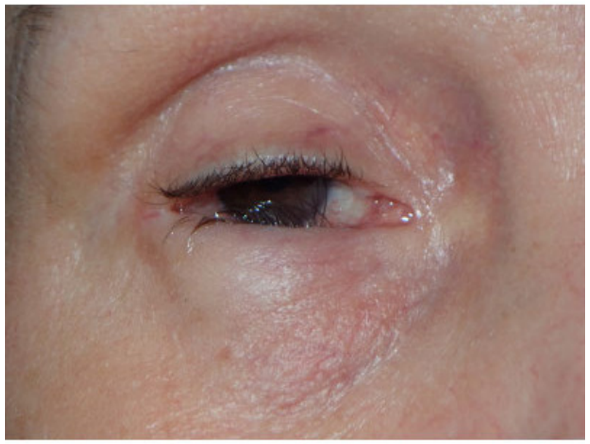


Figure 2

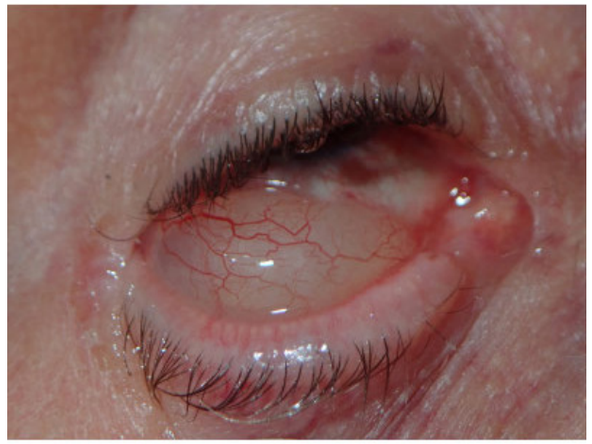


Figure 3

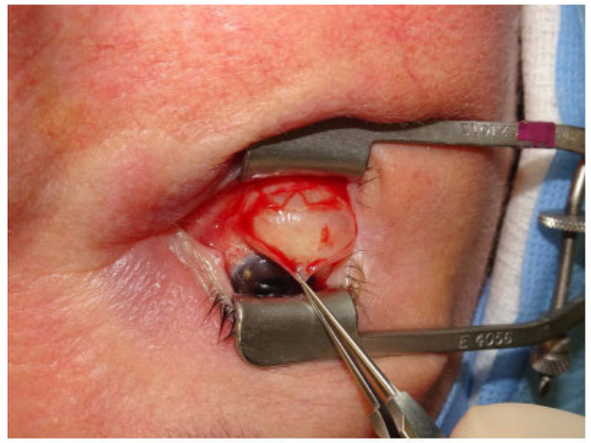


Figure 4

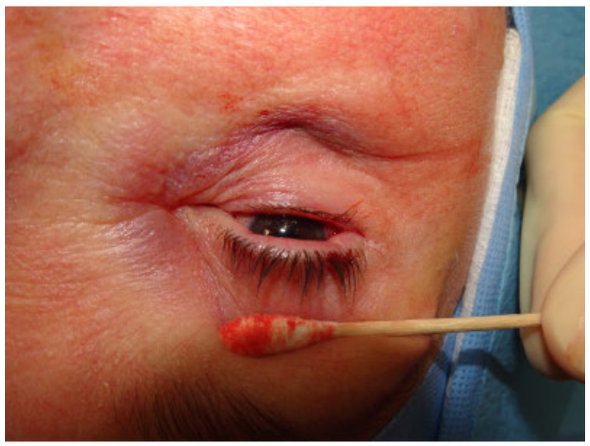
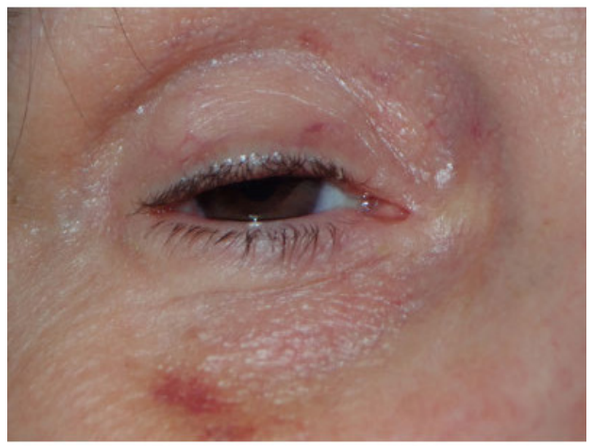


Figure 5



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Müller's Muscle-Conjunctival Resection in Phenylephrine Negative Patients

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Introduction: The decision to pursue Müller's muscle–conjunctival resection (MMCR) surgery for involutional ptosis has classically been dependent on the eyelid elevation after instillation of phenylephrine eyedrops. However, many reports suggest that MMCR surgery can be successful in cases with poor phenylephrine response. This study aims to understand the surgical outcome of MMCR in patients with involutional blepharoptosis and a negative phenylephrine test.

Methods: In this cross-sectional study, patients with involutional ptosis who underwent MMCR surgery over a 13-year period were divided in two groups: phenylephrine negative (change in MRD1 with phenylephrine less than 0.5 mm) and phenylephrine positive (change in MRD1 with phenylephrine more than 2 mm). These groups were then compared as respect to change in MRD1 with surgery and final MRD1 after surgery. Independent sample testing was performed.

Results: Eighty two (50.9%) of the 161 eyes included in this study were identified as phenylephrine negative. The preoperative mean MRD1 was 1.82 mm and 0.77mm for the negative and positive patients respectively ($p<0.001$). The mean change in MRD1 with surgery was 1.09 mm for phenylephrine negative subjects and 2.26 mm for positive patients ($p<0.001$). The mean postoperative MRD1 was 2.8 mm in the negative group and 3.00 mm for the positive group. This difference was not significant ($p=0.225$).

Conclusions: Individuals with very small change in MRD1 after phenylephrine instillation tend to demonstrate higher preoperative MRD1 and less change with surgery. Final postoperative MRD1 was not different between the phenylephrine negative and phenylephrine positive groups.

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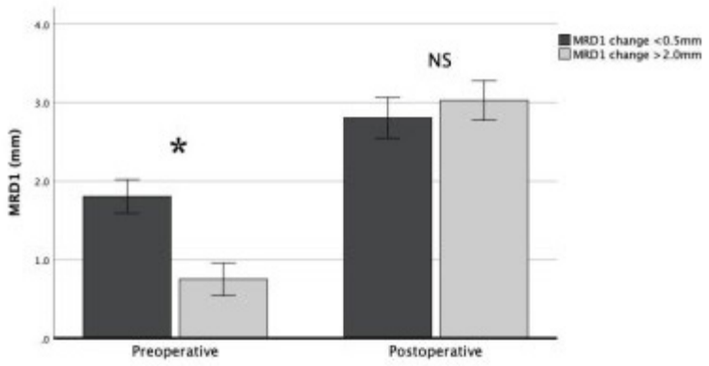
Figure 1



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Multifocal Sebaceous Carcinoma of the Eyelid: A Case Report and Review of Multifocal Disease

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Introduction: Sebaceous carcinoma is a rare but aggressive malignancy that arises from the epithelium of sebaceous glands and often presents in the periorbital region. Simultaneous involvement of both lids is extremely rare and seen in 5% of cases.[1,3] While tumors involving both the upper and lower eyelids and those with multicentric origin have been associated with a poorer prognosis, a comprehensive review of these tumors has not been reported in the literature.[2]

Methods: We report a unique case of multifocal, concomitant sebaceous carcinoma that arose from two distinct sebaceous foci in the upper and lower eyelid with complete secondary invasion of the lacrimal gland. In addition, a literature review is conducted to identify cases exhibiting multifocality in order to report a comprehensive review of the clinical features, management, and outcome of these tumors.

Results: An 81-year-old female presented with a cystic right upper eyelid lesion that was previously diagnosed by an outside institution as squamous cell carcinoma requiring resection and reconstruction. Ocular examination showed a central nodular lesion to the right upper lid margin, exposure keratopathy with diffuse conjunctival injection, and a firm, discrete subconjunctival mass in the inferior right fornix. MRI orbits showed a heterogeneously enhancing, nodular soft tissue mass on the right upper eyelid with right lacrimal gland enhancement concerning for tumor extension. Biopsies of the conjunctiva, eyelid, and lacrimal gland showed sebaceous carcinoma in all areas. Given the extensive disease, an orbital exenteration was performed. Histopathology demonstrated multifocal, invasive sebaceous carcinoma of the right superior eyelid tarsal plate extending to the superior orbital tissues, and a discrete mass in the inferior tarsal plate and inferior anterior orbital soft tissues with extensive pagetoid involvement of the epidermis, skin adnexa, conjunctiva, and corneal epithelium. In addition, there was complete obliteration of the lacrimal gland with no lacrimal gland tissue identified in the exenterated orbital specimen. Post-operative evaluation at 4 months with MRI and PET scan showed evidence of recurrence within the posterior orbit as well as new parotid gland involvement. She was initiated on chemotherapy and radiotherapy.

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Conclusions: Multifocal, concomitant sebaceous carcinoma involving the upper and lower eyelid is a rare clinical entity. This case highlights the unique ability of sebaceous carcinoma to arise from two distinct foci of origin and secondarily invade the lacrimal gland. We hypothesize that prior resection and / or reconstruction of the eyelid can influence periorbital multifocality. We will present a literature review of the clinical features, management, and outcomes of multifocal periorbital sebaceous carcinoma to highlight clinical behavior and prognosis of these tumors.

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Observations on the Anophthalmic Eyebrow

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Introduction: Eyebrow elevation in patients with ptosis is traditionally attributed to a compensatory mechanism to relieve visual obstruction. The presence of an elevated brow in anophthalmic patients has been cited to support an alternative proprioceptive mechanism. This study was performed to determine the incidence and associated findings of anophthalmic eyebrow elevation.

Methods: A retrospective chart and photographic review were performed on patients undergoing enucleation between 2007-2016. Exclusion criteria included: incomplete records, non-standard procedures, conditions impacting brow/eyelid function.

Results: Preoperative analysis included 89 patients, after omitting those with painful eyes and blepharospasm. Of the 56% with ipsilateral brow elevation, 62% had vision ≤LP. Duration of poor vision was ≥1 year in 71% and ≥5 years in 58%. Brow elevation was more frequent in patients with ipsilateral ptosis (65%), than without (33%; p=0.0083). Bilateral symmetrical elevation was also more common in patients with ipsilateral ptosis (59%) compared to absence of ptosis (26%; p=0.0376). Deep superior sulci were more commonly associated with brow elevation (77%), than normal sulci (35%; p<0.0001), regardless of whether ptosis was present. Both unilateral (p=0.0445) and bilateral symmetrical (p=0.052) eyebrow elevation were more frequent with right than left pathology. Levator function and enophthalmos did not correlate with an elevated brow.

Anophthalmic brow elevation was seen in 67% (65/97) of patients included in the postoperative analysis. Compared to preoperative measurements, brow position was: stable (62%), newly elevated (13%), more elevated (11%), less elevated (13%). Increased brow elevation was seen in 41% of patients who also experienced increased postoperative deepening of their sulcus, compared to 13% of patients with a stable sulcus (p=0.0017). Incidence of new onset anophthalmic brow elevation was similar after right (33%) and left (30%) enucleation. There was a trend for patients with worsened ptosis after surgery to more likely have increased brow elevation, compared to those with stable or improved ptosis (p=0.0523).

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Conclusions: Ipsilateral eyebrow elevation is common prior to enucleation, and is often associated with coexisting ptosis, deep superior sulcus, and right sided pathology. Intact vision is not necessary to maintain brow elevation, as many patients had chronic preoperative visual loss. Eyebrow position remained stable after enucleation in most patients, New postoperative elevation developed in 31% of patients. Increased postoperative brow elevation was more common in patients with deepening of the superior sulcus, but similar between right-left sided procedures. These findings may support both compensatory and proprioceptive mechanisms for eyebrow elevation.

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Outcomes of Cutaneous Mucinous Carcinoma of the Face and Scalp Treated with Mohs Micrographic Surgery

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Introduction: To evaluate outcomes of primary cutaneous mucinous carcinoma (PCMC) and endocrine mucin-producing sweat gland carcinoma (EMPSGC) of the face and scalp treated with Mohs micrographic surgery (MMS) at a single academic institution.

Methods: A retrospective study was conducted to identify patients with PCMC or EMPSGC of the face and scalp treated with MMS and reconstructed by dermatologic or oculoplastic surgeons between January 1, 2005 and August 17, 2020 at a single institution. The primary outcome was local recurrence. Tumor location, depth of invasion, number of Mohs stages required to achieve clear margins, preoperative lesion size, postoperative defect size, and reconstructive approach were also analyzed.

Results: 12 patients with PCMC and 2 patients with EMPSGC on the face and scalp treated with MMS were identified. No local recurrences were detected over a median follow-up interval of 37.5 months. The most common anatomic site was the eyelid (42.9%, see figure 1a), followed by the cheek (35.7%), scalp (14.3%), and chin (7.1%). Tumors infiltrated the dermis (50.0%), subcutaneous fat (14.3%), muscle (21.4%), orbital septum (7.1%), and galea aponeurotica (7.1%). More than 1 Mohs stage was required in order to achieve clear margins in 64.3% of cases. The median number of Mohs stages required to achieve clear margins was 2. The mean preoperative lesion size was 1.4 cm2 and the mean postoperative defect size was 7.7 cm2. All patients with tumors involving the eyelids underwent reconstruction by an oculoplastic surgeon. Two cases involving the eyelids required wedge excision and direct repair, while 4 cases involving the eyelids required flap and/or graft closure (see figure 1b).

Conclusions: Mohs micrographic surgery can be used to successfully treat PCMC and EMPSGC with low risk of recurrence. Given the deeply invasive nature of periocular tumors and frequent need for flap and/or graft reconstruction, pre-operative planning and coordination of care between a Mohs surgeon and oculoplastic surgeon may be especially beneficial for this subset of PCMC and EMPSGC tumors.

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Figure 1

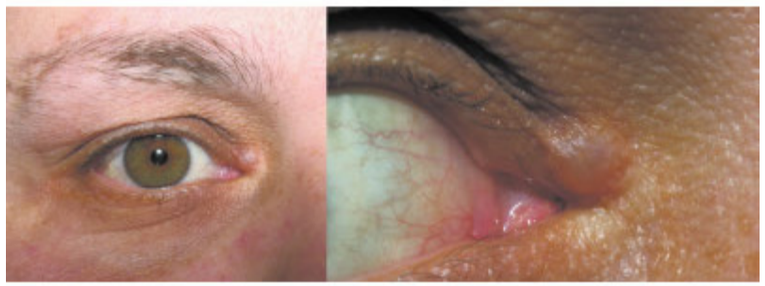
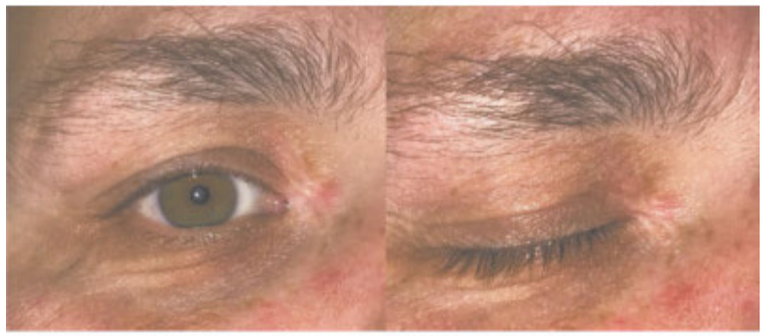


Figure 2



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Repair of Cicatricial Lagophthalmos using Wedge Resection and Full-Thickness Skin Graft

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Introduction: Incomplete repair of complex full thickness eyelid lacerations can result in eyelid notching and focal cicatricial retraction leading to significant lagophthalmos and exposure keratoconjunctivitis.[1,2]

Methods: We present a series of three patients with upper eyelid notching and focal cicatricial lagophthalmos after incomplete full thickness eyelid laceration repair in the past. All presented with cicatricial lagophthalmos and exposure keratoconjunctivitis corresponding to the area of eyelid notching. All patients underwent surgical intervention with a technique that included a full thickness wedge resection of the eyelid notch to remove the scarred eyelid margin, an eyelid crease incision to help pull the eyelid into the correct position, and placement of a full thickness skin graft to lengthen the anterior lamella. There were no intraoperative complications.

Results: All surgeries resulted in excellent postoperative eyelid position and contour, as well as complete resolution of exposure keratoconjunctivitis. Additionally, all patients expressed satisfaction with the cosmetic result of the surgery.

Conclusions: Complex full thickness eyelid lacerations can be very difficult to repair or may be overlooked in the setting of complex polytrauma. Scar contracture after incomplete or inadequate repair can result in eyelid notching, focal cicatricial retraction and exposure keratoconjunctivitis. There are few reports in the ophthalmic literature regarding the surgical treatment of cicatricial lagophthalmos and eyelid notching resulting from prior trauma. We hope the successful functional and cosmetic outcome of patients in this series will contribute to further discussion in the literature of this important topic.

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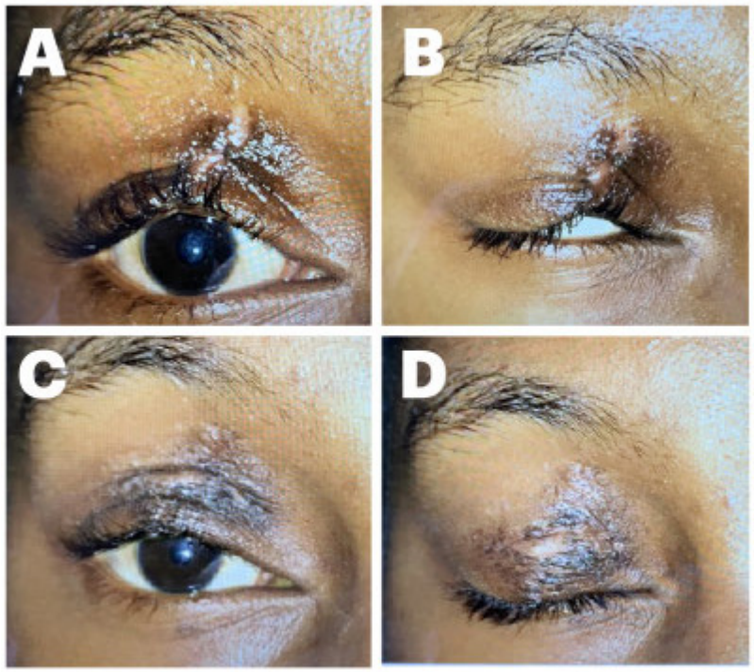
Figure 1



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Retrospective Study of Association Between Hyper-Estrogenic States and Diagnosis of Chalazia, Dry Eye Syndrome, and Meibomian Gland Dysfunction

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Introduction: Meibomian glands have been found to contain estrogen receptors and mRNA for steroidogenic enzymes and sex hormone receptors.[1] Limited clinical studies have found a positive association between hyper-estrogenic states and dry eye syndrome (DES), but no studies have examined the association between hyper-estrogenic states and chalazia or meibomian gland dysfunction (MGD).[2-5]

Methods: A retrospective analysis of electronic medical record data from a single tertiary care center in the U.S. was performed. Female patients 18 years or older with an encounter between January 1, 2019 and December 31, 2020 were included. Patients with a diagnosis of sicca syndrome were excluded. ICD-10 codes were used to determine exposures (pregnancy, in-vitro fertilization, or hormone replacement therapy) and outcomes (chalazia, DES, or MGD). Age and race-adjusted odds ratios (aOR) and their 95% confidence intervals (95% CI) were calculated for evaluating association between each exposure and outcome.

Results: Among 785,328 patients (392,873 from 2019 and 392,455 from 2020) eligible for analysis, 41,553 (5.3%) had pregnancy, 2,213 (0.28%) had HRT, 1,191 (0.15%) had IVF, 2,576 (0.33%) had chalazia, 9,141 (1.16%) had DES, and 4,160 (0.53%) had MGD. The aOR for each exposure and outcome are shown in Table 1. Pregnancy was significantly associated with lower odds of DES (aOR=0.53) and MGD (aOR=0.41). In-vitro fertilization was significantly associated with higher odds of chalazia (aOR=2.34) and MGD (aOR=2.46). Hormone replacement therapy was significantly associated with higher odds of chalazia (aOR=2.23), DES (aOR=2.51), and MGD (aOR=4.42).

Conclusions: In-vitro fertilization and hormone replacement therapy are associated with higher odds of being diagnosed with meibomian gland pathology, while pregnancy is associated with lower odds of being diagnosed with meibomian gland pathology.

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Revision Ptosis Surgery for Under-Correction after Müller Muscle Conjunctival Resection

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Introduction: Müller muscle conjunctival resection (MMCR) ptosis surgery may be more likely to lead to under correction as opposed to overcorrection. In the event of under correction, the algorithm for choosing a revision surgery technique is not clearly defined[1]. We describe here outcomes of revision surgery after MMCR.

Methods: In this cross-sectional study, patients were included if preoperative levator excursion of the affected side(s) was at least 12 mm and if they underwent MMCR surgery. If the operated eyelid(s) demonstrated postoperative margin reflex distance-1 (MRD1) of less than 3.5 mm and/or there was eyelid asymmetry greater than 0.5 mm, and if they underwent subsequent MMCR or external levator resection (ELR) surgery, the patient was included. Standardized primary position photographs were obtained preoperatively and at least 1 month after each surgery. Digital measurements were performed, with pixel to mm conversion based on corneal white to white diameter[2]. Records of complications were collected, including overcorrection (MRD1 > 5.5 mm or MRD1 asymmetry > 1 mm), symblepharon, lagophthalmos and eyelid contour abnormalities. Postoperative MRD1 was the primary outcome measure and postoperative complications were the secondary outcome measures. Two groups were defined: those who underwent MMCR followed by repeat MMCR surgery (M-M) and those who underwent MMCR followed by external levator resection (ELR) surgery (M-L). Bivariate statistics were performed.

Results: 18 eyes (16 patients) met inclusion criteria. Twelve eyes underwent MMCR followed by revision MMCR (M-M) and 6 eyes underwent MMCR followed by ELR (M-L). Overall, mean (SD) preoperative MRD1 was 1.84 mm (0.97) with range -0.41 to 3.39 mm. There was no significant difference ($p = 0.7$) in preoperative MRD1 between M-M and M-L groups. In the M-M group ($n = 12$), mean (SD) MRD1 preoperatively was 1.77 mm (1.12), after the first surgery was 2.35 mm (0.66), and after revision surgery was 3.44 mm (0.31). MRD1 was higher after revision surgery, as compared to preoperatively ($p < 0.05$) and after the first surgery ($p < 0.05$). In the M-L group ($n = 6$), mean (SD) MRD1 preoperatively was 1.98 mm (0.90), after the first surgery was 1.99 mm (0.56) and after revision surgery was 3.44 mm (1.24). In the M-L group, MRD1 after revision surgery was significantly higher than it was preoperatively ($p < 0.05$). There were no differences in postoperative MRD1 between M-M vs. M-L, neither after the first surgery, nor after the revision operation.

Conclusions: For patients who do not achieve satisfactory elevation of MRD1 after MMCR, revision by repeat MMCR or by consecutive ELR are both reasonable options.

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Figure 1

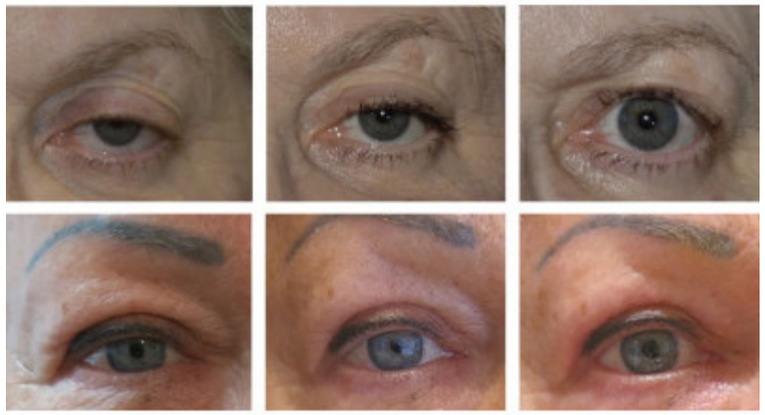
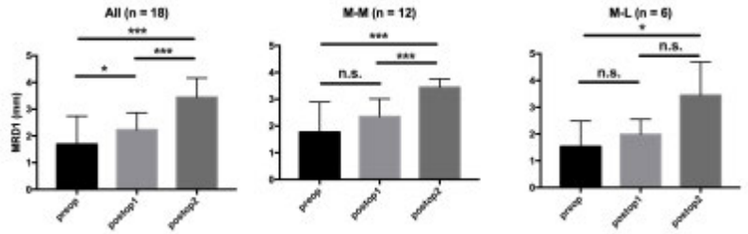


Figure 2



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Silicone Granulomas of the Eyelids – A Case Series Illustrating a Distant Migratory Phenomenon

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Introduction: Exogenous silicone has been reported to migrate to anatomic sights far from the primary injection or implantation site; this phenomenon has been rarely described in the ocular adnexa; we document two encountered cases of distant migration of silicone to the eyelid and review the prior literature.

Methods: A retrospective chart review of two patients was conducted along with analysis of diagnostic histopathology. A comprehensive review of the literature regarding disseminated silicone to the eyelid in patients with either silicone breast implants or silicone facial filler was performed.

Results: A 46 year old female with a history of silicone breast implants presented with painless nodules along her bilateral upper eyelid creases (Figure 1). An excisional biopsy revealed epithelioid granulomas with concern for sarcoidosis; the nodules recurred and re-biopsy showed multiple well defined epithelioid granulomas with giant cells surrounding non-polarizable foreign material or clear, perfectly round vacuoles of varying sizes, (Figure 2-3 & inset) consistent with silicone. The patient's breast implants appeared grossly intact radiographically but explanation is currently planned.

A 73 year old female with first generation silicone breast implants from the 1970s (ruptured for twenty-one years, not explanted) and previous injection of an unknown nonautologous material into her cheeks more than 2-decades ago presented with recalcitrant lower eyelid ectropion and retraction resulting from the prior injections, which was repaired. Later, a routine external levator advancement (sixteen years after facial filler and four decades after her breast implantation) revealed thick and firm fatty tissue abutting the preaponeurotic and nasal fat pads, which histopathologically demonstrated epithelioid granulomas surrounding numerous non-polarizable clear vacuoles. She then developed an abnormal breast contour and a 2-centimeter spiculated mass was detected. Excision and sentinel lymph node biopsy ultimately showed invasive ductal carcinoma and a prominent granulomatous reaction to silicone in both the breast parenchyma and axillary lymph node basin.

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Conclusions: Silicone granulomas of the eyelid, ocular adnexal tissue, and orbit have all been described, particularly following pars plana vitrectomy with intraocular silicone oil injection[1-9]. Migration from silicone breast implants has been detected throughout the body occurring at varying times post-surgery[10-19], but is rarely described in the eyelids.[11,20] Similarly, eyelid granulomas from injection of silicone into the eyelids have been described[21-23], but migration from silicone based facial filler has rarely been reported.[24-27] Although silicone may be chemically inert, migration of silicone elicits a foreign body response. The illustrated histopathology emphasizes the importance of a detailed clinical history regarding any prior surgery or office-based procedure and suggests silicone based facial filler can adversely affect the eyelids. It is important to maintain adequate suspicion for foreign material in patients with deep eyelid nodules of unclear etiology, particularly if they have had facial injections or silicone breast implants.

Figure 1

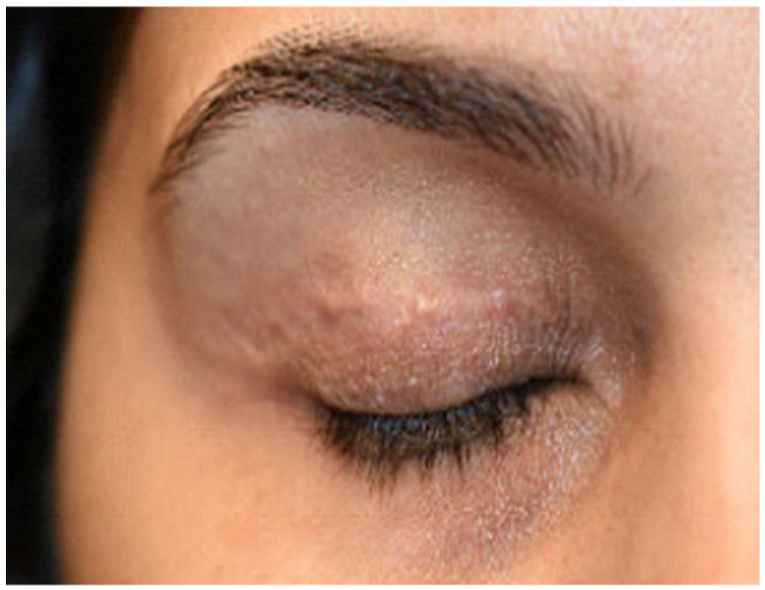
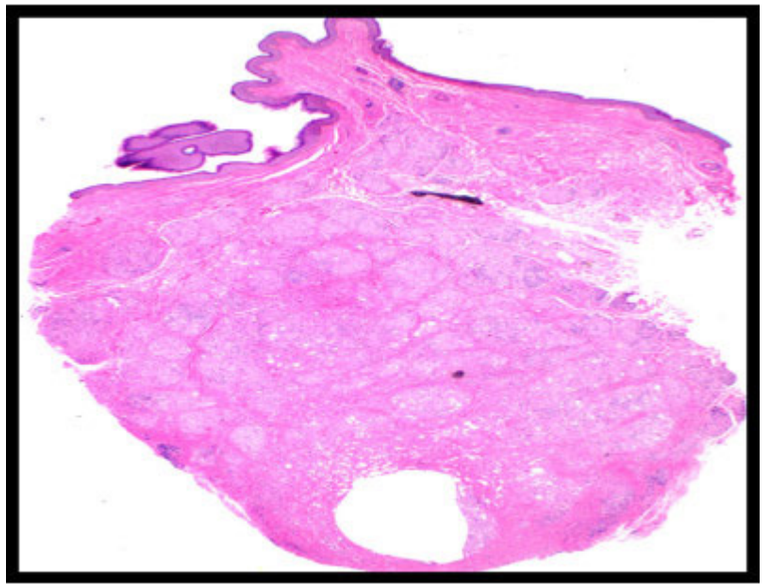


Figure 2



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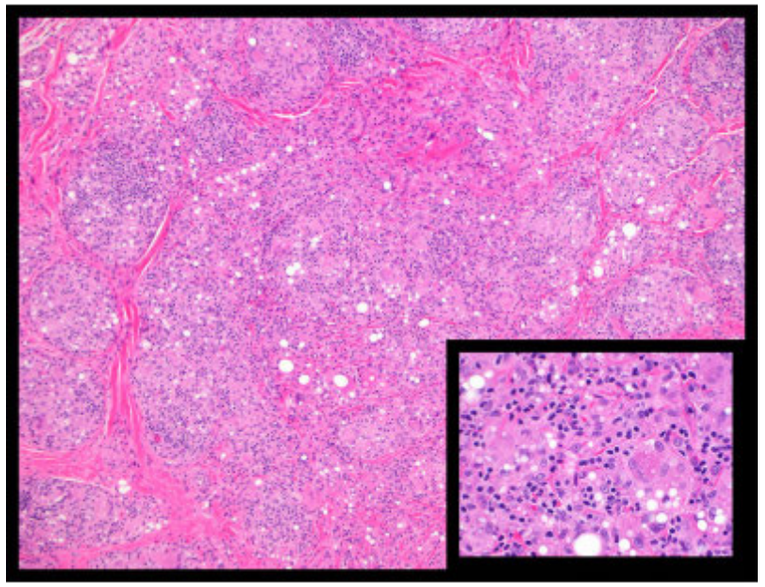

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Surgical Options for Repair of Eyelid Anomalies in Freeman-Sheldon Syndrome

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Introduction: Freeman-Sheldon syndrome (FSS) is a rare congenital myopathic arthrogryposis which presents with multiple facial, ocular and orbital abnormalities including ptosis and strabismus.[1,2] Surgical correction is often required to prevent ambylopia but is complicated by these patients' abnormal musculature and susceptibility to numerous anesthetic complications.

Methods: We report a rare case of a 22-month-old female with FSS who presented to our institution for management of her periocular anomalies. A Pubmed literature review was performed to compare the varied presentations and reported surgical techniques of this patient population using the terms "Freeman", "Sheldon", "eyelid", "orbit". There were no date or language restrictions. No reports were excluded.

Results: A 22-month-old female with confirmed Freeman-Sheldon syndrome presented for surgical evaluation of severe eyelid anomalies. Examination revealed bilateral enophthalmos, blepharophimosis, ptosis, left esotropia, and a severely widened nasal bridge obscuring the left eye's visual axis. She exhibited minimal levator function with scant frontalis recruitment. Given the lack of response to patching therapy for the left eye, surgical options were discussed including medial canthoplasty to widen the horizontal palpebral fissure as well as frontalis flap advancement for ptosis. However, due to the patient's history of severe airway and intraoperative anesthetic complications as a newborn, her mother elected to observe.

Only 6 reports of surgical intervention have been described previously. Ptosis has been managed variably with placement of a frontalis sling, levator muscle resection, or "static sling" to frontalis fascia.[3,4] Blepharophimosis is considerably more challenging to manage with only two reports in the literature describing canthotomy and canthoplasty techniques.[5,6] Unfortunately, one of these patients died shortly after extubation due to anesthetic complications. This highlights the well-documented susceptibility of patients with FSS to adverse anesthesia events due to difficult airways, high incidence of malignant hyperthermia, and unpredictable responses to halogenated anesthetics and neuromuscular blockade.[7]

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Conclusions: Freeman-Sheldon Syndrome is a rare congenital condition with an estimated prevalence of 1 in 1 million in which patients exhibit atrophy of facial musculature leading to a classic "whistling face" appearance with limited facial mobility.[7] Surgical correction is unpredictable and is typically reserved for cases in which there is concern for deprivational amblyopia. Given the high risk of fatal anesthetic complications, surgeons may consider operating under local anesthesia with minimal to no sedation. To the authors' knowledge, this is the first complete review to summarize oculofacial anomalies, surgical techniques and anesthesia complications related to this rare condition.

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Tarsal Ectropion Repair with Modified Bick Lid Tightening and Inverting Sutures

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Introduction: Lower eyelid tarsal ectropion is a rare variant of ectropion that is thought to be due to the disinsertion of the lower eyelid retractors, leading to eversion of the entire tarsus with loss of lid stability. It often affects older individuals, and horizontal laxity is often present. Its surgical correction can be challenging with various techniques described including reattaching the lower lid retractors either transcutaneously or transconjunctivally, and the use of full-thickness inverting sutures. Here, we report our 10-year experience correcting tarsal ectropion using a modified Bick lid tightening and inverting sutures.

Methods: Retrospective, interventional case series of all consecutive patients with tarsal ectropion who underwent a modified Bick procedure and inverting sutures by a single surgeon (RS) between July 2010 and July 2020. Exclusion criteria included patients who had undergone prior surgical correction, or had less than a three-month follow up. Thirty-four patients, 24 of whom were female, with a mean age of 81.6 years (range 59-92) were included. Eight patients had bilateral disease. All procedures were performed under local anesthesia in an office setting. A modified Bick lid tightening procedure, as previously described by Golan and Lelli, with 3 adjunctive inverting sutures were performed. A few minor differences from the Golan technique included the use of 5-0 polypropylene suture to anchor the lid to the lateral orbital rim, and 6-0 plain gut suture to recreate the lateral canthal angle. Inverting sutures were performed using 5-0 double-armed chromic gut suture as described by Berry-Brincat et al. Treatment success was defined by eyelid position, symptoms, and need for reoperation as described by Berry-Brincat et al.[2]

Results: 31 patients had a successful outcome, with the lid well apposed to the globe (Fig 1). Three patients had satisfactory results with improved symptoms and mild residual ectropion, for which further surgery was not required. No patients had poor results. The mean follow-up time was 4.5 months (range 3-11 months). Two patients experienced minor complications: one developed a suture granuloma that resolved with topical ointment and the other had an overly tight inverting suture that was cut before the suture dissolved. No other complications were seen including entropion, infection, or lymphedema. The inverting sutures were well tolerated in all cases and none had to be removed due to ocular surface discomfort. There were no visible scars from the inverting sutures in any patient at postoperative month 3.

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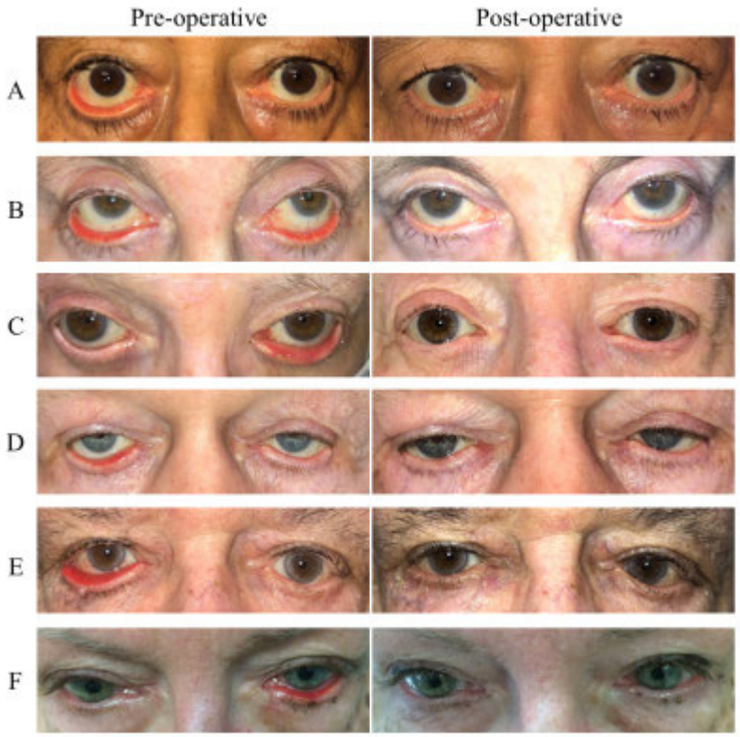
Conclusions: The surgical correction of tarsal ectropion via retractor reinsertion may be surgically challenging, requires delicate tissue dissection, leaves a scar if performed transcutaneously, and may shorten the fornix when performed transconjunctivally. A combination of eyelid tightening using a modified Bick procedure and inverting sutures is a simple and effective treatment for lower eyelid tarsal ectropion with minimal tissue dissection. The technique has a quick learning curve with a high success rate. This technique addresses the retractor disinsertion via the inverting sutures as well as the horizontal laxity associated with tarsal ectropion.

Figure 1



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The “CS10” Rule: Surgical Planning for Asian Blepharoplasty

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Introduction: Asian blepharoplasty is one of the most common eyelid procedures performed in Asian patients for both cosmetic and functional purposes. However, it is a procedure riddled with complications, especially from aggressive skin and fat excision, that can result in an unnatural appearance.[1-4] While it encompasses the fundamental concepts of a traditional blepharoplasty, the anatomical, aesthetic, and cultural differences of Asian eyelids necessitate a distinct procedure, and more specifically, distinct surgical planning. This study presents a simple guideline for a functional Asian blepharoplasty to reduce the risk of excessive skin excision.

Methods: This is a 5-year retrospective chart review of Asian blepharoplasty performed at the Emory Eye Center by a single surgeon (HJK) from 2015-2020. Demographic information as well as surgical methods and outcome were collected.

The “CS10” Rule”: The distance the **C**rease is placed from the lid margin in millimeters (mm) plus the amount of redundant **S**kin to be removed should (in mm) be about **10** mm or less (Figure 1). The “CS10” rule was applied to all patients undergoing the procedure.

Results: A total of 54 patients (35 female, 19 male) were identified with an average age of 68 years (+/- 8 years). Five patients (all males) requested to not have a “double-eyelid”. For these patients, a supraciliary incision was made at about 2mm from the lid margin and between 4-10 mm of skin was excised (Figure 2). Nine patients (2 males, 7 females) had an existing crease that was maintained between 6-8mm with 2-4mm of skin excision. Forty patients (12 males, 28 females) did not have a natural crease but requested a “natural” appearing “double-eyelid”. For these patients, the crease was placed between 7-9mm with skin excision of 1-4mm (Figure 3). Twelve patients required a revision: 7 patients for revision of the crease and 5 patients for additional skin excision that did not exceed 2mm.

Conclusions: The “CS10” rule is a simple guideline that can be utilized for a functional Asian blepharoplasty to maintain the natural appearance of Asian eyelids postoperatively. It is certainly not perfect nor applicable to every Asian patient but serves as a safe starting point to avoid the common mistake of overly aggressive skin excisions.

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Figure 1

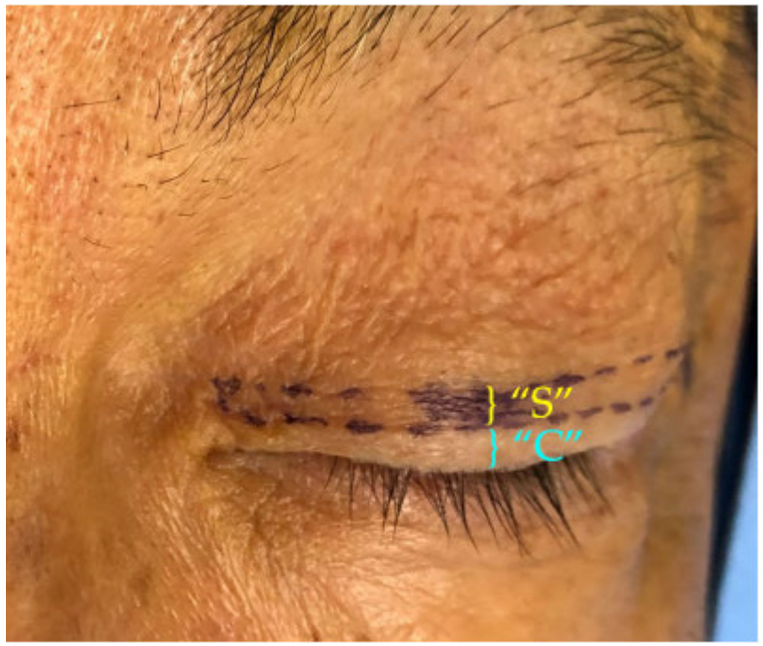


Figure 2

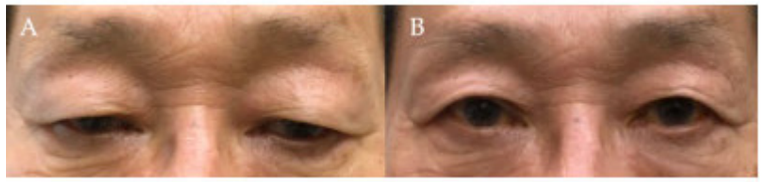
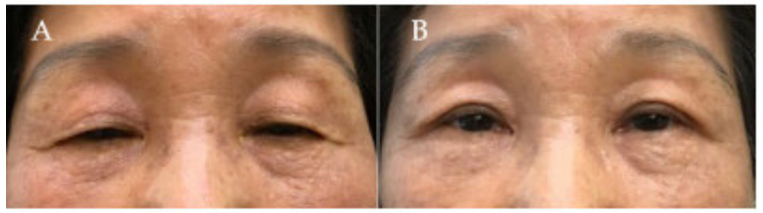


Figure 3



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The Outcomes of Lid Malposition Surgeries in One Tertiary Centre

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Introduction: To examine the outcome of primary aponeurotic ptosis surgery, senile ectropion and senile entropion surgeries in one tertiary centre in United Kingdom (UK) comparing to the outcomes of those surgeries published by the British Oculoplastic Surgery Society (BOPSS), which is currently used as the standard for core surgical outcome in oculoplastic services.

Methods: All operations for senile ectropion, senile entropion and senile/aponeuroticptosis performed at Moorfields Eye hospital (MEH) between 1/2014-12/2016 and 1/2018-12/2019 were included. The following data was collected: number of surgeries per year, success rate, complications rate and re-do surgeries rate. A comparison between the success rates and complications of those surgeries to the success rates published by the BOPSS was done.

Results: During the study years 1908 eyelid malposition surgeries were performed: 1066 of ptosis correction, 418 of ectropion correction and 424 of entropion correction. The mean success rates of those surgeries were 95.49%, 96.17%, 94.81%, respectively. The success rates were higher than those published by the BOPSS for ptosis and ectropion correction surgeries (>85% for ptosis surgery, >80% for ectropion surgery) and similar for entropion correction surgery (95%). The mean complication rates were 5.54% for ptosis surgery, 3.34% for ectropion surgery and 6.13% for entropion surgery.

Conclusions: Beside the fact of MEH being a training centre to junior doctors, the success rates of all lid malposition surgeries are higher (more than 90%) than BOPSS standard. The complications rates were around 5% and acceptable for those surgeries. To the best of our knowledge, this is the first study that collected and examined the results of the core surgical outcome of lid malposition covering such a long period in the last 20 years.

Upper Blepharoplasty performed in the United States Stratified by Subspecialty

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Introduction: Blepharoplasty is performed in the United States by various specialists, including those without specialized periorbital surgery training. Oculofacial plastic and reconstructive surgery is identified as one of the core four subspecialties in facial aesthetic surgery, with unique training emphasizing the periorbital region.[1-2] The American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) trains and certifies oculofacial plastic and reconstructive surgeons, and has focused efforts to educate the public on the benefits and safety of surgery by eyelid specialists.[3-4] In this study, we aimed to understand the proportion of functional upper blepharoplasty surgery performed by subspeciality. Specifically, the surgical volume of ASOPRS-certified surgeons and non-ASOPRS-certified surgeons who performed upper blepharoplasty on Medicare beneficiaries in 2018 was assessed.

Methods: The 2018 Medicare Provider Utilization and Payment Data: Physician and Other Provider dataset was narrowed by provider and service, and queried for Current Procedural Terminology (CPT) code 15823 (upper blepharoplasty.) All Medicare claims filed under ambulatory surgical services and centers were excluded, so as only to include claims filed under individual providers. Surgeons were identified by their National Provider Identification (NPI) numbers and matched to the Physician Compare National Downloadable File, from which physician characteristics including subspecialty were attained. The ASOPRS Membership Directory was then queried to identify ASOPRS-certified surgeons within the dataset. Differences in comparison to total surgical volume were assessed by subspecialty. Additionally, differences in regards to ASOPRS-certified surgeons' average surgical volume compared to non-ASOPRS-certified surgeons were also identified. A Welch two-sample t-test was performed to determine statistical significance of the number of blepharoplasties performed by non-ASOPRS-certified vs. ASOPRS-certified ophthalmologists. All analyses were performed in R version 4.0.3 (R Foundation for Statistical Computing, Vienna, Austria). This study was exempted by the University of Texas at Austin Dell Medical School Institutional Review Board and adhered to the Declaration of Helsinki.

Results: In total, 38,611 functional blepharoplasty procedures performed in 2018 by 1,085 surgeons were assessed. Specialties represented included ASOPRS-certified ophthalmic surgeons, non-ASOPRS certified ophthalmologists, plastic and reconstructive surgeons, otolaryngologists, oral maxillofacial surgeons, general surgeons, sports medicine, and family practitioners. In total, 737 non-ASOPRS certified surgeons including all subspecialties performed 22,901 (59.3%) functional blepharoplasty surgeries with an average of 31.03 surgeries per provider. When assessing ASOPRS certified surgeons, 347 surgeons performed 15,694 (40.6%) blepharoplasty

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surgeries, with an average of 45.23 procedures per provider, as compared to non-ASOPRS certified ophthalmologists who performed an average of 32.16 procedures per surgeon, a statistically significant difference (95% confidence interval [CI] 8.65 to 17.68, $p < 0.001$).

Conclusions: Though ASOPRS certified surgeons performed significantly more blepharoplasty surgeries on average per provider when compared to their non-ASOPRS-certified counterparts, the majority of functional upper blepharoplasty surgeries in the United States are performed by non-ASOPRS-certified surgeons. As such, the need for specific platforms to support awareness and access to ASOPRS-certified oculofacial plastic and reconstructive surgery specialists is paramount.

Figure 1

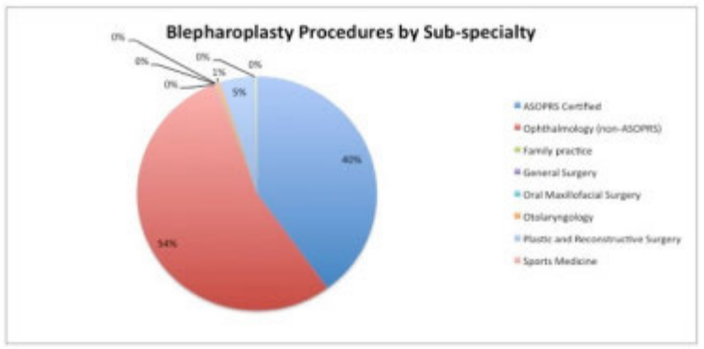

Figure 2

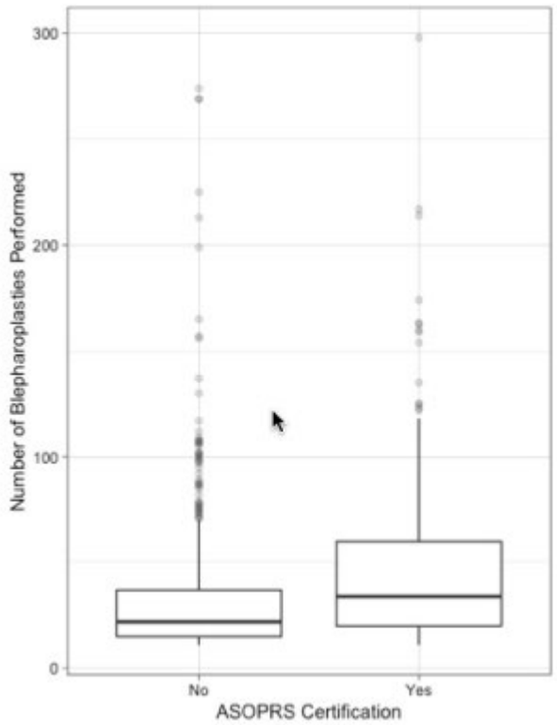

Figure 3

ASOPRS-Certified	Total	Average per provider	Standard Deviation	Minimum	Maximum
No	738	31.0	30.2	11	274
Yes	347	45.2	36.5	11	298

Table 1. Number of functional upper blepharoplasties performed by ASOPRS-certified surgeons versus non-ASOPRS-certified surgeons.

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Dacryocutaneous Alternaria Infection in an Immunosuppressed Host: A Case Report

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Introduction: To describe a rare case of an invasive fungal *Alternaria* infection affecting the ocular adnexa.

Methods: Case report

Results: A 56-year-old woman with a history of well-controlled type 1 diabetes and systemic lupus erythematosus presented with 4 months of an ulcerative lesion overlying her left medial canthus that was initially suspected to be a malignancy. Biopsy at an outside facility showed granulomatous inflammation consistent with a ruptured hair follicle. Upon presentation to our tertiary care center, examination revealed an 11 mm tall x 6 mm wide purulent, moderately tender lacrimal sac fistula (Figure 1) with involvement of the distal canaliculi. Culture was obtained and grew *Alternaria* species. The pathology slides from the previous biopsy were stained with Grocott-Gomori's (or Gömöri) methenamine silver (GMS), revealing hyphae (Figure 2). After consultation with our hospital's infectious diseases service, the patient was admitted for treatment with intravenous amphotericin B. Magnetic resonance imaging showed extension within the ocular adnexal soft tissues but not into the perinasal sinuses. Urgent surgical debridement was conducted until vital tissue was encountered, creating a cavity 13 mm tall x 9 mm wide x 9 mm deep that extended into the medial orbit. Reconstruction is planned following completion of her antifungal course.

Conclusions: Cutaneous *Alternaria* infections are very rare in humans (more common in plants),[1] though may be found in an immune compromised host. This infection appears to be increasing in frequency, particularly in solid organ transplant recipients.[2,3] We could not identify any published cases of periocular or lacrimal *Alternaria* infections. Given the finding of a lacrimal sac fistula, our patient's infection may have started within the lacrimal system and eroded outward through the overlying skin. This rare entity may be suspected if biopsy of a chronic ulcerated lesion does not show malignancy, and should prompt fungal cultures and special stains.

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Figure 1

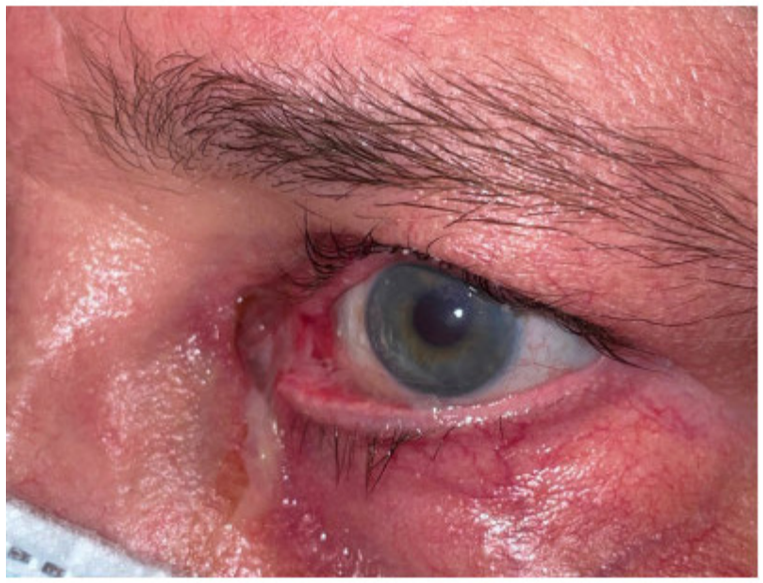
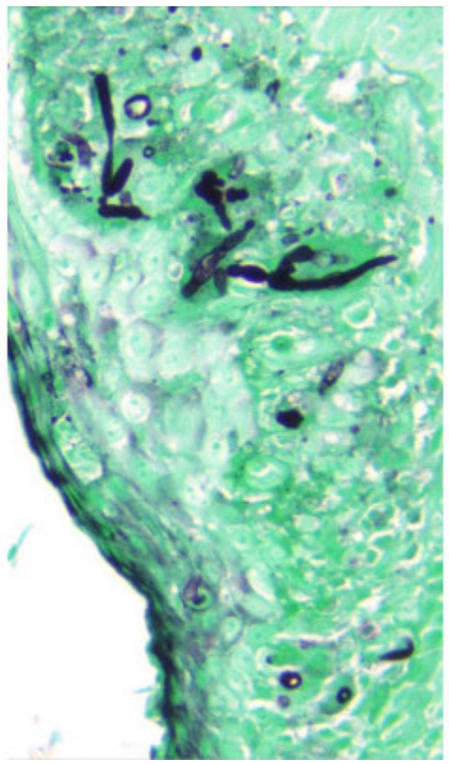


Figure 2



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Fabry Disease of the Lacrimal Gland

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Introduction: Fabry disease is an X-linked lysosomal storage disease that results from an error in the glycosphingolipid metabolic pathway. Deficiency of the enzyme alpha-galactosidase A leads to pathologic accumulation of globotriaosylceramide (Gb3) in lysosomes of the skin, kidneys, heart, brain, and other organs.[1] While certain ophthalmic manifestations are well known, there have been no reports in the literature of histologically proven lacrimal gland involvement. The authors present a case of Fabry disease involving the lacrimal glands.

Methods: Case report.

Results: A 26-year-old male presented with bilateral upper eyelid fullness secondary to dermatochalasis, steatoblepharon, and palpable, nontender lacrimal glands (Figure 1). The patient had a known history of Fabry disease with classic ophthalmic findings including corneal verticillata, tortuosity of conjunctival and retinal vessels, and posterior subcapsular lens opacities (Fabry cataract). Computed tomography demonstrated anterior prolapse of the bilateral lacrimal glands (Figure 2). The patient underwent bilateral upper eyelid blepharoplasty with reduction of the preaponeurotic fat pads, anchoring of the lacrimal glands to the superotemporal orbital rims, and biopsy of the lacrimal glands and preaponeurotic fat. Biopsy of the lacrimal glands demonstrated lamellated intracytoplasmic inclusions characteristic of Fabry disease (Figure 3). Biopsy of the preaponeurotic fat demonstrated normal adipose tissue without evidence of inclusions.

Conclusions: To our knowledge, this is the first reported case of histologically proven lacrimal gland involvement in Fabry disease. The lacrimal gland involvement in this case was associated with clinical and radiographic lacrimal gland prolapse. Fabry disease has been associated with dry eye syndrome and reduced lacrimal secretion, as well as periorbital fullness.[2,3] Such manifestations may be related to the effects of Gb3 deposition on lacrimal gland morphology and function.

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Figure 1

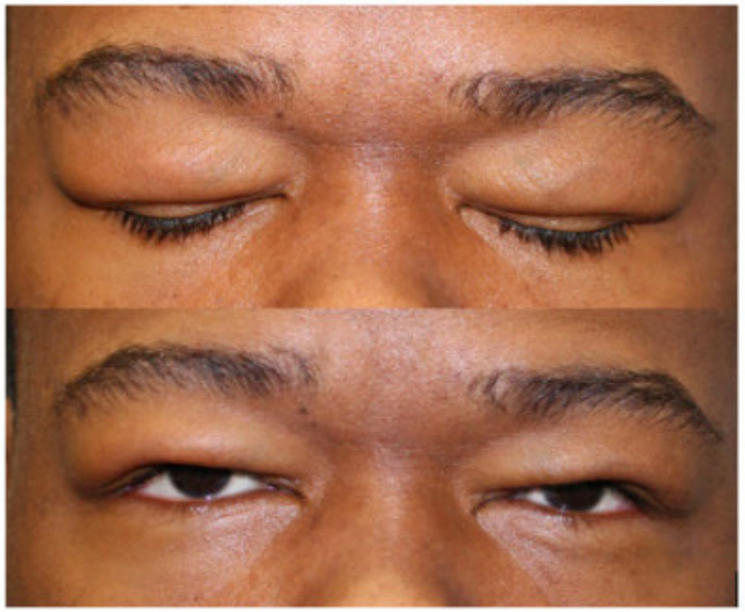


Figure 2

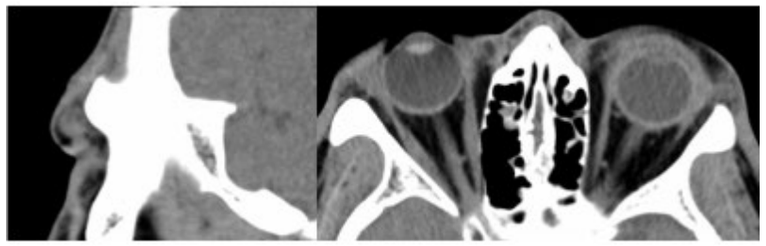
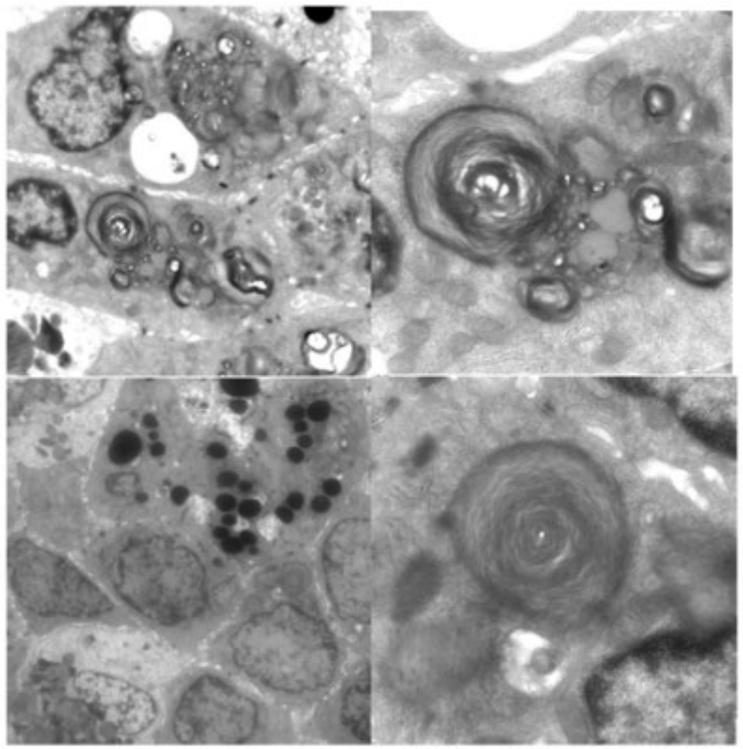


Figure 3



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Lacrimal Allodynia – A Case Series of Post-Operative Painful Lacrimation

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Introduction: Allodynia is described as painful sensation secondary to a stimulus that does not usually provoke pain.[1] The mechanisms by which it happens are complex and may be related to sympathetic nervous system stimulus.[2] A wide variety of conditions are believed to trigger the pain, such as mechanical, thermal and tactile factors. Although lacrimal neuralgia has been previously described following light touch on the periocular area[3], pain evoked by lacrimal production has not yet been described. Herein we review two unusual cases of orbital pain triggered by lacrimation after orbital surgery.

Methods: In this consecutive case series two patients with lacrimal allodynia after orbital surgery are presented descriptively.

Results: The study included two patients with intermittent sharp periocular pain triggered by crying and lacrimation. Both patients were female in their mid-forties. One patient sustained blunt left trauma with orbital floor blowout fracture and open globe injury. The patient underwent ruptured globe repair, extraocular muscles repair and orbital floor reconstruction with a titanium mesh embedded within pourous polyethylene matrix. Following surgery, the patient developed dry eyes and described feeling a sharp periocular pain triggered by tearing. The pain was described as a debilitating stabbing feeling in the eye socket, which lasts until she stops tearing up. Gabapentin therapy was discussed, but the patient preferred to manage the situation without medication. The second patient presented with a cavernous malformation in the superolateral orbit and underwent an uncomplicated orbitotomy with lesion removal. Beginning three weeks following surgery, the patient experienced severe neuropathic pain in the lacrimal region upon tearing. The pain was severe and transient, lasting about 10 seconds after starting to produce tears. The patient was prescribed gabapentin 300 mg and reported improvement of the pain. She continued on this medication each evening with good pain control. In both cases, tear production pain was associated with emotional distress and after reflex tearing from ocular surface dryness or irritation, for example, while cutting onions. Both patients'symptoms persist to the present date. The first patient sustains the condition with same sharpness. The second patient maintains therapy with gabapentin. In the latter, although allodynia persists, the response became less intense and less frequent over time.

Conclusions: Lacrimal allodynia is a rare cause of neuralgic periorbital pain occurring after blunt trauma and orbital surgery. The pain is typically located in the upper lateral eyelid and/or the adjacent area of the temple and is triggered upon tear production. Painful sensation is severe and transient. Gabapentin seems to improve the lacrimal allodynia.

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Lacrimal Gland Prolapse as a Factor in Dry Eyes Due to Duct Kinking

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Introduction: The lacrimal gland is comprised of a larger orbital portion that rests above the levator complex, and then wraps around to become the palpebral lobe posterior to the aponeurosis to project into the superolateral fornix. It is well known that multiple excretory ducts from the orbital portion join those of the palpebral gland to drain together into the fornix. Lacrimal gland prolapse is often an incidental finding during eyelid surgery, or related to involutional changes, trauma, or blepharochalasis syndrome. Often, it can be bothersome to the patient from an aesthetic standpoint. This study describes 8 patients who noted significant or complete improvement of preexisting dry eye symptoms following repair of the lacrimal gland prolapse. It is hypothesized that descent of the orbital lobe over the lateral aponeurosis results in mechanical kinking of the multiple ducts of the gland that run from one lobe to the other. This may decrease tear secretion into the fornix, that improves when the gland is repositioned to allow the ducts from the orbital lobe to unkink and drain inferiorly again.

Methods: Case series

Results: Nine patients (15 eyelids) between Sept 2019-2021 underwent routine upper eyelid surgery (blepharoplasty, levator repair) and concurrent suture dacryopexy, and were found to describe incidental postoperative improvement in dry eyes. Six patients underwent bilateral dacryopexy; 3 had unilateral repair. 4 patients underwent cosmetic upper blepharoplasty. In all cases the lacrimal gland was normal in appearance, but with the orbital lobe extending anterior and inferior to the orbital rim by 10mm (range 6-17mm). The capsule of the anterior gland was resuspended to the superolateral periosteum with nonabsorbable sutures to return the gland to normal position. All described significant improvement in dry eye symptoms and/or decreased mattering within 1 week following surgery, and demonstrated improved tear lake measurements to >0.2mm and improved Schirmer testing. Six patients had complete resolution and no longer required artificial tears. Decreased conjunctival injection and punctate keratopathy were also noted. One patient with gland prolapse OD and ipsilateral dry eye for many years also improved following resuspension.

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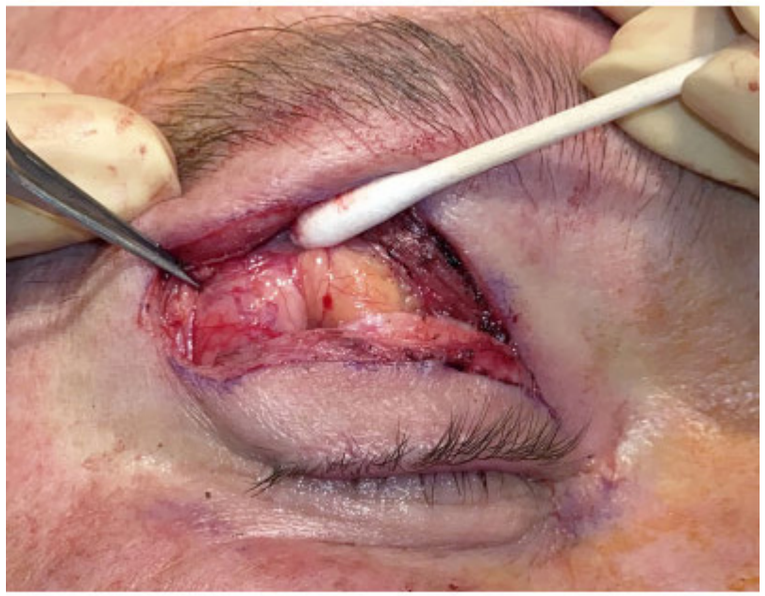
Conclusions: Repositioning the lacrimal gland back into normal anatomic position within the gland fossa improved symptoms and clinical signs in patients with chronic dry eyes. It may be that as the gland descends inferiorly, the ducts that drain from the orbital to the palpebral lobe become kinked, similar to a hose, which limits tear secretion. Once repositioned, the affected ducts may unbend/open and thus allow for drainage and improved aqueous lubrication. Further study is needed to better understand this finding, and to evaluate whether this may provide additional support for the medically necessary repair of lacrimal gland prolapse.

Figure 1



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Prophylactic Antibiotic Prescribing Patterns and Postoperative Infection Rates During Endoscopic Dacryocystorhinostomy at Two Institutions

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Introduction: Prophylactic antibiotics are commonly prescribed to prevent surgical site infections. However, there is limited evidence to support or dispute this practice. A data-driven consensus regarding the appropriateness of prophylactic antibiotics in lacrimal procedures, specifically endoscopic dacryocystorhinostomy (endo-DCR), is needed. This study aimed to investigate how often prophylactic pre-, peri- and post-operative antibiotics were prescribed and which factors affected post-operative infections in patients who underwent endo-DCR.

Methods: Retrospective chart review of all patients who underwent endo-DCR over a five-year period (2015-2020) at two academic institutions.

Results: 331 cases of endo-DCR were included, each eye counting as one case. Of these, 238 patients were females (71.9%) with mean age of 55 +/- 18 years. The most common presenting signs and symptoms were: epiphora (275, 83%), swelling or redness (33, 10%), nasal obstruction or mass (15, 4.5%), trauma or facial fractures (3, 0.9%), and nasal or oral bleeding (3, 0.9%). There were 19 cases (5.7%) of acute dacryocystitis and 36 cases (10.9%) of chronic dacryocystitis. Relevant past medical histories included a nasal mass (33, 9.9%), thyroid cancer treated with radioactive iodine (11, 3.3%), sarcoidosis (6, 1.8%), dacryocystocele (4, 1.2%), nasal or orbital radiation (4, 1.2%), and prior chemotherapy (4, 1.2%). Relevant past surgical histories included prior DCR (61, 18.4%) and prior sinus surgery (58, 17.5%).

Perioperative prophylactic antibiotics were given in 194 cases (58.6%); most commonly intravenous cefazolin (171, 88.1%) or clindamycin (18, 9.3%). Postoperative prophylactic oral antibiotics were given in 148 cases (44.7%); most commonly cephalexin (58, 39.2%), amoxicillin/clavulanic acid (49, 33.1%), clindamycin (14, 9.5%), trimethoprim/sulfamethoxazole (9, 6.1%), and levofloxacin (7, 4.7%). Postoperative oral antibiotic courses ranged from 7 to 14 days.

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Post-operative infection occurred in 22 cases (6.6%). Three cases of infection had preoperative acute dacryocystitis (14%) and 6 had preoperative chronic dacryocystitis (27%). Other medical histories associated with these infections were prior DCR (3, 14%), sarcoidosis (3, 14%), chronic sinusitis (3, 14%), orbital trauma (1, 5%), prior chemotherapy (1, 5%), and intranasal drug usage (1, 5%). Odds ratios comparing post-operative infection rates based on peri-operative prophylactic antibiotics (OR=1.02, [0.39, 12.79]), post-operative prophylactic antibiotics (OR=0.85 [0.31, 2.22]), and either peri- or post-operative prophylactic antibiotics (OR=0.62 [0.23, 1.86]) were not found to be significant. There was no correlation between gender, race, preoperative dacryocystitis, past medical or surgical history, or the use of perioperative or postoperative prophylactic antibiotics and those who had a post-operative infection.

Conclusions: There is limited data regarding the pre- or post-operative factors that may influence infection after endo-DCR. A recent retrospective study demonstrated that prophylactic postoperative antibiotics following any orbital surgery did not lower the risk of postoperative infection.[3] Our study supports these findings similarly for endo-DCR. Further research is needed to create formal antibiotic utilization guidelines.

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Punctal Stenosis-Related Epiphora – Simple Dilation Vs. Sclerectomy-Punch Assisted Punctoplasty Both with Silicone Monocanalicular Stenting

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[1]Ophthalmology, Sheba Medical Center, Ramat Gan, Israel, [2]Ophthalmology, Sheba Medical Center, Ramat Gan, Israel, [3]Ophthalmology, Sheba Medical Center, Ramat Gan, Israel

Introduction: To compare the outcome of punctal stenosis-related epiphora in patients undergoing punctal dilation and silicone monocanalicular stent insertion vs. the more invasive and more tissue-traumatizing sclerectomy punch-assisted punctoplasty and silicone monocanalicular stent insertion.

Methods: Retrospective, comparative analysis. All patients with punctal stenosis-related epiphora treated at the Goldschleger Eye Institute in a one-year period. Comparison and analysis of symptom relief and subjective epiphora scores of patients with punctal stenosis-related epiphora treated either by punctal dilation with MM insertion (group 1) or by sclerectomy punch-assisted punctoplasty and silicone monocanalicular stent insertion (group 2).

Results: The mean (+ SD) age of the 46 study participants (23 in each group) was 61 years (±12, range 30-86 years), and the cohort included 31 females (67%). Baseline characteristics (age, gender distribution, and visual acuity) were similar in both groups. The silicone monocanalicular stent was placed for an average period of 2 weeks, and all the patients received postoperative steroids and antibiotic treatment for one week. The Munk score decreased significantly for both groups following the procedure, dropping from 4.4 to 1.1 in group 1 and from 4.9 to 1.7 in groups 2 ($P < 0.005$ for both groups). There was no difference in the delta Munk score between the 2 groups. Most of the patients in both groups did not require any additional procedure, such as silicone stenting, a dacryocystorhinostomy, or a dacryocystorhinostomy with a Jones tube

Conclusions: Punctal dilation followed by the insertion of an silicone monocanalicular stent insertion is effective in alleviating the symptoms of punctal stenosis-related epiphora. There was no added benefit when the more invasive sclerectomy punch-assisted punctoplasty was used, raising some doubt about its justification in these cases

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Secondary Acquired Nasolacrimal Duct Obstruction from Middle Turbinate Spindle Cell Neoplasm

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Introduction: Spindle cell tumors are rare sinonasal neoplasms which encompass a range of benign and malignant pathologies.[1] Secondary acquired nasolacrimal obstruction can arise from any nasal neoplasm which encroaches on the lacrimal drainage system. This is the first reported case of a patient presenting with secondary acquired nasolacrimal duct obstruction and dacryocystitis ultimately determined to be caused by a middle turbinate mass, a spindle cell neoplasm, which compressed the lacrimal sac. Clinical symptoms and signs alerting a physician to an underlying etiology instead of a primary acquired nasolacrimal duct obstruction (PANDO) are highlighted here.[2]

Methods: Results: A 67 year-old Hispanic man presented to the Ophthalmology clinic with a chief complaint of four days of left lower eyelid swelling, itching, and redness. He had experienced a similar episode six months prior that self-resolved. The patient was noted to have acute dacryocystitis with dependent lower-lid edema of the left lacrimal sac.

The patient was treated medically with amoxicillin-clavulanate and warm compresses. After initiation of treatment, some symptoms improved, although the patient experienced an episode of increased tearing, bloody tears, and purulent drainage from the left lower eyelid. After two weeks, the infectious signs and symptoms had resolved while tearing persisted. Lacrimal probing and irrigation was performed which confirmed obstruction at the level of the nasolacrimal duct.

The patient was referred to Otolaryngology for evaluation and co-management. Mild midfacial swelling was present at the Otolaryngology visit despite periocular edema and erythema improvement. The patient also reported left nasal obstruction for several months. Nasal endoscopy revealed a polypoid mass with superficial vasculature emanating from the left-middle meatus. This mass was compressing the area of the maxillary line and obstructing the left nasal cavity. There were no ulcerative or exophytic areas of the mass.

A CT sinus was obtained and confirmed a large, peripherally calcified and mildly enhancing soft tissue mass in the left nasal cavity (Figure 1). This mass appeared to arise from the left middle turbinate and uncinate process with associated demineralization and remodeling of the left ostiomeatal complex and lacrimal sac.

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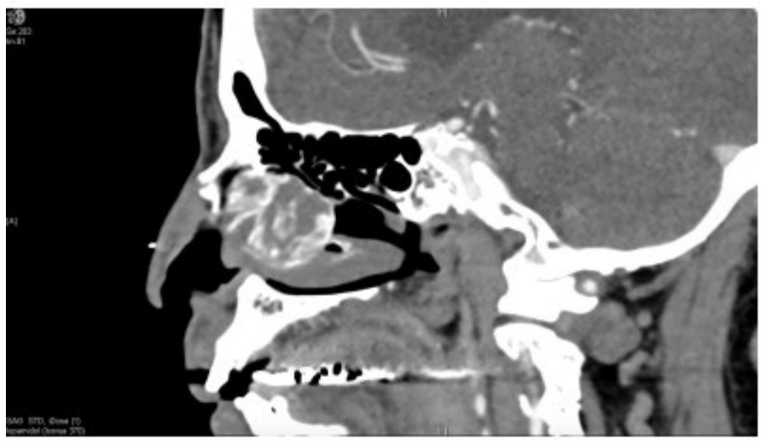
The patient underwent endoscopic sinus surgery with resection of the mass, including subtotal middle turbinectomy, left total ethmoidectomy, and left maxillary antrostomy. Frozen section suggested a benign pathology. The mass had compressed the lacrimal sac at the maxillary line resulting in remodeling of bone with intact mucosal coverage. Endoscopic DCR with placement of tubes was performed with creation of a neo-ostium to re-establish lacrimal patency. Pathology of the nasal mass demonstrated a benign spindle cell neoplasm, possibly an angiofibroma.

Conclusions: While acute dacryocystitis can often represent a manifestation of PANDO leading a patient to seek clinical care, there are signs and symptoms that may alert the physician to a secondary cause of acquired nasolacrimal duct obstruction. In this case, these included bloody tears, nasal congestion and persistent facial swelling below the orbit. Pre-operative nasal endoscopy and/or imaging helps recognize secondary causes of nasolacrimal obstruction. This is the first reported case of a middle turbinate spindle cell tumor obstructing the nasolacrimal system.

Figure 1



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Success of DCR Surgery for Radioactive Iodine-Associated NLDO Compared to Primary NLDO

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Introduction: This study characterizes outcomes of external and endoscopic dacryocystorhinostomy (DCR) in patients with nasolacrimal duct obstruction (NLDO) in the setting of radioactive iodine (RAI), and compares these outcomes with DCR performed for primary acquired nasolacrimal duct obstruction (PANDO).

Methods: An IRB-approved retrospective review of medical records identified cases of NLDO associated with RAI that underwent external or endoscopic DCR from January 2000 to January 2021 at a single institution. A 3:1 age and sex-matched control population consisting of patients who underwent DCR for PANDO with no history of RAI treatment was identified. All patients included in the study were undergoing their first DCR—no revision cases were included. A successful outcome was defined as the presence of complete symptomatic relief post-operatively, without the need for subsequent surgeries. Fisher's exact test and a 2-sided unpaired student t test were used to compare outcomes, with a p value of <0.05 deemed to be statistically significant.

Results: The study population consisted of 14 cases of NLDO secondary to RAI and 42 age and sex-matched controls. Of the 14 RAI cases, six underwent external DCR and eight underwent endoscopic DCR (Table 1). The mean age of the RAI cases was 41.6 ± 16.6 years and the mean age of the control population was 42.2 ± 16.2 years ($p = 0.849$). All but two of the RAI cases were females who carried a diagnosis of papillary thyroid cancer. The mean dose of radioactive iodine 131 received was 153.6 ± 67.5 mCi. Complete symptom relief was accomplished in all but 2 of the RAI cases, and none of the RAI cases underwent subsequent additional surgeries. The percentage of cases achieving complete symptom relief in the RAI group was 78.6% compared with 87.2% in the control group ($p = 0.422$) (Table 2). For external DCR cases, 83.3% of RAI cases and 86.7% of control cases reached complete symptom control ($p = 1.000$). For endoscopic DCR cases, 75% of RAI cases and 87.5% of control cases achieved complete symptom control ($p = 0.422$). Thus, there was no statistically significant difference between outcomes in RAI and PANDO groups.

Conclusions: This demonstrated that the epiphora outcomes for RAI-associated cases of NLDO compared to PANDO were similar, and external DCR may have a higher success in such cases.

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Table 1

Table 1. Characteristics and outcomes of patients who underwent dacryocystorhinostomy for nasolacrimal duct obstruction in the setting of radioactive iodine treatment.

Patient	Age (Years)	Sex	Diagnosis	^{131}I Dose (mCi)	Surgery	Symptom Relief*	Additional Surgeries
1	52	F	PTC	200	Ext	Complete	0
2	48	F	PTC	160	Ext	Complete	0
3	30	F	PTC	200	Ext	Complete	0
4	42	M	Poorly differentiated thyroid cancer	100	Ext	Partial	0
5	71	F	PTC	100	Ext	Complete	0
6	35	F	PTC	150	Ext	Complete	0
7	33	F	PTC	149	Endo	Complete	0
8	33	F	PTC	100	Endo	Complete	0
9	18	F	PTC	339	Endo	Complete	0
10	56	F	PTC	100	Endo	Complete	0
11	72	M	PTC	206	Endo	Partial	0
12	31	F	PTC	101.5	Endo	Complete	0
13	24	F	PTC	150	Endo	Complete	0
14	33	F	PTC	95	Endo	Partial	0

* Symptom relief was defined as complete if epiphora fully resolved and partial if epiphora did not fully resolve, or if it recurred after any amount of time
Abbreviations: PTC, Papillary thyroid cancer; ^{131}I, radioactive iodine 131; F, female; M, male; Ext, external dacryocystorhinostomy; Endo, endoscopic dacryocystorhinostomy

Table 2

Table 2. Percentage of cases that obtained complete symptom relief after dacryocystorhinostomy.

	Percentage of Cases with Complete Symptom Relief*	p-value
External DCR:		
RAI Cases	83.3%	1.000
Controls	86.7%	
Endoscopic DCR:		
RAI Cases	75%	0.578
Controls	87.5%	
External and Endoscopic DCR Cases Combined:		
RAI Cases	78.6%	0.422
Controls	87.2%	

* Symptom relief was defined as complete if epiphora fully resolved and partial if epiphora did not fully resolve, or if it recurred after any amount of time
Abbreviations: DCR, dacryocystorhinostomy; RAI, radioactive iodine

A Case of Metastatic Orbital Myxofibrosarcoma

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Introduction: Myxofibrosarcoma (MFS) is the most common sarcoma in adults, typically present in the proximal extremities. Orbital involvement is very rare, with fewer than 10 cases reported in the literature. We report a case of metastatic MFS affecting the orbit.

Methods: The clinical history, imaging studies, and histopathological results of the orbital biopsy were reviewed.

Results: A 56-year-old female presented with right proptosis, progressing over 3 weeks. Relevant history included excision of a left palmar myxofibrosarcoma 2 years prior. Exam revealed dilated temporal conjunctival vessels in the right eye, 5 millimeters of proptosis and complete restriction in abduction with mild restriction in all other gaze directions. There was no evidence of optic nerve compromise. Computerized tomography (CT) of the orbits revealed a well-circumscribed, homogenous mass possibly arising from the lateral rectus muscle in the right orbit. Orbital biopsy showed glandular tissue with chronic inflammation and no evidence of malignancy. Over the following two weeks the patient developed diffuse conjunctival injection with chemosis, ptosis, increasing right proptosis, complete ophthalmoplegia, and a new afferent pupillary defect. Repeat orbital biopsy with deeper dissection revealed a thin-capsuled mass with a gelatinous contents. Pathology confirmed high-grade (3/3) MFS consistent with metastasis. The patient underwent 30 Gray of orbital radiation in 10 fractions and is currently on cycle 4 of chemotherapy with adriamycin and ifosfamide, which has resulted in decreased proptosis, improved motility, and decreased activity of the orbital lesion on positron emission tomography (PET) scan.

Conclusions: Metastatic MFS of the orbit is extremely rare and has not been previously reported. Diagnosis can be challenging given rarity and overlapping histopathologic features with similar soft tissue tumors. In a patient with relevant history, metastasis should remain high on the differential diagnosis, and repeat biopsy should be pursued when clinical suspicion is present. Biopsy and histopathological grading are key to diagnosis, management, and prognosis, as higher grade tumors have a significantly higher rates of local recurrence and metastasis. Critical analysis of each case is crucial in understanding optimal treatment to improve patient outcomes. This case highlights the importance of maintaining a high clinical suspicion for metastasis in a patient with pertinent past medical history and rapidly progressing proptosis.

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Figure 1

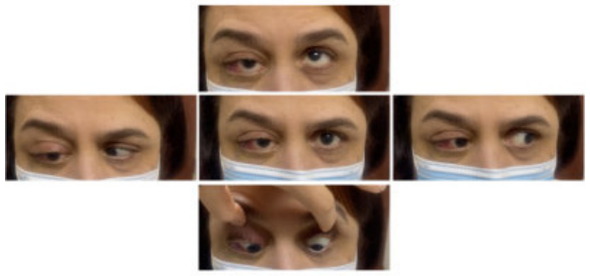


Figure 2

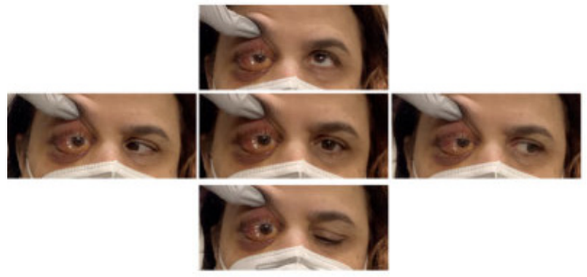


Figure 3

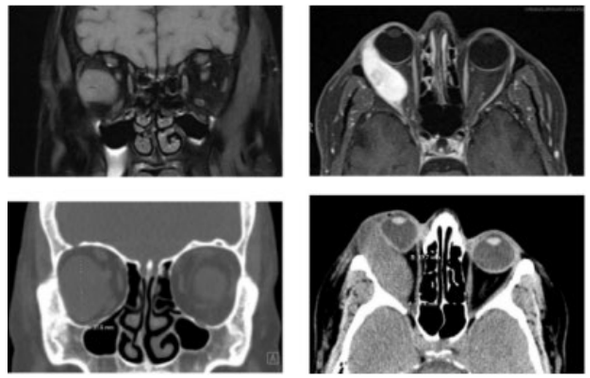


Figure 4

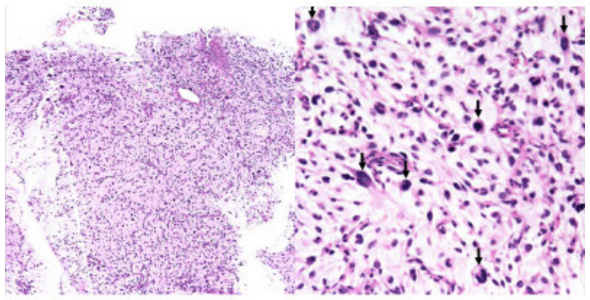
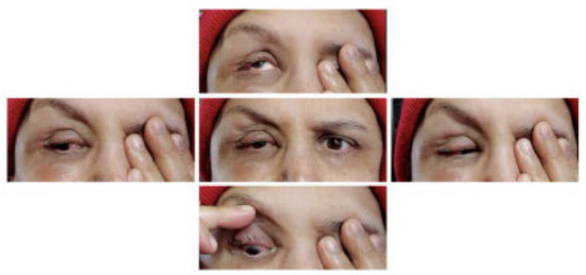


Figure 5



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Acute Herpetic Keratitis after Orbital Decompression in the Setting of Corticosteroid-Induced Immunosuppression

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[2]Ophthalmology, Walter Reed National Military Medical Center, Bethesda, Maryland, United States

Introduction: This report illustrates a case of severe HSV epithelial keratitis after orbital decompression in the setting of systemic immunosuppression for the treatment of thyroid eye disease (TED)-associated compressive optic neuropathy.

Methods: A 69-year-old African American man with a past medical history of Graves' disease and hypertension presented to the oculoplastic surgery clinic with a two-month history of decreasing vision in both eyes. He was started on IV methylprednisolone for suspected bilateral optic neuropathy. CT of the orbits demonstrated crowding of the orbital apex. After three doses of weekly methylprednisolone 500 mg followed by two weekly doses of 250 mg, his vision continued to decline. He developed new diplopia, worsening retraction, and evidence of further optic neuropathy on visual field testing. He was admitted to the hospital and started on intravenous methylprednisolone 250mg every 6 hours, and ultimately underwent bilateral lateral wall and endoscopic medial wall decompression. His vision and symptoms rapidly improved following surgery. He was transitioned to oral prednisone 40mg daily and discharged on a weekly taper. On post-operative week 2, he presented to clinic with acute blurry vision and irritation of the left eye. He was found to have diffuse geographic herpes keratitis (Figure 1 A/B), with significantly reduced visual acuity. The patient reported a remote history of oral herpetic lesions, however there was no evidence of cutaneous or intraocular involvement at the time of presentation.

Results: The patient was started on oral Valacyclovir 1 gram three times per day, as well as topical Ganciclovir ophthalmic gel. His Prednisone course was tapered over the next 9 days. Corneal cultures confirmed a diagnosis of HSV-1 keratitis. Follow-up examinations revealed gradual improvement and ultimate resolution of keratitis without visual consequences.

Conclusions: Corticosteroids are an important tool in the initial treatment of TED-associated compressive optic neuropathy. Despite the potential benefits, systemic corticosteroids increase the risk for serious opportunistic infections in a time and dose-dependent manner. The neurotropic nature of HSV enables it to lay dormant in the ganglia, where it can ultimately reactivate to cause clinically active disease. Although incompletely understood, observational studies suggest a relationship between immunosuppression, corneal trauma, and physiological stress on the incidence and severity of recurrent HSV infection. In this case, an initial episode of dendritic keratitis presented as florid epithelial disease with large stellate ulcers involving a large corneal surface area. This dramatic presentation likely

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reflects an underlying deficit in cellular defense mechanisms resulting in opportunistic intracellular viral propagation. This case highlights the importance of prompt evaluation of immunocompromised patients with nonspecific visual complaints in the post-operative period, and raises further questions regarding the role of HSV prophylaxis in similar patients with suspected latent infections.

Figure 1

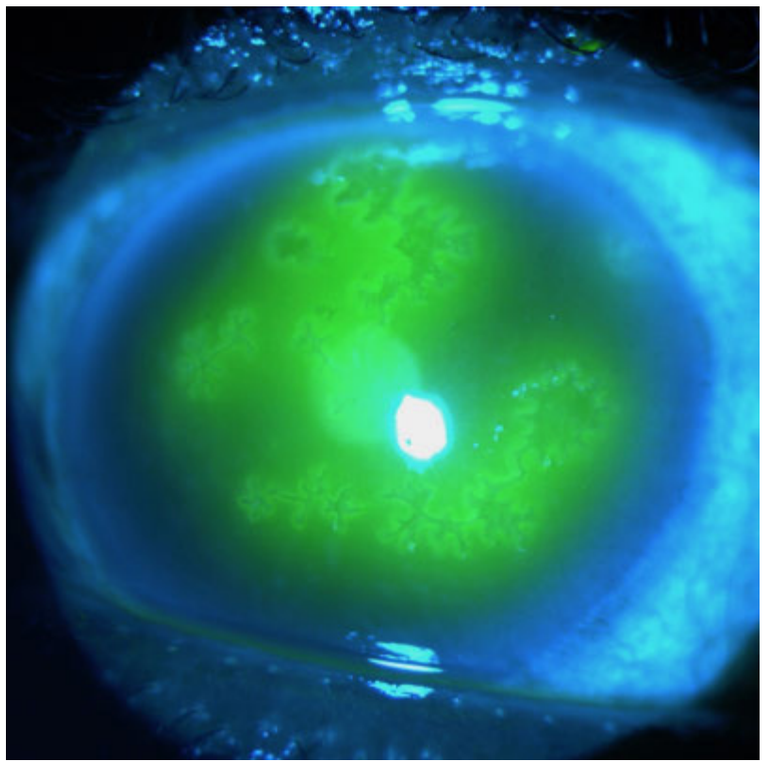
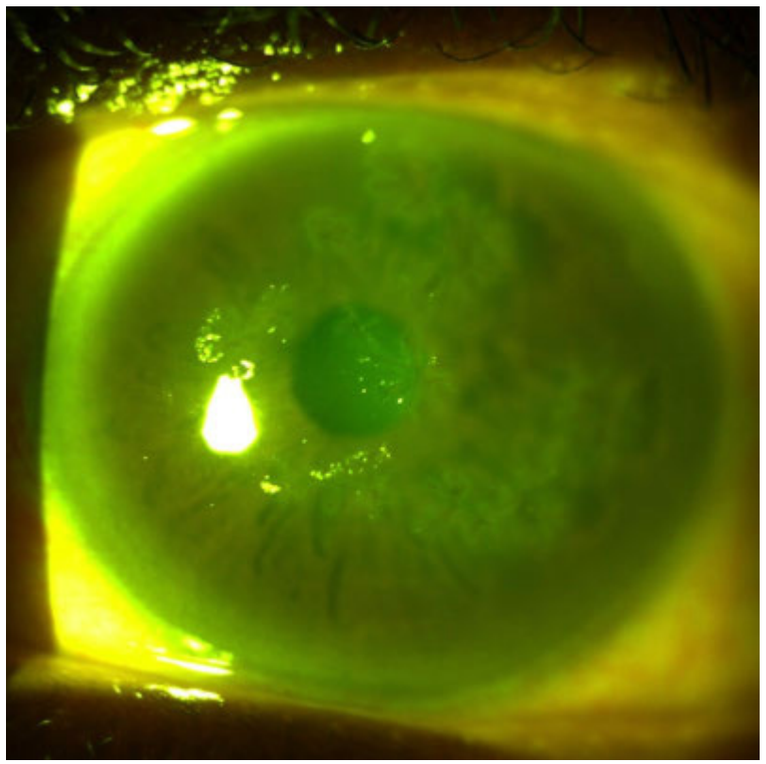


Figure 2



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Endophthalmitis in a Patient Following Bilateral Upper and Lower Eyelid Blepharoplasty

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[1]*Ophthalmology, Bascom Palmer Eye Institute, Miami, Florida, United States*

Introduction: Blepharoplasty is a common elective eyelid procedure. Although the vast majority of blepharoplasties are performed without consequence, severe potential complications are possible, including vision loss from retrobulbar hemorrhage, corneal laceration, and globe perforation.[1,2] Endophthalmitis is a very rare complication after blepharoplasty; only one brief report has been previously documented in the literature, in which a 22 year-old man developed *Staphylococcus aureus* endophthalmitis in the setting of a posterior fundus laceration following bilateral lower eyelid blepharoplasty.[3] The authors present a case of endophthalmitis due to globe perforation in a patient who underwent upper and lower eyelid blepharoplasty.

Methods: Case report.

Results: A 59-year-old woman presented to the emergency room with eye pain and blurry vision in her right eye for one month duration. Her past medical history was notable for hypothyroidism, and her past surgical history included bilateral upper and lower eyelid blepharoplasty performed by an oculoplastic surgeon at an outside hospital immediately prior to the onset of her symptoms. She denied prior eye surgeries or injections, recent hospitalizations, or systemic symptoms. Exam was notable for visual acuity of hand motion in her right eye with normal intraocular pressure, diffuse injection of the conjunctiva with a region of scleritis and purulent discharge inferotemporally, cell in the anterior chamber with iris posterior synechia, and dense vitritis with loculations and membranes of the right eye (Figure 1). Ultrasound demonstrated dense vitritis, loculations, membranes, and an inferotemporal retinal detachment in the area of scleral involvement (Figure 2). Scleral scrapings and a vitreous tap were performed, which were negative for bacteria or fungus. She received intravitreal vancomycin and ceftazidime and was started on fortified antibiotic drops and oral moxifloxacin. Three days later, her vision remained unchanged, and she subsequently underwent a diagnostic 25-gauge pars plana vitrectomy and lensectomy with silicone oil tamponade with injection of intravitreal vancomycin and ceftazidime and subtenon triamcinolone. The vitreous culture obtained intraoperatively was positive for pan-sensitive *Streptococcus Pseudoporcinus*. She received 10 days of oral levofloxacin with improvement in her vision and pain.

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Conclusions: To the best of the authors' knowledge, this is only the second reported case of endophthalmitis following blepharoplasty[3] and the first documented case of upper and lower eyelid blepharoplasty that resulted in endophthalmitis with retinal detachment. Given the infection-related scleritis, the mechanism of the endophthalmitis was thought to be due to ocular penetration during anesthesia. This case highlights the importance of meticulous attention to surgical technique and suggests a role for routine use of eye protection such as corneal protectors, even for superficial aesthetic procedures such as blepharoplasties. Furthermore, if this complication is encountered, prompt referral for retinal evaluation and care may be necessary to avoid additional ocular sequelae.

Figure 1

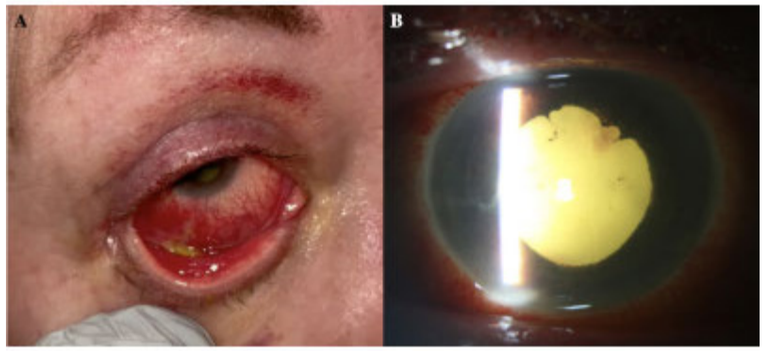
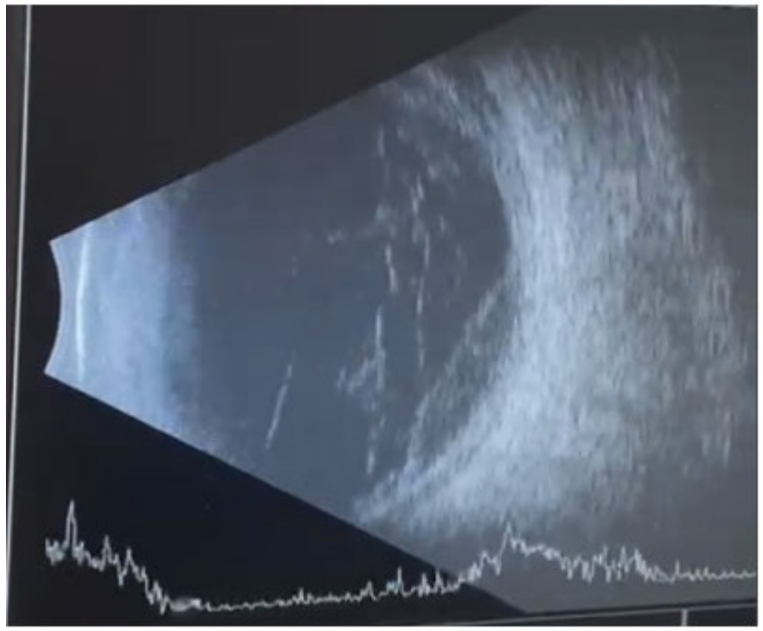


Figure 2



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Leprosy Mimicking Delayed Facial Filler Reaction

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Introduction: Herein we present the first reported case of leprosy following dermal filler injections.

Methods: Clinical records were reviewed including history, clinical examinations, multimodal imaging and investigations done in Canada and Mexico. A thorough review of the literature was performed.

Results: A 70-year female presented to our University Hospital oculoplastic service with a 6-week history of gradual facial swelling and disfigurement involving her eyebrows and nasolabial folds. Her past medical history and review of systems were non-contributory aside from rheumatoid arthritis and presumed collagen vascular disease. On initial examination she had non-tender, firm, subcutaneous induration along her brows and nasolabial folds with no pruritus, pain or erythema. Bilateral non-scarring brow madarosis and symmetric upper lid edema was noted. No associated oral mucosal ulceration, erythema or cervical lymphadenopathy was present. She reported a history of dermal fillers in the nasolabial and periocular areas performed 10 years ago in Mexico.

Multiple biopsies of the brow and cheek lesions revealed Xanthogranulomatous reaction of the subcutis and deep dermis with diffuse epithelioid histiocytes, scattered foamy histiocytes and rare multinucleated giant cells. All mycobacteria stains were negative and the specimen had no evidence of lymphoproliferative disorder or foreign body material. Initial working diagnoses considered included xanthoma disseminatum, drug reaction, adult orbital xanthogranulomatous disease and necrobiotic xanthogranuloma . Following intralesional hyaluronidase injections and no notable improvement, she underwent CT and MRI imaging which revealed symmetric, minimally enhancing subcutaneous tissue deposits in the areas corresponding to her lesions.

She then revealed she had spent winter months for the last 20 years in Oaxaca Mexico, near small villages with endemic leprosy. Despite having no history of infectious contacts or exposure to armadillos (known carriers of Mycobacterium leprae), a new working diagnosis of lepromatous multibacillary leprosy with early leonine facies was proposed by our infectious disease service.

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Following treatment with Rifampin, Dapasone and Minocycline, she developed bilateral lower limb erythema nodosum leprosum. Her facial deformity persisted and repeat biopsies showed lymphocytic inflammation with multinucleated giant cells in the dermis suggestive of an infectious etiology, but were negative for all mycobacterium stains.

Infectious workups including HIV, Strongyloides stercoralis, Lyme and Tuberculosis were all negative. Tissue biopsy for PCR was negative for Mycobacterium leprae. Nonetheless, after 4 months on her treatment regime, she began to have resolution of her facial lesions suggesting a diagnosis of presumed paucibacillary lepromatous disease.

Conclusions: To the best of our knowledge, this is the first reported case of presumed leprosy following dermal filler injections. Our patient presented with paucibacillary leprosy mimicking a delayed dermal filler complication. Infection due to Mycobacterium lepra is a serious condition rarely encountered in North America. Transmitted through contact with armadillos or via droplets from nasal or oral mucosa, this bacterium's incubation period ranges from 9 months to 20 years. Diagnosis of the paucibacillary leprosy can be challenging with only 36% of tissue biopsies yielding detectable PCR amplification. Thus a thorough history, clinical assessment, and response to empiric treatment play an important role in its diagnosis. Despite decreasing global prevalence, with increasing immigration and global travel, unusual diseases such as leprosy should be considered on the differential of facial and periocular granulomatous inflammation.

Figure 1

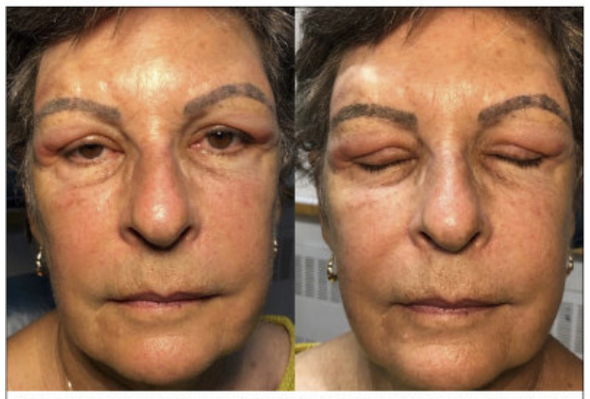

Figure 1. 70year old female presenting with bilateral non scarring brow madarosis, symmetric upper lid edema, and nontender, firm, subcutaneous induration along her brows and nasolabial folds.

Figure 2

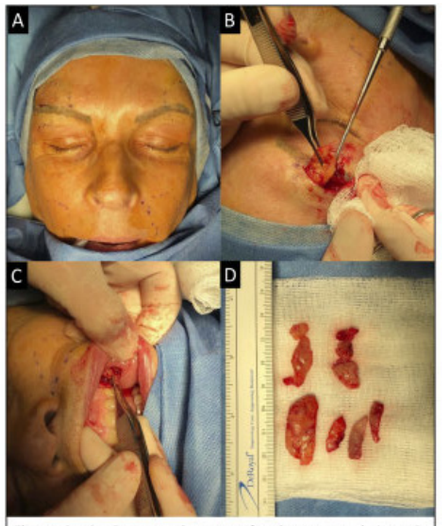

Figure 2. A. Demarcated areas of subcutaneous lesions **B.** Supracilliary approach to brow lesion **C.** Intraoral approach to buccal lesion **D.** Gross appearance of brow and cheek lesions biopsies.

Figure 3

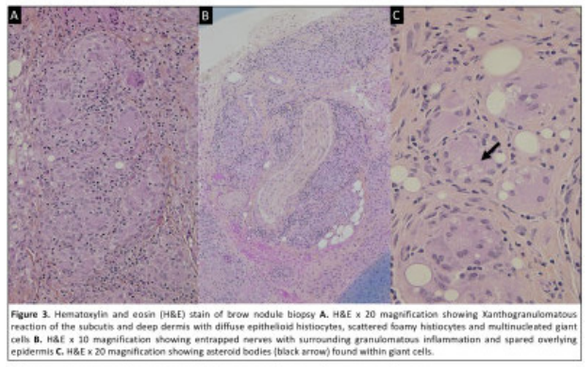

Figure 3. Hematoxylin and eosin (H&E) stain of brow nodule biopsy **A.** H&E x 20 magnification showing Xanthogranulomatous reaction of the subcutis and deep dermis with diffuse epithelioid histiocytes, scattered foamy histiocytes and multinucleated giant cells **B.** H&E x 10 magnification showing entrapped nerves with surrounding granulomatous inflammation and spared overlying epidermis **C.** H&E x 20 magnification showing asteroid bodies (black arrow) found within giant cells.

Figure 4

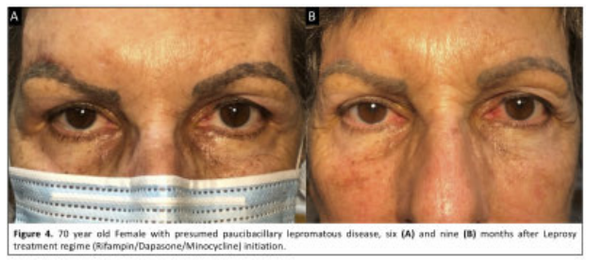

Figure 4. 70 year old Female with presumed paucibacillary lepromatous disease, six **(A)** and nine **(B)** months after Leprosy treatment regime (Rifampin/Dapasone/Minocycline) initiation.

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Lower Eyelid Ectropion Secondary to Over the Counter Treatment of Xanthelasma

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Introduction: Xanthelasmas are common localized accumulations of lipids that, although benign, can be cosmetically concerning. Over the counter remedies for xanthelasmas exist, however, can carry risks.

Methods: Xanthelasmas are localized accumulations of lipids, mainly cholesterol, that can occur in the epidermis, dermis and muscle of the eyelids. They are the most common cutaneous presentation of xanthoma and occur most commonly on the upper eyelid near the inner canthus. Despite their benign presence, xanthelasmas can be cosmetically concerning. With this in mind, several treatment modalities have been described to eliminate the appearance. We report the first case to describe a cicatricial ectropion from the topical treatment, “Glycolic acid, Lactic acid, Mandelic acid, Salicylic acid, Resorcinol, Jessners peel”.

Results: After sustaining chemical burns and a lower eyelid ectropion the patient underwent three injections of a 5-FU formulation over the course of 53 days. Afterwards, the patient was comfortable without lagophthalmos or tearing. As the patient was very pleased with his current condition and eyelid position the decision to continue observation was made.

Conclusions: Based on our patient’s clinical history and presentation, he appeared to have suffered from third degree burns to his eyelids. Thankfully, treatment with 5-FU helped dramatically improve the patient’s cicatricial ectropion, however, may not be the case with every patient. The authors’ intent in publishing this case report is to raise awareness of this over the counter xanthelasma treatment and the potential risks it carries, so that patients can be better educated as they approach potential treatments.

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Figure 1

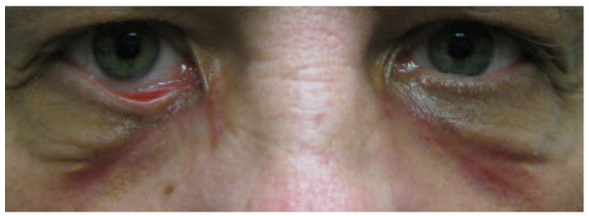


Figure 2

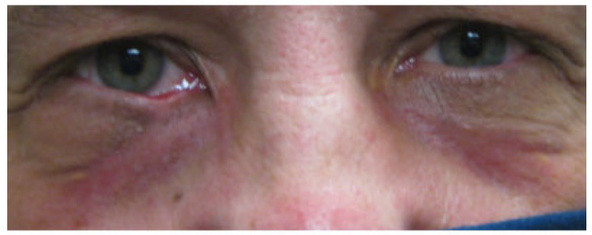


Figure 3

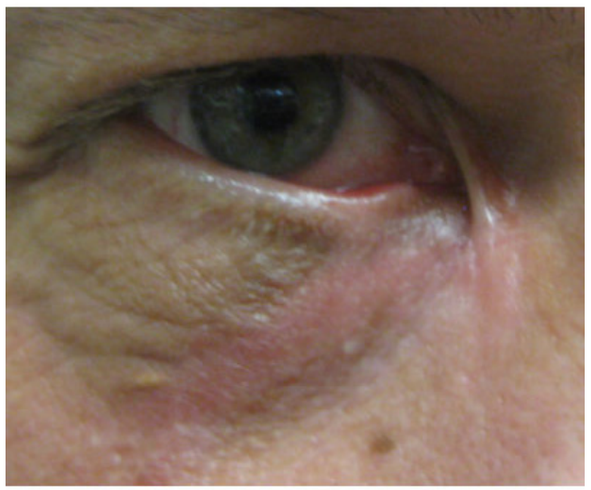
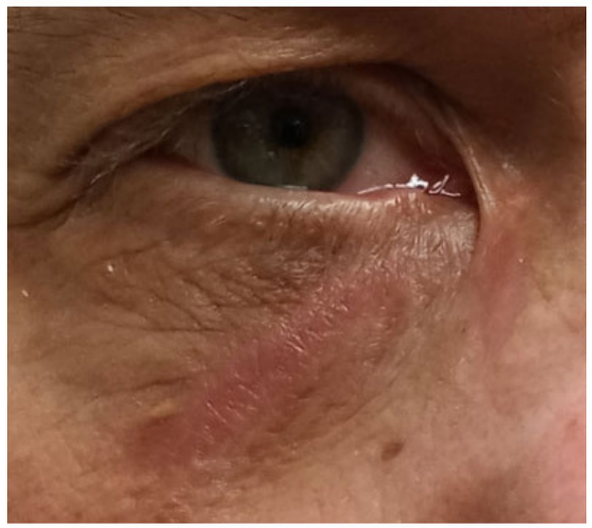


Figure 4

Figure 5



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Periocular Non-Tuberculous Mycobacterium Infection after Combination Autologous Fat Transfer with Subdermal Micro-Needling and Fractional Radiofrequency Skin Resurfacing

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Introduction: This case details Mycobacterium chelonae infection after combination facial autologous fat transfer with subdermal microneedling and fractional radiofrequency skin resurfacing successfully treated with novel tedizolid therapy.

Methods: Case report, collection and evaluation of protected patient health information were HIPPA compliant.

Results: A 59-year-old woman presented from an outside facility three weeks after bilateral lower eyelid autologous fat transfer, subdermal micro-needling and fractional radiofrequency skin resurfacing. Two weeks after surgery, she developed unilateral left-sided swelling and a small erythematous nodule. After failing outpatient antibiotic therapy with clindamycin and trimethoprim-sulfamethoxazole, she presented to the emergency room for imaging and intravenous antibiotics for pre-septal cellulitis. Maxillofacial computerized tomography with contrast demonstrated left preseptal cellulitis without frank abscess. After poor response to intravenous vancomycin and ampicillin/sulbactam, her wound was cultured in an area of fluctuance and revealed Myocobacterium chelonae. She was transitioned to an outpatient regimen of clarithromycin and tedizolid for a total of 4 months with resolution of her infection (Figure 1). No recurrence has been detected 3 months after discontinuation.

Conclusions: This case highlights the need for vigilance and a broad differential in delayed post-operative wound infections including non-tuberculous mycobacterium infections. Additional caution may need to be exercised when performing combination autologous fat transfers with subdermal micro-needling procedures. When encountered, Mycobacterium chelonae infections may respond well to prolonged combination therapy with oral clarithromycin and tedizolid.

Figure 1

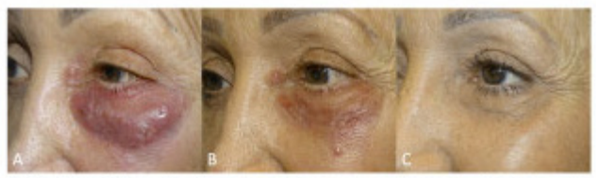

Figure 1. Treatment of left-sided *Mycobacterium chelonae* infection with clarithromycin and tedizolid at A) pre-initiation, B) one month of treatment, C) completion of four-month course.

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Severe Diesel Injection Injury to the Face, Neck and Orbit: Surgical Management and Critical Care Considerations

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Introduction: The purpose of this report is to describe a severe, high powered diesel fuel injury to the face and orbit and discuss the challenges in medical and surgical management.

Methods: We present a case of a 29-year old male who sustained a high-pressure diesel injection injury from a tractor fuel injector to the left orbit, maxillofacial region, and neck. Diagnosis was delayed, he was transferred for tertiary level care four days after injury given clinical deterioration on antibiotics and concern for necrotizing fasciitis.

Results: The patient required nine surgical debridements, intensive care unit (ICU) level care, and ultimately sub-total exenteration. Decision making for debridement was guided by serial c-reactive protein (CRP) levels and computed tomography imaging of the face, neck and orbits. The wounds were packed with antibiotic soaked packing and irrigated with clindamycin three times daily through red rubber drains. The patient's course was complicated by airway compromise, deep soft tissue necrosis of the left face down to the mediastinum, and optic nerve tenting despite orbital decompression. Ultimately, definitive treatment required selective exenteration and negative wound pressure therapy over the orbit. He underwent eyelid and socket reconstruction as an outpatient.

Conclusions: We conclude that without prompt recognition and meticulous washout/debridement, the damage from high-pressure injection injuries can be devastating and lead to permanent vision loss, loss of eye, loss of facial function, and airway compromise depending on the location of the injury. A multi-disciplinary team involving oculoplastics, otolaryngology, infectious disease, and ICU should be assembled based on the extent of injury. CRP is useful to monitor need for further surgical intervention and patient recovery. When debridement results in complex wounds over the orbit and face, negative pressure wound therapy should be considered.

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Figure 1

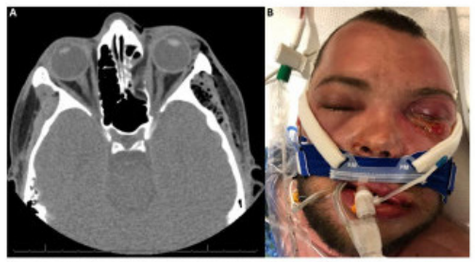

Figure 1 A. Initial CT scan shows orbital and facial cellulitis with post-septal involvement. B. Clinical presentation upon arrival to our hospital four days after the initial injury.

Figure 2

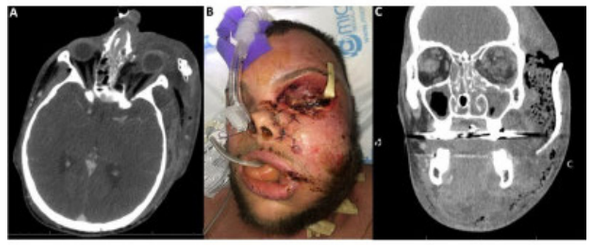

Figure 2. A. Eight days post-injury optic nerve tenting becomes evident on axial cuts of the CT scan. B. Clinical appearance 8 days post-injury shows progressive swelling and tissue necrosis despite surgical intervention, systemic antibiotics, and corticosteroids. C. Nine days post-injury, now following a second debridement at our institution with placement of more drains due to significant orbital, facial, and mediastinal cellulitis.

Figure 3

Figure 3. Red rubber drains were placed and used to irrigate the orbit and facial soft tissues with clindamycin three times daily.

Figure 4

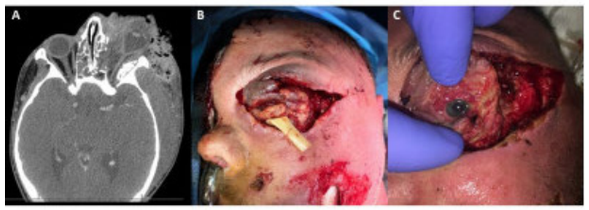

Figure 3. A. Three days before left sub-total exenteration progression of globe tenting and distortion can be appreciated. B. External photo taken before subtotal exenteration shows areas of pervious peri-orbital surgical debridement. C. External photo of the eye proceeding subtotal exenteration.

Figure 5

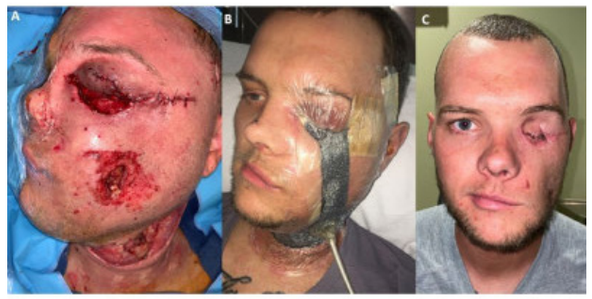

Figure 4. A. Clinical photo showing facial wounds following sub-total exenteration. B. Clinical photo taken one month after the initial injury showing the negative pressure wound therapy dressing. C. Clinical photo taken 5.5 months following initial injury and 5 months following left subtotal exenteration.

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Sliding Free Flap for Mid Face Reconstruction after Facial Gunshot Injury

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Introduction: Gunshot wounds to the face are an infrequent occurrence outside of a war zone, and microvascular free tissue transfer is often employed to reconstruct significant facial defects. We described the novel utilization of a well healed exising left free radial forearm flap for midface reconstruction.

Methods: A 42 year old man with a history of accidental gunshot wound to the left side of the face 20 years ago presented with complaints of a slow growing bump in the left medial canthus and tearing. He also wanted correction for left facial defect with difficulty to wear a face mask for work as a professional painter. His past medical history included left traumatic optic neuropathy and hemophilia A which he took emicizumab. His surgical history included repair of left orbital floor and mediall wall with transnasal wiring and a left free radial forearm flap to the left upper lip and medial cheek along the nasolabial fold. Examination showed visual acuity of 20/20 OD and 20/50 OS. A left afferent pupillary defect was noted with full ocular motility and confrontational visual field. External examiantion showed a 1.5cm soft tissue mass at the left medial canthus with well healed facial scars from the medial left brow extended down the medial canthus and nasolabiral fold with a well healed radial forearm flap. However, a loss of mid face projection resulted in significant depression over the inferior maxilla and alveolus. The left globe appeared hyperglobus, and slight pallor of the optic nerve was observed on dilated fundus examination. Orbital CT scan revealed a 2.7x3.3x2.9cm cystic expansile lesion involving the left lacrimal region with distortion of the left medial rectus and globe. Post injury osseous defect were seen along with a 2x1.6cm cystic lesion over the medial margin of the remnant zygoma. After admission for hematologic optimization, he underwent drainage of sinus mucoceles and orbital floor, medial wall, and rim reconstruction with 3D printed titanium plates. The radial forearm flap was deepithelialized and was tucked under a cervicofascial flap derived from the existing scars. The patient had an uneventful recovery with resolution of oclular symptoms and was able to resume painting work without difficulty at 3 months follow up.

Conclusions: Microvascular free tissue transfer is versatile and can provide significant volume to restore midface projection in ballistic injury. It could serve as viable alternative to synthetic implants in midface reconstruction.

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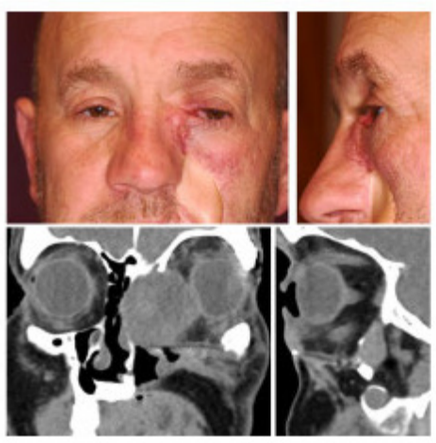
Figure 1



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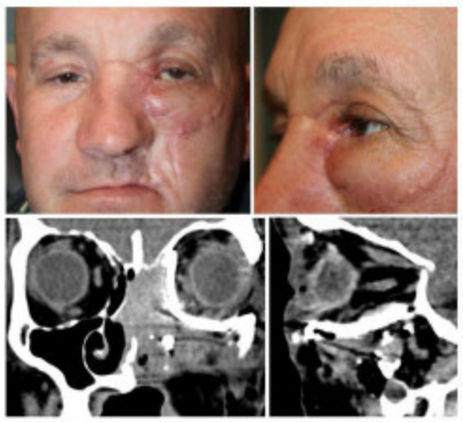

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A Rare Case of High-Grade Dedifferentiated Solitary Fibrous Tumor in the Lacrimal Sac Region

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Introduction: Solitary fibrous tumors (SFTs) are rare spindle cell tumors originating from connective tissue. While this tumor is commonly located in the pleura[1], it may rarely present in the orbit, with fewer than 150 cases reported[2], and even less commonly develops in the lacrimal drainage system.[3] We present a patient with a very rare high-grade dedifferentiated solitary fibrous tumor in the lacrimal sac region.

Methods: Case report and literature review.

Results: A 77-year-old male presented with a right medial canthal mass and epiphora for 3 months. He denied trauma, discharge, bleeding, pain, or vision changes. His past medical history included basal cell carcinoma and squamous cell carcinoma on his nose, back, and extremities, which had been excised. He denied prior eyelid, orbital, or nasolacrimal surgeries. Exam demonstrated a large mass below the medial canthal tendon in the tear trough region (Figure 1). Imaging demonstrated an enhancing mass abutting the globe inferomedially in the nasolacrimal sac region without globe deformity or bony erosion (Figure 2). The patient underwent excisional biopsy with the tumor removed in toto. Histopathology revealed a morphologically heterogeneous tumor containing an area of classic SFT with 8 mitotic figures per 10-high-power-field and a sharply demarcated area of undifferentiated pleomorphic sarcoma with >10 mitotic figures per 10-high-power-field involving 60% of the tumor (Figure 3) with immunohistochemistry positive for STAT6 and CD34, and negative for smooth muscle actin, desmin, and S100, consistent with high-grade (grade 3/3) dedifferentiated SFT. Follow-up PET scan was negative, and the patient underwent adjuvant orbital radiation without clinical recurrence of the lesion at 4 months follow-up.

Conclusions: SFTs rarely present in the lacrimal drainage system (Table 1).[3] Patients clinically present with epiphora or mass, with CT demonstrating a well-defined, enhancing lesion in the lacrimal fossa region with extension into the bony nasolacrimal duct, orbit, or sinonasal tissues. Biopsy is essential for diagnosis, and treatment involves surgical resection and occasionally adjuvant radiotherapy.[2] This patient presented with high-grade SFT, differing from previously reported lacrimal drainage system SFTs, which were low-grade. Furthermore, dedifferentiated SFTs in the orbit are very uncommon; only 10 cases of SFT with dedifferentiation or malignant transformation in the setting of tumor recurrence have been reported.[2] To the best of the authors' knowledge, this is the first case of SFT in the orbit or lacrimal drainage system with evidence of histopathological dedifferentiation on initial presentation.[4] Additional

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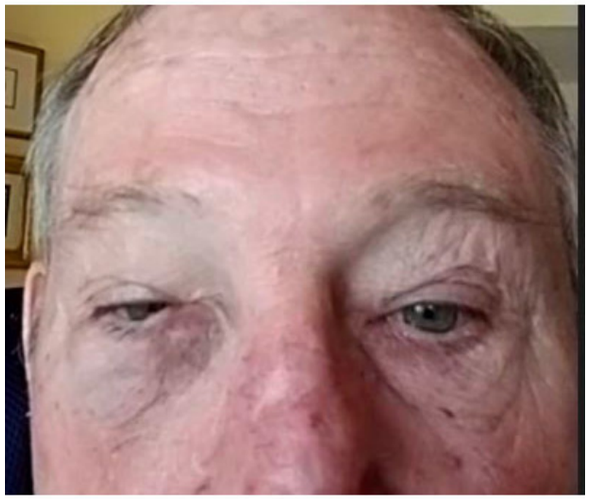
understanding regarding the behavior and optimal treatment of high-grade dedifferentiated SFT in the lacrimal drainage system and orbit is required; therefore, prompt and accurate diagnosis, treatment, and close follow-up are essential.

Figure 1



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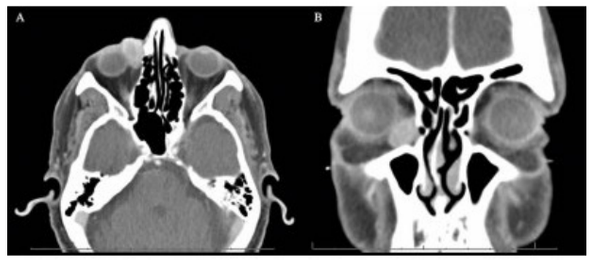

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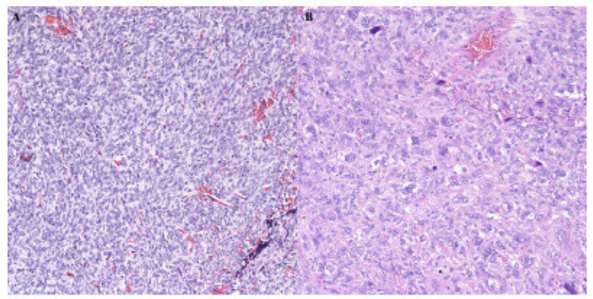

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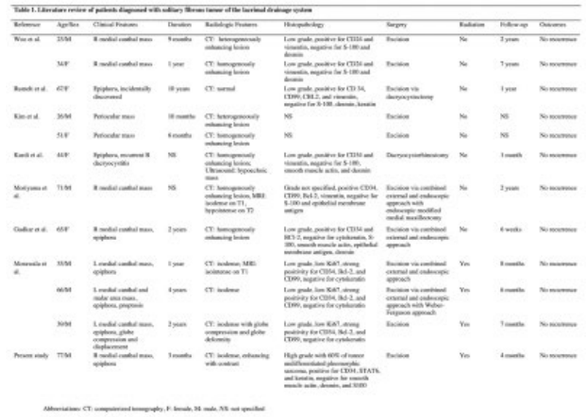

Table 1. Literature review of patients diagnosed with solitary fibrous tumor of the lacrimal drainage system

Reference	Age/Sex	Clinical Features	Duration	Radiologic Features	Histopathology	Surgery	Radiation	Follow-up	Outcomes
Wise et al.	23/M	R medial canthal mass	9 months	CT: heterogeneously enhancing lesion	Low grade, positive for CD34 and vimentin, negative for S-100 and desmin	Excision	No	2 years	No recurrence
	34/F	R medial canthal mass	1 year	CT: homogeneously enhancing lesion	Low grade, positive for CD34 and vimentin, negative for S-100 and desmin	Excision	No	7 years	No recurrence
Rumelt et al.	47/F	Epiphora, incidentally discovered	10 years	CT: normal	Low grade, positive for CD 34, CD99, CBL2, and vimentin, negative for S-100, desmin, keratin	Excision via dacryocystectomy	No	1 year	No recurrence
Kim et al.	20/M	Periocular mass	10 months	CT: heterogeneously enhancing lesion	NS	Excision	No	NS	No recurrence
	51/F	Periocular mass	6 months	CT: heterogeneously enhancing lesion	NS	Excision	No	NS	No recurrence
Ranil et al.	44/F	Epiphora, recurrent R dacryocystitis	NS	CT: homogeneously enhancing lesion; Ultrasound: hypoechoic mass	Low grade, positive for CD34 and vimentin, negative for S-100, smooth muscle actin, and desmin	Dacryocystorhinostomy	No	1 month	No recurrence
Moriyama et al.	71/M	R medial canthal mass	NS	CT: homogenously enhancing lesion, MRI: isodense on T1, hypointense on T2	Grade not specified, positive CD34, CD99, Bcl-2, vimentin, negative for S-100 and epithelial membrane antigen	Excision via combined external and endoscopic approach with endoscopic modified medial maxillectomy	No	2 years	No recurrence
Gudkar et al.	65/F	R medial canthal mass, epiphora	2 years	CT: homogenously enhancing lesion	Low grade, positive for CD34 and BCL-2, negative for cytokeratin, S-100, smooth muscle actin, epithelial membrane antigen, desmin	Excision via combined external and endoscopic approach	No	4 weeks	No recurrence
Monavarjeh et al.	55/M	L medial canthal mass, epiphora	1 year	CT: isodense, MRI: isointense on T1	Low grade, low Ki67, strong positivity for CD34, Bcl-2, and CD99, negative for cytokeratin	Excision via combined external and endoscopic approach	Yes	8 months	No recurrence
	66/M	L medial canthal and malar area mass, epiphora, proptosis	4 years	CT: isodense	Low grade, low Ki67, strong positivity for CD34, Bcl-2, and CD99, negative for cytokeratin	Excision via combined external and endoscopic approach with Weber-Ferguson approach	Yes	6 months	No recurrence
	36/M	L medial canthal mass, epiphora, globe compression and displacement	2 years	CT: isodense with globe compression and globe deformity	Low grade, low Ki67, strong positivity for CD34, Bcl-2, and CD99, negative for cytokeratin	Excision	Yes	7 months	No recurrence
Present study	77/M	R medial canthal mass, epiphora	3 months	CT: isodense, enhancing with contrast	High grade with 60% of tumor multifascicular pleomorphic sarcoma, positive for CD34, STAT6, and keratin, negative for smooth muscle actin, desmin, and SOX10	Excision	Yes	4 months	No recurrence

Abbreviations: CT: computerized tomography, F: female, M: male, NS: not specified

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Acute Bilateral Vision Loss Following Unilateral Optic Nerve Sheath Fenestration

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Introduction: Optic nerve sheath fenestration (ONSF) can prevent vision loss in settings of acute fulminant papilledema and progression of papilledema despite maximum medical therapy or due to non-adherence to therapy.[1] The risk of blindness due to arterial occlusion, ischemic optic neuropathy, or retrobulbar hemorrhage of the operated side following ONSF is 1-2%.[2,3] We present a unique case of rapid bilateral vision loss after a unilateral ONSF.

Methods: A retrospective review of all cases of bilateral vision loss following unilateral ONSF from January 2016 to May 2021 was performed at our institution. All cases that had bilateral visual complications following a bilateral ONSF were excluded.

Results: A total of 39 cases of ONSF surgeries were identified. A single case of bilateral vision loss after unilateral ONSF was identified. A 57 female previously diagnosed with idiopathic intracranial hypertension presented for ONSF. She had 20/30 vision bilaterally but was noted on Humphrey visual fields to have severe peripheral visual field loss. She had severe bilateral papilledema, and magnetic resonance imaging (MRI) studies without evidence of any masses or venous thromboses. She underwent uneventful ONSF of the left eye. The patient noted rapid bilateral vision loss three days after left ONSF with visual acuity of no light perception in the left eye with sluggish pupil reactions and trace afferent pupillary defect, and count fingers in the right eye. Dilated fundus exam showed improved optic disc edema in the left eye with persistent Frisen grade 4+ hemorrhagic disc edema in the right eye without evidence of retinal artery occlusions in both eyes. MRI of the brain and orbits showed a mild T2 hyperintensity in the optic chiasm bilaterally with a subtle enhancement of the 7th and 8th cranial nerve complexes suggestive of leptomeningeal disease. Furthermore, multiple osseous lesions throughout the skull base, calvarium, and upper cervical spine suggestive of metastasis were found. She underwent a CT scan of the chest, abdomen, and pelvis which revealed a large pelvic mass with liver and spine metastasis. A biopsy of the pelvic mass showed metastatic adenocarcinoma with elevated CA 19-9 and CA 125 suspicious for pancreatic cancer. She was diagnosed with metastatic adenocarcinoma with leptomeningeal carcinomatosis and optic chiasmal involvement resulting in her vision loss.

Conclusions: Bilateral vision loss can occur following unilateral ONSF in the presence of leptomeningeal carcinomatosis possibly due to the seeding of tumor cells with infiltration of the optic nerve sheath.[4]

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An Impressive Response of Locally Aggressive Periocular Basal Cell Carcinoma to Vismodegib

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Ophthalmic Surgeons & Consultants of Ohio, Columbus, Ohio, United States

Introduction: Basal cell carcinoma (BCC) is the most common malignancy in the periocular area[1]. Standard of care is surgical excision with frozen section control or Mohs micrographic surgery, when possible[2]. There are rare cases of locally aggressive and/or metastatic disease where surgical excision or radiation therapy is either not possible or would result in significant dysfunction and disfigurement. Newer chemotherapy agents vismodegib and sonidegib, hedgehog pathway inhibitors, have shown promise in reducing size and morbidity of locally aggressive and metastatic BCC[3]. We present a case of locally aggressive disease involving the medial canthus, nasolacrimal system, and nasal sinus cavities that showed impressive clinical response to vismodegib.

Methods: A 70-year-old female was evaluated for a “slowly progressive” lesion of the left medial canthus causing disfigurement, tearing, discharge, and blurred vision (Figure 1). A clinical diagnosis of infiltrative BCC was made. Imaging showed orbital infiltration of the lesion with destruction of the lamina papyracea, extension through the ethmoid sinuses, and obstruction of frontal and maxillary sinus outflow in the nasal cavity (Figure 2). Given the extent of disease, surgical excision was not possible, and the patient refused radiation therapy. She was sent for consultation with a dermatologist, where treatment with oral vismodegib was initiated.

Results: Two months after starting treatment, a dramatic amount of regression was apparent clinically. Repeat imaging after five months showed significant reduction of the tumor from 3.5 cm in greatest dimension to 1 cm. There had also been interval clearing of the paranasal sinuses (Figure 3). At most recent follow up of two years, the patient has persisting clearance of the tumor (Figure 4). However, she has cicatricial medial lower lid ectropion from medial canthal scarring and epiphora from neoplastic destruction of her nasolacrimal system. Fortunately, she continues to have excellent vision and a preserved ocular surface. The patient reported mild, tolerable muscle spasms during her treatment, alopecia of the eyebrows, and thinning hair of her scalp.

Conclusions: This patient demonstrates a dramatic clinical response of an extensive tumor in a challenging location following treatment with vismodegib. She was spared invasive treatments such as exenteration and sinus surgery, along with their reconstruction, and radiation that would have resulted in significant disfigurement and morbidity. Nevertheless, management dilemmas remain involving her cicatricial ectropion and epiphora. It is unknown whether the tissue bed in an area of regressed BCC would be receptive to a full thickness skin graft or to conjunctivo-dacryocystorhinostomy with Jones tube, respectively, to repair these issues. Further experience is needed with this treated tissue to advise on the available interventions to further optimize care in these patients.

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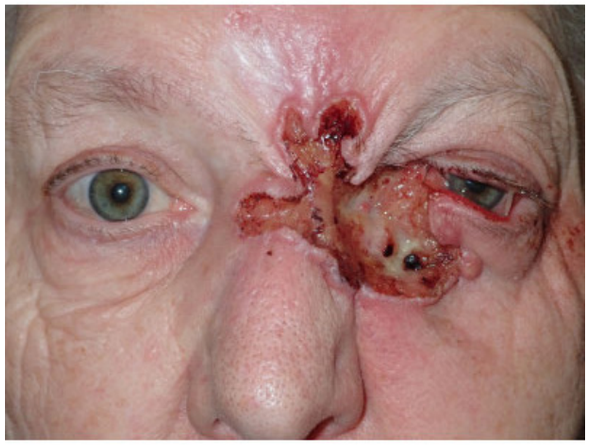
Figure 1



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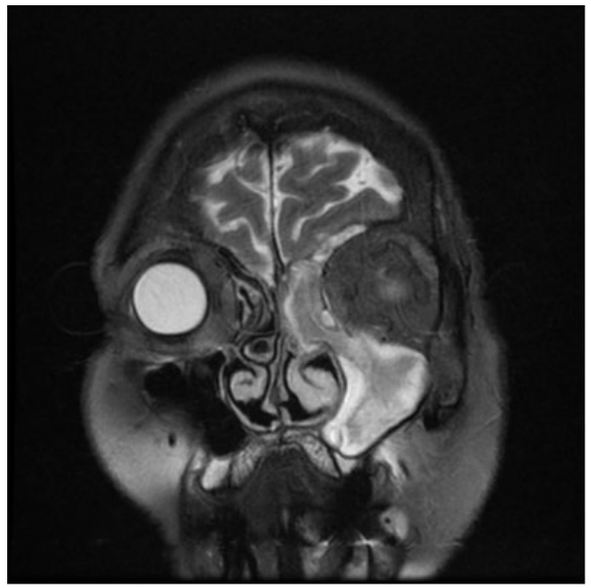

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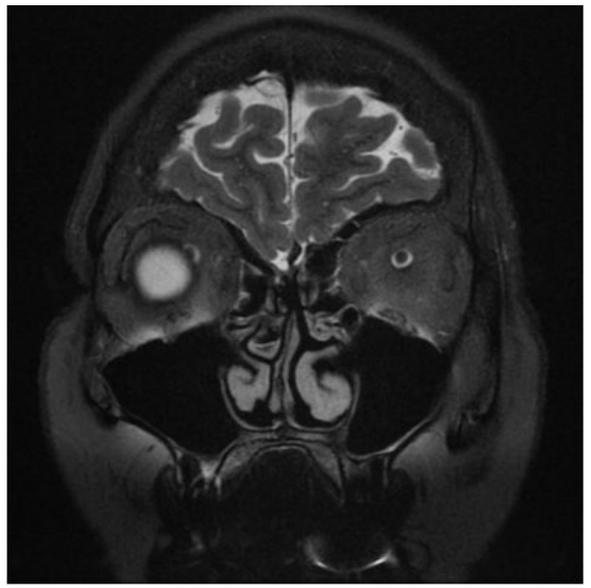

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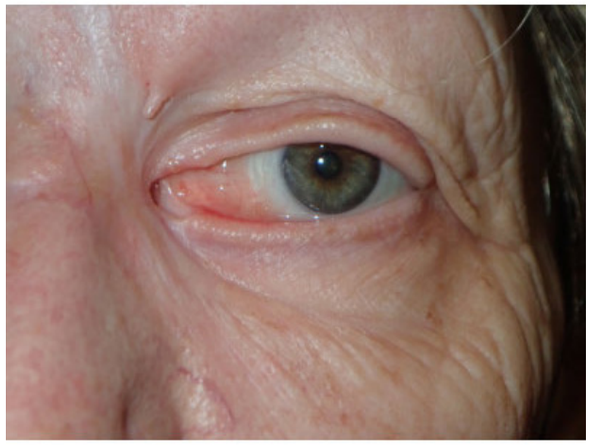

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Atypical Radiographic Findings of Orbital Rhabdomyosarcoma

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Introduction: As the most common malignant intraorbital tumor in pediatric patients, rhabdomyosarcoma classically presents with findings of diffusion restriction on diffusion-weighted magnetic resonance imaging (MRI). Diffusion-weighted MRI (DWI) serves as a helpful tool to better differentiate between benign and malignant etiologies of orbital tumors. Malignant tumors typically demonstrate diffusion restriction while benign tumors lack such findings. Here, we describe an atypical case of an orbital rhabdomyosarcoma lacking diffusion restriction on initial presentation.

Methods: The medical records, radiography and pathologic reports of one patient were reviewed.

Results: An otherwise healthy three-year-old male presented to pediatric ophthalmology clinic with a three week history of rapidly progressive painless, left-eye proptosis. Examination was significant for 8-mm left-sided proptosis, hypoglobus, and restrictive strabismus with significant limitation extraocular motility (Figure 1). Visual acuity and color vision were symmetric bilaterally, and there was no afferent pupillary defect. Examination of the right eye was within normal limits. Orbital MRI performed at an outside hospital was reviewed and demonstrated a large well-circumscribed homogenously enhancing extraconal mass in the superior orbit negative for air-fluid levels or diffusion restriction. Imaging was most suggestive of orbital hemangioma while clinical suspicion was most concerning for rhabdomyosarcoma. The patient was treated with two weeks of oral propranolol however the mass continued to grow and proptosis and extraocular motility restriction increased. Repeat imaging was performed, and CT of the orbits revealed areas of hypodensity concerning for necrosis and suggestive of a malignant neoplastic etiology. He underwent urgent orbitotomy and biopsy of the orbital mass which confirmed embryonal rhabdomyosarcoma. PET CT was notable for avid uptake by the left orbital mass. MRI of the face, neck, and orbit showed no evidence of parameningeal involvement or intracranial extension. Nuclear medicine bone scan was negative for metastasis. The pediatric oncology initiated combination chemotherapy (actinomycin, cyclophosphamide, and vincristine) and the patient had a rapid regression of the disease burden and improved proptosis and extraocular muscle restriction.

Conclusions: Diffusion weighted MRI has been found to serve as a useful tool to differentiate benign from malignant orbital lesions. Malignant tumors, which present with high cellularity and metabolic activity, have lower apparent diffusion coefficients (ADCs) and thereby present with diffusion restriction. Benign lesions, which often accompany inflammation or edematous soft tissue, usually present with higher ADCs. While diffusion restriction be one of the earliest diagnostic indicators of malignancy with greater than 90% sensitivity

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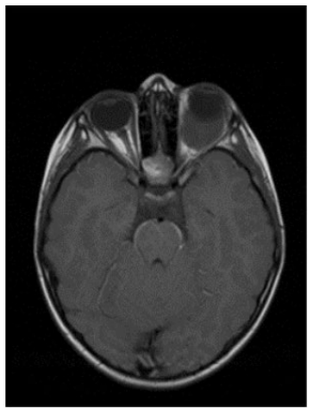
and specificity, this case of rhabdomyosarcoma failed to demonstrate diffusion restriction on initial imaging. Herein we present atypical imaging of a pediatric orbital embryonal rhabdomyosarcoma with initial MRI imaging most consistent with orbital hemangioma.

Figure 1

Figure 2



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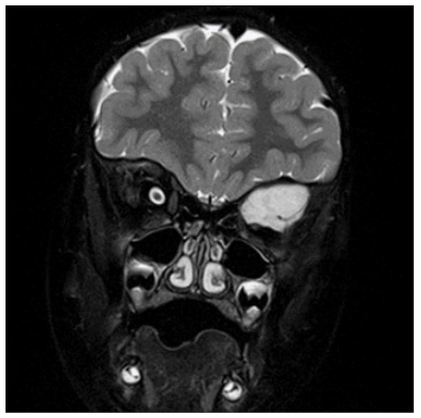

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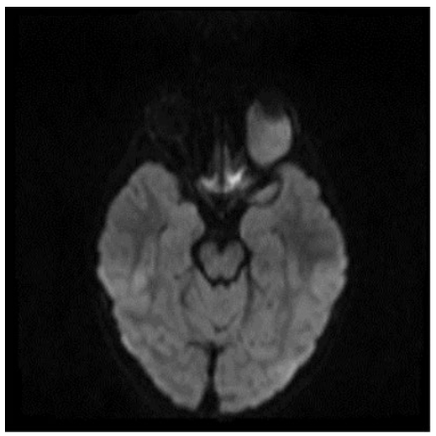
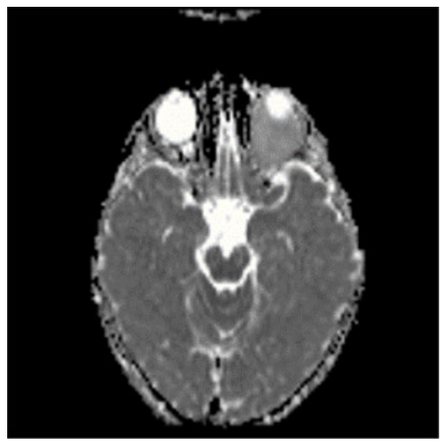


Figure 5



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Avoiding Exenteration in Recurrent Orbital Basal Cell Carcinoma with Vismodegib: A Case Report

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Introduction: The sonic hedgehog pathway inhibitor vismodegib has been approved for the medical treatment of locally advanced and metastatic basal cell carcinoma (BCC). This case report demonstrates the use of this medication to avoid exenteration in the treatment of advanced periorbital BCC.

Methods: The authors report the case of a patient with recurrent periorbital basal cell carcinoma who was treated with vismodegib.

Results: A 65-year-old man with multiple past BCC excisions presented with orbital recurrence of BCC (Figure 1 and Figure 4A). He was pre-treated with vismodegib, with hope of avoiding exenteration. He had significant corneal exposure related to prior BCC treatments (Figure 2) and underwent eyelid reconstruction after 2 months of vismodegib (Figure 3). At the time of reconstruction, biopsy of periorbital, orbital, and medial wall tissue was performed. Although repeat imaging was similar in appearance to that obtained prior to treatment (Figure 4B), biopsies returned positive for BCC in the anterior medial wall and orbit, but the deep tissues were negative for carcinoma.

He continued vismodegib with hopes to further decrease tumor burden. At 6 months into his treatment, his left eyelids were opened and biopsies were performed of the lower eyelid margin. These returned negative for BCC. Under the reconstructed eyelids, his cornea had healed well (Figure 5).

Around 9 months of vismodegib treatment, he was suffering from moderate side effects, including muscle cramps and alopecia. Vismodegib was stopped and he returned to the operating room for exploration of the orbit and repeat biopsies. These showed vascular changes and prominent fibrosis compatible with therapy-induced effect, but no viable tumor was detected.

The next steps for our patient include a reconstruction of the left medial orbit, as vismodegib had left an empty space where tumor had previously occupied.

Conclusions: Vismodegib should be considered in patients with extensive BCC or BCC in areas that are difficult to reconstruct, especially in the periocular region. It is important to note that imaging after treatment does not always distinguish between carcinoma and scar. In these cases, pathological tissue examination is essential to help determine the extent of surgical resection. Our case demonstrates that vismodegib is an important tool in the treatment for extensive BCC as it may aid to avoid exenteration.

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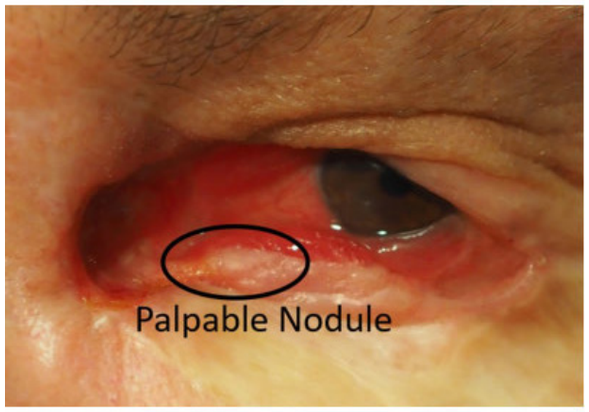
Figure 1



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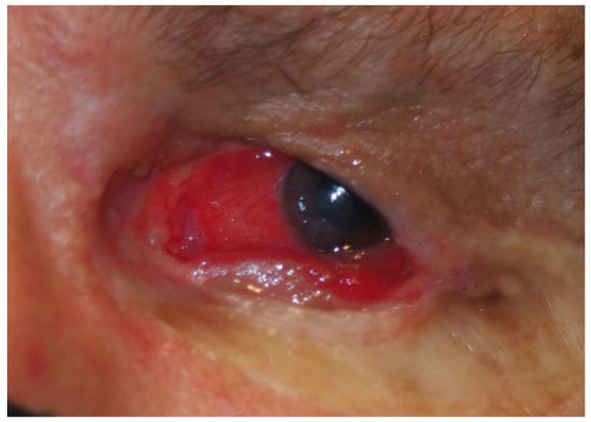

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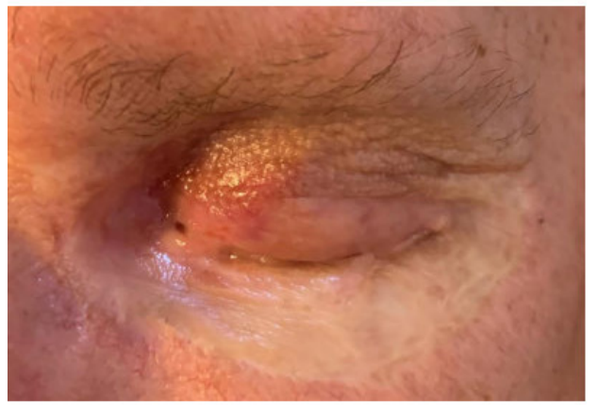

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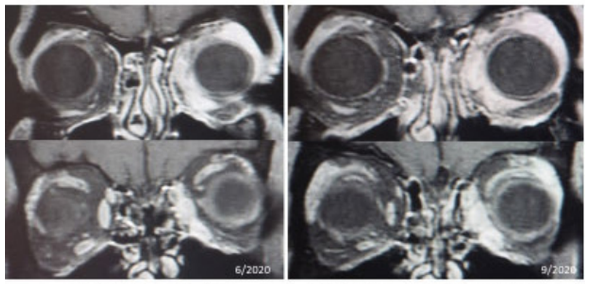
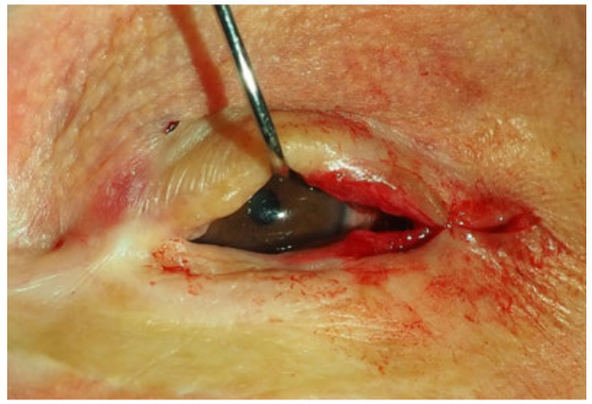


A) Initial evaluation B) s/p 2 months Vismodegib

Figure 5



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Bilateral Concurrent Endocrine Mucin-Producing Sweat Gland Carcinoma and Mucinous Carcinoma of the Eyelids

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Introduction: Endocrine mucin-producing sweat gland carcinoma (EMPSGC) is thought to be a precursor to primary cutaneous mucinous carcinoma (MC), both of which are rare. Here, the authors present a 55-year-old woman with concurrent EMPSGC and MC manifesting as two distinct lesions on her left upper and lower eyelid and one lesion on her right lower eyelid. Two of the lesions were found to be EMPSGC and one was found to be mucinous carcinoma.

Methods: A retrospective, single-patient case report.

Results: A 55-year old woman with no past medical history presented to the eye clinic with slowly-enlarging, non-painful cystic appearing lesions on her bilateral eyelids. She reported the left upper and lower eyelid lesions had been present for six years, and that the right lower eyelid lesion had been present for three months (Figure 1). Excisional biopsy was performed for all three lesions. Histopathological analysis revealed endocrine mucin-producing sweat gland carcinoma of her left upper and right lower eyelid (Figure 2A-D). The left lower eyelid specimen was consistent with mucinous adenocarcinoma with positive margins (Figure 2E-F). Immunohistochemistry showed positive p63 staining of the two EMPSGC tumors (Figure 2G). All tumors were CK7 positive and CK 20 negative (Figure H). The patient underwent a staged slows Mohs micrographic surgery, starting with the left lower eyelid mucinous carcinoma, with delayed reconstruction. Given the documented metastatic potentialof MC, metastatic workup was initiated and revealed negative serum cancer biomarkers including CA 19-9, CA 15-3, CA 27-29, and CEA. She was referred to the oncology service for the remainder of her metastatic workup including mammography, colonoscopy, PET, and CT scan.

Conclusions: This is one of the few published cases of EMPSGC in the literature, and the only one of concurrent EMPSGC and primary cutaneous mucinous carcinoma occurring bilaterally. It supports the close relationship between the two tumor types. Additional studies are needed to determine how, and if, the two tumor types should be managed differently.

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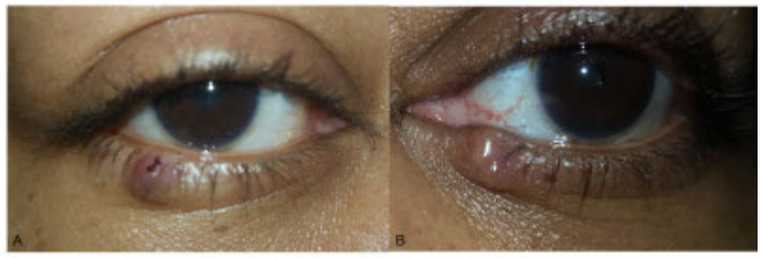
Figure 1



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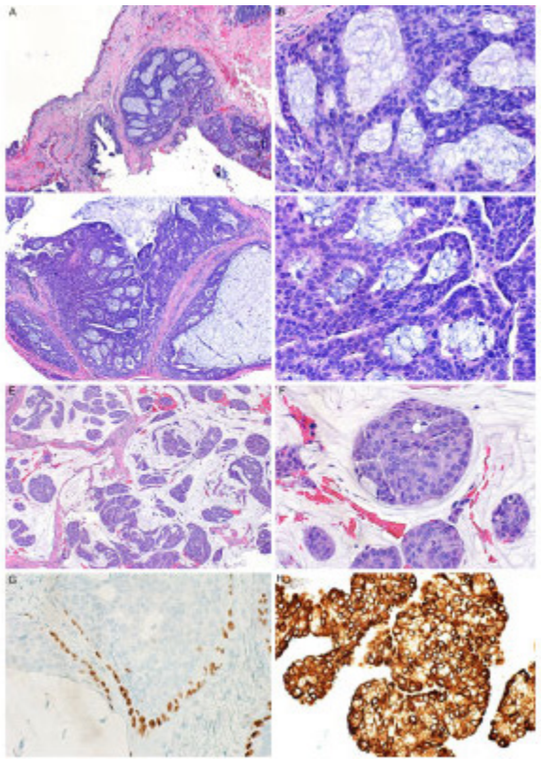

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Bilateral Enlargement of All Extraocular Muscles: A Presenting Ophthalmic Sign of Hematologic Malignancy

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Introduction: We report two cases of bilateral, diffuse extraocular muscle enlargement with associated proptosis, extraocular motility limitation, and compressive optic neuropathy (CON) secondary to infiltration from systemic hematologic malignancy.

Methods: Case report and review of the literature.

Results: Case 1: A 61-year-old woman presented with three months of periorbital pain, swelling, and progressively worsening blurry vision acutely worsening one week prior. Examination revealed visual acuities of 20/200 in the right eye and 20/400 in the left eye and marked bilateral dyschromatopsia without relative afferent pupillary defect (rAPD). There was symmetric bilateral proptosis, resistance to retropulsion, lagophthalmos, moderate limitation of extraocular motility in all directions of gaze, eyelid edema and erythema, and conjunctival injection and chemosis (Figure 1A). Dilated fundus exam showed mild disk elevation and hyperemia bilaterally. Magnetic resonance imaging (MRI) orbits with contrast demonstrated extensive irregular enlargement and abnormal enhancement of all extraocular muscles with severe apical crowding (Figure 1B). Thyroid function and autoantibody testing were normal. Peripheral blood smear showed 50% blasts and flow cytometry confirmed a new diagnosis of acute lymphoblastic leukemia (ALL). She received three days of high-dose intravenous (IV) methylprednisolone with minimal clinical improvement. Chemotherapy was then initiated with subsequent rapid, significant clinical and radiographic improvement and reversal of CON (Figure 2). Visual acuities of 20/30 in each eye (OU) and full extraocular motility were maintained at four-month follow-up.

Case 2: A 51-year-old man with history of diffuse large B-cell lymphoma (DLBCL) in remission presented with blurry vision and periorbital swelling. Examination revealed visual acuities of 20/70 OU without dyschromatopsia or rAPD and intraocular pressures of 40 mm Hg. There was bilateral proptosis, complete ophthalmoplegia, conjunctival chemosis, and choroidal folds with mild optic disk edema (Figure 3A). Within one day he experienced clinical deterioration with visual acuities of 20/400 OU and marked bilateral dyschromatopsia. Computed tomography (CT) orbits with contrast demonstrated globular enlargement and irregular enhancement of all extraocular muscles (Figure 3B). Positron emission tomography (PET) CT revealed extensive systemic fluorodeoxyglucose-avid lymphadenopathy with involvement of bilateral extraocular muscles. Inguinal lymph node biopsy confirmed recurrent DLBCL. High-dose IV dexamethasone and tailored chemotherapy were initiated, with return to baseline visual acuity of 20/25 OU and reversal of CON that was maintained at two-month follow-up (Figure 4).

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Conclusions: Leukemia or lymphoma involving the extraocular muscles is rare; existing literature is limited to case reports or small case series, most often describing unilateral involvement.[1–8] Bilateral disease is likewise limited to three case reports to date.[9–11] We report two cases of bilateral enlargement and abnormal enhancement of all extraocular muscles with CON, leading to subsequent diagnosis of hematologic malignancy (ALL, DLBCL). In both cases, prompt initiation of appropriate chemotherapy led to reversal of CON with rapid improvement in visual acuity, exam findings, and extraocular muscle appearance on repeat neuroimaging. This case report highlights the importance of including hematologic malignancy in the differential diagnosis of atypical bilateral extraocular muscle enlargement. Prompt systemic workup and treatment can lead to good visual outcomes and improved overall prognosis.

Figure 1

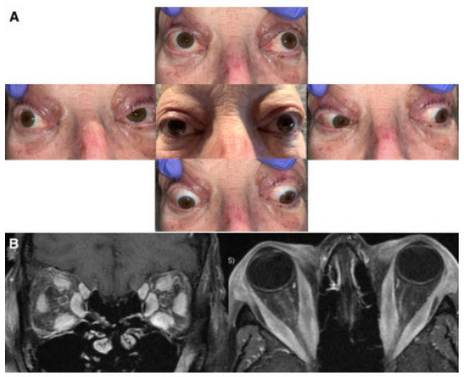
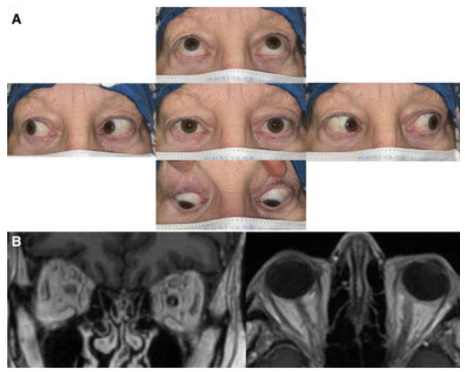


Figure 2



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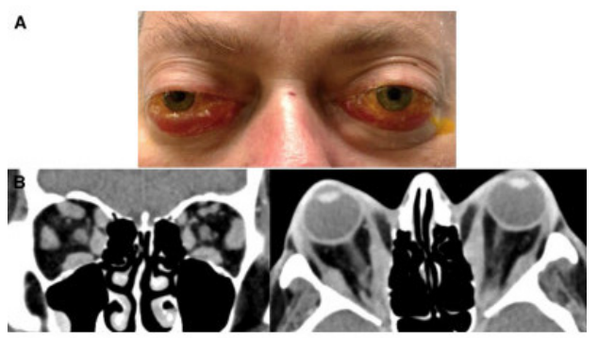
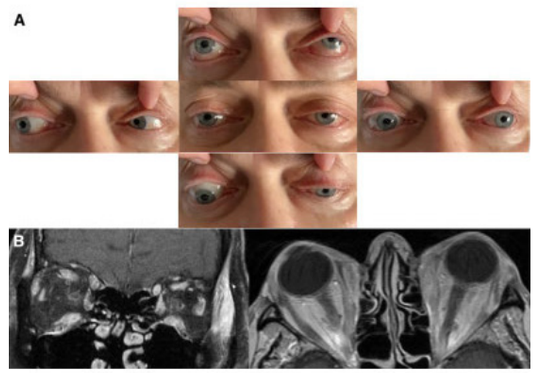


Figure 4



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Clear Cell Syringoma of the Eyelids: A Distinctive Histopathologic Variant Associated with Diabetes Mellitus

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Introduction: The authors describe two cases of the clear cell variant of syringoma, an otherwise common eyelid lesion, which has not been reported in the ophthalmic literature and is an important histopathologic mimicker of other tumors with clear cell change and a potential indicator of uncontrolled diabetes.

Methods: A retrospective case series was conducted in compliance with the rules and regulations of the Health Insurance Portability and Accountability Act and all applicable federal and state laws, and in adherence to the tenets of the Declaration of Helsinki.

Two cases on file in the ophthalmic pathology lab are described. Patient data including medical and surgical records and clinical photographs was reviewed along with glass slides of diagnostic formalin fixed, paraffin-embedded, hematoxylin and eosin-stained skin specimens.

Results: Two women, ages 56 and 76 years of age, presented to oculoplastics clinic, one with multiple bilateral flesh-colored lower eyelid lesions and the other with three, 2 mm right lower eyelid papules (Figure 1). Both women had prior diagnoses of diabetes mellitus with most recent A1c values of 13.6% and 7.8%, respectively. Each underwent successful excisional biopsies.

Histopathology in each case revealed a superficial dermal proliferation of nests, strands and small ductal structures of banal epithelial cells set in a well-defined fibrous stroma (Figure 2 and 3). The cuboidal epithelial cells showed pale to clear-staining cytoplasm, and in the former case, showed abundant clear cytoplasm (Figure 4), without vacuolization or cytologic atypia.

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Conclusions: Syringomas are common, benign translucent to flesh-colored eyelid lesions that are often multiple and located on the lower eyelids of women. They are felt to be eccrine-derived. They have a relatively distinctive histopathologic appearance, composed of small basaloid cords and ducts, often with a tadpole configuration. While clinically indistinguishable, clear cell syringomas have a distinct histopathologic appearance with expanded lobules containing pale or clear cytoplasm.[1] The differential diagnosis includes clear cell reticulated transformation of eccrine glands, sebaceous neoplasia or clear-cell squamous cell carcinoma. Other metastatic tumors such as renal cell carcinoma may also show prominent clear cell change.[2] A large review of 254 syringomas (all anatomic locations) identified 8.5% as clear cell variant, four of which were found on the eyelid.[3] Another review of 9 cases of the clear cell variant in the dermatopathology literature found that 7 were located on the eyelid.[4] To our knowledge, this variant has not been previously described in the ophthalmic literature.

Clear cell syringomas have a close association with diabetes mellitus[4], and the clear cell changes are due to increased content of intracellular glycogen due to phosphorylase deficiency in glycogenesis.[5] Both patients presented herein have diabetes with significantly elevated Hgb A1c levels. Without this history, a diagnosis of clear cell syringoma should prompt a laboratory glucose evaluation.

Figure 1

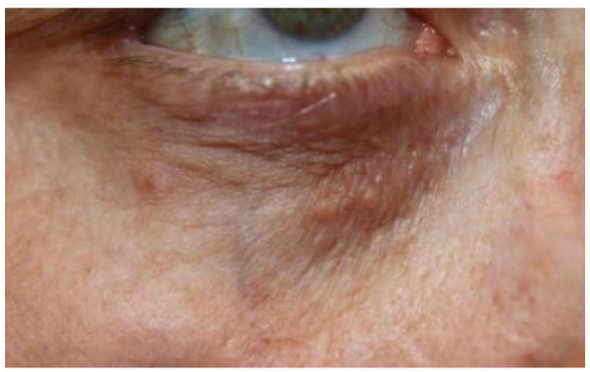


Figure 2

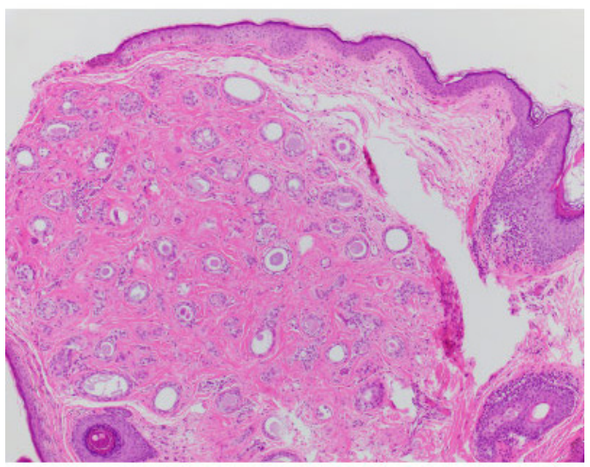
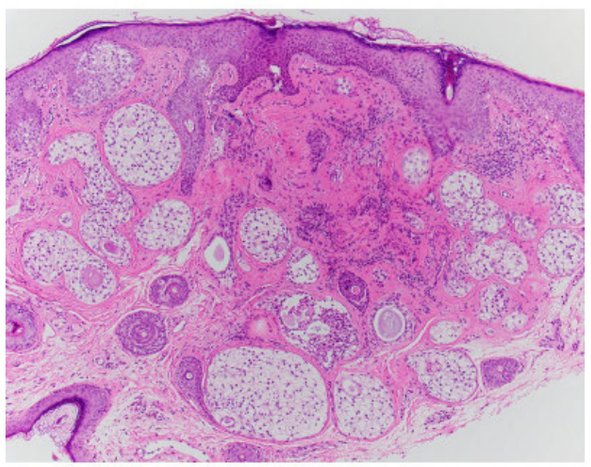


Figure 3



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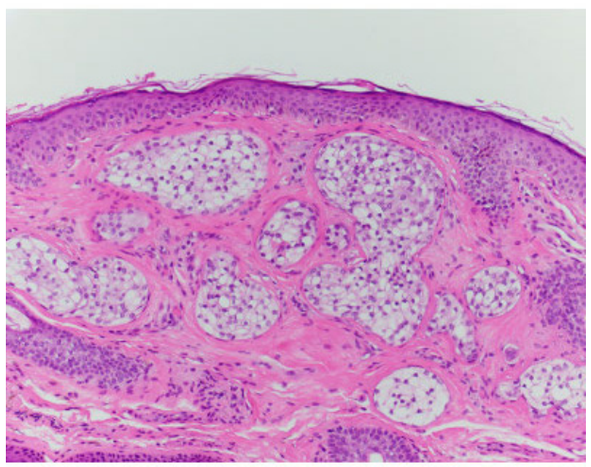

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Conjunctival MALT Lymphoma Presenting a Decade After Initial Diagnosis of Conjunctival Amyloidosis

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Introduction: Conjunctival MALT lymphoma was identified in an area previously diagnosed with amyloidosis nine years prior. Protocols should be established for pathologic evaluation after diagnosis of ocular amyloidosis in order to investigate for a potential malignant primary etiology.

Methods: The authors present the case of a 57-year-old female with a history of a hypertrophic inferior palpebral conjunctival process, conjunctival edema, and recurrent subconjunctival hemorrhage nine years prior. A biopsy of the lesion resulted in the diagnosis of unilateral lower lid AL amyloidosis. Recurrence of the conjunctival mass and associated symptoms occurred over the next several years, involving both lower lids. (Figure 1). A repeat biopsy of both inferior palpebral conjunctiva showed recurrence of amyloidosis (Figure 2) in both sides accompanied by extranodal marginal zone cell lymphoma (EMZL) (Figure 3 showing plasma cells strongly positive for Kappa light chain supporting monoclonality). Archival investigation of the original slides revealed EMZL after sectioning non-adjacent deeper cuts not evaluated in the original pathologic examination.

Results: Full disclosure of the modified original diagnosis was given to the patient under the guidance of healthcare resolutions. Systemic workup was negative for other involved sites. The patient opted to treat with whole eye radiation (2400 cGy/12 sessions). Side effects included grade 2 dermatitis and conjunctivitis manifesting one week following treatment completion and persisting for six weeks. She is being followed closely with a multi-disciplinary team. There has been no early recurrence of the EMZL to date.

Conclusions: EMZL, a common malignant lesion of the conjunctiva, has a 90% non-recurrence, non-progression rate at one year with treatment.[1] Conjunctival amyloidosis is a rare and benign process. Systemic amyloidosis carries a dismal prognosis and standard workups are followed when amyloid is found.[2] AL amyloidosis is known to result from dyschrasias, such as EMZL, secondary to aberrant light chain production.[3-5] Currently, there is no standardized pathologic evaluation that occurs with discovery of ocular amyloidosis. We propose standardization of practice to include performing multiple cuts to rule out adjacent lymphoma. Adequate diagnosis of amyloid is critical primarily to treat the source and secondarily prevent recurrence of amyloid.

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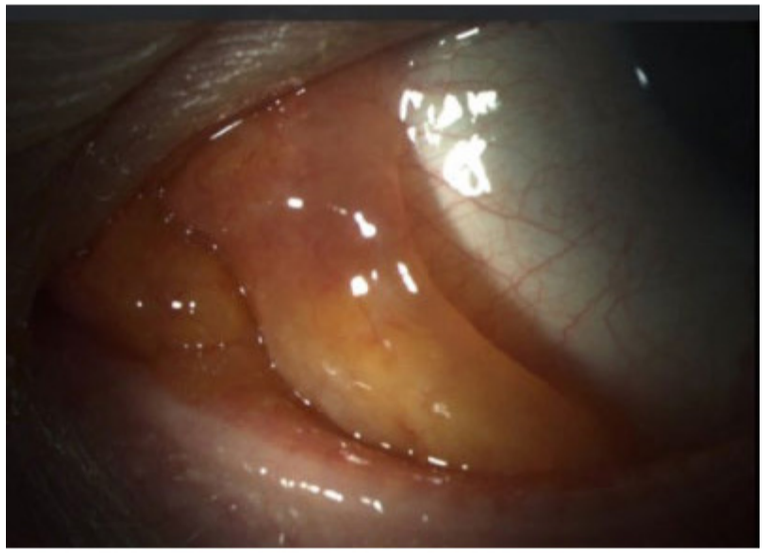
Figure 1



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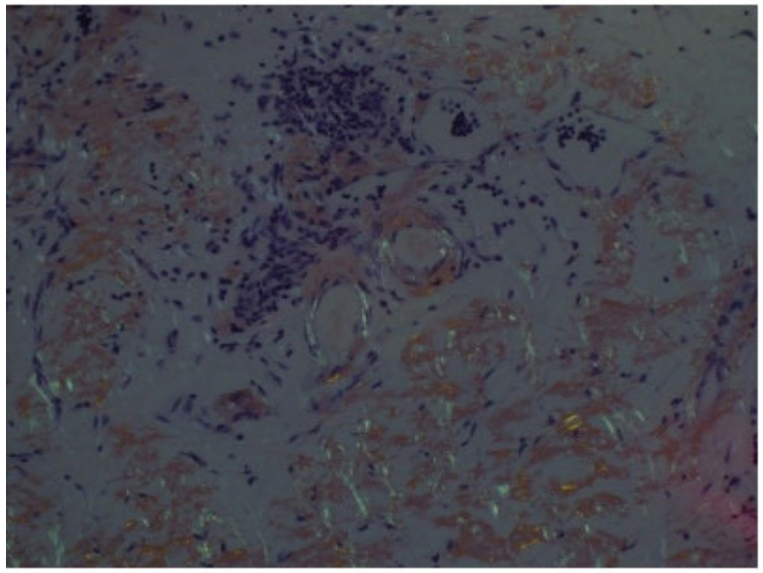

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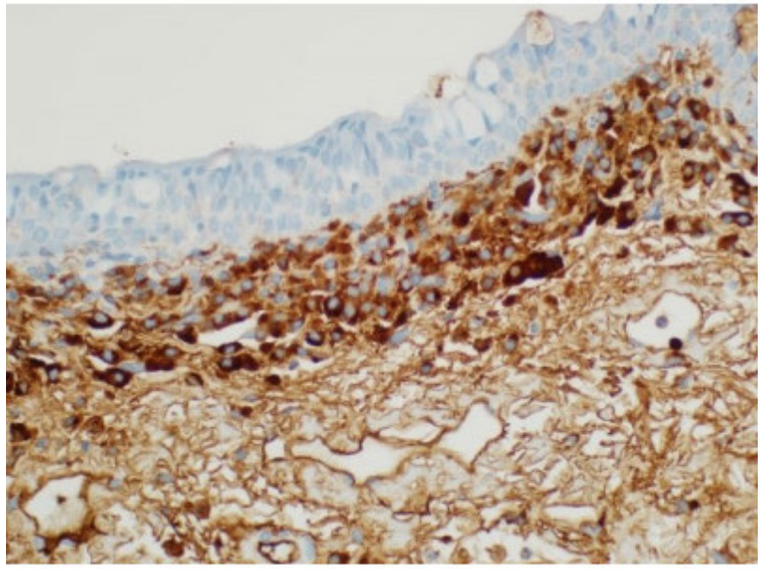

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Immune Checkpoint Inhibitor Therapy in Invasive Lacrimal Sac Squamous Cell Carcinomas with High-Risk Human Papilloma Virus Positivity

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Introduction: With the recent arrival of immune checkpoint inhibitors in cancer therapeutics, there has been a paradigm shift in the management of difficult-to-treat malignant tumors, such as non-small cell lung cancer, melanoma, and head and neck squamous cell carcinoma (HNSCC).[1] Despite significant improvements in clinical response rates and progression-free survival compared to conventional therapies, favorable results are observed in only a subset of patients. Biomarkers, such as the presence of transcriptionally active high-risk human papilloma virus (HPV), the expression of programmed cell death protein 1 (PD-1) or programmed death-ligand 1 (PD-L1), and tumor mutation burden (TMB), have been evaluated for their potential in predicting immunotherapy response.[2] In HNSCC, tumors with HPV positivity, PD-L1 expression, and high TMB show greater treatment responsiveness and have better prognosis compared to their counterparts.[3] It is postulated that HPV-related tumors may be more responsive to immune checkpoint inhibitors due to greater baseline tumor immunogenicity, increased immune infiltration, and increased PD-L1 expression. Immunotherapy has also been used in the treatment of conjunctival squamous cell carcinomas with orbital extension.[4] However, given the rarity of disease, there are no reports to date of using immunotherapy to treat patients with advanced lacrimal sac squamous cell carcinomas (LSSCCs), with or without HPV positivity. Here, we describe two cases of advanced HPV-positive LSSCC treated with immune checkpoint inhibition.

Methods: The medical records of patients with history of lacrimal sac malignancy treated with immune checkpoint inhibitors from 2019 to 2021 were retrospectively reviewed. Histopathologic diagnosis, extent of disease, imaging findings, surgical procedures, treatment history, treatment toxicity, disease progression (i.e., locoregional recurrence, distant metastasis), disease-specific mortality, and follow-up duration were recorded and evaluated. Somatic TMB and PD-L1 expression were determined by the MI-OncoSeq assay in a Clinical Laboratory Improvement Amendments (CLIA)-certified laboratory using a panel of more than 1700 cancer-related genes.[4]

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Results: Case 1: A 62-year-old Caucasian female with p16+ HPV+ high-grade LSSCC with orbital invasion was treated with pembrolizumab, a PD-1 inhibitor. TMB was 1.8 mutations/Mb of DNA, and both PD-1 and PD-L1 were expressed within the tumor. Due to debilitating arthralgias, myalgias, and fatigue, the patient temporarily suspended therapy and later resumed infusions at half the dose, completing a total of 6 cycles. Interval imaging at 4 months showed progressive disease despite treatment with immunotherapy (Fig. 1). She then underwent orbital exenteration with maxillectomy, total parotidectomy, and neck dissection, with free forearm flap and paramedian forehead flap for reconstruction. All surgical margins were negative, without evidence of perineural invasion or regional nodal metastasis. Whole-body imaging was negative for distant metastasis. She is alive with no evidence of disease (NED) at 6 months since initiation of immunotherapy.

Case 2: A 50-year-old Caucasian male with p16+ HPV+ poorly-differentiated non-keratinizing LSSCC with orbital invasion was treated with avelumab, a PD-L1 inhibitor, and cetuximab, an epidermal growth factor receptor (EGFR) inhibitor. TMB was 4.4 mutations/Mb of DNA, and both PD-1 and PD-L1 were expressed within the tumor. The patient showed significant initial tumor reduction after 10 weeks of immunotherapy (Fig. 2A, B). Due to the development of autoimmune hepatitis, avelumab was discontinued after nearly 4 months, but he continued on cetuximab. After a total of 6 cycles, interval imaging showed progressive disease (Fig. 1C). He then underwent exenteration, ethmoidectomy, and partial maxillectomy with reconstruction using a free forearm flap. All surgical margins were negative, without evidence of perineural invasion. Whole-body imaging was negative for metastasis. He received 60 Gy of adjuvant radiation for perineural invasion on the original biopsy specimen. He is alive and NED at 16 months since initiation of immunotherapy.

Conclusions: For LSSCC, high-risk HPV positivity may not confer the same favorable response to immunotherapy as seen with HNSCC. Low TMB may also be a negative predictor for progression-free survival in advanced LSSCC. Adverse effects, such as autoimmune hepatitis, may limit the durability of immune checkpoint blockade.

Figure 1

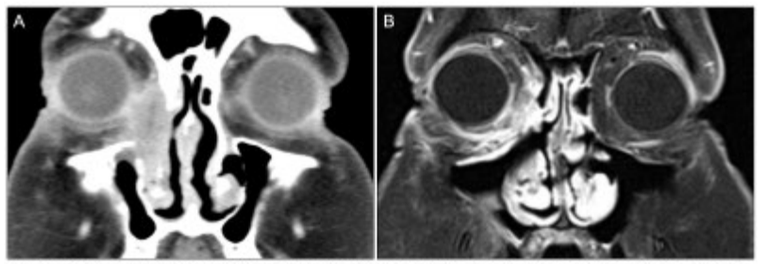

Fig. 1: A 62-year-old Caucasian female with high-grade squamous cell carcinoma of the lacrimal gland with orbital invasion was treated with pembrolizumab, a programmed cell death protein 1 (PD-1) inhibitor. **(A)** A coronal view on computed tomography demonstrates an invasive lacrimal sac tumor on the right prior to initiation of immunotherapy. **(B)** After 4 months (6 cycles) of immunotherapy, there is evidence of progressive disease on magnetic resonance imaging, requiring surgical resection.

Figure 2

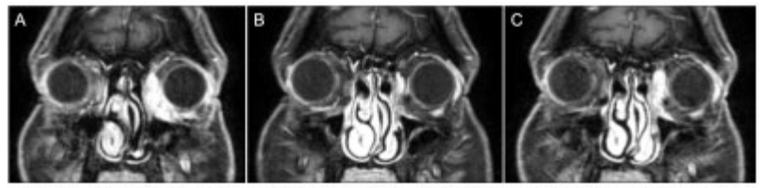

Fig. 2: A 50-year-old Caucasian male with poorly-differentiated non-keratinizing squamous cell carcinoma of the lacrimal sac with orbital invasion was treated with avelumab, a programmed death-ligand 1 (PD-L1) inhibitor, and cetuximab, an epidermal growth factor receptor (EGFR) inhibitor. Serial coronal scans on magnetic resonance imaging at presentation **(A)**, 10 weeks after initiation of combination therapy **(B)**, and 5 months of cetuximab and 6 weeks after cessation of avelumab for autoimmune hepatitis **(C)** demonstrate a significant clinical response initially, followed by progressive disease on the left, requiring surgical resection and adjuvant radiation.

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Intravascular B-Cell Lymphoma Presenting with Bilateral Ptosis and Ophthalmoplegia

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Introduction: Intravascular lymphoma (IVL) is a rare type of non-Hodgkin lymphoma, affecting the lumen of small blood vessels, especially capillaries. The orbit is an uncommon site of involvement for IVL, and diagnosis before autopsy is even more rare as most cases are established post-mortem. Here, the authors report a case of intravascular B-cell lymphoma (IVL) presenting with bilateral ptosis and ophthalmoplegia, diagnosed by ethmoid sinus biopsy.

Methods: A retrospective, single-patient case report.

Results: A 73-year-old man presented to the eye clinic with bilateral ptosis and restricted eye movements for three weeks. The symptoms began in his right eye and then affected his left eye several days later. The patient endorsed frontal headaches and subjective fevers for several days. He denied vision changes or diplopia. He initially presented to the emergency department where he underwent a stroke assessment and computed tomography (CT) of the head, which revealed left frontal and ethmoidal sinus opacification.
He presented to ophthalmology two weeks later with complete left upper eyelid ptosis, MRD1 0.5mm OD, and severe limitation in extraocular movements in all gaze directions bilaterally. Magnetic resonance imaging (MRI) of the orbits revealed diffuse abnormal thickening and enhancement of the bilateral orbital apices, superior orbital fissures, and cavernous sinus. Focal signal abnormalities were again seen in the left frontal and ethmoid sinuses (Fig. 1). Orbital inflammatory workup of the serum and cerebrospinal fluid was unrevealing. The patient was started on intravenous solumedrol and then transitioned to oral prednisone 1mg/kg daily with minimal improvement in symptoms. Given the asymmetric sinus disease and morbidity associated with cavernous sinus biopsy, the patient underwent endoscopic sinus surgery by the otolaryngology service with a biopsy of the ethmoid sinus. Pathological analysis revealed medium-sized vessels with large malignant cells within the vasculature that stained positive for CD20, CD5, PAX5, which was consistent with the diagnosis of large B cell intravascular lymphoma. A bone marrow biopsy was negative for lymphoma cells. The patient was started on rituximab, vincristine, doxorubicin, cyclophosphamide, and prednisone, and prophylactic intrathecal methotrexate by the oncology service.

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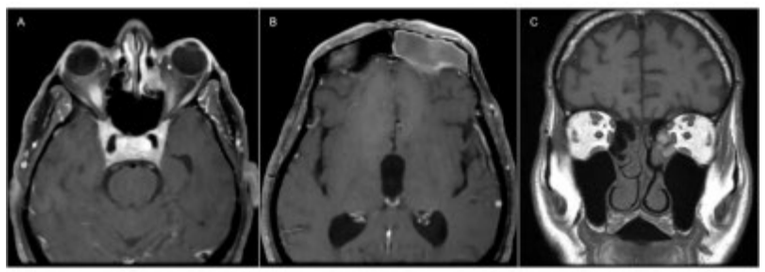
Conclusions: This case describes a case of IVL presenting as a bilateral cavernous sinus syndrome. There have been two other case reports describing IVL in a similar anatomical location within the cavernous sinus, both presenting as a cavernous sinus mass and initially diagnosed as pituitary apoplexy. These were diagnosed via biopsies of the lacrimal gland and of the dura mater adjacent to the cavernous sinus. An otherwise negative workup should prompt a biopsy of the affected site, and in this case the most accessible and least invasive route was a biopsy of the ethmoid sinus. The diagnosis of IVL by nasal biopsy has been reported only twice, and should be a site that is considered for sampling when IVL is suspected. Timely treatment of IVL with anthracycline-based chemotherapy improves patient survival.

Figure 1



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Is Flow Cytometry Worth the Time, Money, and Tissue? A Diagnostic Approach to Orbital Lymphoma: The Role of Flow Cytometry

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Introduction: Orbital lymphoma is most often diagnosed by imaging studies and surgical biopsy with fresh frozen tissue samples and flow cytometry. In many orbital biopsy cases, orbital tissue may be limited and flow cytometry as a routine diagnostic test may not be necessary. The purpose of this study is to evaluate the role of flow cytometry in the diagnostic approach of orbital lymphoma.

Methods: A retrospective chart review of orbital lesions containing 453 charts ranging from 2010 to 2020.

Results: We identified 22 patients diagnosed with orbital lymphoma, which consisted of 8 males and 14 females with ages ranging from to 36 to 99 years old. Nineteen patients identified as Caucasian, two patients identified as African American, and one patient identified as “other”. The most common presenting ocular symptoms included proptosis, pain, swelling, and visual disturbances. The majority of identified lymphomas were of B-cell origin (17/22; 77%), with low-grade extra-nodal marginal zone B-cell lymphoma being the most common subtype. Follicular lymphoma was diagnosed in three patients (3/22; 14%), and Burkitt lymphoma was diagnosed in one patient (1/22; 5%). Two patients were found to have NK/T-cell lymphoma (2/22; 9%), and three patients had atypical presentations that were not able to be definitively diagnosed but were suspected to be of B-cell origin (3/22; 14%). Flow cytometry was conducted on 21/22 patients. Of these tests, 12 showed positive immunophenotypic results (12/21; 57%). Biopsy identified atypical presentation in the patient who did not have flow cytometry conducted.

Two additional patients in the chart review were identified as having B-cell acute lymphoblastic leukemia. Flow cytometry was conducted on both patients and both samples showed immunophenotypic results consistent with the final diagnosis.

Conclusions: Flow cytometry from tissue biopsy can help confirm the diagnosis of orbital lymphoma. However, it can yield a high percentage of false negative results which suggests its role as a routine diagnostic test is limited. It may be most useful only when there is ample tissue available and other clinical findings remain inconclusive.

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Ocular Perivascular Epithelioid Cell Neoplasm Presenting as Subconjunctival Hemorrhage

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Introduction: To present a rare case of a conjunctival perivascular epithelioid cell tumor that initially presented with recurrent subconjunctival hemorrhage.

Methods: Descriptive case report and literature review using the National Institutes of Health PubMed database.

Results: A 71-year-old male presented with recurrent episodes of subconjunctival hemorrhage in the right inferior fornix over the past year. On examination, he was noted to have a dome-shaped, dark red subconjunctival mass measuring 0.5 cm x 0.5 cm with internal pigment and feeder vessels (Figure 1). Magnetic resonance imaging demonstrated a non-enhancing lesion without intraocular or orbital invasion. Diagnostic excisional biopsy was performed and showed polygonal tumor cells with clear to eosinophilic cytoplasm arranged in nested and pseudoalveolar formations (Figure 2A) and moderate pleomorphism with enlarged nuclei and prominent nucleoli (Figure 2B). Immunohistochemical staining was positive for *TFE3*, Melan A/MART1 (Figure 2C), P504s, E-cadherin, calretinin, CD10, vimentin, CK7 and HMB45. Next generation sequencing showed a single gene fusion: *RBM10-TFE3*. Computed tomography of the chest, abdomen and pelvis was performed but showed no evidence of primary malignant disease. The patient was diagnosed with a primary perivascular epithelioid cell neoplasm. Complete surgical excision with negative margins and application of mitomycin C were performed. There was no clinical recurrence of the disease at three months.

Conclusions: Subconjunctival hemorrhages commonly present to eye care professionals and are frequently regarded as benign and self-limited conditions. In select cases, subconjunctival hemorrhages can be a harbinger of more severe disease. Perivascular epithelioid cell tumors, or PEComas, are rare mesenchymal neoplasms believed to originate from perivascular myoid cells and rarely present in ocular structures.[1] Our case was initially concerning for metastatic malignancy: the pigmented features of the mass suggested ocular melanoma, and *RBM10-TFE3* gene fusions have only been previously reported in renal cell carcinoma.[2] However, given the otherwise negative workup and the tumor's morphological and immunohistochemical characteristics, ocular PEComa was the most likely diagnosis. To the best of our knowledge, this is the first description of a PEComa with a *RBM10-TFE3* gene fusion. Physicians should be aware of this rare condition and its presentation as a recurrent subconjunctival hemorrhage.

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Figure 1

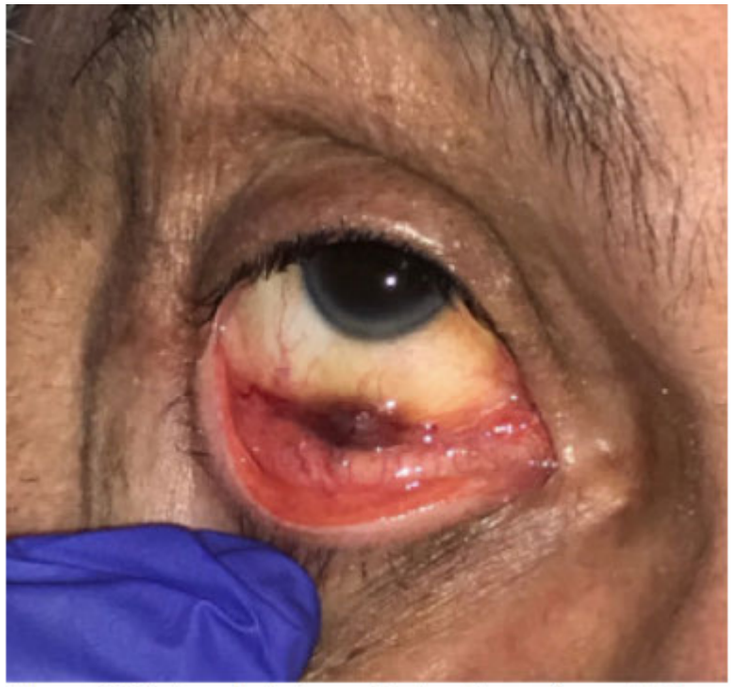

Figure 1. External photograph showing a pigmented conjunctival mass in the inferior fornix of the right eye.

Figure 2

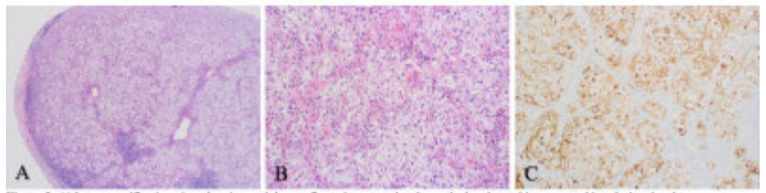

Figure 2. A) Low magnification view showing nodular configuration, nested and pseudoalveolar architecture, and intralesional and peripheral lymphocytic aggregates (original magnification x 40; Hematoxylin and eosin). B) Tumor cells exhibited abundant clear to eosinophilic cytoplasm and moderate pleomorphism with enlarged nuclei and prominent nucleoli (original magnification x 200; Hematoxylin and eosin). C) Tumor cells show diffuse immunoreactivity for Melan-A (original magnification x 200; immunohistochemistry).

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Orbital Cavernous Venous Malformation – A Large Case Series

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Introduction: Orbital Cavernous Venous Malformation (OCVM) is a common benign primary orbital tumor in adults. We report the demography, clinico-radiological findings, surgical technique and outcome.

Methods: A retrospective, interventional, consecutive case series with 80 patients of histopathologically confirmed OCVM.

Results: OCVM constituted 5.4% of operated orbital tumors in the study period. The median age was 44years (range 3-65years). Of the 70(87.5%) symptomatic patients, with a mean duration of 2years (range, 5days to 10years), protrusion of eyeball 54(67.5%) and diminished vision 29(36.2%) were predominant. Signs were proptosis 59(73.8%), diminished vision 39(48.8%), palpable mass 36(45%), disc edema 20(25%), choroidal folds 13(16.3%), strabismus 11(13.8%), and ptosis 6(7.5%). CT-scan showed a well-circumscribed, homogenous mass, hyperdense, with bone remodeling, with mild contrast enhancement. MRI showed a heterogenous mass with flow void. Location was intraconal 53(66.2%), with extraconal extension 15(18,7%) or extraconal 10(12.5%). The most common intraconal location was supero-temporal 15(18.7%). There was extraocular-muscle involvement in 37(46.2%) and optic nerve in 14(17.5%). Excisional biopsy was performed with lateral orbitotomy in 41(51.3%), anterior orbitotomy 21(26.3%), or transconjunctival 18(22.5%) patients. Transient complications included ptosis 8(10.26%), ocular-muscle restriction 5(6.41%), visual-loss 1(1.28%) and diplopia 1(1.28%). At the final follow up of 12.2+1.8 years (range, 1.5 to 25 years), all the patients had local tumor control and none had a permanent functional deficit.

Conclusions: Considering the common and variable presentation of OCVM, emphasis should be laid on accurate preoperative clinico-radiological diagnosis and tailoring of surgical technique. Meticulous surgery with minimal disturbance of vital orbital structures yields gratifying outcome.

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Figure 1

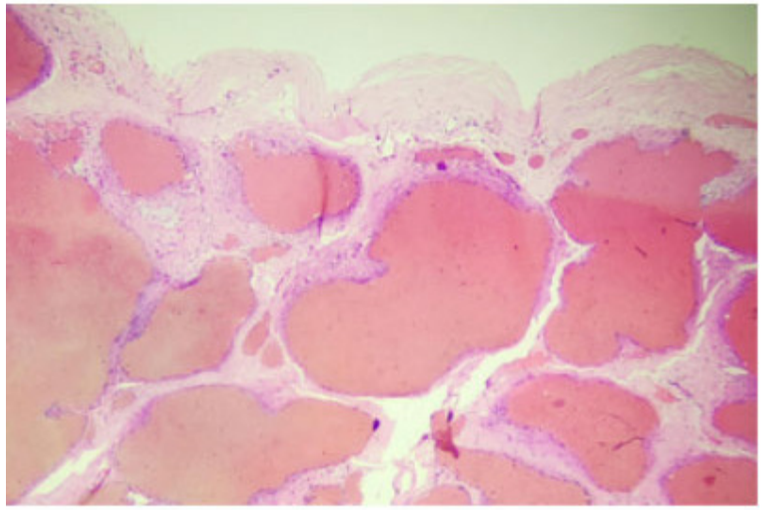

Figure 2

A 36-year-old lady presented to us with the complaint of left eye proptosis and no palpable mass. MRI (T2) showed an intra-conal well circumscribed homogenous mass suggestive of a vascular tumor. Transconjunctival orbitotomy was performed for her and histopathology confirmed the diagnosis. Excellent cosmesis was seen.

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Orbital Involvement in Adult Leukemias

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Introduction: Orbital involvement in acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) is well-described in pediatric patients[1,2] however is very uncommon in adults. The purpose of this study is to report two cases of adult-onset AML and ALL with orbital involvement, and to summarize existing literature[3,4].

Methods: A PubMed search of "orbital leukemia" in March 2021 yielded 712 results. Abstracts and papers available in English were reviewed, and leukemia with orbital involvement was confirmed. Results are summarized. Cases are presented descriptively.

Results: *Case 1:* A 37-year-old male initially presented with generalized weakness and bruising. Bone marrow biopsy showed acute promyelocytic leukemia with t(15;17) translocation and he was started on all-trans retinoic acid (ATRA) and arsenic trioxide (ATO). A few weeks later, he developed a tan-pink-colored sub-conjunctival lesion in the left eye. Incisional biopsy confirmed the diagnosis of AML (Figure 1).

Case 2: A 35-year-old male with a prior diagnosis of B-cell leukemia re-presented with left-sided proptosis and hypoglobus. Fine needle aspiration biopsy of the left orbital lesion confirmed the diagnosis of ALL. Lumbar puncture also demonstrated CNS relapse. He was treated with external beam radiotherapy and received intrathecal methotrexate. Follow up MRI showed an improvement in orbital lesion and repeat lumbar puncture was negative. He then received an allogenic hematopoietic stem cell transplant (HSCT) (Figure 2).

Literature review yielded a total 136 relevant articles, from which 25 cases with AML and 3 cases of ALL in the obit were identified. Mean age of 50.3 years. Sixty two percent were male and unilateral involvement occurred in 76% of cases. The majority (23/25; 92%) had systemic evidence of leukemia. Of these patients, 6 were diagnosed with orbital involvement first, with mean lag time of 10 months to diagnosis with systemic leukemia, 8 were diagnosed concurrently, and 5 had known leukemia first with mean lag time of 18 months to orbital involvement. Roughly half of the tumors were located in the extraconal space (56%) and treatments included chemotherapy (8/25; 32%), chemotherapy + HSCT (3/25; 12%), radiation (2/25; 8%), chemotherapy + radiation (8/25; 32%), or all of the above (1/25; 4%).

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Three adult patients with ALL were identified in the literature. They had a mean age of 35 years, 66% were female and all presented with unilateral disease. Most tumors were extraconal (66%). All had known leukemia at the time of orbital diagnosis and were treated with chemotherapy +/- HSCT.

Conclusions: In adult populations, orbital involvement of both AML and ALL tends to be unilateral. In most cases, systemic diagnosis of leukemia precedes orbital involvement, however in AML, 24% of patients were diagnosed with systemic leukemia a mean of 10 months following presentation with orbital disease. In both AML and ALL, orbital involvement tends to present in the extraconal space.

Figure 1

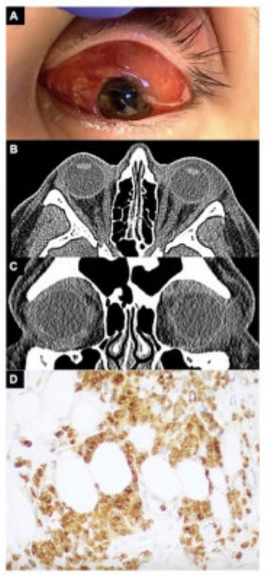

Figure 1: Case 1 **(A)** Salmon-pink appearing left subconjunctival lesion. **(B)** Axial and **(C)** coronal computed tomography (CT) without contrast demonstrating a homogenous region of soft tissue peribulbar thickening, extending into the anterior supero-lateral orbit. **(D)** Histopathology of left conjunctival lesion demonstrates immature myeloid precursors with MPO immunostain.

Figure 2

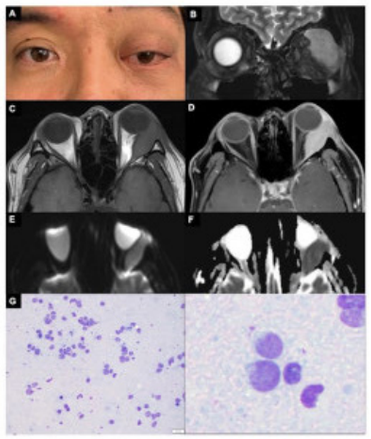

Figure 2: Case 2 **(A)** External photograph demonstrating left proptosis and hypoglobus. **(B)** On coronal T2-weighted MRI, a relatively well circumscribed, hyperintense lesion is visualized in the superolateral orbit. **(C)** The mass is isointense on T1-weighted imaging and **(D)** shows diffuse, avid contrast enhancement. **(E)** Diffuse weighted and **(F)** apparent diffusion coefficient images demonstrate restricted diffusion. **(G)** Low (right) and high (left) magnification cytopathology of left orbital lesion demonstrate numerous blasts.

Table 1

Table 1: Case reports included in the literature review on adult AML with orbital involvement

Author (s)	Year of Publication	N	Age	Sex	Location	Clinical Presentation	Laterality	Systemic Leukemia	Time of orbital involvement to systemic leukemia	Treatment	Prognosis
Haddad et al	2020 (USA)	1	71	M	Multifocal	Decreased visual acuity, pain	Left	Yes	7 mo prior	CT, HSCT	Relapse after 4th CT cycle, remission after HSCT unknown duration
Mangla et al	2012 (USA)	2	85	M	Extraconal	Diplopia, proptosis, restricted motility	Left	Yes	36 mo after	RT	Death 2 mo from renal failure
			45	M	Extraconal	Periorbital swelling, ptosis	Left	Yes	24 mo after	CT	Death 3 mo
Woo et al	2004 (Australia)	1	71	M	Multifocal	Decreased visual acuity, pain, proptosis	Bilateral	Yes	NA	CT	Death 6 weeks from cerebral complications
Vera-Aguilera et al	2018 (Mexico)	1	43	M	Multifocal	Decreased visual acuity	Bilateral	Yes	Concurrent	CT	Death 9 days from ventricular fibrillation
Phelps et al	2015 (USA)	1	19	M	Periorbital	Decreased visual acuity	Right	Yes	12 mo prior	CT	Death 13 mo
Van Veen et al	1991 (Netherlands)	1	56	M	Extraconal	Decreased visual acuity, periorbital swelling	Right	Yes	13 mo prior	CT, RT	Relapse 1 yr, death 2 yrs
Karimi et al	2016 (India)	1	80	M	Periorbital	Periorbital swelling	Bilateral	Yes	NA	CT	Death 3 mo from cardiac arrest
Tallman et al	1992 (USA)	2	26	F	Extraconal	Diplopia, proptosis	Right	Yes	5 mo after	CT, RT	Death 6 mo
			21	NA	Extraconal	Diplopia	Left	Yes	Concurrent	CT, HSCT	Death 150 d from GVHD
O'Neill et al	2017 (USA)	1	66	F	Extraconal	Diplopia, proptosis, decreased visual acuity	Right	Yes	12 mo after	S, CT	Death 1 mo
Pinckemeier et al	2010 (Germany)	1	75	F	Periorbital	Chemosis, pain	Bilateral	Yes	Concurrent	RT, CT	Death 5 mo from pneumonia
Lo et al	2010 (Taiwan)	1	88	F	Periorbital	Chemosis	Left	Yes	Concurrent	CT	Remission 10 mo
Zhu et al	2018 (China)	1	86	M	Extraconal	Pain, proptosis	Right	Yes	NA	CT, RT	NA
Sun et al	2020 (China)	1	57	M	Multifocal	Proptosis, ptosis	Left	No	35 mo after	RT	Death 6 mo from pneumonia and cardiac arrest
Ravisankar et al	2016 (USA)	1	31	F	Multifocal	Decreased visual acuity, proptosis	Bilateral	Yes	Concurrent	CT, RT, HSCT	Remission 18 mo
Allattar et al	2004 (Saudi Arabia)	1	66	F	Extraconal	Proptosis, ptosis	Right	No	-	S	NA
Grigoleto et al	2015 (USA)	1	61	M	Extraconal	Proptosis	Right	No	-	RT	Remission 6 mo
Gupta et al	2017 (India)	1	32	M	Extraconal	Periorbital swelling, proptosis	Right	Yes	Concurrent	CT	Relapse after 18 mo
Payne et al	2014 (Ireland)	1	65	M	Extraocular muscle	Decreased visual acuity, diplopia, pain	Right	Yes	Concurrent	RT, CT	Death unknown time
Padilla et al	1999 (Spain)	1	77	M	Extraconal	Periorbital swelling, proptosis	Left	Yes	Concurrent	NA	Death 4 mo
Watkins et al	1997 (USA)	1	71	F	Extraconal	Decreased visual acuity, proptosis	Right	NA	NA	CT, RT	NA
Pe-piatzis et al	2012 (USA)	1	49	F	Extraconal	Diplopia, proptosis	Right	Yes	6 mo after	CT, RT	Death 10 mo
Mako et al	2008 (Hungary)	1	57	F	Intraconal	Elevated intraocular pressure, proptosis, restrictive motility	Bilateral	Yes	6 mo prior	RT, CT	Death 11 mo from hypertensive crisis
Lee et al	2008 (South Korea)	1	25	M	Extraconal	Proptosis	Right	Yes	12 mo prior	CT	Remission 1 mo

Legend: N = Number of patients, F = Female, M = Male, CT = Chemotherapy, RT = Radiotherapy, HSCT = Hematopoietic stem cell transplant, S = Surgery, NA = Not Available

Table 2

Table 2: Case reports included in the literature review on adult ALL with orbital involvement

Author (s)	Year of Publication	N	Age	Sex	Location	Clinical Presentation	Laterality	Systemic Leukemia	Time of orbital involvement to systemic leukemia	Treatment	Prognosis
Burshtein et al	2020 (India)	1	29	M	Extraocular muscle	Diplopia	Left	Yes	Concurrent	CT	Disease-free after 2 cycles
Esmaeli et al	2001 (USA)	1	40	F	Extraconal	Ecchymosis, periorbital swelling	Left	Yes	12 mo after	CT, HSCT	Disease-free at 3 mo after HSCT
Yucel et al	2015 (USA)	1	36	F	Extraconal	Decreased visual acuity, elevated intraocular pressure, proptosis	Left	Yes	History of recurrent ALL, exact timing unknown	S, CT	NA

Legend: N = Number of patients, F = Female, M = Male, CT = Chemotherapy, RT = Radiotherapy, HSCT = Hematopoietic stem cell transplant, S = Surgery, NA = Not Available

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Orbital Lesions: A Review of the Past Decade at an Academic Institution

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Introduction: Many processes can create lesions in and around the orbit including congenital defects, vascular lesions, inflammatory diseases, infections, benign neoplasms, and malignant neoplasms. The purpose of this project is to examine the prevalence of different orbital lesions at our institution over the past decade to better characterize the phenomena.

Methods: A retrospective chart review of orbital lesions containing 453 charts ranging from 2010 to 2020. CPT codes were used to identify relevant patient charts. Lesions were classified into thirteen main categories described in the results. Diagnoses were made based on clinical findings, imaging results, and biopsy results when applicable.

Results: We identified 453 patients diagnosed with an orbital lesion, which included 164 males and 174 females with ages ranging from 5 to 99 years old. Within this group 349 patients identified as Caucasian (77%), 51 patients identified as African American (11%), 8 patients identified as Asian (2%), 42 patients identified as “other” (9%), and 3 patients declined to answer (1%). A variety of procedures were performed including orbitotomy with and without a bone flap, orbitotomy with drainage, orbitotomy with removal of the lesion, and exenteration of the orbit. The most common imaging modalities were CT and MRI with 231 patients receiving a CT (51%) and 183 patients receiving an MRI (40%). Other types of imaging studies including CTA, MRA, and PET scan were performed on 8 patients (2%), and many patients received more than one type of imaging study. Biopsy was performed on 428 patients (94%).

The prevalence of each type of orbital lesion is as follows:

- 71 patients (15.7%) had meningioma.
- 67 patients (14.8%) had invasive carcinomas including squamous cell, basal cell, neuroendocrine, and adenocarcinoma.
- 55 patients (12.1%) had other benign tumors including schwannomas, neurofibromas, and adenomas.
- 42 patients (9.3%) had orbital cellulitis of infectious etiology.
- 39 patients (8.6%) had vascular lesions including hemangiomas and lymphangiomas.
- 37 patients (8.2%) had inflammatory diseases including sarcoidosis, idiopathic orbital inflammation, and thyroid eye disease.
- 30 patients (6.6%) had cystic lesions including dermoid.
- 23 patients (5.1%) had benign lesions including lipomas, papillomas, and granulomas.

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- 22 patients (4.9%) had lymphoma including MALT, follicular, Burkitt, and NK/T-cell subtypes.
- 19 patients (4.2%) had other malignant tumors including sarcomas, neuroblastomas, and solitary fibrous tumors.
- 12 patients (2.6%) had trauma or foreign body related complications.
- 12 patients (2.6%) had melanoma.
- 24 patients (5.2%) had unspecified lesions.

Conclusions: Orbital lesions comprise a diverse set of pathologic entities. The most prevalent lesion types at our institution over the past decade include meningiomas and invasive carcinomas. Imaging studies including CT and MRI and surgical biopsy remain the most important tests for diagnosis.

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Primary Diffuse Large B-Cell Lymphoma of the Frontal Sinus Masquerading as an Orbital Mucocele

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Introduction: The purpose of this study is to describe a case of a primary, stage IE diffuse large B-cell lymphoma (DLBCL) of the frontal sinus masquerading as an orbital mucocele.

Methods: Case report.

Results: A 73-year-old male presented to the oculoplastics clinic with gradual right upper eyelid swelling of six months duration and progressive right eye blurred vision and binocular diplopia of three weeks duration.

His visual acuity was 20/70 in the right eye (OD) and 20/20 in the left eye (OS). Pupil exam was normal, without relative afferent pupillary defect. Intraocular pressures were 33 OD and 22 OS. Extraocular motility was restricted in all directions of gaze OD and full OS. Exophthalmometry measured 21 mm OD and 17 mm OS and margin to reflex distance-1 was -2 mm OD and 4 mm OS (Figure 1). Examination demonstrated right periorbital edema, ptosis, conjunctival injection, and chemosis; the remainder of the exam was unremarkable.

Computed tomography scan of the head demonstrated a large, homogenous, hyperdense, expansile mass extending from the right frontal sinus into the right superior extraconal space, deemed most likely a mucocele (Figure 2). The patient was placed on a prednisone taper and scheduled for right anterior orbitotomy and endoscopic frontal sinus exploration with tissue removal, total ethmoidectomy, and maxillary antrostomy. In the intervening month, the patient experienced rapid progression of disease, presenting on day of surgery with severe periorbital edema and hemorrhagic chemosis (Figure 3), concerning for a malignant process. Orbital exploration revealed a firm, grey-tan-colored, solid tumor invading the superior orbit (Figure 4). Histopathologic analysis of the right orbit, frontal recess, and sinus contents revealed CD5 positive DLBCL with MYC gene rearrangement. He underwent staging and metastatic work-up, which were negative for central nervous system involvement, but did reveal interval increase in the size of the lesion with encasement of the right superior rectus muscle, lateral rectus muscle, and optic nerve (Figure 5, top panels). The patient was diagnosed with a stage IE DLBCL of the frontal sinus and right orbit (Ann Arbor classification).

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He completed three cycles of chemotherapy with rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone in addition to consolidative radiotherapy for a total dose of 3600 cGy. Follow-up nasal endoscopy revealed no evidence of tumor within the frontal sinuses and positron emission tomography and magnetic resonance imaging showed complete metabolic response (Figure 5, bottom panels). Six months following his surgery, patient's visual acuity was 20/30 OD; pupil exam and intraocular pressures were normal. He had a right upgaze deficit and esotropia in primary gaze. He had mild fullness of the right upper lid and improved ptosis. He will be followed with serial sensorimotor examinations, with plan for likely strabismus surgery once his alignment remains stable for at least six months.

Conclusions: Primary frontal sinus lymphoma is a rare entity, which typically manifests with tumor mass effect or cranial nerve palsy. These malignant tumors may often mimic benign lesions, such as mucoceles, on imaging. Timely recognition and multidisciplinary management is crucial to reduce associated morbidity.

Figure 1

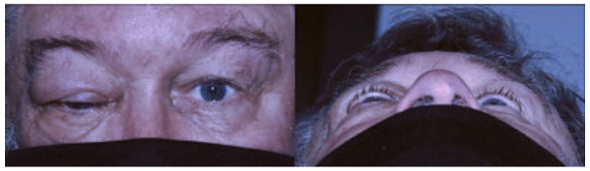


Figure 2

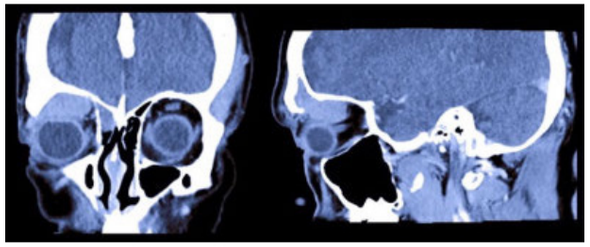


Figure 3

Figure 4

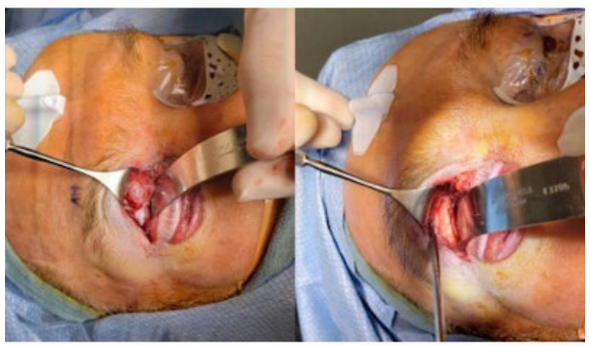
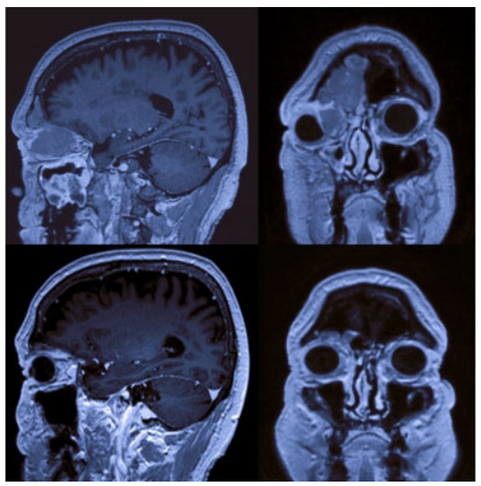


Figure 5



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Quantification and Identification of Risk Factors for the Development of Transient Depressive Symptoms after Mohs Micrographic Surgery

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Introduction: Mohs micrographic surgery (MMS) is a precise surgical technique used for excision of skin cancer. Despite the high cure rate and optimal cosmetic outcomes offered with MMS, psychological distress has been previously demonstrated months to years after the procedure.[1,2] Presently, the authors sought to assess the frequency of development of depressive symptoms in the immediate postoperative period after MMS.

Methods: A prospective cohort study of subjects undergoing MMS at two high-volume physician practices (JL, FS) was conducted. Prior to their procedure, consented subjects provided demographic and medical information. They were also administered the Patient Health Questionaire-8 (PHQ-8), a modified version of the PHQ-9 (a standardized depression screening commonly implemented in the primary care setting) without the inquiry regarding suicidal ideation. This modification has been used when it is not feasible to bring a subject to immediate psychiatric care.[3] The PHQ-8 was re-administered at 1, 2, 4, 6, and 12 weeks post-procedure. PHQ-8 scores range from 0-24 with previously used cutoff scores for clinical depression ranging from > 5 to >10.3 The primary outcome measures were average weekly PHQ-8 score and change from baseline PHQ-8 score.

Results: Forty-three subjects were included, of which 53% were female, with an average age of 65 years. Facial malignancies were removed from 74% of subjects. The average baseline PHQ-8 score was 1.23 +/- 2.16. Of the 43 subjects, 18 (42%) had some increase in score during the 12-week follow-up period. Eleven of the 18 subjects with increased scores had a facial MMS site (61%).

For all subjects, average PHQ-8 scores were significantly elevated from baseline (p=0.00) at week 2 (1.70 +/- 2.48) and week 4 (1.70 +/- 2.48; Figure 1), with scores increasing from 1 to 6 points. Average scores returned to baseline by week 12 (1.20 +/- 1.95; Figure 1). When analyzing by surgical site, individuals with lower extremity anatomic sites had significantly higher average PHQ-8 scores at week 4 (p=0.02) and significantly increased change from baseline scores at weeks 2 (p=0.01), 4 (p=0.00) and 6 (p=0.04) compared to those with other anatomic locations, including the face.

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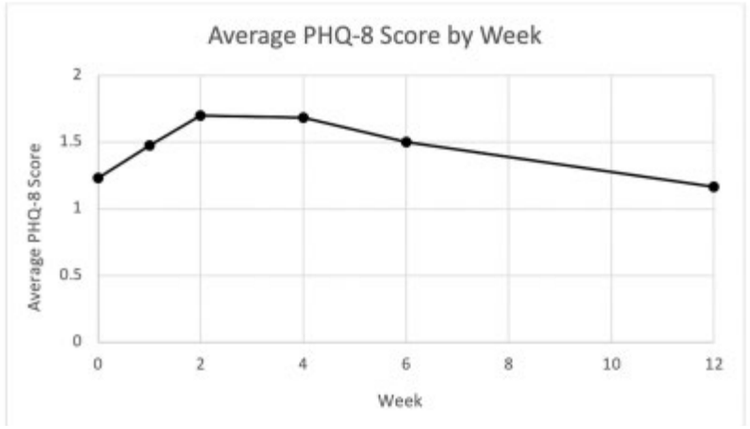
Conclusions: A minority of individuals undergoing MMS may be at risk for experiencing transient depressive symptoms in the immediate postoperative period, with a peak at weeks 2-4. When analyzing by location, those with lower extremity lesions had significantly higher scores than those with other anatomic sites, including facial MMS, potentially due to the impact of this location on mobility and activities of daily living. Ultimately, specific evaluation of patients' emotional state during a potentially vulnerable postoperative time period may enhance patient communication and psychological outcomes.

Figure 1



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Risk Factors for Advanced Periorbital Non-Melanoma Skin Cancer

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Introduction: Non-melanoma skin cancers (NMSC) are the most common malignancies in the United States. While many are amenable to local excision a subset of advanced tumors requires extensive resection or systemic immunotherapy. Sociodemographic, clinical, and psychologic factors associated with advanced disease in malignancies such as breast cancer have been previously described but are under reported for NMSC. Immune checkpoint and Hedgehog inhibitors for the treatment of squamous and basal cell carcinomas are being investigated and the ideal patient population is yet to be defined. Identifying patients with advanced NMSC or candidates for novel immunotherapies may reduce the morbidity associated with existing treatments.

Methods: A retrospective chart review of patients presenting between 2010 and 2019 to a tertiary care center with NMSC in the periorbital region was conducted. Tumors were classified as advanced or non-advanced on the basis of the type and extent of treatment required. Defects equal to or greater than 3 cm or requiring extensive posterior lamellar, orbital or nasolacrimal system reconstruction were classified as advanced. Tumors requiring sacrifice of the globe (enucleation/exenteration) or systemic immunotherapy were also classified as advanced. Tumor characteristics such as size, histologic subtype and location were recorded. Characteristics of the patients' medical and social histories and treatment course were compared for statistical significance using the chi-squared test for discrete outcomes and Student's t-test for continuous data.

Results: A total of 97 advanced and 177 non-advanced tumors were identified. These tumors consisted of 224 basal cell carcinomas, 46 squamous cell carcinomas and 4 sebaceous carcinomas. Advanced NMSC were significantly larger (3.9 cm vs 1.3 cm, $P< .001$) and required a greater mean number of procedures for reconstruction (3.3 vs 1.9, $P<.001$). Advanced tumors were more likely to be recurrent than non-advanced tumors (35% vs 11%, $P<.001$). Patients with advanced tumors were more likely to reside in ZIP codes with lower mean household income ($P=.001$) and at greater distances from the tertiary care center ($P <.001$) [Figure 1]. Patients with advanced tumors were more likely to be insured by Medi-Cal (California state low-income insurance) than those with non-advanced tumors ($P<.001$). Immunosuppression, occupational UV light exposure, smoking, lack of established primary care, use of photosensitizing medications and lack of sunscreen use were additional features more common in patients with advanced tumors. Patients treated with immunotherapy were statistically significantly more likely to have high risk tumor sub-types (82% vs 33%, $P<.001$), tumors in high-risk locations (76% vs 23%, $P<.001$), recurrent tumors (65% vs 17%, $P<.001$) or multiple (76% vs 46%, $P=.01$).

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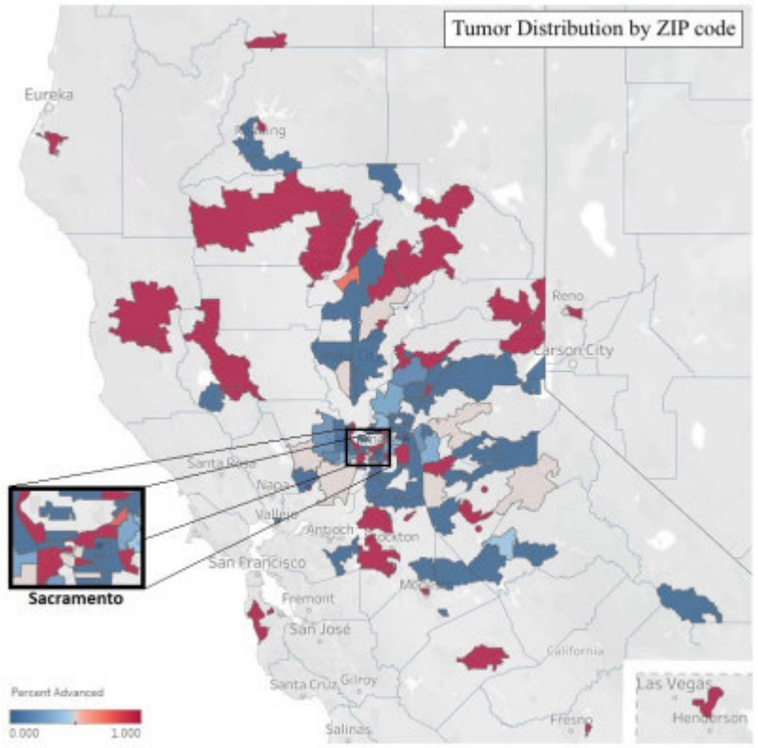
Conclusions: NMSC is a common cause of morbidity and health care expenditure in the United States. Our data suggests that there are significant sociodemographic and clinical features that may aid in identifying at risk patients for advanced periorbital disease. Outreach, prevention strategies, and accessibility needs to be improved for patients of lower socioeconomic status and those living long distances from a tertiary care center. When early prevention and local control fails identifying candidates for systemic immunotherapies is necessary.

Figure 1



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Statistical Evaluation and Positive Predictive Value (PPV) of Key Features of Periorbital Basal Cell Carcinoma (BCC)

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Introduction: Incisional biopsy with histologic confirmation remains the gold standard to identify cutaneous malignancies of the ocular adnexa. Nonetheless, several classic clinical features (telangiectasis, madarosis, and ulceration) suggest the presence of a malignant lesion, although the confidence associated with these changes has not been assessed in a quantitative fashion.[1-4] This study was designed to determine the predictive value of these features in assessing eyelid lesions.

Methods: This retrospective review of patients who underwent biopsy of eyelid lesions was conducted over a five-year period, between 2015 and 2020 at a single clinical site. Specifically, the histopathologic diagnosis and the presence or absence of clinical signs of madarosis, ulceration and telangiectasia were recorded. The positive predictive value (PPV) for eyelid BCC and odds ratio of each of these clinical signs was calculated individually and collectively.

Results: 179 patients underwent incisional biopsies of eye lid lesions. Of the 79 patients with eyelid BCC, 96% had ulceration, 95% had madarosis, and 75% had telangiectasias over the lid lesion; this contrasted with the 3%, 4% and 6% respectively in the 100 patients with benign lid lesions. The PPV for eyelid BCC of ulceration was 95.0%, madarosis was 96.2% and telangiectasias was 90.8%. The presence of two or all three signs in a patient was strongly predictive of BCC (PPV=100% for 2 signs, PPV=100% for 3 signs).

Conclusions: The presence of two or more suspicious features almost ensures the presence of a cutaneous malignancy, with a PPV of 100% in this study. Biopsy of eyelid lesions that demonstrate several defining features may not be necessary, and tumors with these clinical signs that strongly suggest a malignancy may be treated empirically (i.e., with excisional surgery).

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Uveal Melanoma Presenting as Panophthalmitis in the Absence of Intraocular Mass

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Introduction: In rare cases, uveal melanoma can present with robust inflammation simulating endophthalmitis or panophthalmitis. Rarer still are cases of necrotic uveal melanoma presenting as panophthalmitis without a discrete mass identified clinically or on imaging. The authors present a case of necrotic uveal melanoma simulating panophthalmitis with no evidence of intraocular mass on clinical examination or imaging and review the literature surrounding this presentation and the management of these rare cases.

Methods: Case report and review of the literature.

Results: An 80-year-old male presented with severe right orbital edema, chemosis, conjunctival injection, corneal opacification and intraocular pressure of 70 mmHg. B-scan ultrasonography demonstrated dense vitreous debris concerning for endophthalmitis. Computed tomography (CT) orbit showed evidence of pre-septal inflammation, possible tenting of the right globe, and vitreous debris. Magnetic resonance imaging (MRI) brain and orbits demonstrated extensive intraocular exudative/loculated material with orbital inflammation concerning for orbital cellulitis, without evidence of intraocular mass. This presentation was concerning for endogenous endophthalmitis with progression to panophthalmitis but did not improve with intravitreal and intravenous antibiotics. The eye was enucleated and unexpectedly revealed spindle cell melanoma with extensive ischemia, hemorrhage, and necrosis on histopathology. Review of the literature identified 7 additional cases of necrotic uveal melanoma presenting without evidence of intraocular mass on imaging. Including our case, among 8 total patients, median patient age at presentation was 78 years, with 63% female. Patients commonly presented with vision loss (75%) and pain (50%). Exam findings included elevated IOP (75%), eyelid and/or periorbital edema (75%), chemosis (63%), no light perception vision (50%), proptosis (37%), extraocular motility restriction (37%), conjunctival injection (37%), and corneal edema (25%). There was no view to the fundus in 88% of cases. No intraocular mass was detected by CT scan (75%) or ultrasound (63%). A diagnosis of orbital cellulitis or endophthalmitis was in the differential in 63% of cases. Medical management included intravenous antibiotics (50%) or systemic corticosteroids (37%). Surgical management included enucleation (50%), evisceration (37%), or conservative management (13%). Histopathologic examination revealed uveal melanoma in all cases confirmed intraocularly (88%) or presumptively diagnosed from histopathologically confirmed metastasis (12%). Necrosis was present in 75% of cases. Ocular outcomes were specified for 75% of cases and with no uveal melanoma recurrence at median 4 months follow-up.

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Conclusions: Necrotic uveal melanoma can present as panophthalmitis without evidence of an intraocular mass on imaging. These cases are particularly challenging, and we review 8 total cases with this presentation. For patients presenting with marked ocular inflammation in the absence of a known inflammatory syndrome or infectious source, intraocular malignancy should be strongly considered. When globe removal is required, enucleation should be considered over evisceration even if there is no evidence of malignancy on imaging, especially when a view of the posterior pole is not possible.

Figure 1

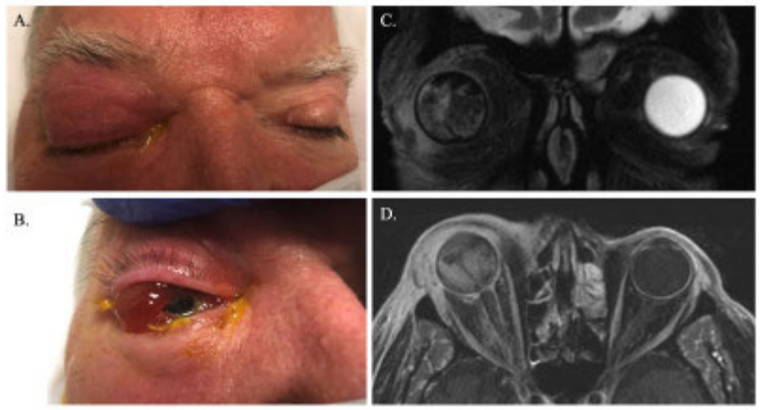
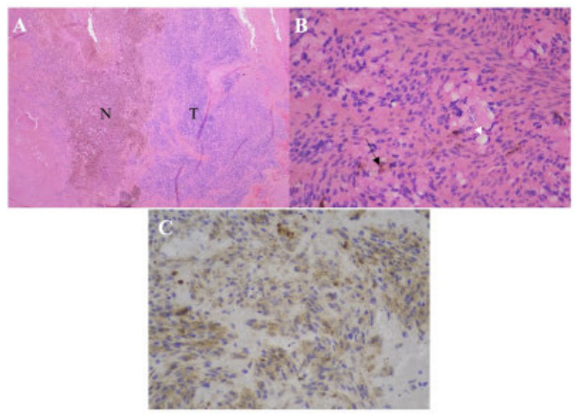


Figure 2



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A Case of Intra-Orbital Inflammatory Myofibroblastic Tumor Presenting as Orbital Cellulitis

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Introduction: Inflammatory myofibroblastic tumor (IMT) is a rare, mesenchymal neoplasm that can affect any soft tissue or viscera but usually affects the lung, abdomen, and retroperitoneum. IMTs are predominately found in children and young adults. They are histopathologically composed of spindle cells with an inflammatory infiltrate background[1]. More than half of extrapulmonary IMTs have gene rearrangement in the anaplastic lymphoma kinase (ALK) gene[2]. Here, we discuss a case of intra-orbital IMT presenting as orbital cellulitis that was ALK negative and SMA positive. Collection and evaluation of protected patient health information was HIPAA compliant.

Methods: 14-year-old Black female presented to the emergency room with right eye pain and eyelid swelling for 3 weeks. Her eye pain worsened with extraocular movement. She denied any vision changes. The patient's father mentioned that she had a history of intermittent eyelid swelling that he related to allergies but was significantly worse at the time of presentation. The patient was given an antibiotic eye drop at an outside urgent care facility which initially seemed to help but the day prior to presentation the eyelid swelling became worse which prompted presentation to hospital. She had no other prior ocular history, systemic illnesses, or family history of autoimmune disease.

On examination in the emergency room, she had marked proptosis of the right eye as well as swelling and erythema of the right upper and lower eyelid, with restricted motility of the right eye in all directions. There were no signs of visual decline, though the optic nerve had 360-degree disk edema on the right side. The conjunctiva was injected and chemotic. The remainder of the eye exam, including the intraocular pressure, was normal. She was afebrile, with a normal white blood cell count, a normal C-reactive protein level, and only mildly elevated erythrocyte sediment rate. A CT orbit with contrast was obtained which was read as right preseptal and postseptal cellulitis with proptosis. Radiology also noted a crescent-shaped low-density rim-enhancing fluid collection consistent with evolving abscess in the right intraconal space. (Fig 1.) Due to concern for orbital cellulitis with a potentially sight threatening intraconal abscess the patient was started on IV antibiotics, and the oculoplastics service was consulted for further management.

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The patient was subsequently taken to surgery for exploration of the orbit and possible abscess drainage. A transconjunctival approach was used to explore the medial orbit and intraconal space. No abscess or purulence was found, rather, a firm thickened mass of the orbital tenon's fascia in the medial and retrobulbar space was encountered. An incisional biopsy was performed and the tissue was sent to pathology for examination.

Given the likelihood of a non-infectious inflammatory orbital process, she was started on IV Solumedrol. A work up for causes of orbital inflammation was performed and was non-diagnostic. Histopathologic examination of the biopsy specimen showed a myofibroblastic/fibroblastic proliferation with foci of acute and chronic inflammation. Cells of interest were SMA positive and negative for ALK1 and Desmin (Fig 2). The final diagnosis was determined to be primary orbital inflammatory myofibroblastic tumor.

Over the next few days on IV steroids the patient's eyelid swelling, proptosis, eye pain, and motility restriction improved significantly. She was discharged on an extended taper of oral steroids with eventual radiologic and clinical resolution.

Results: The etiology of inflammatory myofibroblastic tumor is unknown and is not limited to any particular location[1], however, the lung, mesentery, and omentum are the three most common sites that IMT is found. IMT is considered a benign lesion but there are rare occurrences of metastasis to other locations[3,4]. There have only been a handful of cases of primary orbital IMT.

Strianese et al. found no gender predilection in their study of orbital IMT[1,5], however in other case reports of IMT involving the orbit the patients were mostly males[3,6,7]. Based upon our literature review gender does not seem to influence the occurrence of orbital IMT.

Orbital IMT can have various clinical presentations such as painless mass, eye pain, diplopia, progressive vision loss, ptosis, conjunctivitis, invasion of the lacrimal gland, extraocular muscle movement restriction, and/or edema. In Strianese et. al., twenty-five cases of primary orbital IMT were compared, and the orbital locations were reported as either anterior, posterior or diffuse. Our patient's orbital disease location was retrobulbar and peribulbar, with the inflammatory mass encircling portions of the medial and posterior globe and optic nerve.

To confirm a diagnosis of IMT, histopathological evaluation is needed. Histopathological findings include proliferating myofibroblasts, spindle cells, and inflammatory cells that include plasma cells, lymphocytes and eosinophils. 50% of IMT are ALK-1 positive on immunochemistry and this is useful to help differentiate this tumor from other types of mesenchymal tumors. Our literature review did not shown a clinical distinction between ALK-1 positivity and ALK-1 negativity in regards to clinical outcome, recurrence, regression, or metastasis[8,7,9,10]. Our patient was ALK-1 negative and had complete resolution of symptoms after treatment with systemic steroids.

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Management of IMT varies depending on the clinical presentation and location but may include surgical excision, systemic steroids, and/or radiotherapy. Systemic steroids are usually the first line treatment with partial to complete regression in 31-78% of patient within 48 hours but has a high rate of recurrence[7]. Low dose radiation therapy is used in refractory cases with local regression in 67-87% of patients[7]. Some cases are more amenable to surgical resection and in rare cases of large orbital IMT, enucleation or exenteration may be necessary for complete remission[11,12]. Metastasis is rare, <5% of cases, but the most common sites are brain and liver[3].

Conclusions: This was a rare case of IMT involving the orbit masquerading as orbital cellulitis. Although rare, this case illustrates the importance of having a broad differential in a patient presenting with orbital inflammation and proptosis. Response to systemic steroids for IMT is usually rapid with partial to complete resolution of symptoms but a prolonged taper is often necessary to prevent recurrence of these lesions.

Figure 1: Axial view of CT orbit with contrast showing right orbital lesion at time of presentation

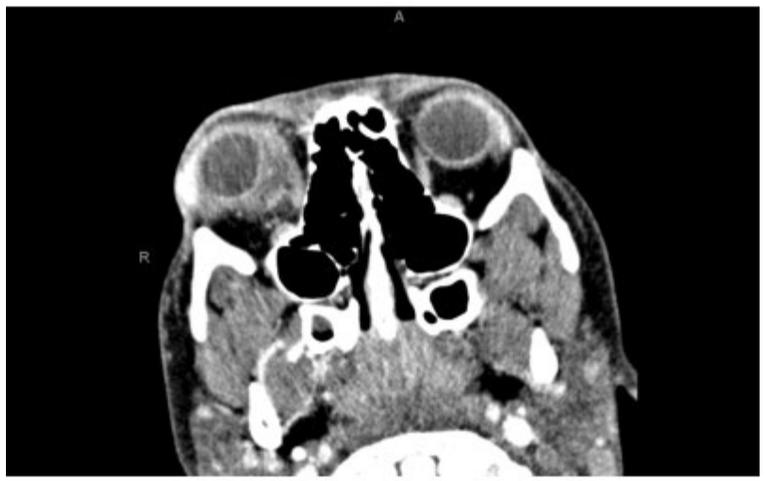
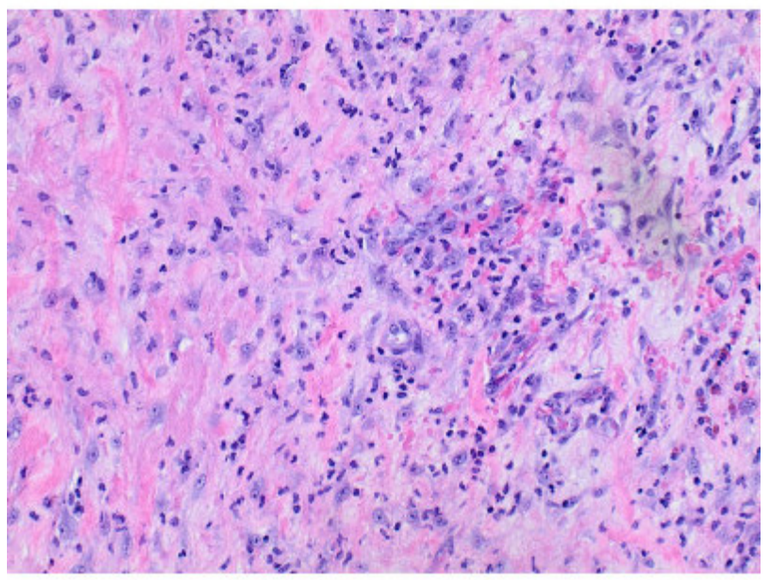


Figure 2: H&E stain, showing myofibroblastic / fibroblastic proliferation with foci of acute and chronic inflammation



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A Case of Orbital IgG4 Related Disease Associated with Chronic Intranasal Cocaine Abuse

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Introduction: Intranasal cocaine abuse may cause an inflammatory disease process mimicking neoplastic, infectious, or inflammatory etiologies; including mimicking destructive and tumefactive lesions of midline structures found in IgG4 Related Disease (RD).[1] In the orbit, cocaine has been previously linked to wide spectrum of inflammatory disorders leading to visual complications such as optic neuropathy. The addition of levamisole, an adulterant and to cocaine during the past decade or so, has also been associated with a positive ANCA vasculitis presenting as orbitopathy.[2] Herein, we review the literature and present a patient with orbital IgG4-RD diagnosed 2-years after following extensive work-up, including nasal biopsy, for cocaine-induced optic neuropathy, midline destruction and pachymeningitis.

Methods: Case report with literature review.

Results: A 61-year-old, Caucasian, male with a past medical history significant for multi-decade intranasal cocaine abuse presented with acute painless vision loss in the right eye. Exam revealed a right optic neuropathy with disc edema. In addition to the optic neuropathy, imaging (Figure 1 and 2) demonstrated extensive chronic sinus destruction, along with a diffuse, infiltrative, enhancing, soft-tissue process involving the infraorbital fissures, bilateral pterygopalatine fossae, and cavernous sinus, along with pachymeningeal enhancement of the anterior and middle cranial fossae. Nasal tissue biopsy revealed polypoid chronic sinusitis with focal squamous metaplasia. Additional neurosurgical workup for potential biopsy of the meningeal/cavernous sinus process was recommended, however, the patient was lost to follow up. Two years later he presented with left eye pain, lower lid swelling, and binocular diplopia. Ophthalmologic testing revealed decreased visual acuity in both eyes, a relative afferent pupillary defect of the right eye, dysmotility, and 3 mm of left proptosis. Imaging (Figures 3 and 4) revealed infiltrative masses involving the left greater than right orbits. Biopsy was performed on the left orbital mass and histologic analysis revealed fibrous connective tissue with mixed inflammatory infiltrate with IgG increased to up to 100 IgG4 cells per high powered field (HPF). Laboratory testing for serum IgG4 was 135 mg/dl and titers for cytoplasmic neutrophil antibody (c-ANCA) were positive at 1:640. ESR (73) and CRP (5.4) were elevated while the rest of the work up including lumbar puncture with CSF analysis, p-ANCA, serine protease antibody, and myeloperoxidase antibody were unremarkable. He was started on IV solumedrol with notable improvement in his inflammatory markers. He was discharged on a long steroid taper and continues follow-up with ophthalmology and rheumatology.

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Conclusions: The widespread destructive sequelae of the patient's chronic cocaine use made initial identification of the underlying IgG4-RD difficult in this case. Cocaine has a number of immune modulating effects including increased plasma pro-inflammatory molecules, mainly IL-6 and TNF-α, along with decreased anti-inflammatory molecules.[3] It is hypothesized that the pro-inflammatory nature of chronic cocaine may have potentiated the development or worsened the concurrent/underlying IgG4-RD process.[4,5] To our knowledge, this is the first case of IgG4-RD described in the context of chronic cocaine use and reveals the complexity of diagnosing and managing overlapping rheumatologic processes in this unique circumstance.

Figure 1

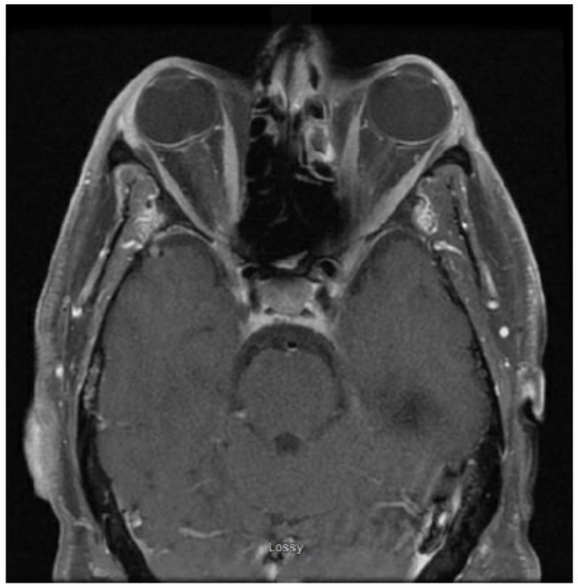


Figure 2

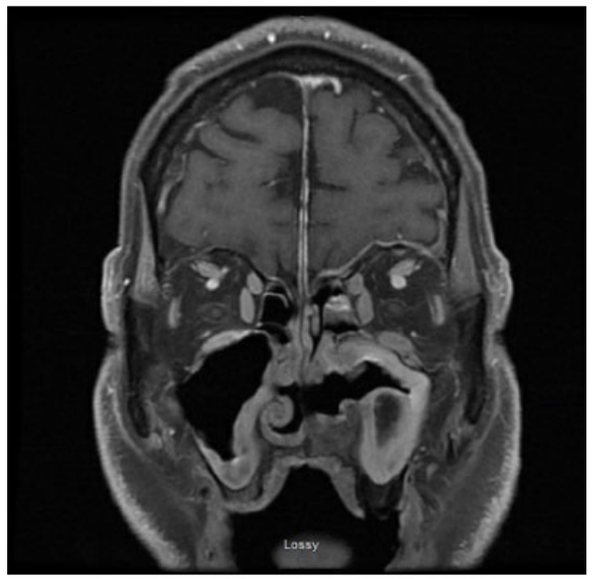


Figure 3

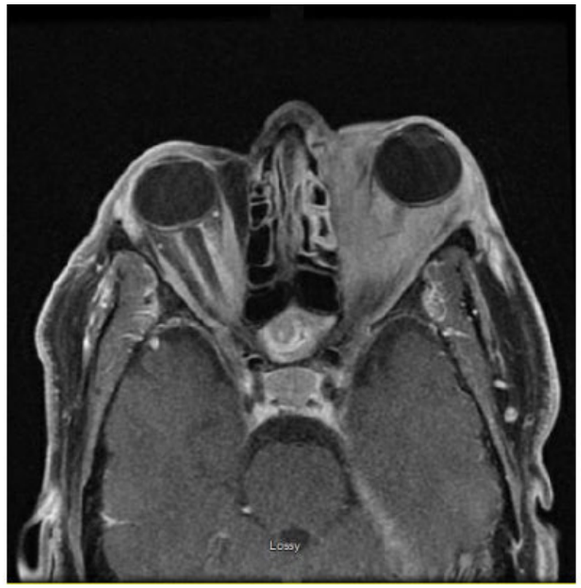
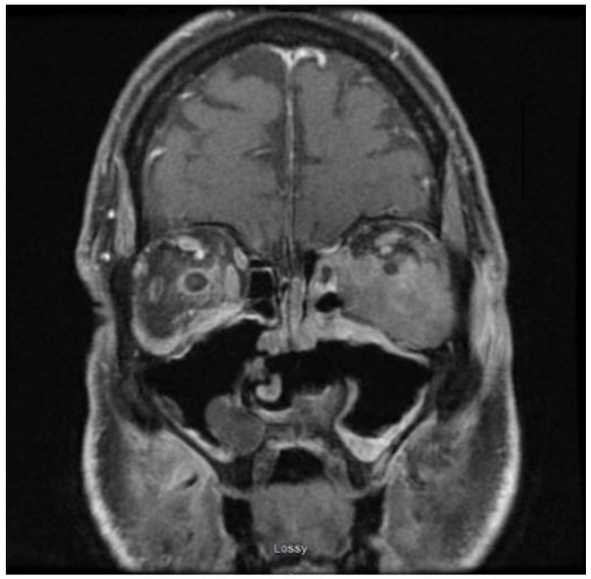


Figure 4



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A Case of the Blues – Colored Pencil Orbitopathy in an 18-Month-Old Boy

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Introduction: The purpose of this study is to describe a case of a penetrating orbital injury with retained blue colored pencil core foreign body leading to orbital abscess in an 18-month-old child.

Methods: This is a retrospective case report.

Results: An 18-month-old boy was seen in oculoplastics clinic after sustaining a penetrating orbital injury to the left upper eyelid two days prior to presentation. The patient was holding a colored pencil when he tripped and fell onto the pencil, which penetrated the left orbit. He was initially evaluated at a local hospital where the majority of the pencil was removed from the left upper eyelid. However, a CT scan revealed a radiodense foreign body within the superior orbit (Figure 1A, 1B). The globe was uninjured. The patient was discharged on oral antibiotics and seen in oculoplastics clinic two days later.

Two days post injury, the father reported progressive worsening of left upper eyelid swelling. He had brought in the pencil – wooden with a dark blue colored pencil core in several pieces. The external exam revealed an edematous, erythematous, tense left upper lid with a small horizontal linear eschar (Figure 2A). There was a complete mechanical ptosis. The globe was intact (Figure 2B). The patient underwent pre-operative MRI of the orbits, which showed interval increase in size of the superior orbital abscess and he underwent exploratory orbitotomy the same day.

Intraoperatively, exploration of the left upper eyelid led to drainage of several milliliters of thick, dark-purple fluid (Figure 3A), which, once evacuated, revealed staining of the orbital tissues in a bright blue color (Figure 3B, 3C). No solid foreign body was identified within the superior orbit. The waxy colored pencil core had presumably melted and was absorbed by the surrounding tissue, which was notably friable. All pigmented tissues were debrided in piecemeal fashion (Figure 3D). The orbital roof was intact. Pathology revealed areas of inflammation and necrosis with frequent aggregates of bright, turquoise blue, small needle-like foreign material (Figure 4A). Some aggregates demonstrated white birefringence with cross-polarization (Figure 4B). Post-operative CT confirmed no persistent orbital foreign body (Figure 1C, 1D). The patient did well post-operatively on broad-spectrum intravenous antibiotics and was eventually transitioned to oral antibiotics and discharged home on post-operative day 2.

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Conclusions: Orbital penetrating injuries from pencils are rare.[1] Retained graphite pencil lead can lead to delayed granulomatous reaction several weeks to up to 40 years post-injury.[2,3] Due to differences in composition, colored pencil core behaves differently than graphite pencil "lead" within the orbit leading to rapid inflammation and abscess formation; intra-operatively, retrieval can be more challenging as the wax melts and infiltrates surrounding tissue. This case highlights the importance of more timely removal of the orbital foreign body in cases of colored pencil cores.

Figure 1

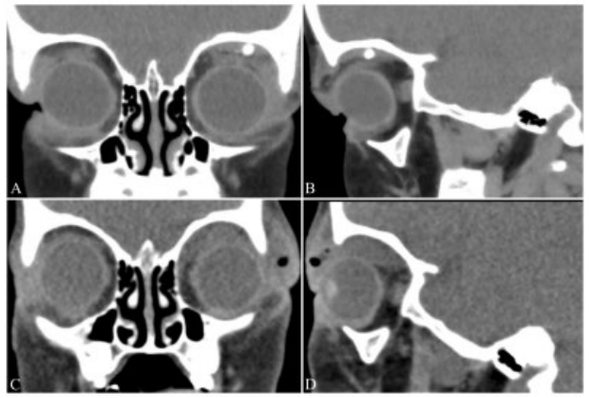
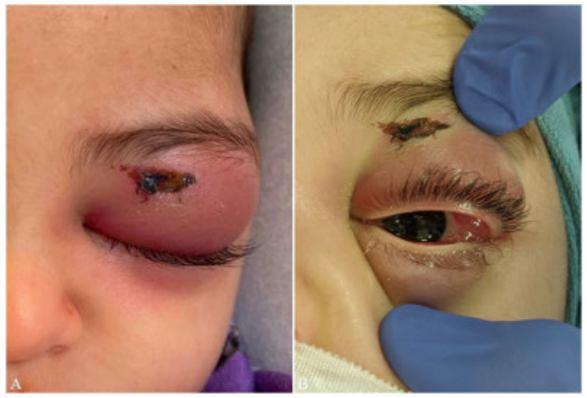


Figure 2



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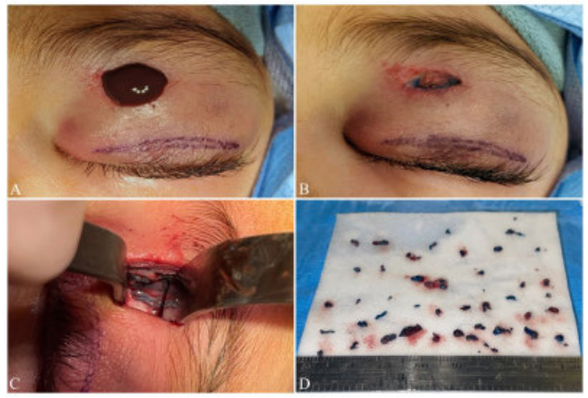
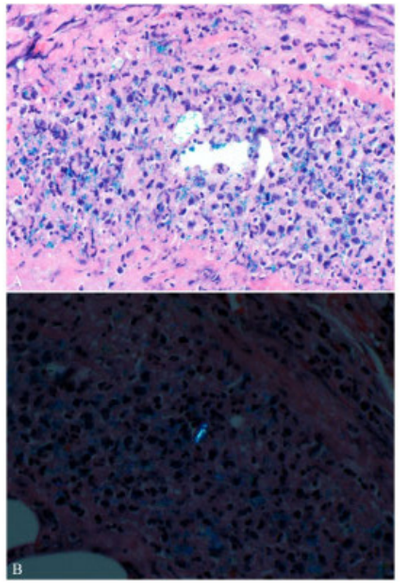


Figure 4



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A Novel Device to Quantify Resistance to Ocular Cyclotorsion

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Introduction: Ocular cyclotorsion refers to the rotation of the globe around its visual axis and is controlled primarily by the superior and inferior oblique extraocular muscles, with the former responsible for internal rotation and the latter for external rotation. Clinically significant rotational misalignment of the eyes may occur in nerve palsies, congenital strabismus, conditions such as thyroid eye disease that result in extraocular muscle fibrosis, or as a complication of orbital surgery.[1] The most commonly used method for assessing restriction of cyclotorsion is the manual cyclotorsion test, in which the globe is manipulated by grasping the conjunctiva with forceps. However, this method relies on a clinician's subjective perception and is thus dependent on individual experience and highly variable. Previous attempts to develop apparatuses for objectively measuring resistance to cyclotorsion have not been widely adopted for clinical use.[2] Here, we present quantitative measurement of resistance to cyclotorsion via an intelligent platform for comprehensive evaluation of orbital soft tissue compliance and demonstrate its utility in Brown syndrome, a condition characterized by restriction of the superior oblique tendon and subsequently more restriction to excyclorotation.

Methods: The device consists of a rotational motor stage attached to a custom designed torsional load cell (Figures 1A and 1B). This in turn interfaces with a platform that interfaces with the ocular surface via vacuum-assisted suction (Figure 2). The entire apparatus is mounted on a locking gooseneck arm that can be fastened to a patient's bed for rapid bedside assessment.

To test the device, we used a cadaver head to measure resistance to cyclotorsion before and after restricting movement of the superior oblique tendon (Figures 3A and 3B). A hemostat was used to clamp the superior oblique tendon to simulate an inelastic or tethered superior oblique muscle-tendon, a condition that is clinically known as Brown syndrome.

Results: We obtained measurements of resistance to manual 30 degree cyclorotation of the cadaver eye before and after clamping the superior oblique tendon. There was significantly more resistance to cyclotorsion measured after clamping (Figures 4A and 4B).

Conclusions: Our updated platform for the evaluation of orbital soft tissue compliance now permits quantitative characterization of resistance to cyclotorsion in human eyes. Objective measurements of cyclotorsion can improve treatment of diseases such as Brown syndrome. These measurements can allow for better monitoring of clinical progression, quantify pre-op and post-op outcomes, and ultimately help shape treatment algorithms for precision strabismus surgery and lysis of orbital adhesions.

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Figure 1

Figure 1A & 1B. Functional prototype of our device (A), with blue arrow indicating rotational motor stage and red arrow indicating torsional load cell. Computer-aided design model (B) of custom designed torsional load cell.

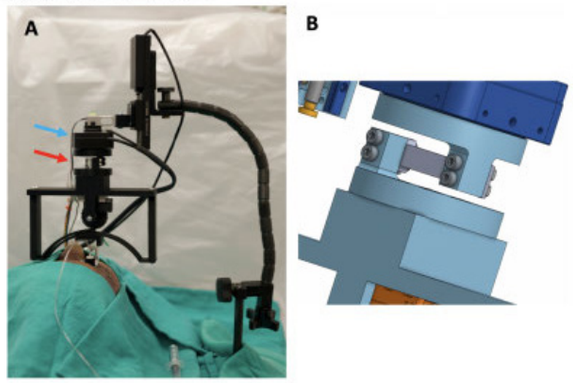


Figure 2

Figure 2. Close-up of suction cup interfacing with surface of globe.

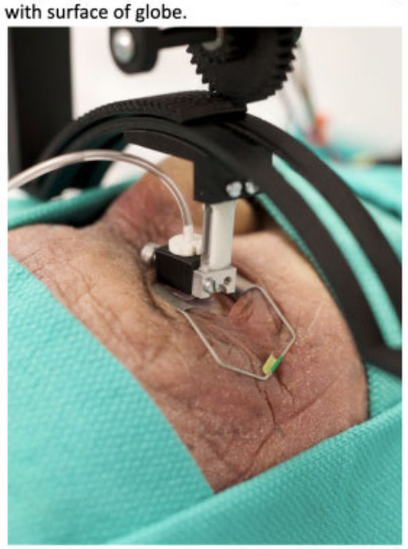


Figure 3

Figures 3A & 3B. Cadaver head with normal superior oblique tendon exposed (A; red arrow) and with superior oblique tendon clamped (B) to simulate a restricted superior oblique tendon, such as seen in Brown syndrome.

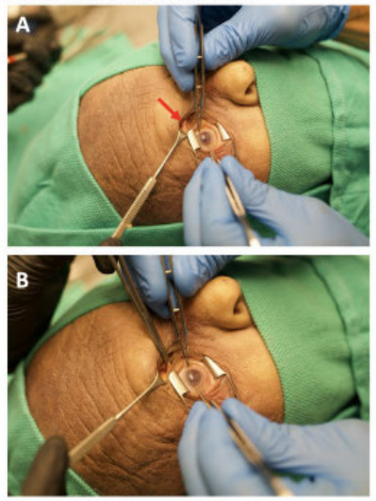
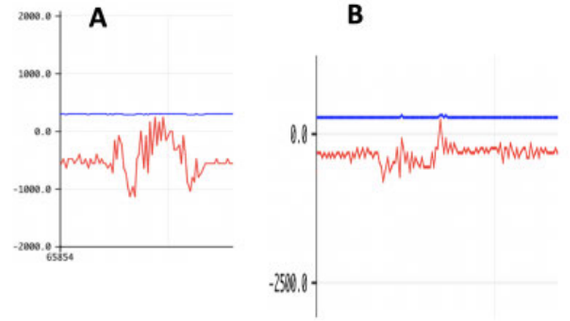


Figure 4

Figures 4A & 4B. Measurements of resistance to cyclotorsion when manually cyclotorting the eye without clamping the superior oblique tendon (A) vs. after clamping the superior oblique tendon (B). Y-axes have been scaled to allow direct visual comparison of differences in amplitude of resistance measurements.



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A Rare Case of Right Optic Nerve Sheath Dural Arteriovenous Fistula and Review of Literature

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Introduction: Orbital dural arteriovenous fistulas (dAVFs) between the ophthalmic artery and orbital veins are extremely rare. The clinical presentation is similar to dAVF in the cavernous sinus, and management may be challenging. We present a unique case of a dAVF between the ophthalmic artery and superior ophthalmic vein as well as a review of the literature highlighting cases similar to our patient.

Methods: One case of optic nerve sheath dural arteriovenous fistula was described, and a literature review via PubMed was performed using “orbital dural arteriovenous fistula” and “ophthalmic arteriovenous fistula.” Twenty-seven papers were reviewed and their clinical presentation, management, and outcomes were analyzed.

Results: A 59 year old male presented with progressive blurry vision, redness of the right eye, and binocular diplopia for two months. On exam, he was noted to have decreased vision at 20/40, elevated intraocular pressure, 3 mm relative proptosis and dilated corkscrew vessels without chemosis (Figure 1). MRI, MRA and MRV revealed an enlarged right superior ophthalmic vein (SOV) with thrombosis and a prominent right ophthalmic artery. A diagnostic cerebral angiogram delineated a fistula between the ophthalmic artery and the SOV (Figure 2). Endovascular embolization with neurosurgery was not possible due to thrombosis of the facial vein and cavernous sinus. The oculoplastics team performed an anterior orbitotomy to directly access the SOV and embolize the fistula between the ophthalmic artery and SOV, with notable improvement in venous outflow after successful embolization (Figure 3, 4). Post-operatively, the patient’s visual acuity, intraocular pressure, and binocular diplopia had improved. In addition, improved venous outflow was noted after embolization.

The literature highlights 29 cases, with the average age at presentation being 58.6 years old and 67% being male. The average duration of symptoms was 19 weeks and the most common presentation was proptosis (93%) followed by injection (77%). At presentation, 43% of cases reported decreased vision with acuity ranging from 20/40 to Count Fingers. Elevated or asymmetric intraocular pressure was noted in 94% of cases. Treatment consisted of venous or arterial embolization in 73% of patients, while only 3 cases required direct orbitotomy approach. All cases reported resolution of chemosis and proptosis and 69% had improvement of visual acuity to better than 20/100 (range: 20/20 - 20/100).

Conclusions: Orbital dural arteriovenous fistulas (dAVFs) are a rare clinical entity that may present insidiously and are often misdiagnosed or mistaken for cavernous carotid fistulas given their similar clinical and radiographic features. Optimal management

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of intraorbital dAVFs is unclear due to the small number of reported cases. Our case and literature review illustrate the importance of prompt diagnosis and interdisciplinary approach to management in order to preserve vision and minimize associated morbidity.

Figure 1

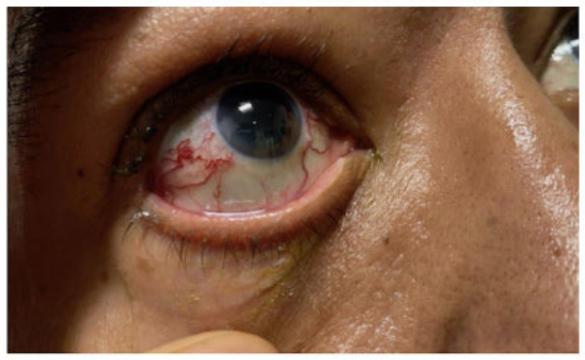

Figure 1: External photo, right eye

Figure 2

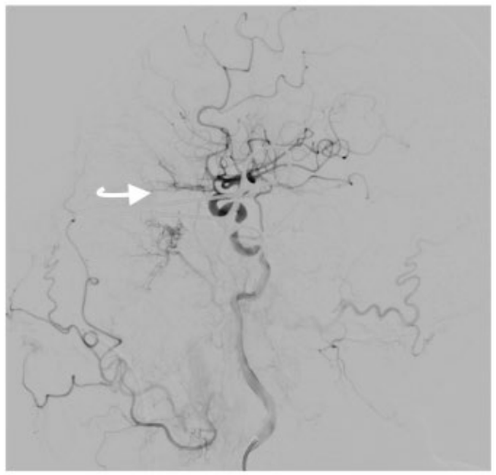

Figure 2: RIght Cerebral angiogram showing SOV thrombosis and optic nerve sheath dAVF fed by ophthalmic artery draining into SOV

Figure 3

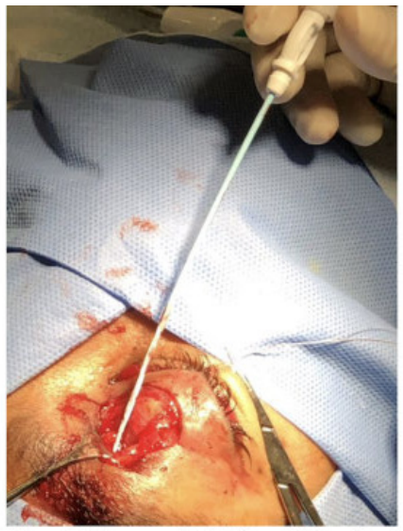

Figure 3: Intra-operatively, the catheter placed in the dilated superior ophthalmic vein

Figure 4

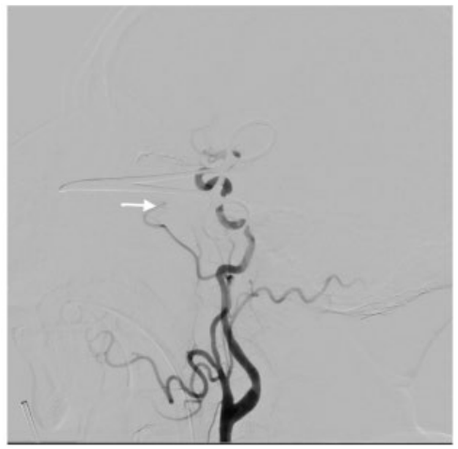

Figure 4: Right Cerebral angiogram after embolization.

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A Single-Institution Review of Lacrimal Gland Biopsies between 1962 and 2017

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Introduction: To examine the clinical and histopathologic characteristics of lacrimal gland biopsies performed at a tertiary academic center.

Methods: A retrospective chart review of all patients undergoing lacrimal gland biopsy or excision between 1962 and 2017 was performed by identifying cases via the ocular pathology specimen log. All cases were reviewed for demographic information, clinical presentation and outcome, and the histopathologic diagnosis.

Results: 402 consecutive eyes in 356 patients were included for the final analysis (Table 1). Median age was 49 (range 5-91) with a female predominance (255, 72%, p<0.001). Most had unilateral involvement (309, 87%) and visual acuity of 20/50 or better (332 eyes, 83%). Limitation in extraocular motility was present in 71 eyes (18%), relative afferent pupillary defect in 10 eyes (2.5%), and intraocular pressure 20 mmHg or above in 80 eyes (20%). The pre-operative radiology report commented on the enlargement of the lacrimal gland in 236 eyes (58.7%), and lack thereof in 73 eyes (18.2%). The most common histopathologic diagnoses were nonspecific inflammation or orbital pseudotumor (170, 42%), lymphoma (65, 16%), pleomorphic adenoma (22, 5.5%), adenoid cystic carcinoma (19, 4.7%), granulomatous inflammation (19, 4.7%), normal lacrimal gland (16, 4%), and dacryops (15, 3.7%). 307 cases were benign (76%) and 95 malignant (24%). The biopsy specimen was diagnostic in 343 (85%), and non-diagnostic in 59 (15%) (Table 2). Among the bilateral cases, 37 (77%) were inflammatory conditions, followed by lymphoma (8, 17%) (Table 3). In the pediatric population, 91% were benign, with predominance of inflammatory conditions (73%) (Table 4). The diagnoses most commonly presenting with limitation in extraocular motility were nonspecific orbital inflammation (23, 32%), lymphoma (9, 13%), and pleomorphic adenoma (9, 13%). The majority of cases presenting with concurrent enlargement of the lacrimal gland and extraocular muscle were inflammatory in nature (34, 68%).

Conclusions: This is a comprehensive review of one of the largest ocular pathology databases of lacrimal gland lesions. This study confirms the wide range of inflammatory and neoplastic conditions affecting the lacrimal gland and highlights the nuances of histopathologic diagnoses and diagnostic yield of biopsies in clinical practice.

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Figure 1

Baseline Characteristics 402 consecutive eyes		
		Number (%)*
Eye	Right	212 (52.7)
	Left	190 (47.3)
Laterality	Unilateral	309 (86.7)
	Bilateral	48 (13.5)
Age	Range 5 - 91, Median 49.0	
	0-20	23 (6.4)
	21-40	95 (26.7)
	41-60	132 (37.1)
	61-80	95 (26.7)
	81-100	11 (3.1)
Gender	Male	101 (28.4)
	Female	255 (71.6)
Visual acuity	Range - 0.3 - NLP, Median 0.10	
	<0	9 (2.2)
	0-0.4	323 (80.3)
	0.5-0.9	13 (3.2)
	1.0-1.4	10 (2.5)
	1.5-1.9	7(1.7)
	NLP	3 (0.7)
	Unknown	37 (9.2)
IOP (mmHg)	Range 7 - 29, Median 17	
	<10	3 (0.7)
	10-14	99 (24.6)
	15-19	165 (41.0)
	20-24	70 (17.4)
	25-30	10 (2.5)
	Unknown	55 (13.7)
EOM Motility Restriction	Normal	274 (68.0)
	25%	41 (10.2)
	50%	19 (4.7)
	75%	5 (1.2)
	Frozen globe	6 (1.4)
	Unknown	57 (13.8)
RAPD	Present	10 (2.5)
	Absent	347 (86.3)
	Unknown	45 (11.2)
Exophthalmometry (mm)	Range, median	10 - 33, 21.0
Imaging	None	18 (5.0)
	US	183 (51.4)
	CT	120 (33.7)
	MRI	129 (36.2)
LG enlargement	Present	236 (58.7)
	Absent	73 (18.2)
	No imaging or not mentioned	93 (23.1)
EOM enlargement	Present	67 (16.7)
	Absent	242 (60.2)
	No imaging or not mentioned	93 (23.1)
Time to presentation (months)		28 +/- 38 (0 - 360)
Follow up (months)		12.5 (0.25 - 360)

Figure 2

Diagnosis	N	%	Gender (% female)	Median age (range)
Inflammatory disorders				
Nonspecific inflammation	124	30.8	77	45 (5-85)
Pseudotumor	46	11.4	73	40 (13-71)
Lymphocytic infiltrate	12	3.0	80	47 (8-80)
Sarcoidosis	7	1.7	80	41.5 (36-68)
Non-diagnostic for sarcoidosis	5	1.2	66	34 (26-56)
Granulomatous inflammation- NOS	19	4.7	93	54 (29-68)
Inflammation related to autoimmune condition	4	1.0	100	26 (16-56)
Lymphoproliferative disorders				
Lymphoma	65	16.2	69	61 (29-91)
MALT lymphoma	52			
Follicular lymphoma	5			
Mantle cell lymphoma	4			
Malignant lymphoma	3			
B-cell lymphoma	1			
Non-diagnostic for lymphoma	16	4.0	69	61 (11-83)
Benign lymphoid hyperplasia	3	0.7	67	50 (41-63)
Chronic lymphocytic leukemia	1	0.3	0	65 (65)
Epithelial and non-epithelial tumors				
Pleomorphic adenoma	22	5.5	59	63.5 (28-76)
Carcinoma ex-pleomorphic adenoma	1	0.2	100	53 (53)
Adenoid cystic carcinoma	19	4.7	42	40 (11-71)
Primary adenocarcinoma	2	0.5	50	61.5 (41-82)
Acinic cell carcinoma	1	0.2	100	26 (26)
Epithelial-myoepithelial tumor	1	0.2	100	75 (75)
Distant metastasis	6	1.5	60	66.5 (44-86)
Breast	4			
Squamous cell carcinoma	1			
Osteosarcoma	1			
Other				
Dacryops	15	3.7	80	53 (31-86)
Fibrovascular tissue	10	2.5	56	50 (5-61)
Normal lacrimal gland	16	4.0	56	47 (29-76)
Thyroid eye disease	5	1.2	75	42 (34-44)
Amyloid	1	0.2	100	60 (60)
Langerhans cell histiocytosis	1	0.2	0	10 (10)
Malignant	95	23.6	57	50 (11-91)
Benign*	307	76.4	65	48 (5-87)
Diagnostic	343	85.3	63	49.5 (5-91)
Non-diagnostic**	59	14.7	61	30 (5-87)

Figure 3

Cases with bilateral involvement (n = 48 patients)			
Diagnosis	**N (%)**	**Gender (% female)**	**Median age (range)**
Nonspecific inflammation	19 (40.4)	68	42 (15-69)
Pseudotumor	6 (12.8)	83	50 (22-63)
Lymphocytic infiltrate	3 (6.4)	66	44 (8-50)
Sarcoidosis	2 (4.3)	100	41.5 (41-42)
Non-diagnositc for sarcoidosis	2 (4.3)	100	26 (26)
Granulomatous inflammation -NOS	4 (8.5)	100	55.5 (29-68)
Inflammation related to autoimmune condition	1 (2.1)	100	25 (25)
Lymphoma	8 (17)	50	48 (41-71)
Metastasis (breast)	1 (2.1)	0	86 (86)
Normal	1 (2.1)	100	32 (32)
Fibrovascular tissue	1 (2.1)	0	38 (38)

Figure 4

Pediatric cases age 18 and under				
Diagnosis	**N**	**%**	**Gender (% female)**	**Median age (range)**
Nonspecific Inflammation	11	50.0	64	12.5 (5-18)
Pseudotumor	3	13.6	100	16 (13-18)
Lymphocytic infiltrate	1	4.5	100	8
Inflammation related to autoimmune condition	1	4.5	100	16
Non-diagnostic for lymphoma	1	4.5	100	11
Pleomorphic adenoma	1	4.5	0	17
Adenoid cystic carcinoma	2	9.1	50	12.5 (11-14)
Langerhans cell histiocytosis	1	4.5	0	10
Fibrovascular tissue	1	4.5	0	5

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A Taser Probe Ripping Through the Medial Canthus

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Introduction: The goal of this report is to discuss a case of deep orbital penetrating injury resulting from the use of a taser by law enforcement officials.

Methods: This is a case report involving one patient. All the clinical data and relevant literature have been reviewed.

Results: A 54-year-old woman presented after being shot in the face with a taser during an altercation with law enforcement in Toronto, Ontario. The taser probe penetrated through the soft tissues of the left medial canthus and migrated deep within the orbit to impale the posterior aspect of the orbital floor and maxillary sinus adjacent to the orbital apex. On presentation, visual acuity was 20/25 in both eyes. Pupils were round and reactive to light, and there was no afferent pupillary deficit. Dilated fundus exam of the left eye revealed severe commotio retinae nasally. The patient underwent urgent intra-orbital foreign body removal in the operating room without complications. Visual acuity and ocular ductions were preserved postoperatively.

Conducted energy weapons, commonly referred to as tasers, are one of the non-lethal use of force options available to law enforcement officials. These devices have been designed to momentarily disable uncooperative individuals by delivering an electric charge, but they can also lead to serious eye injuries.[1]

Conclusions: Our case report shows that modern-day taser probes have the potential to penetrate deep within the orbit, potentially leading to significant harm. Whenever possible, law enforcement officials should try avoiding vulnerable areas such as the head and neck region when using tasers.

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Figure 1

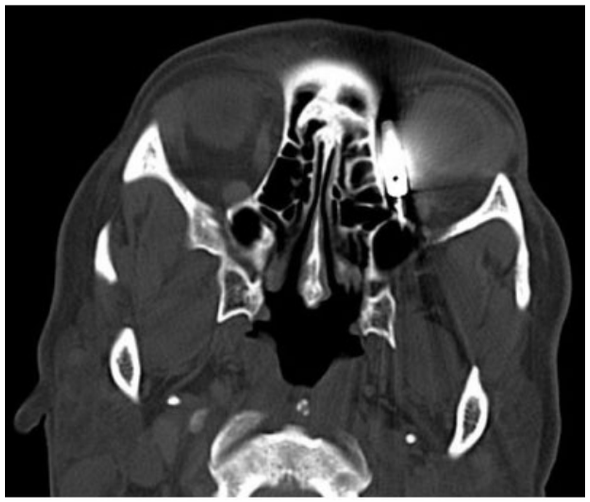


Figure 2

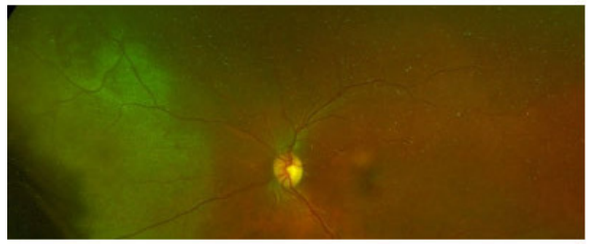


Figure 3

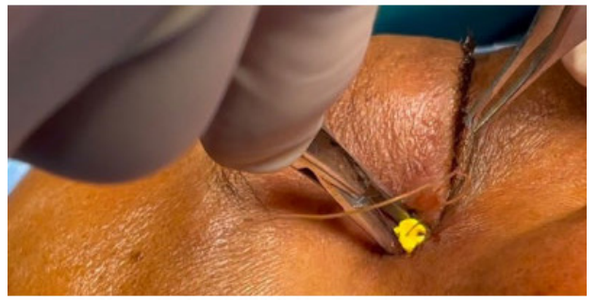


Figure 4

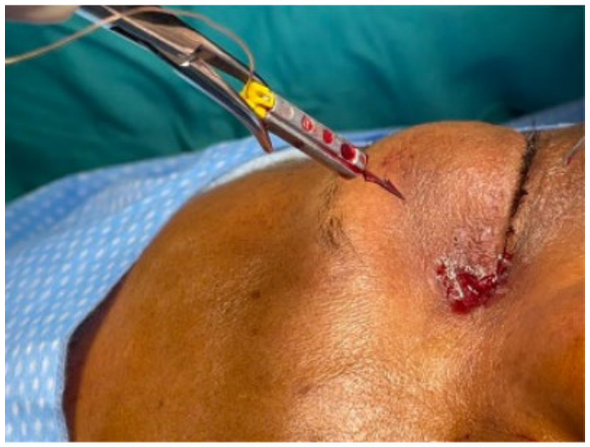
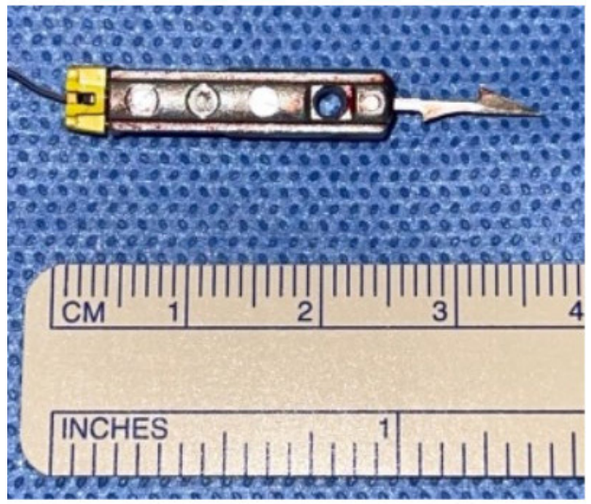


Figure 5



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Activation of Mast-Cell-Derived Chymase in the Lacrimal Glands of Patients with IgG4-Related Dacryoadenitis

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Introduction: IgG4-related disease is characterized by infiltration of IgG4+ plasma cells result in storiform fibrosis.[1] Human mast cells are resident cells of connective tissue classified into two types, i.e., MCTC cells containing both tryptase and chymase, and MCT cells containing tryptase only.[2] An attention has been focused on mast-cell-derived chymase among the studies regarding on various fibrotic-related diseases,[3] as it activates latent TGF-β1 and procollagen-I in their active forms.[4] The purpose of this study was to investigate the involvement of the mast-cell-derived chymase in the pathogenesis of IgG4-related ophthalmic disease (IgG4-ROD), researching the expression of chymase in the lacrimal-grand tissue.

Methods: This prospective study involved 7 patients afflicted with IgG4-ROD (2 males, 5 females, mean age: 52.4±10.7 years, range: 39-72 years) and 6 non-IgG4-ROD patients for control (3 males, 3 females, mean age: 76.3±5.3 years, range: 67-85 years) who underwent lacrimal-gland biopsy for the diagnosis. Histopathological studies, including immunohistochemical staining using chymase- and tryptase-antibody, were performed to determine the distribution of chymase- and tryptase-positive mast cells. The mast cells were counted under the high-power field (HPF, 200X) at 3 hot-spot areas in each specimen, and the mean counts of 3 areas were analyzed to compare the two groups. Correlation between chymase- and tryptase-positive mast cells were analyzed. Real-time polymerase chain reaction (RT-PCR) analysis was also performed to compare the mRNA expression of tryptase, chymase, TGF-β1, and collagen-I in the lacrimal-glands specimen of both groups. The Mann-Whitney U test was utilized to compare the cell counts and mRNA expression between two groups. Pearson's correlation coefficient was measured to test the linear relationship, and a *P*-value of <0.05 was considered statistically significant.

Results: The histopathological study revealed the number of both chymase-positive and tryptase-positive mast cells increased in the IgG4-ROD group compared to the control (Figure 1) with significant difference of *P*=0.003, *P*=0.004, respectively. The numbers of chymase-positive cells and tryptase-positive cells were found to have a strong positive correlation between the expression of chymase and tryptase (r=0.928, Figure 2). The mRNA expression of chymase, tryptase TGF-β1, and collagen-I tended to increase in the IgG4-ROD patients compared to the contorl. (*P*=0.153, *P*=0.086, *P*=0.198, and *P*=0.003, respectively)

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Conclusions: Our study showed that chymase increased in the involved lacrimal glands with IgG4-ROD, possibly result in an increase of TGF-β1 and collagen I that may form characteristic storiform fibrosis.

Figure 1

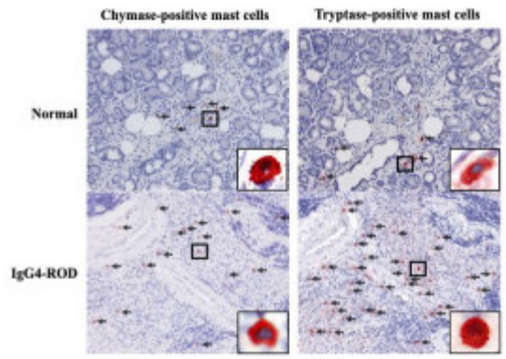
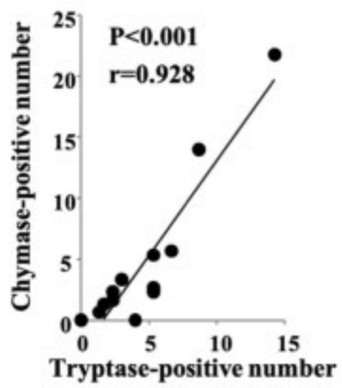


Figure 2



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Altas-Based Automated Segmentation of the Orbit

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Introduction: This study aims to develop an automated atlas based method for segmentation of orbital soft tissues on computed tomography (CT) scans. There is no previously-published fully automated segmentation for orbital soft tissue compartments. Automatically identifying and characterizing these compartments would have applications for conditions such as thyroid eye disease, such as aiding in diagnosis and evaluating change over time.

Methods: Orbit CT scans from patients without orbital pathology were retrospectively collected and manually segmented for orbital fat, optic nerve, lacrimal gland, globe, and each extraocular muscle. A nonlinear registration process was also used to segment these individual patient scans using a novel CT atlas of the average adult orbit, labeled using expert consensus by neuroradiologists and orbital surgeons.

Results: A total of 22 scans were included in this study. Accuracy as determined by the Jaccard index varied between 0.679 and 0.907, depending on the structure, while the mean Dice coefficient ranged from 0.785 to 0.946.

Conclusions: This automated atlas-based process produces accurate segmentation of orbital soft tissue compartments. This is the first such fully automated segmentation of orbital soft tissue components, allowing for rapid determination of specific soft tissue compartment volume and density on CT, which has many potential clinical and research applications.

An Unusual Case of Chronic Veillonella Dispar Orbital Cellulitis in Delayed Diagnosis of Occult Wooden Orbital Foreign Bodies

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Introduction: *Veillonella dispar* is a Gram-negative anaerobic coccus, normally resides in the mouth, gastrointestinal tract, and urogenital area. It is rarely described as an infectious cause of periodontitis, meningitis, endocarditis, osteomyelitis, pelvic, pulmonary and epidural abscesses, and life-threatening bacteremia. To the best of our knowledge, this is the first case report describing 2 months of *V. dispar* orbitcal cellulitis with delayed diagnosis of retained wooden foreign bodies.

Methods: An 11 year old boy was referred for 10 weeks of right eye swelling and redness with foul smelling discharge after fallen on a *Hydrangea* bush. His past medical history was significant for prematurity with repaired ventricular septal defect and speech delayed. He initially had examinations under anesthesia with removal of an eyelid foreign body and excision of conjunctival pyogenic granuloma and was treated with tobramycin-dexamethasone ointment and vancomycin. He was discharged with trimethoprim/sulfamethoxazole and moxifloxacin. Examination was significant for visual acuity of 20/60 OD, 20/40 OS. There was no afferent pupillary defect, but motility was limited with right eye adduction. A 3mm proptosis was noticed along with injection and chemosis of the caruncle and jagged conjunctival scars of the right eye. Slit lamp examination and dilated fundus examination was unremarkable. Orbital CT scan revealed a 1.2 x 0.5 x 0.5 cm extraconal soft tissue thickening with enhancement in the superomedial orbit without fat stranding or sinus opacification. The patient underwent an exploratory orbitotomy with removal of 2 large wooden foreign bodies. Wound culture grew *Veillonella dispar* susceptible to clindamycin and metronidazole. He had an eventful recovery with resolution of infection at one month follow up after completion of a 10 days course of clindamycin.

Results: Conclusions: An orbital foreign body should be suspected even in low-velocity trauma. This case highlighs the needs for orbital exploration to retrieve any remaining orbital foreign body even after removal of eyelid and conjunctival foreign body. Previous reports of closely related *V. parvula* causing eyelid abscess and dacryocystitis responded to chloramphenicol and cephalosporins respectively. *V. parvula* peri-orbital cellulitis in an infant with resistant to penicillin, amoxicillin/cavulanate and metronidazole responded to clindamycin for two months. Next generation sequencing may be a useful adjunct to culture for atypical infection as in our case.

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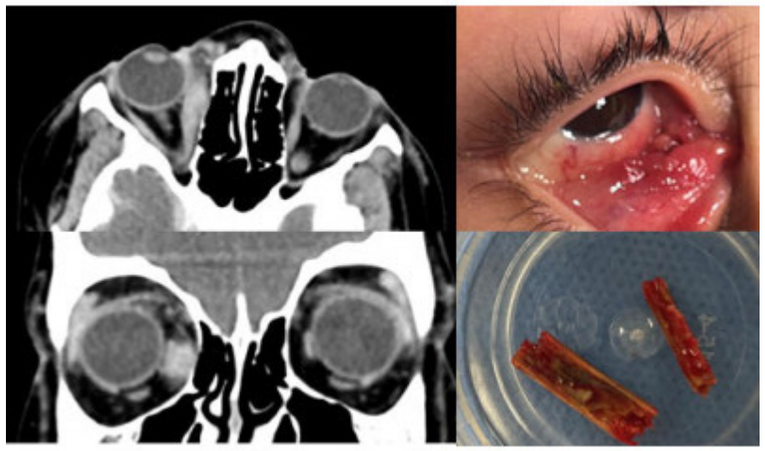
Figure 1



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Anatomic Success of Orbital Fracture Repair: A Proposed Grading System

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Introduction: There is wide variability in the quality of orbital blowout fracture repair in the U.S., but no standardized system currently exists to determine the anatomic success of the procedure. This study proposes a novel grading system for the objective assessment of anatomic success following orbital blowout fracture repair.

Methods: Description of grading criteria and scoring system.

Results: Five separate criteria are assessed on postoperative CT scan: 1.) implant positioning on stable bony ledges, 2.) implant displacement, 3.) presence of a gap between the implant and bony ledges, 4.) herniation of orbital contents, and 5.) impingement of the implant on orbital structures. Points are subtracted from a baseline score of 10 based on these objective criteria to determine a final score.

Conclusions: The described grading system can provide orbital surgeons and researchers with an objective scale by which to determine the anatomic success of orbital fracture repair. Further research is planned to determine whether a correlation exists between anatomic scores and reoperation rates or clinical outcomes.

Figure 1

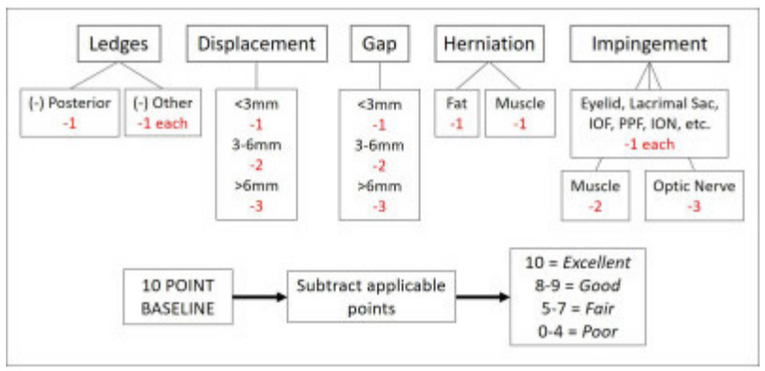
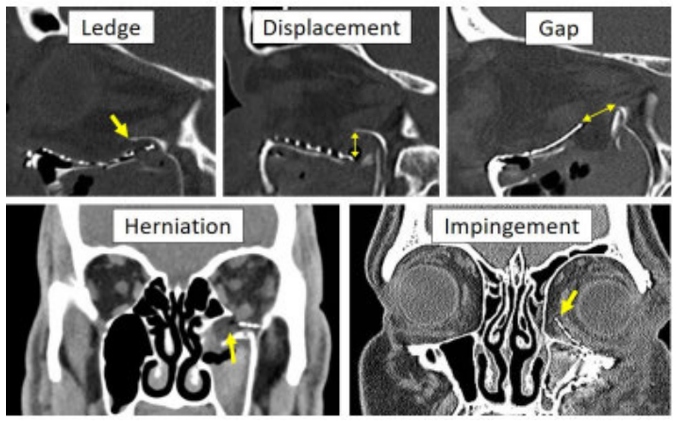


Figure 2



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ANCA-Associated Vasculitides and IgG4-Related Disease Overlap in Orbital Inflammation – A Case Series

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Introduction: IgG4-related disease (IgG4RD) and anti-neutrophil cytoplasmic antibody (ANCA)-associated vasculitides (AAV) are two distinct clinical entities; however, there have been numerous reports in the literature arguing for the existence of an overlap syndrome. The authors describe 4 patients who presented with orbital and periorbital lesions with mixed laboratory and histopathologic evidence of IgG4RD and AAV.

Methods: Retrospective case series with literature review.

Results: Four patients underwent biopsy after presenting with orbital and periorbital inflammation. Three biopsies were obtained from orbital lesions and 1 tissue sample came from a diffuse, plaque-like yellow eyelid lesion. All 4 patients had IgG4+ cells (> 30 cells/hpf) on their tissue biopsies and elevated serum IgG4 (> 135 mg/dL). One patient was initially diagnosed on biopsy with IgG4RD, but repeat biopsy was more consistent with granulomatosis with polyangiitis (GPA). Another patient had been previously diagnosed as a Rosai-Dorfman or Erdheim-Chester variant before the eventual diagnosis of IgG4RD was made. Of note, all 4 patients were ANCA and anti-proteinase 3-positive as well. One of the 4 patients was pANCA-positive only, while the other 3 patients had positive serum cANCA (1 had concurrent pANCA positivity). Two of the patients with IgG4RD improved with mycophenolate therapy. The patient diagnosed with GPA improved with a combination of rituximab and prednisone.

Conclusions: GPA and other AAVs can closely mimic IgG4RD, and vice versa, especially in and around the orbit. Differentiating between the two can be a diagnostic challenge, and clinicians must be aware of this diagnostic pitfall to ensure proper management. Further research is required to better understand the relationship between IgG4RD and other inflammatory conditions including xanthogranulomatous disease, GPA, and AAV.

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Figure 1

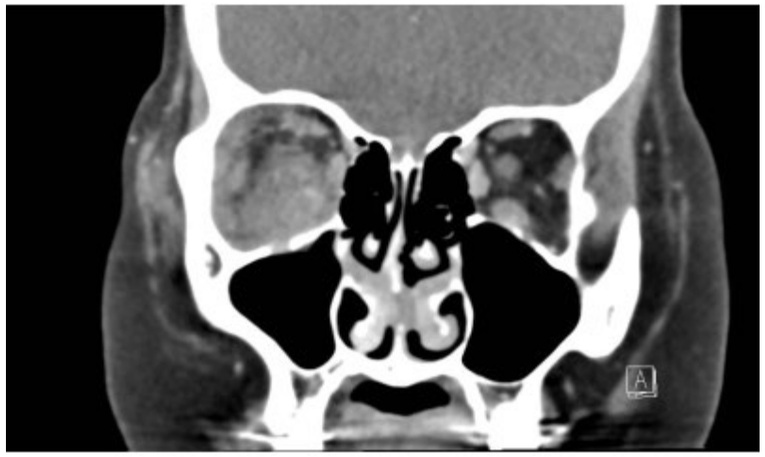
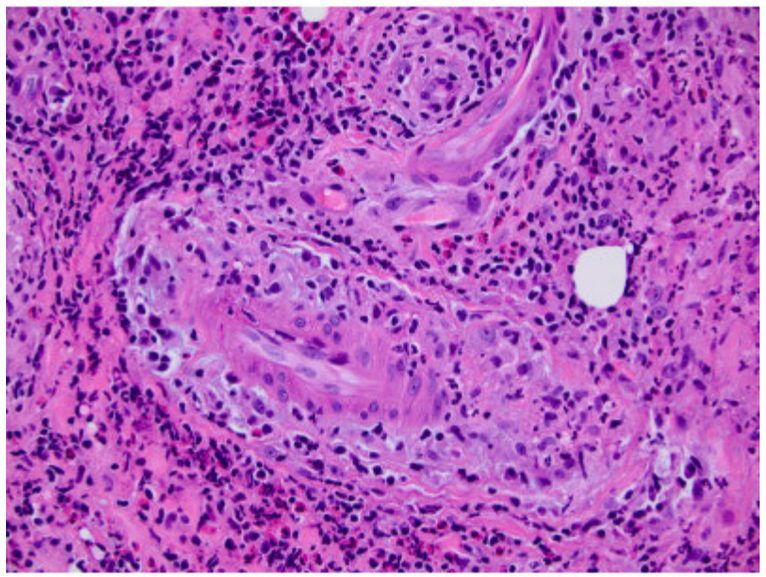


Figure 2



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Comparison of Laryngeal Mask Airway and Endotracheal Intubation for Orbital Fracture Repair

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Introduction: Supraglottic airways, such as the laryngeal mask airway (LMA), are an alternative to intubation with an endotracheal tube (ETT) for patients undergoing general anesthesia. Several studies have demonstrated that LMAs are safe and effective with advantages over ETT, such as ease of use, better hemodynamic stability during intubation and extubation, shorter anesthesia induction time and recovery time, and lower cost.[1-9] Previous studies[10-12] have demonstrated that LMAs are safe and may be even superior for surgical cases involving the oral cavity and upper respiratory tract. ETT can be associated with increased coughing and Valsalva during extubation, which can cause increased nasal bleeding.[10] On the contrary, LMAs provided a higher quality surgical field and less blood loss with superior upper airway protection during nasal, sinus surgery, and dacryocystorhinostomy.[11-13]

Orbital fracture repair can have significant sinus bleeding and secretions which can theoretically place the patient at risk for blood aspiration. As such, some providers prefer to use an ETT tube during orbital fracture repair. However, the increased coughing and Valsalva during extubation with ETT can theoretically increase the risk of orbital hemorrhage. To the author's knowledge, no study has evaluated the safety and efficacy of LMAs in patients undergoing orbital surgery, particularly orbital fracture repair. The purpose of this study is to evaluate the safety of LMAs as compared to ETTs in patients undergoing orbital fracture repair, and to determine if there is an increased risk of postoperative orbital hemorrhage in patients with an ETT undergoing orbital fracture repair.

Methods: This retrospective cohort study examined all patients who underwent orbital fracture repair at the practices of the authors from 2012 to 2020. Patients were excluded if they had concurrent repair of other facial fractures or a preexisting tracheostomy. Data obtained included patient demographics, type of fracture repaired, type of airway used by anesthesia, and any airway or immediate postoperative complications. The patients were divided into two groups based on whether an LMA or ETT was used during the surgery. Outcome variables included significant airway complications and immediate postoperative orbital complications, such as orbital hemorrhage.

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Results: There were 506 patients who underwent orbital fracture repair during the time period. An ETT was used in 310 patients, while an LMA was used in 196 patients (Table 1). There was no statistically significant difference in the demographics between the two groups. Neither group had any significant airway complication. As shown in Table 2, the LMA group had no immediate postoperative orbital complications, while two patients in the ETT group had postoperative events (*p= 0.*52). One patient had prolonged coughing following extubation leading to severe periorbital edema, while another developed an orbital hemorrhage requiring emergent intervention. There was a general trend of more ETT cases compared to LMA from 2013 to 2019 without a statistically significant difference in these years alone (p=0.10) as shown in Table 3.

Conclusions: In patients undergoing orbital fracture repair, LMAs are safe and may help to prevent postoperative complications such as orbital hemorrhage.

Table 1

		Total Patients (506)	%
Gender			
	Male	297	(58.7%)
	Female	209	(41.3%)
Age			
	Average age (years)	38.8	
	Youngest patient (years)	2	
	Oldest patient (years)	90	
	Number of pediatric patients (age<18)	75	(14.5%)
Fracture Type			
	Floor	268	(52.9%)
	Floor/medial wall	171	(33.8%)
	Isolated medial wall	55	(10.9%)
	Roof	11	(2.2i%)
	NOE	1	(0.2%)
Airway Type			
	Endotracheal Tube (ETT)	310	(61.3%)
	Laryngeal Mask Airway (LMA)	196	(38.7%)

Table 1: Study Population Characteristics

Table 2

		Endotracheal Tube (ETT)	%	Laryngeal Mask Airway (LMA)	%	P value
Total Patients		310		196		
Gender						0.66
	Male	181	(58.4%)	116	(59.2%)	
	Female	129	(41.6%)	80	(40.8%)	
Age						
	Average age (years)	39.66		37.5		0.25
	Youngest patient (years)	2		5		
	Oldest patient (years)	90		90		
	Number of pediatric patients (age<18)	40	(12.7%)	35	(17.3%)	0.14
Fracture Type						0.51
	Floor	158	(50.9%)	110	(56.1%)	
	Floor/medial wall	105	(33.9%)	66	(33.7%)	
	Isolated medial wall	38	(12.3%)	17	(8.7%)	
	Roof	8	(2.6%)	3	(1.5%)	
	NOE	1	(0.3%)	0	(0.0%)	
Airway Complications						
	Aspiration, prolonged extubation, pneumonia, need for hospitalization	0	(0.0%)	0	(0.0%)	
Postoperative Complications						
	Complications	2	(0.6%)	0	(0.0%)	0.52
	Orbital hemorrhage/ Compartment syndrome	1	(0.3%)	0	(0.0%)	1.0

Table 2: Comparison of Endotracheal Tube vs Laryngeal Mask Airway groups

Table 3

Table 3 Comparison of Airway Type Based on Date of Surgery

Time of Surgery	Total Patients	Endotracheal tube (ETT)	%	Laryngeal Mask Airway (LMA)	%	P value
2012	70	60	(85.7%)	10	(14.3%)	
2013	59	27	(45.8%)	32	(54.2%)	
2014	64	42	(65.6%)	22	(34.4%)	
2015	67	41	(61.2%)	26	(38.8%)	
2016	57	41	(71.9%)	16	(28.1%)	
2017	57	34	(59.6%)	23	(40.4%)	
2018	41	22	(53.7%)	19	(46.3%)	
2019	43	28	(65.1%)	15	(34.9%)	
2020	48	15	(31.3%)	33	(68.7%)	p<0.05
Prior to orbital hemorrhage in 2017	335	226	(67.5%)	109	(32.5%)	
After orbital hemorrhage in 2017	170	83	(48.8%)	87	(51.2%)	p<0.05

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Echographic Assessment of Extraocular Muscle Response to Teprotumumab

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Introduction: Thyroid eye disease (TED) is a progressively debilitating autoimmune disease that can manifest with proptosis, diplopia, and enlarged extraocular muscles (EOM). While MRI and CT have been used to assess the severity of TED dysfunction and monitor therapeutic ocular responses, the use of orbital echography to evaluate teprotumumab response in TED has not been previously reported. The purpose of this study is to evaluate the use of orbital echography, which is both cost effective and time efficient, in assessing EOM response to teprotumumab in TED patients.

Methods: This IRB-approved retrospective study was conducted at a academic ophthalmology department between January 2020 and May 2021. Adult TED patients with pre- and post-teprotumumab orbital echography were included in this study. Data collected included: age, Hertel measurements, clinical activity score (CAS), Gorman diplopia scores, ocular motility, and recti muscle diameters as measured by echography. The more proptotic eye of each patient prior to treatment initiation was designated as the study orbit[1]. Ocular motility was assessed by totaling the ductions in all four cardinal directions as measured by the light reflex technique[2]. Orbital echography was obtained prior to treatment and between a minimum of two weeks to three months post treatment. Response of total and individual EOM diameters was assessed. Statistical analysis of EOM recti diameters was performed using SPSS software two-tailed t-tests.

Results: Six patients (3M, 3F) with a mean age of 67 years (range 30-90) were included in this study. A mean 14% decrease in proptosis was observed post-treatment with 11/12 orbits showing improvement ($p<0.05$). All six patients had a decrease in CAS score (Table 1). Four of 6 patients had an improvement in Gorman diplopia scores, and ocular motility in the study orbit improved significantly by a total mean of 27° ($p<0.05$). Mean total EOM diameter was reduced from 27.4 to 23.4 mm. On average, superior recti were largest before and after treatment, followed by inferior, medial, then lateral recti (Table 2). However, inferior recti showed the greatest reduction, followed by medial and superior recti, with significant reductions in size at 23%, 16%, and 13%, respectively ($p<0.02$ for all). Lateral recti reduction of 5% was not significant ($p=0.40$) (Table 2). After completing infusions, all six patients experienced a reduction in total EOM diameter, ranging from a 5-29% decrease (Table 3).

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Conclusions: Orbital echography demonstrated overall EOM reduction in all patients after teprotumumab, which correlated with improved CAS scores. Compared to MRI and CT, orbital echography offers a safe, cost effective, and efficient imaging alternative to assess EOM response to TED therapy. Because of its safety profile, echography may be used to monitor therapeutic response to teprotumumab during treatment and at follow-up appointments to assess treatment efficacy.

Table 1

Table 1. Clinical outcomes after teprotumumab

	Clinical Activity Score (CAS)		Gorman diplopia score		Proptosis reduction (mm)	
	Pre-treatment	Post-treatment	Pre-Treatment	Post-Treatment	Study orbit	Non-study orbit
Patient 1	1	1	3	4	4.0	5.0
Patient 2	2	0	4	4	6.0	3.5
Patient 3	7	0	4	0	7.0	4.5
Patient 4	3	2	3	2	2.0	2.5
Patient 5	6	3	3	0	3.0	-1.5
Patient 6	5	2	3	0	3.5	2.0

Clinical response to teprotumumab measured by: Clinical activity score (CAS), Gorman diplopia score, and proptosis changes after therapy. Study orbit indicates the more proptotic eye before treatment initiation.

Table 2

Table 2. Extraocular muscle diameter changes in study and non-study orbits

	Pre-treatment mean (mm)	Post-treatment mean (mm)	Mean % reduction post-treatment	p-value
Total EOM	27.4 ± 4.39	23.4 ± 4.49	15%	<0.01*
Inferior rectus	6.87 ± 0.90	5.28 ± 0.96	23%	<0.01*
Medial rectus	5.88 ± 1.01	4.96 ± 0.82	16%	<0.02*
Superior rectus	9.85 ± 1.61	8.53 ± 1.90	13%	<0.02*
Lateral rectus	4.84 ± 0.88	4.59 ± 0.80	5%	0.4

Total extraocular muscle (EOM) is the sum of all four recti muscles as measured on echography.
* p-value indicates statistical significance at $p < 0.05$ (n=12 orbits).

Table 3

Table 3. Extraocular muscle diameter totals in study and non-study orbits

	STUDY ORBIT			NON-STUDY ORBIT		
	EOM diameter total (mm)			EOM diameter total (mm)		
	Pre	Post	% Reduction	Pre	Post	% Reduction
Patient 1	28.59	21.99	23%	27.37	22.66	17%
Patient 2	25.66	23.39	9%	28.67	20.38	29%
Patient 3	27.70	23.81	14%	28.77	23.44	19%
Patient 4	28.79	23.11	20%	28.33	24.56	13%
Patient 5	21.95	19.82	10%	22.62	17.87	21%
Patient 6	29.74	29.70	13%	31.14	29.70	5%

Extraocular muscle (EOM) diameter total demonstrates the sum of all four recti diameters before and after teprotumumab on echography. Study orbit indicates the more proptotic eye before treatment initiation.

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Effect of Teprotumumab on Ocular Surface Disease in Active Thyroid Eye Disease

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Introduction: Over 65% of patients with thyroid eye disease (TED) complain of ocular surface symptoms, likely due to increased corneal exposure, accelerated tear film evaporation, and ocular surface inflammation.[1-4] The purpose of this study was to investigate the effect of teprotumumab on quantitative and qualitative measurements of ocular surface disease among patients with TED.

Methods: This prospective cohort study included patients with moderate to severe TED and dry eye symptoms treated with teprotumumab. Patients were evaluated at baseline and week 24 after 8 infusions of teprotumumab. Measurements of ocular surface disease included: clinical signs of conjunctival injection and chemosis, the Schirmer tear test, the Standardized Patient Evaluation of Eye Dryness (SPEED) questionnaire, and meibomian gland evaluation using infrared meibography with the Oculus Keratograph 5M. Meibography scores were assessed by 2 masked graders using a validated, 4-point ImageJ scale (http://imagej.nih.gov/ij/; NIH, Bethesda, Maryland, USA): grade 0 = no meibomian gland loss (MGL); grade 1 = 66% MGL. Quality of life changes were assessed using the visual functioning-specific subset of the Graves' ophthalmopathy-specific Quality of Life (GO-QOL) questionnaire.

Results: 16 patients were analyzed, (13 females and 3 males), with a mean age of 52 years (range 30 to 82 years). Patients experienced significant improvement in the frequency and severity of dry eye symptoms (P = 0.001), with lower SPEED scores after 24 weeks of teprotumumab treatment (9.81 ± 5.98, mean ± SD) compared to baseline scores (15.88 ± 4.47). Clinical signs of ocular surface disease significantly improved among those with baseline findings, with resolution (53.33%) or improvement (46.67%) of conjunctival injection in all patients and resolution (87.5%) or improvement (12.5%) of chemosis in all patients at 24 weeks. Schirmer test results for the studied eyes also improved overall at 24 weeks (20.14 ± 11.77) compared to baseline (17.13 ± 10.29). In eyes with abnormally low baseline tear volumes (less than 10 mm wetting in 5 minutes), Schirmer tear volumes almost doubled at 24 weeks (13.65 ± 10.01) compared to baseline (7.14 ± 2.73) (P = 0.151). Meibography analysis revealed improvement in the grade of meibomian gland loss in 35.71% of patients, with the meibomian gland dropout rate decreasing from 46% (± 15.16%) at baseline measurements to 35% (± 12.59%) after 24 weeks of treatment (P = 0.059). Visual functioning-related quality of life significantly improved (P = 0.00018), with higher scores at 24 weeks (79.76 ± 23.47) compared to baseline (54.61 ± 24.18).

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Conclusions: Teprotumumab significantly improved both quantitative and qualitative measurements of ocular surface disease as well as visual functioning-related quality of life at 24 weeks compared to baseline. Meibomian gland analysis showed some improvement in meibomian gland loss with therapy. Additional studies with longer follow-up are needed to confirm these findings and assess durability of improvement in ocular surface symptoms.

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Effects of Smoking on Outcomes of Thyroid Eye Disease Treated with Teprotumumab

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Introduction: Patients with thyroid eye disease who smoke have been shown to have less favorable response to treatment with glucocorticoids and radioactive iodine ablation, greater disease severity, and increased risk of disease progression. Teprotumumab is a recently approved IGF-1 receptor inhibitor which has been shown to reduce orbital fat volume, proptosis, diplopia, and improve quality of life in patients with thyroid eye disease. The impact of smoking on response to teprotumumab therapy is not yet known. In this single center, retrospective study we describe the effects of smoking on teprotumumab outcomes.

Methods: Literature review and retrospective cohort study.

Results: 34 patients with thyroid eye disease who were scheduled to begin teprotumumab were reviewed. Of those 34, 16 of them began or completed teprotumumab during the course of the study. The remaining 18 were excluded. Seven of the included 16 (43.7%) patients were ever-smokers. All of the smokers in the study had type 2 disease, defined as in diplopia within 20 degrees of fixation with restrictive myopathy, versus type 1 disease which affects orbital fat without diplopia.

Visual acuity (VA) outcomes were not significantly different between smokers versus non-smokers. All smokers had VA of 20/25 or better after receiving treatment with teprotumumab, except one patient who had a long-standing history of nystagmus and decreased visual potential whose vision remained stable and fluctuated between 20/30 and 20/40 OU.

Six of the 7 (85.7%) smokers had diplopia prior to treatment, whereas 6 of the 9 (66.6%) non-smokers began with diplopia. Of the smokers, only two of the six patients had resolution of diplopia with treatment, while four of the six non-smokers reported resolution or improvement in diplopia. One smoker without initial diplopia developed complaints of diplopia after treatment.

Only one smoker had documented improvement in clinical activity score (CAS), from 6 to 1. Four of the 9 non-smokers had reduction in CAS, by 6.6 points on average.

Proptosis was reduced by 1.5mm per eye on average in smoker's versus 2.9mm per eye in non-smokers.

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Conclusions: Smoking is a modifiable risk factor known to increase risk and severity of thyroid eye disease. Smoking has shown decreased effectiveness on several outcome measurements of teprotumumab treatment in this small study. More extensive research is needed to assess the long-term impact of smoking on teprotumumab effectiveness. Patients with thyroid eye disease should be counseled regarding the negative impact smoking may have on treatment outcomes and offered resources for smoking cessation.

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Effects of Teprotumumab Therapy on Chronic Graves Disease Patients

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Introduction: The purpose of this case series is to describe the effects of Teprotumumab therapy on patients with chronic Thyroid eye disease (TED).

Methods: Data was collected retrospectively of patients with a > 9-month-history of TED, with or without prior orbital radiotherapy, who completed an eight dose treatment course of teprotumumab. Key pre-treatment and post-treatment measurements included degree of proptosis, as measured by the same observer using the same Hertel ophthalmometer; and Clinical Activity Score (CAS).[1] Additional data collected included degree of diplopia, as measured by the Gorman diplopia score,[2] and degree of lagophthalmos.

Results: All five patients, including those with a history of orbital radiotherapy, achieved a proptosis reduction of > 2 millimeters in each eye and a decrease in Clinical Activity Score of > 2 points. All patients with baseline diplopia experienced an improvement in diplopia, with only one patient remaining diplopic after treatment. All eyes with baseline lagophthalmos except for one showed a decrease in degree of lagophthalmos, and over half of cases resolved. Reported treatment side effects were mild and self-limited.

Conclusions: Although generalizability is limited, the results of this report show promise for teprotumumab as a safe and efficacious therapy for patients with chronic TED and even those who have failed orbital radiotherapy. Further study of teprotumumab in this patient population is needed, though providers may be encouraged in the meantime to consider teprotumumab for their patients with chronic or referactory disease.

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Efficacy and Safety of Intravenous Corticosteroids as an Initial Treatment for IgG4-Related Ophthalmic Disease

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Introduction: To evaluate the efficacy and safety of intravenous corticosteroids as a primary treatment of IgG4-related ophthalmic disease (IgG4-ROD), compared to oral corticosteroids.

Methods: We retrospectively reviewed the medical records of patients underwent systemic corticosteroid therapy as an initial treatment of IgG4-ROD at Asan medical center from June 2012 to June 2020. Corticosteroids were administered orally or intravenously to patients according to the date of treatment. Clinicoserological features, treatment response rate, relapse rate during follow-up, the cumulative doses of prednisolone or an equivalent, and complications related to corticosteroids were compared between two groups.

Results: Thirty nine patients were evaluated over mean follow-up period of 33.0 months. Age, sex, bilaterality, initial serum IgG4 level and treatment response rate were similar in oral corticosteroid group (n = 23) or intravenous corticosteroid group (n = 16). Relapse rate during follow-up were significantly higher in oral corticosteroid group (73.9% vs. 31.3%, p = 0.04, Fisher's exact test). The cumulative doses of prednisolone or an equivalent were similar in both groups (oral corticosteroid group vs. intravenous corticosteroid group = 6.44g vs. 6.51g, p = 0.42). Corticosteroid-related systemic complications were slightly frequent in oral corticosteroid group without statistical significance (43.5% vs. 18.8%, p = 0.17).

Conclusions: Intravenous corticosteroid therapy showed better efficacy and safety compared to oral corticosteroid therapy as a primary treatment of IgG4-ROD. Further large-scale randomized prospective studies are warranted for a more definitive conclusion.

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Epidemiology of Orbital Cellulitis in the United States: A 13-Year Analysis

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Introduction: To determine the incidence rate**,** risk factors, and economic burden of orbital cellulitis in the United States.

Methods: A retrospective, longitudinal study was completed using data from the United States Nationwide Emergency Department Sample (NEDS) dataset[1]. Emergency department (ED) visits with a primary diagnosis of orbital cellulitis from 2006-2018 were included in the study. Incidence rates and descriptive statistics were calculated using linear and multivariate logistic regression models.

Results: From 2006-2018, there were an estimated 204,102 ED visits in the US with a primary diagnosis of orbital cellulitis. Children (age £ 10) comprised a majority of cases (30.9%) with a mean age of 29.2 (95% CI, 28.5-29.8). Hypertension and tobacco use were the two most commonly associated diagnoses ($p < 0.001$) overall. When stratified by age, sinusitis and conjunctivitis were most associated with orbital cellulitis in children ($p < 0.001$). Contrary to expectation, 64.7% of cases were routinely discharged from the ED and only 27.6% of cases admitted for inpatient care. The unadjusted ED charges from 2006-2018 totaled over $353 million with a mean visit cost of $2,127.24.

Conclusions: Orbital cellulitis is a costly infection to the United States. Identifying individuals at risk for infection is vital for accurate diagnosis and appropriate triage of care.

Figure 1

Secondary Diagnoses Associated with a Primary Diagnosis of Orbital Cellulitis

Associated Diagnosis	Children (0-10)	Adolescents (11-20)	Young Adults (21-44)	Adults (45-64)	Elderly (≥ 65)	Total	Total (N)	p value
Hypertension	0.0%	0.7%	8.3%	28.2%	44.8%	11.8%	24122	<0.001
Tobacco Use	0.0%	5.0%	21.1%	19.0%	8.5%	11.2%	22884	<0.001
Sinusitis	11.8%	13.2%	5.9%	7.5%	8.6%	9.1%	18639	<0.001
Conjunctivitis	6.0%	4.1%	4.6%	5.6%	7.5%	5.4%	11043	<0.001
Diabetes	0.0%	0.3%	3.3%	12.6%	19.0%	5.1%	10330	<0.001
Asthma	3.9%	4.8%	4.6%	4.5%	3.4%	4.3%	8750	<0.001
Hyperlipidemia	0.0%	0.0%	1.3%	8.3%	18.5%	3.6%	7325	<0.001
Esophageal reflux	0.5%	0.6%	2.0%	5.2%	8.7%	2.6%	5289	<0.001
Depression	0.0%	0.7%	2.8%	4.4%	4.6%	2.1%	4347	<0.001
Hypothyroidism	0.0%	0.2%	1.0%	4.1%	10.0%	2.0%	4010	<0.001

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Evisceration Without Implant Placement in Patients with Endophthalmitis: An Alternative Technique

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Introduction: Evisceration is often the procedure of choice for a blind eye with overwhelming endophthalmitis[1-3]. Previous studies have discussed whether to place an implant at the time of the primary evisceration or as a secondary stand-alone procedure to reduce the rate of infection and implant extrusion[4-8]. The purpose of this study is to describe a no-implant technique for evisceration as an alternative to traditional implant-based evisceration to avoid the risk of implant infection and extrusion and the morbidity of a second standalone surgery in the setting of endophthalmitis.

Methods: A retrospective case series was conducted of patients who underwent an evisceration with no implant placement for blind eyes in the setting of acute, overwhelming endophthalmitis over a 5-year period. Main outcome measures included presence of complications such as enophthalmos, sunken socket, ptosis, socket edema, socket contraction, pyogenic granuloma, and the need for a secondary procedure for successful fitting of the prosthesis. The technique is as follows: After removal of the uveal contents with an evisceration spoon and irrigation of the scleral cavity with absolute alcohol to ensure no remnants of uveal tissue remained, scleral relaxing incisions were made 180 degrees apart. Next, bismuth tribromophenate gauze was packed into the scleral cavity (Figure 1). Antibiotic ointment and a conformer are then placed, followed by a temporary tarsorrhaphy stitch. Three days later, the tarsorrhaphy is released and the bismuth tribromophenate gauze is removed, leaving the scleral shell to collapse on itself (Figure 2). The conformer is replaced, and the patient follows up in 1 month. At that visit, the patient is referred to an ocularist for prosthetic fitting if the socket has healed (Figure 3).

Results: A total of 16 patients underwent evisceration per the technique described above. Two patients were lost to follow up after sending for prosthetic fit and were excluded. Mean age was 66.4 years (5-93 years). Mean time to follow up was 1.39 years (0.89-2.53 years). Only 1 patient (7%) experienced a minor complication: a pyogenic granuloma that was successfully treated with topical timolol drops. Two patients (14%) required additional procedures: one patient required an in office conjunctivoplasty to induce scleral collapse, and one patient required a return to the operating room for bismuth tribromophenate gauze removal as the patient did not follow up as instructed after the initial procedure. After 3-5 days, the gauze hardens and can become extremely difficult to remove in the office. Both patients underwent successful prosthetic fitting.

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Conclusions: This study describes a novel, no-implant technique for evisceration. Notable advantages of this technique include avoiding implant infection or extrusion and reduce the need for a secondary procedure under anesthesia. In our patients, any secondary procedures were either performed in office (conjunctivoplasty) or were avoidable with appropriate patient follow up. In the blind eye with recalcitrant endophthalmitis, evisceration with the described no-implant technique is a reasonable alternative to evisceration with primary implant placement.

Figure 1

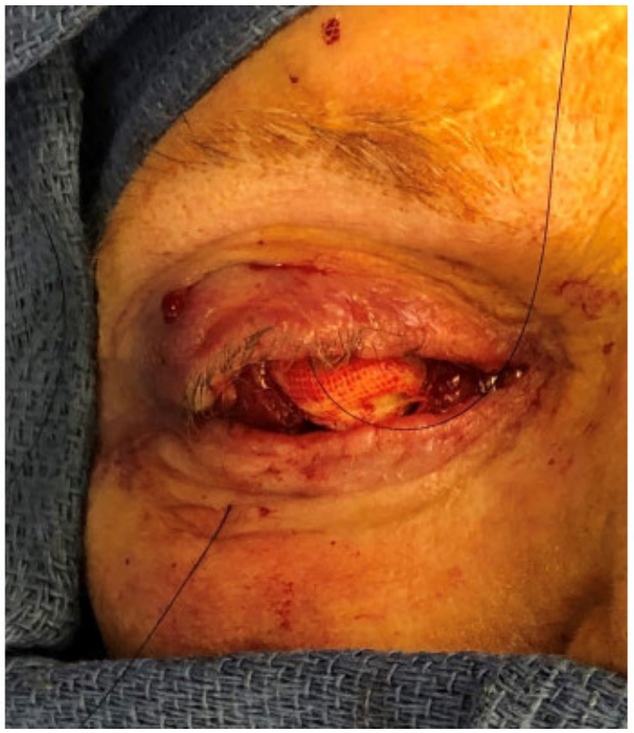


Figure 2

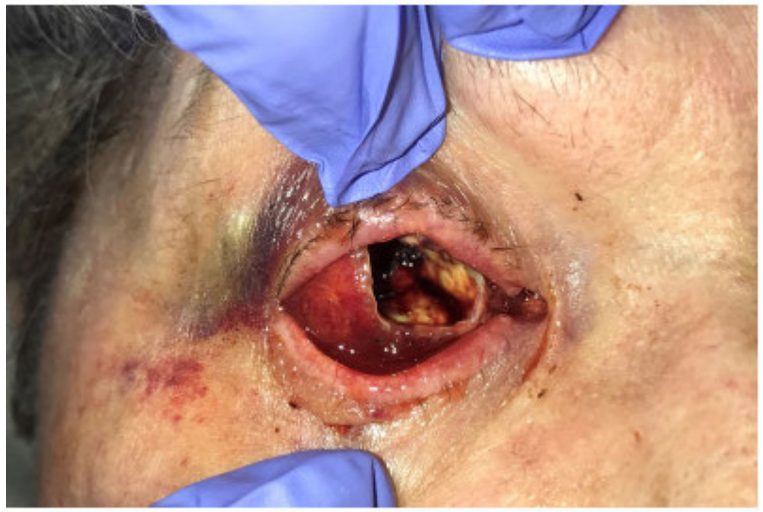
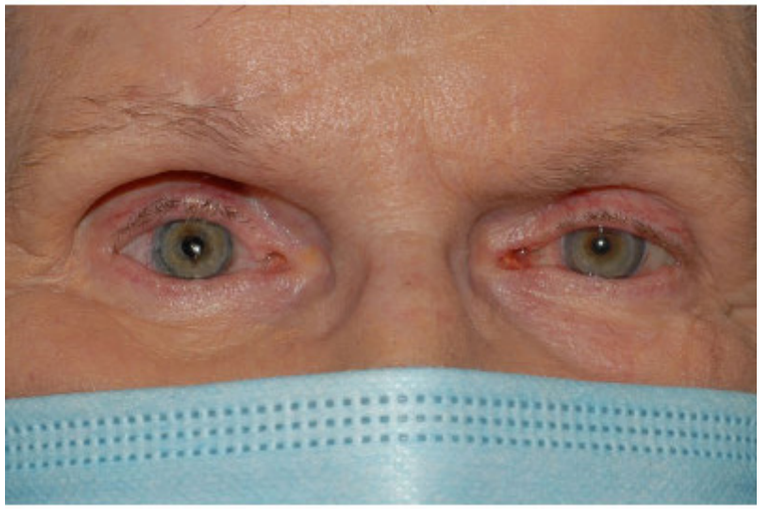


Figure 3



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Glue Embolization Without Surgical Resection for Orbital Venolymphatic Malformation

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Introduction: Orbital venolymphatic malformations are rare, benign, congenital vascular malformations[1,2] composed of endothelial-lined lymphatic cysts reinforced by a matrix of fibrous connective tissue[3-5]. Surgical resection of these lesions can be complex, especially when these lesions are in close association with critical neurovascular structures. An alternative to surgery is percutaneous sclerotherapy,[6] but this treatment carries risk of inflammation and off target application may limit use in the intraconal space. Glue embolization followed by surgical resection tends to have better long term efficacy, however this modality can similarly be limited when the lesion involves critical intraconal structures. Glue embolization without surgical resection is rarely considered in the orbit, although it is performed elsewhere in the body. This report describes such use in the orbit.

Methods: In this case report, clinical and radiologic features are presented in descriptive format.

Results: A 59-year-old man presented with persistent pain and Valsalva-induced expansion of a recurrent left orbital distensible, venous dominant venolymphatic malformation. Over his 15 year clinical course, the patient underwent multiple rounds of sclerotherapy, experiencing only transient relief with these procedures. Over time vision was compromised to NLP on presentation. Examination revealed with 8 mm of relative enophthalmos and rapid filling and draining of the lesion with Valsalva maneuver. Pain was noted for most bending activities, interfering with both work and sleep. Given baseline enophthalmos and poor vision of the left eye, glue embolization without surgical resection was offered. After two rounds of glue embolization, the patient experienced a marked decrease in baseline and Valsalva-induced pain as well as partial resolution of enophthalmos. He remains stable at 7 months post therapy. Figure 1a demonstrates the pre-Valsalva appearance and Figure 1b demonstrates post-Valsalva expansion. Figure 1c depicts the patient's external appearance after glue embolization and Figure 2b depicts the post-embolization axial orbital CT angiography.

Conclusions: The use of glue embolization without surgical resection may be a viable option in selected patients, particularly those who are not surgical candidates due to anatomic localization, who do not achieve effective pain control with sclerotherapy, and who demonstrate baseline enophthalmos. Glue embolization without resection may thus provide a conservative approach to selected orbital distensible venous dominant venolymphatic malformations.

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Figure 1

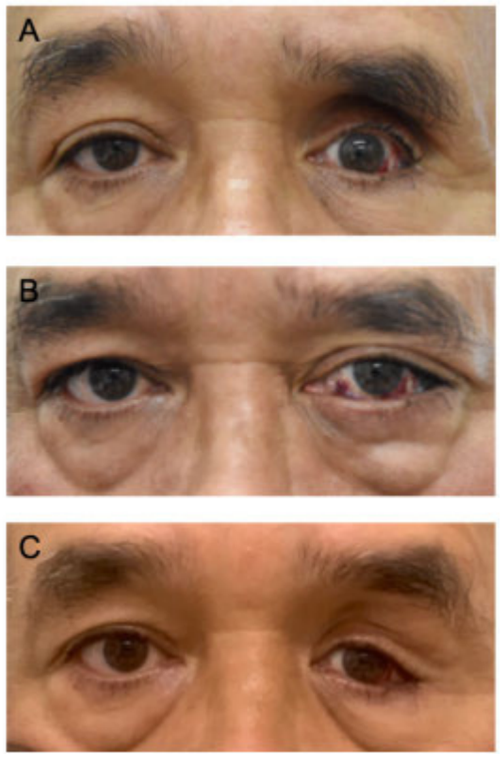
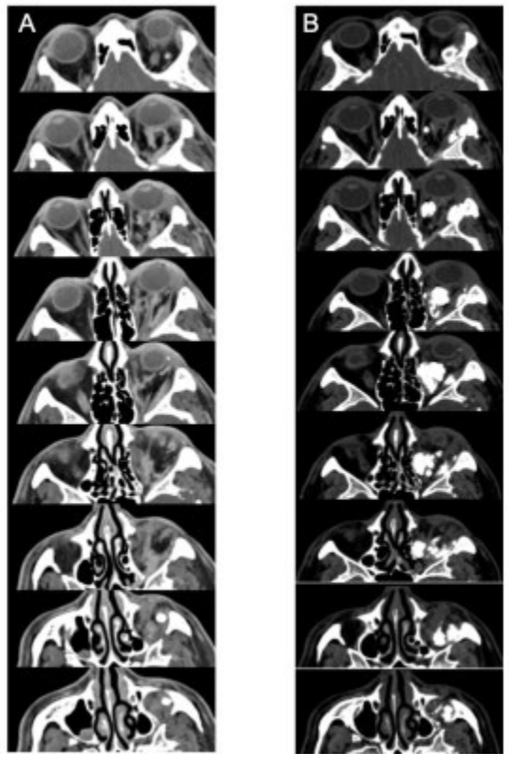


Figure 2



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Hematic Pseudocyst Masquerading as Orbital Cellulitis and Sinusitis

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Introduction: Hematic pseudocysts are fibrous, non-epithelial lined capsules containing blood byproducts that may present many years following orbital fracture hardware implantation. Trauma, implant migration, and tissue erosion may cause hemorrhage into the capsular space.[1] Risk factors include inadequate posterior fracture reduction and use of nonporous material preventing fibrovascular ingrowth.[1,2] Mass effect from these lesions causes patients to present with pain, lid swelling, hyperglobus, proptosis, lid retraction, motility restriction, and blurry vision. Imaging typically reveals a well-defined, homogenous mass surrounding the implant and prior fracture.[1] Herein we report a unique case of hematic pseudocyst masquerading as orbital cellulitis with maxillary sinusitis.

Methods: All patient information was handled in compliance with HIPAA guidelines. A literature review of relevant cases indexed on PubMed was performed using the keywords “orbital fracture,” “hematic cyst,” and “pseudocyst.”

Results: A 59-year-old male presented two years after orbital floor fracture repair with two days of right sided periorbital pain and swelling. He denied new trauma, discharge, fever, rash, or vision changes. He reported chronic nasal allergies but no sinus pain, congestion, or sore throat. CT showed a soft tissue collection between the inferior rectus and floor fracture fragment with peripheral enhancement and central fluid density (Figure 1). Maxillary sinus inflammation was also noted. The patient was diagnosed with orbital cellulitis, given intravenous antibiotics, and transferred to our institution.

Upon our examination, visual acuity was 20/20. Intraocular pressure, pupils, and motility were normal. There was mild periorbital edema, hyperglobus, and proptosis, but the eye exam was otherwise normal, raising suspicion for a noninfectious process (Figure 2).

After one day of antibiotics, the patient had not improved and was taken to the operating room. Transconjunctival orbitotomy was performed, revealing two stacked silicone/plastic implants with titanium screw fixation, which were found to be surrounded by a blood byproduct-filled capsule without purulence. Incomplete posterior fracture reduction was noted. The implant, screw, and blood were removed. Given globe symmetry and lack of enophthalmos, no additional implant was placed and the incisions were closed. The patient was discharged on an oral and topical antibiotic.

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Literature review revealed 27 prior cases of hematic pseudocyst surrounding an orbital floor implant for which a full case description was available (Table 1). While six recent cases have occurred with porous implants, the majority involve nonporous implants similar to that found in our patient. Retrospective studies by Romano and Peng reported 0/140 and 1/269 occurrence rates with porous implants, but follow-up duration was limited.[1,2] Pseudocysts have been misdiagnosed as a choroidal mass, orbital tumors, and transient ischemic attacks.[3-5] One case involved a pseudocyst which expanded into the maxillary sinus, but without any associated hardware.6 To our knowledge, this is the first reported case of a hardware-associated orbital pseudocyst masquerading as orbital cellulitis with opacification of the maxillary sinus.

Conclusions: We have reported a unique case of hardware-associated hematic pseudocyst masquerading as orbital cellulitis. Orbital surgeons should be aware of the increased risk with nonporous implants, the delay to presentation, and the possibility of misdiagnosis as infectious or neoplastic entities.

Figure 1

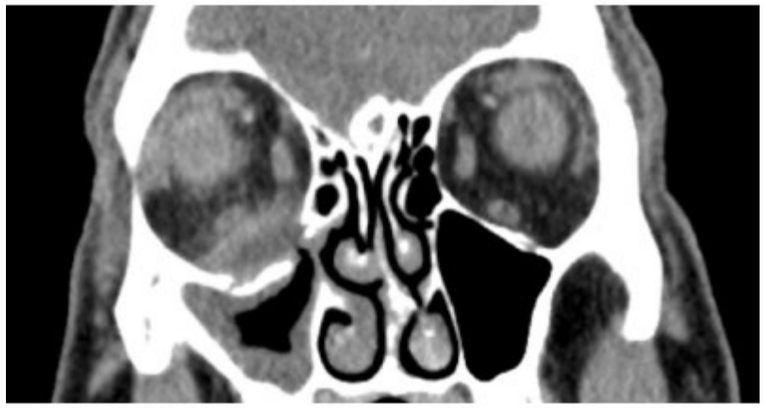


Figure 2

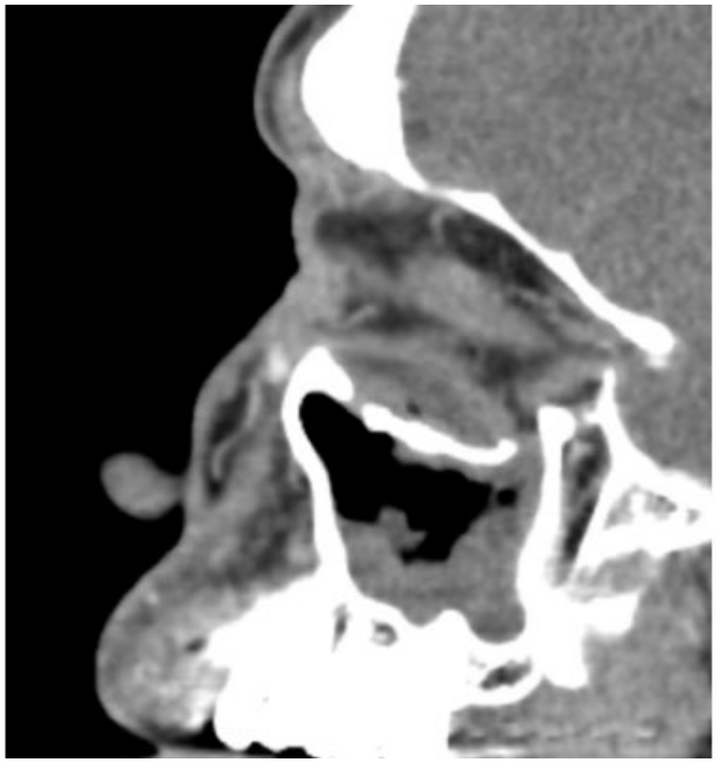
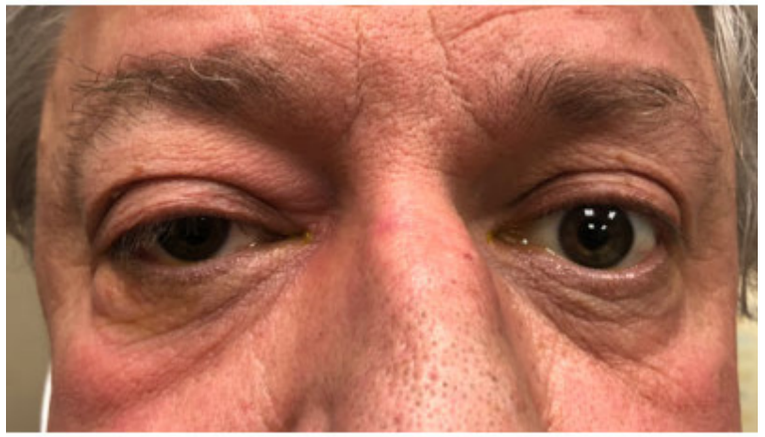


Figure 3



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Histopathologic Correlation of Radiographic Features in Well-Circumscribed Orbital Tumors

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Introduction: The more common well circumscribed tumors of the orbit can be recognized relatively accurately based on CT and MRI features. However, in some cases the radiologic appearance may be atypical, leading to an intraoperative or postoperative histopathologic surprise. This study is intended to understand histopathologic-radiologic correlates in both radiologically typical and atypical lesions commonly found in the orbit.

Methods: Patients undergoing biopsy for one of four diagnoses were included. Mass lesions included: solitary fibrous tumour (SFT), schwannoma (SCH), cavernous venous malformation (CVM) and lymphoma (LYM). Imaging was reviewed in a systematic manner to identify both typical and unusual radiographic features. Patient records were reviewed to collect demographic and clinical information. Histopathology was reviewed at both low and high power, and microscopic characteristics are described for distinct radiologically identified regions.

Results: Imaging was reviewed for a total of 59 patients. Histopathologic diagnosis included SFT (8/59; 13.6%), SCH (4/59; 6.8%), CVM (22/59; 37.3%) and LYM (25/59; 42.4%). SFT were considered typical if described as homogenous, isointense T1 lesions with early diffuse contrast enhancement. One SFT demonstrated an unusual bi-lobed organization with a distinct region that was hypointense on T1 and T2, with minimal patchy enhancement (Figure 1A – C). Histopathology demonstrated spindle shaped cells with elongated nuclei and eosinophilic cytoplasm separated by dense collagen fibres, and the degree of cellularity was inversely correlated with T2 intensity (Figure 1, D – F). SCH were considered typically appearing if described as homogenous, isointense on T1 and heterogenous, hyperintense on T2. An unusual appearance was noted in one case in in which biphasic contrast enhancement and T2-heterogenity was demonstrated (Figure 2, A and B). Areas of T2 hypo-intensity corresponding to Antoni A, iso-intensity corresponding to Antoni B and one small area of hyperintensity corresponding to a region of melanocytic pigmentation (Figure 2, C – E). Typical radiologic features of CVM included iso-intensity on T1, hyper-intensity on T2, and early focal contrast enhancement with progressively diffuse enhancement of the lesion on later sequences (Figure 1 A-E). These features corresponded to numerous thin-walled interconnected dilated vascular spaces lined by flattened endothelial cells, with earlier contrast enhancing regions appearing to have larger vascular spaces on histopathology (Figure 1 F – H). The majority of LYM were homogeneous appearing on T1 and T2 weighted and displayed moderate contrast enhancement

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(Figure 4, A – C). This corresponded to sheets of large cells with high nuclear to cytoplasmic ratio, irregular nuclear contours and prominent nucleoli.

Conclusions: Several radiologic findings in circumscribed orbital tumors can be explained histopathologically. In SCH and SFT, regional variations in cellularity result in variable and sometimes heterogeneous T2 intensity. In CVM, relative size of dilated vascular channels may play a role in regional spread of contrast enhancement. And in LYM, the homogenous appearance on imaging was paralleled by homogenous sheets of lymphoid cells histopathologically.

Figure 1

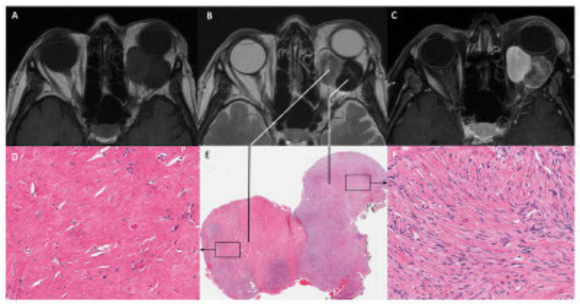

Figure 1. Solitary fibrous tumour demonstrating (A) biphasic iso- and hypo- intensity on T1, (B) hyper- and hypo- intensity on T2, (C) and moderate to avid contrast enhancement on T1-weighted post-contrast sequences. On histopathology, the portion of the tumour that appeared iso-intense on T1 and hyper-intense on T2 (D and E) has a greater proportion of dense collagen fibres, (E and F) whereas the T1 hypo-/T2 hypo- portion is composed of more spindle shaped neoplastic cells with elongated nuclei.

Figure 2

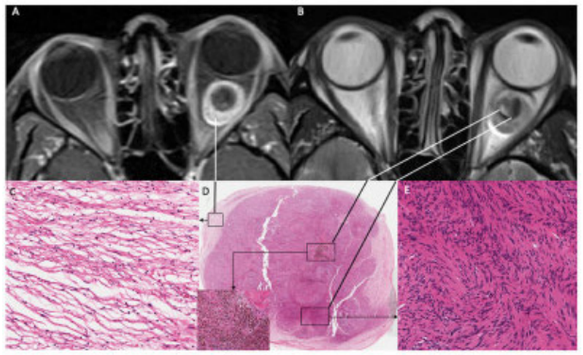

Figure 2. (A and B) Schwannoma demonstrating peripheral contrast enhancement of a region that is iso-/hyper-intense on T2 (C and D) corresponding to Antoni B pattern. Centrally, there is a region of T2- hypo-intensity that does not enhance with contrast, (E) corresponding to Antoni A pattern on histopathology. Additionally, a small central region of T2 hyperintensity appears to correspond to a small, central region of melanocytic pigmentation.

Figure 3

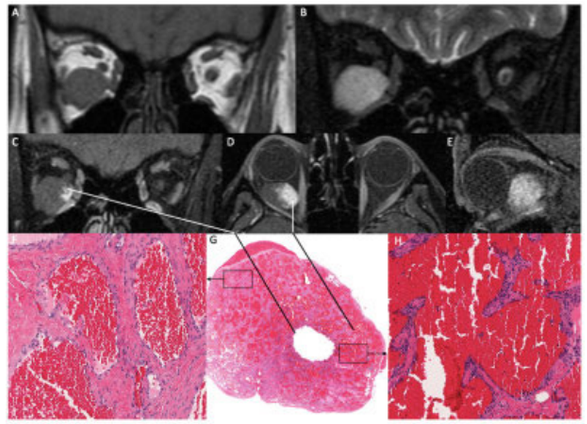

Figure 3. (A and B) Cavernous venous malformation that appears homogeneously iso-intense on T2 and hyper-intense on T2. (C – E) As time from contrast administration increases, there is progressive enhancement of the lesion. (F – H) In this tumour, the earliest region of contrast enhancement appears to correspond to a large central channel (G) with progression initially along the medial aspect of the tumour, (H) corresponding to the region with larger dilated vascular channels.

Figure 4

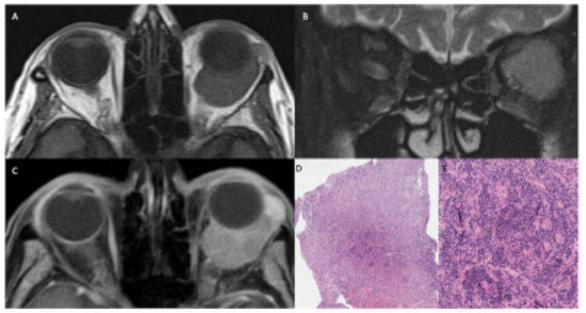

Figure 4. (A and B) Diffuse large B-cell lymphoma with a homogeneous iso-intense appearance on T1- and T2- weighted images and (C) moderate, diffuse contrast enhancement corresponding to (D and E) sheets of large cells with high nuclear to cytoplasmic ratio, irregular nuclear contours and prominent nucleoli.

Idiopathic Orbital Inflammation Masquerading as a Drug Associated Thyroid Eye Disease

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Introduction: Alemtuzumab has been reported to cause thyroid eye disease in patients being treated for MS; we present a case of idiopathic orbital inflammatory disease masquerading as thyroid eye disease after alemtuzumab.

Methods: A case review of idiopathic orbital inflammation presenting like thyroid eye disease associated with alemtuzumab, and a literature review of alemtuzumab associated thyroid eye disease.

Results: A 41-year-old female was referred for evaluation and treatment of thyroid eye disease. Three years prior to presentation, she was treated for relapsing, remitting multiple sclerosis with alemtuzumab. Three months prior to presentation, she developed eye pain, pressure, and binocular diplopia. Her prior lab work was consistent with Graves' disease and an outside provider began treating her with selenium. Our exam showed 20/25 vision OU, mildly elevated IOP; 25 OD, 21 OS; and a 2+ afferent pupillary defect OS. Motility showed –1 deficit with left abduction. Hertel measurements were 19 mm OD and 23 mm OS. Slit lamp exam showed 1+ edema and erythema of both upper eyelids. There was 1+ injection of the conjunctiva and caruncle with 1+ chemosis OU. The remainder of her exam was unremarkable. We obtained thyroid labs and imaging. The labs showed a TSH of 0.6, low free T4 0.02, elevated TSI 4.9 and elevated thyroid receptor antibody 4.78. CBC, ACE, lysozyme, ANA, ESR, CRP MPO, PR3 were all within normal limits. IgG subclass 4 was low <0.3 mg/dL. CT of the orbits without contrast showed moderate left greater than right infiltrative soft tissue thickening in the superior and lateral intraconal and extraconal orbits with less involvement in the inferior orbit. These findings were nonspecific but were not suggestive of thyroid eye disease. The patient underwent left orbitotomy with biopsy of the abnormal tissue. The biopsy showed focal lymphoplasmacytic infiltrate, chronic inflammatory infiltrate. The findings were suggestive of a reactive process. Immunoglobulin gene rearrangement was negative, excluding lymphoma.

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Conclusions: This case highlights the similarities between idiopathic orbital inflammation and thyroid eye disease. The patient was presumed to have thyroid eye disease given the associations in the literature with alemtuzumab and lab work consistent with Graves' disease. However, imaging showed foci consistent with orbital inflammation rather than muscle enlargement seen with Graves' ophthalmopathy. Inflammatory workup was negative, as was gene rearrangement. Biopsy demonstrating chronic inflammation confirmed the diagnosis of idiopathic orbital inflammation. This case emphasizes the importance of maintaining a broad differential when evaluating patients with symptoms suggestive of thyroid eye disease. Orbital imaging and histopathological analysis remain important diagnostic steps in distinguishing thyroid eye disease from other inflammatory processes.

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Importance of Multiple Surgical Samples for Achieving an Accurate Microbiological Profile in Orbital Cellulitis Infections

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Introduction: Orbital cellulitis (OC) in the pediat ric population is most often a result of the extension of an adjacent paranasal sinus infection. Medical treatment with IV antibiotics, decongestants and close observation has been well established . If the patient progresses despite medical t reatment, surgical drainage of the abscess and affected sinuses is necessary and may provide important microbiological data to guide further management. We present the microbiological data from patients with OC and subperiosteal abscess (SPA) who required surgical drainage. We examine the importance of obtaining multiple surgical samples for achieving an accurate microbiological profile in surgically treated OC with SPA.

Methods: This was a retrospective chart review of patients with OC and SPA identified using ICD 9 and 10 codes at a pediatric tertiary care center. Patients with radiographically confirmed OC and SPA who required surgical treatment and had intraoperative cultures collected were included in the analysis.

Results: One-hundred and twenty-eight pediatric patients with OC and SPA were identified. Of these, 70 patients required surgical intervention and had intraoperative cultures collected. Three patients did not have complete records and were excluded from analysis. Of the 67 patients in the final analysis, 50 were male and 17 female. The average age was 8.2 +/- 4.6 years (range 2 months – 17 years). All patients had concomitant sinusitis. Patients were surgically treated either with endoscopic or external sinus debridement with SPA decompression (ESS), orbitotomy or with a combined surgery consisting of ESS and orbitotomy. Fifty-four patients (81%) had pathogens isolated on culture. Samples were obtained from sinus only in 14 patients with 64% having positive culture results, from abscess only in 24 patients with 83% positive cultures and from both sites in 29 patients with 86% positive cultures. Among the patients who had intraoperative cultures from both abscess and sinus, 10 (34%) had culture results which differed between the two sites. Six patients had one negative culture (either SPA or sinus), five (83%) of which underwent ESS alone. The four patients with positive growth on both cultures but with different isolates between SPA and sinus, all underwent combined surgery (Figure 1). The most common pathogens were Streptococcus species (n=39) with S. milleri, S. pyogenes and S. pneumoniae found in 19, 12 and 7 patients respectively. Staphylococcus species was isolated in 19 patients, with methicillin sensitive, methicillin resistant and coagulase negative Staphylococcus found in 10, 2 and 7 patients respectively. Seventeen patients had polymicrobial infections.

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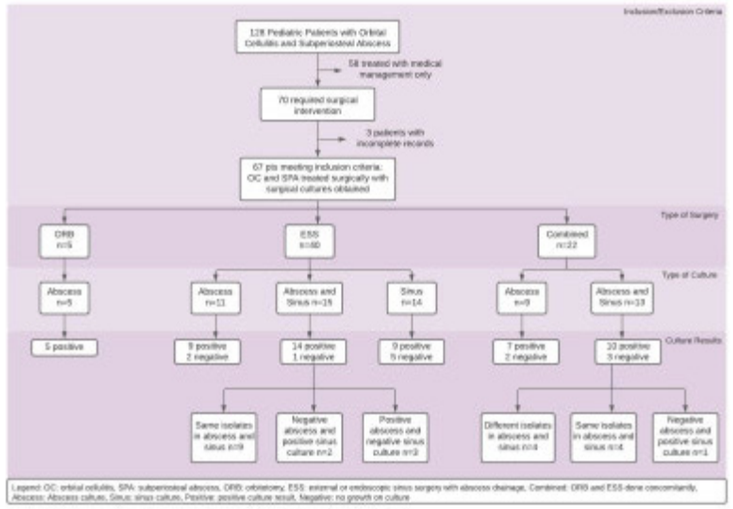
Conclusions: Our results are supportive of utilizing a combined surgical approach to surgery for patients with orbital cellulitis and subperiosteal abscess requiring operative management. This data demonstrates that obtaining intraoperative samples from both infected sinus and subperiosteal abscess provides the most complete microbiological profile in patients with orbital cellulitis with abscess. Furthermore, our results suggest that there is a higher yield from the operative cultures, with a more complete microbiological profile when samples are obtained from combined procedures as compared to those gathered from sinus surgeries alone. Finally, our patients had a similar microbiological profile to prior studies .

Figure 1



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Incidence of Optic Disc Edema on Baseline Screening Exams in an Obese Population

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Introduction: Obesity is a significant risk factor for the development of idiopathic intracranial hypertension (IIH), which can result in irreversible and complete vision loss. Although previous studies have shown the incidence of IIH is three times higher in obese women, there are no established vision screening guidelines for those diagnosed with obesity.

Bariatric surgery can be an effective long-term treatment for morbid obesity, but patients with unrecognized IIH may be at risk for vision loss during general anesthesia. Anesthetics, hypoventilation, and fluctuations in blood pressure during surgery are known to cause acute rises in intracranial pressure (ICP). In patients with preexisting papilledema, such fluctuations in ICP can result in arterial occlusion, ischemia, and even permanent vision loss. The purpose of this study is to evaluate patients with morbid obesity scheduled to undergo bariatric surgery for subclinical papilledema or undiagnosed IIH.

Methods: This is a case series of patients being evaluated for bariatric surgery who underwent a baseline ophthalmology exam. Collected data included symptoms, visual acuity, intraocular pressure, retinal and optic nerve exam, fundus photos, and optical coherence tomography of the retinal nerve fiber layer (OCT RNFL). OCT RNFL was used as a surrogate measure of intracranial pressure.

Results: Five patients from the bariatric surgery service underwent baseline eye exams as part of their pre-operative evaluation. Four patients had no previous diagnosis of IIH, and one patient had a prior diagnosis of IIH and is on medical treatment. Of the four patients with no previous IIH diagnosis, two were found to have optic nerve head edema on fundus exam and increased thickness on OCT RNFL. Two patients reported symptoms including headache, transient visual obscurations, pulsatile tinnitus, diplopia, nausea, vomiting, and blurry vision were noted. No patients required neurosurgical intervention.

Conclusions: In this limited series of patients referred from the bariatric surgery service for a preoperative vision exam, two of the four patients had subclinical optic disc edema present on their baseline ophthalmology exam, while one patient had an established diagnosis of IIH. This finding reveals that there may be a much higher incidence of optic disc edema and subclinical IIH in obese patients than what is expected in the general population of 7.8 per 100,000 as shown in previous studies. Early screening of high-risk, obese patients can help to identify patients with undiagnosed IIH and reduce complications and morbidity associated with prolonged elevated ICP.

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Figure 1

No previous IIH Diagnosis							
Case	Age	Gender	BMI	Visual Acuity	Papilledema	RNFL (µm)	Symptoms
1	34	F	47.30	20/20 OU	Grade 1 OU	OD 109 OS 110	Headache, nausea
2	28	F	66.13	20/20 OU	Grade 0 OU	OD 82 OS 83	None
3	44	M	54.59	20/20 OU	Grade 0 OU	OD 79 OS 76	None
4	44	M	45.46	20/20 OU	Grade 1 OU	OD 103 OS 110	None
Previous IIH Diagnosis on Treatment							
5	42	F	44.79	20/20 OU	Optic nerve pallor	n/a	Headache

Figure 2

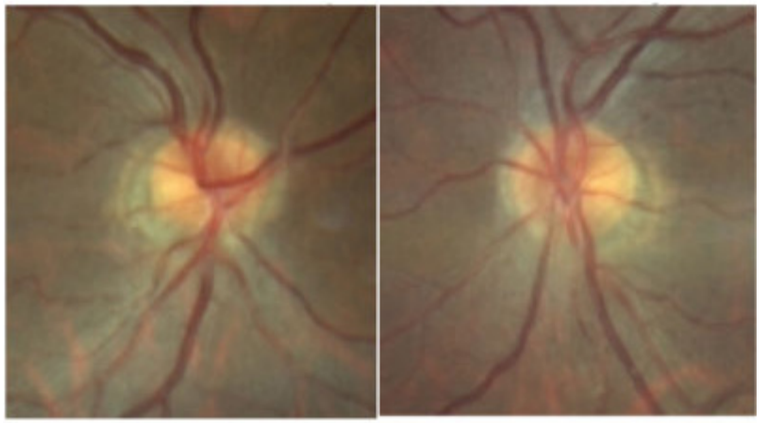
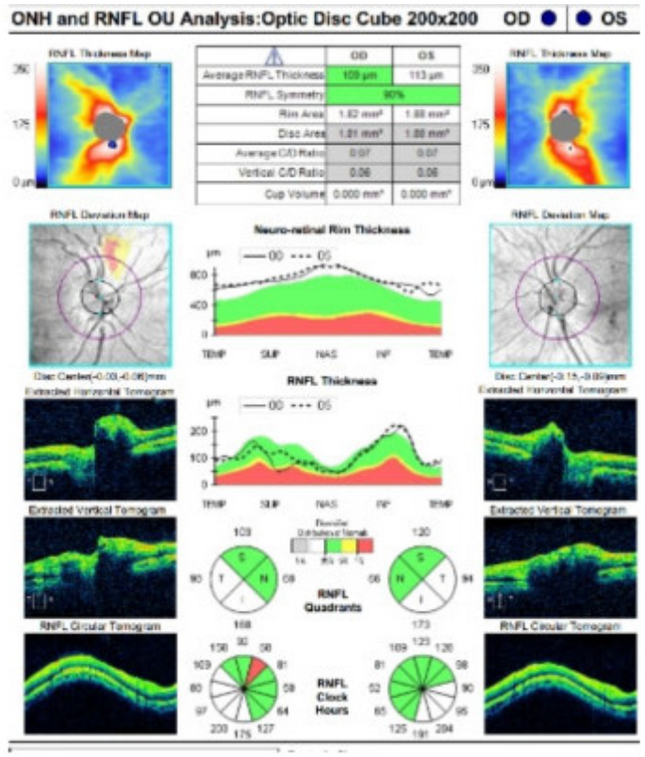


Figure 3



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Lacrimal Gland Enlargement: Evaluation with Imaging and Clinical Features

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Seoul, Korea, Republic of

Introduction: To investigate the orbital imaging features associated with clinical manifestations for differential diagnosis causative diseases of lacrimal gland enlargement.

Methods: Ninety-one patients were included who underwent surgical biopsy of lacrimal gland enlargement between January 2010 and January 2020 were included in this retrospective study. Collated data contained patient demographics, clinical presentation, orbital imaging findings, histopathologic diagnosis and immunohistochemistry for IgG andIgG4, and any associated systemic involvement. Each CT and MR image was evaluated independently by two experienced neuroradiologists in head and neck imaging, respectively.

Results: Forty-two cases diagnosed with non-specific dacryoadenitis and 33 with IgG4-related dacryoadenitis. The 16 cases of lymphoproliferative disease, the second most common etiology, consisted of 17 with mucosa-associated lymphoid tissue (MALT) lymphoma. The lymphoma group was significantly less likely to present with bilateral disease (6/16, 37.5%) at older age (mean 59.9 years) than the dacryoadenitis groups (nonspecific; 29/42, 69.0%: mean 46.0 years, IgG4; 28/33, 84.8%: mean 49.4 years, respectively). The maximal diameter of lacrimal gland is significantly smaller in dacryoadenitis than IgG4-RD or lymphoma. Furthermore, the proportion of presence of wedge sign is significantly lower in dacryoadenitis than the other two groups. The extraorbital involvement, especially infraorbital nerve enlargement was significantly common in the IgG4-RD than the other two groups; among 15 patients with involvement of infraorbital nerve, 12 were diagnosed as IgG4-RD.

Conclusions: Patients with lacrimal gland enlargement had various etiology, and orbital imaging could be useful tool for differential diagnosis. The maximal diameter of the lacrimal gland, the wedge sign, and the extraorbital involvement were revealed as significant points in this study.

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Management of Refractory Strabismus with Palmaris Longus Tendon Autograft, A Novel Technique

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Introduction: Persistent strabismus despite conventional strabismus surgery techniques can pose a significant challenge. Here we describe a novel technique using a palmaris longus tendon (PLT) autograft for extraocular muscle (EOM) tendon elongation in a case of complex monocular large-angle deviation.

Methods: Single retrospective case report and description of a novel technique of PLT grafting in a patient with large-angle hypertropia and severe right superior rectus (RSR) scarring and orbital inflammation following scleral buckle surgery.

Results: A 62-year-old female was referred for evaluation of a large-angle right hypertropia (RHT). She developed diplopia after scleral buckle surgery to treat a right retinal detachment in 2016. Despite subsequently undergoing multiple procedures including lysis of scar tissue around the RSR, excision of the scleral buckle, complete RSR tenotomy and maximal right inferior rectus resection of 6mm, she still had a residual RHT of 65 prism diopters (Figure 1). To address this, we performed placement of a PLT spacer graft to elongate the scarred RSR tendon.

A 15mm segment of the PLT was harvested via two small 1cm incisions in the volar forearm. A cut was made longitudinally to match the PLT graft width and thickness to that of the native RSR tendon. Extensive scar dissection was performed to release the RSR from the globe. Two 6-0 vicryl sutures were used to secure the cut end of the RSR to the PLT. A caliper was used to mark 10mm along the PLT, and a double-armed 6-0 vicryl suture was used to secure the tendon at this location to the original site of RSR insertion on the globe. 2mg of 5FU was injected into the RSR to minimize scar formation and the ocular surface was reconstructed with amniotic membrane.

The patient had improvement in RHT from 65 PD preoperatively to 18 PD at post-operative month two and achieved single binocular vision with a small chin-down head posture (Figure 2).

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Conclusions: We describe the first use of the PLT as a spacer graft to treat a patient with refractory monocular large-angle deviation. Autologous PLT has potential advantages over alternative allograft materials such as bovine pericardium, donor sclera, Gore-tex, Mersilene mesh, and silicone spacers, which have been reported to extrude or develop fibrotic adherence to the sclera. PLT has several advantages – it can be easily resized to match the length and width of the original EOM tendon and it is surrounded by a smooth bursa, allowing it to glide easily against surrounding orbital tissues during ocular movements, thus mimicking the native EOM tendons. With appropriate technique, the risk of complications from PLT harvest is exceedingly rare, and the function of the hand or wrist remains uncompromised, making PLT a commonly used autologous tendon graft. Significant improvement in strabismus with stability following the surgery suggests that the autologous palmaris longus tendon is a suitable graft for extraocular muscle tendon elongation in the orbit.

Figure 1

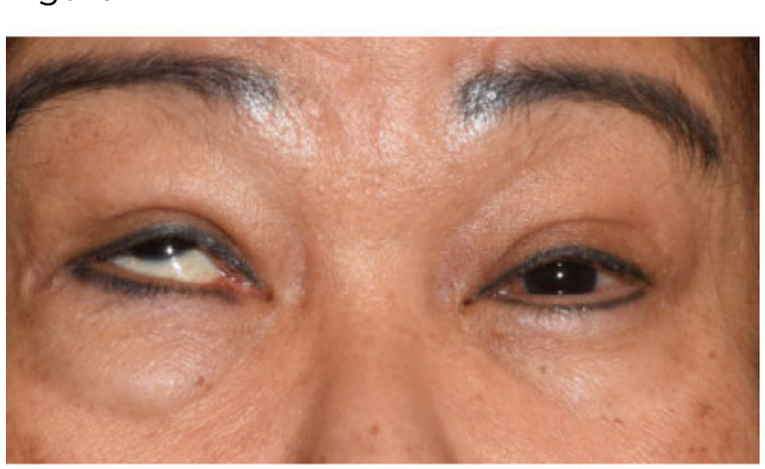
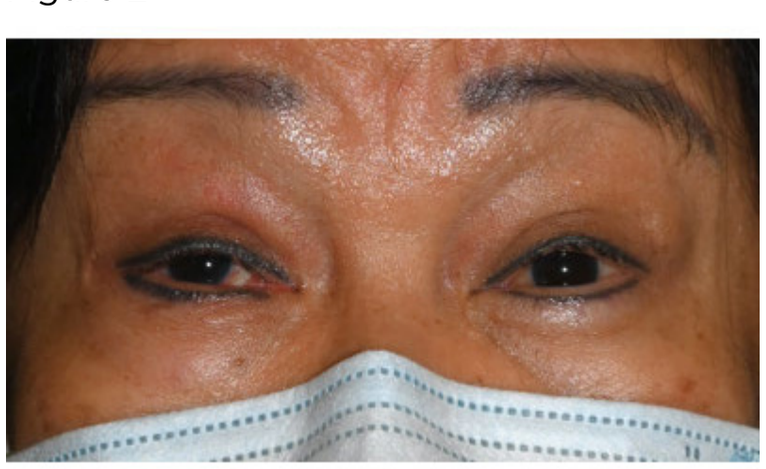


Figure 2



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Parosteal Ossifying Fasciitis of the Orbit: A Rare But Benign Mimicker of Rhabdomyosarcoma

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Introduction: We describe a case of parosteal ossifying fasciitis of the orbit presenting in an 11-year-old female. This benign lesion was concerning both clinically and histologically for rhabdomyosarcoma (RMS). Recognition of this entity as a RMS mimicker is crucial to the rapid differentiation of the lesions, initiation of treatment for malignant tumors, and avoidance of aggressive therapy in benign lesions.

Methods: We describe the evaluation and management ofparosteal ossifying fasciitis presenting as a rapidly enlarging orbital mass in a child, illustrate the histopathologic features of the lesion, and perform a literature review comparing the histology of similarly presenting malignant tumors.

Results: An 11-year-old previously healthy female presented with 9 days of right periorbital edema and ecchymosis. On examination, there was obvious right hypoglobus and 3mm of proptosis by Hertel with resistance to retropulsion of the right eye. Visual acuity was symmetric and there was no afferent pupillary defect. CT scan of the orbits revealed an extraconal mass along the superior orbit. Differential remained broad based on imaging, so patient was taken immediately to surgery for orbital exploration with sub-total excisional biopsy. Evaluation of a frozen section was initially concerning for RMS, but final diagnosis was unable to be determined without immunohistochemistry. The mass was described as a cellular proliferation of fusiform and stellate spindle cells occurring between vascular channels with extravasated erythrocytes and lymphocytes, as well as mineralized woven bone spicules and osteoid rimmed with osteoblasts. Spindle cells stained for smooth muscle actin, and did not stain for desmin, myogenin S-100, or ALK. Diagnosis of RMS was ruled out, and lesion was determined to be consistent with ossifying fasciitis. On 8-week follow up, proptosis had resolved and hypoglobus was largely improved. MRI of the orbits showed only mild, poorly defined enhancement in the superior orbit. No further treatment was initiated.

Conclusions: Despite initial concern for possible malignant and aggressive lesion, our patient was discovered to have benign ossifying fasciitis, which is very rare and has not previously been described in the orbit. Ophthalmologists should be aware of this process as it can mimic orbital sarcoma but can be treated exclusively with excision.

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Periocular Nerve Blocks: Indications and Therapeutic Responses

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Introduction: Chronic orbital pain syndrome is a debilitating condition that is difficult to treat as it often has no known etiology, no characteristic imaging findings, and no effective clinical treatment. While injections with local anesthetic and steroids have been described to be beneficial for trochleitis and ocular pain, little has been described regarding treatment of orbital pain. The purpose of this study is to evaluate the use of periocular nerve blocks at a single academic institution including diagnoses treated and response to treatment such as resolution of photophobia and pain and improvement in quality of life.

Methods: An IRB-approved retrospective review was conducted of patients who underwent periocular injections for ocular and orbital pain and photophobia between January 2017 and May 2021. Data obtained through chart review included: patient demographics and response to injections including pain, ability to resume activities, quality of life, photosensitivity, duration of pain resolution, and desire for subsequent injections. Injections included lidocaine with epinephrine and bupivacaine with or without dexamethasone (total of 0.5ml-1.0ml per side). Orbital injections were administered inferior to the orbital rim in the orbit in the region of the supratrochlear, supraorbital, and lacrimal nerves and superior to the orbital rim in these regions. When patients benefitted from the injections, additional injections were administered 1 week to 3 months apart.

Results: A total of 14 patients underwent periocular nerve blocks during the study period injection (Table 1).

The majority of patients treated were women (11/14) and the mean age was 52.9 years (range 25-74). Prior to injection, the patients had experienced pain for widely variable time frames (11 days – 26 years). Previous diagnoses included: migraine, iritis, scleritis, trochleitis, dry eye, Sjogren's disease, thyroid eye disease, dacryoadenitis, myositis, ocular chemical injury, dystonia, blepharospasm, orbital inflammation, neuropathic pain, and recent enucleation. Previous treatments included: artificial tears, prednisolone ophthalmic drops, autologous serum tears, NSAIDs, prednisone, antibiotics, sumatriptan, gabapentin, hydrocodone, botulinum toxin, scleral lenses, and acupuncture.

Ten patients had significant improvement in orbital pain and/or photophobia with the periocular injection. Resolution of pain typically lasted 2 weeks to 3 months. Patients have received up to 13 injections over a 51-month time frame.

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Four patients chose not to proceed with subsequent injections - 3 patients did not experience significant improvement in pain post injection and 1 patient had complete resolution from the pain for 10 days but symptoms then returned to baseline.

There were no complications.

Conclusions: Chronic orbital pain can be debilitating and is difficult to diagnose and treat. While inflammation is often the primary etiology, periocular nerve blocks may useful in disrupting the neuropathic pain cycle. Providing relief for these debilitated patients can be extremely rewarding. Further studies are needed to better characterize which patients will benefit from injections, when steroid is needed, and the timing of repeat injections.

Figure 1

Patient #	Age	Gender	Etiology of pain	Duration of pain	Pain response	# of injections
1	69	F	Acute Dacryoadenitis improved on prednisone	2 months	None	1
2	66	M	Chronic Migraines, Trochleitis	16 years	None	1
3	69	F	Sjogren's, Thyroid eye disease, exposure keratopathy	2 years	Excellent, improved photophobia	8 over 24 months
4	43	F	Ocular chemical injury	4 years	Good	3 over 2 months
5	74	F	Fungal keratitis, enucleation, orbital inflammation, and temple pain (TAB negative)	11 days	Excellent	4 over 3 months
6	38	F	Dry eye, migraine, previous orbital inflammation	2 months	None	1
7	66	F	Dry eye with presumed neuropathic pain	7 years	Good	7 over 18 months
8	38	F	Resolved traumatic iritis with pain and photophobia	6 months	Excellent, photophobia resolved	3 over 2 months
9	49	M	Neuropathic pain after cerebellar infarct	4 years	Complete resolution x 10 days	1
10	26	F	Bulimia with spasm, trochlear pain	4.3 years	Excellent	13 over 31 months
11	64	F	Bilateral trochleitis	2.5 years	Excellent	8 over 16 months
12	61	F	Idiopathic orbital inflammation	3 months	Excellent	4 over 2 months
13	65	M	Blepharospasm with photophobia	2.5 years	Good, photophobia resolved	1
14	49	F	Migraines and resolved scleritis	3 months	Good	4 over 2 months

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Posterior Ischemic Optic Neuropathy in the Setting of Cocaine-Induced Orbital Inflammation

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Introduction: Prolonged intranasal cocaine use is known to cause cocaine-induced midline destructive lesions (CIMDL), sino-orbital inflammation, bony destruction, and infection. Severe cases of destruction beyond the orbital walls can cause orbital cellulitis and optic neuropathy. We present the first case of acute, painless vision loss in the setting of chronic cocaine-induced necrotizing sino-orbital inflammation with neuroimaging suggestive of posterior ischemic optic neuropathy (PION).

Methods: Case report.

Results: A 46 year-old man with long-standing history of cocaine use presented with diplopia, right periorbital pain and swelling. Examination revealed visual acuity of 20/25 in the right eye and 20/30 in the left eye without relative afferent pupillary defect (rAPD) or dyschromatopsia. There was right-sided proptosis, periorbital edema and erythema, conjunctival injection, and restriction of extraocular motility in all gazes (Figure 1). Dilated fundus exam (DFE) was normal. Computed tomography (CT) orbits with contrast revealed right-sided orbital cellulitis, sino-nasal destruction and pansinusitis. Nasal endoscopy and biopsy were negative for invasive fungal rhinosinusitis, and extensive lab work-up was negative for necrotizing angiitis or other mimicking diagnoses. He was treated with endoscopic sinus surgery and debridement by otorhinolaryngology and broad-spectrum IV antibiotics. He presented with three similar episodes over three months, each with urine toxicology positive for cocaine, and with clinical improvement on antibiotics.

One month later, he presented with one day of acute, painless vision loss in the right eye. Examination revealed no light perception (NLP) vision and a brisk rAPD, with no periorbital edema, erythema, or conjunctival injection (Figure 2), and a newly hyperemic, full optic disc. Urine toxicology was positive for cocaine. Magnetic resonance imaging (MRI) orbits showed progressive sino-nasal destruction and inflammation extending into the right orbit up to the optic nerve, with new restricted diffusion along the posterior aspect of right optic nerve with high signal intensity on diffusion-weighted imaging (DWI) corresponding to reduced apparent diffusion coefficient (ADC) in the same area suggestive of PION (Figure 3, arrows).

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He was treated with high dose IV methylprednisolone and prophylactic IV antibiotics. Endoscopic sinus surgery and debridement by otorhinolaryngology confirmed worsening necrosis (Figure 4), with necrotic tissue 2-3 mm from the optic nerve on intraoperative image guidance. Pathology confirmed inflamed necrotic sinus tissue, birefringent particles consistent with cocaine, and no fungus. He was treated with an additional 7 days of oral prednisone, but remained NLP.

Conclusions: CIMDL is a well-described entity whereby vasoconstriction leads to sinonasal tissue necrosis. However, cocaine-induced optic neuropathy is rare; a review of the literature revealed 11 cases with cocaine-related optic neuropathies to date.[1] These cases describe varying etiologies for optic neuropathy including inflammation, ischemia, and direct optic nerve compression. This is the first reported case with neuroimaging demonstrating restricted diffusion in a segment of the optic nerve on DWI/ADC sequences, suggestive of PION in the setting of cocaine-induced CIMDL, orbital inflammation and necrosis.

Figure 1

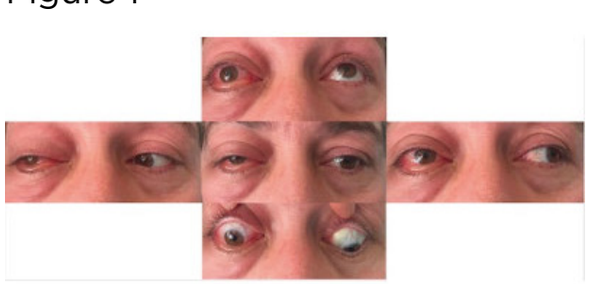


Figure 2

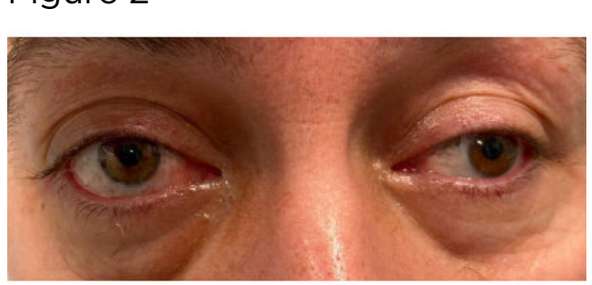


Figure 3

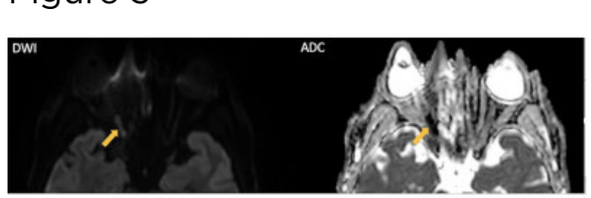
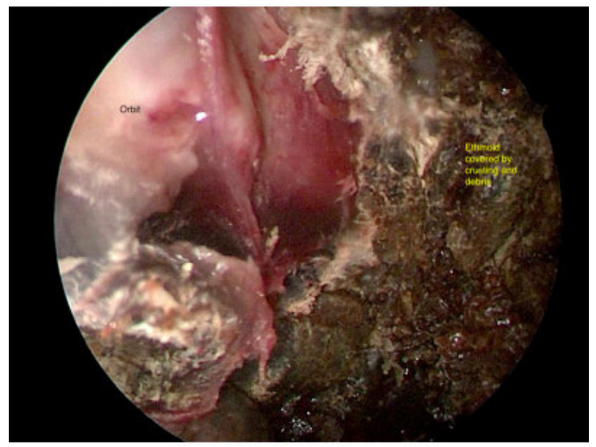


Figure 4



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Postoperative Orbital Emphysema Presenting with Severe Vision Loss

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Introduction: We present a case of orbital emphysema resulting in acute severe vision loss in a patient status post sphenoid wing meningioma resection, which returned to baseline after evacuation of the air.

Methods: A 31-year-old woman with a suspected right sphenoid wing intraosseous meningioma causing progressive exophthalmos was seen in the clinic for surgical evaluation. In the preoperative visit, her distance vision was 20/30 right eye (OD) and 20/50 left eye (OS), no RAPD OU, color vision full OU, exophthalmometer measured 32 OD, 26 OS at base 104mm, and dilated fundoscopic exam was within normal limits. She underwent a frontotemporal craniotomy where biopsy confirmed Grade I meningioma and tumor debulking was performed to help alleviate her exophthalmos. After maximal tumor debulking, superolateral orbital reconstruction was performed by placing a smooth nylon plate under stable bone medially, laterally and under the superior orbital rim anteriorly, ensuring 3-point stabilization of the implant without use of sutures or screws[1].

Results: On the first postoperative day, the patient was found to have severe proptosis and exposure keratopathy of the right eye, with near vision of 20/400 OD and 20/40 OS, intraocular pressure of 17 OD and 18 OS, extraocular motility severely restricted in all directions OD and full OS, and 0/11 color plates OD and 9/11 OS. Pupils were minimally reactive OU and difficult to discern an RAPD. The patient was unable to close her right eye. Postoperative MRI of the orbits (Figure 1) found right periorbital soft tissue air. On palpation, the air appeared to be greatest in the superolateral aspect of the eyelid. A 3mm stab incision was made on the lateral aspect of the right upper eyelid with a 15 blade and soft tissue air was evacuated through the wound with gentle pressure on the globe, with immediate improvement of proptosis and ability to cover the cornea. Immediately following the decompression, her near vision OD improved to 20/200 and she was able to identify all color plates. Near vision continued to improve to 20/40 OD and 20/20 OS the next day. At her 10-month follow-up visit, her vision was 20/30 OD and 20/40 OS at distance, exophthalmometer measurements were 30 OD, 26 OS at base 100mm, and repeat fundus exam was unremarkable. Patient also received gamma knife radiotherapy to stabilize tumor growth.

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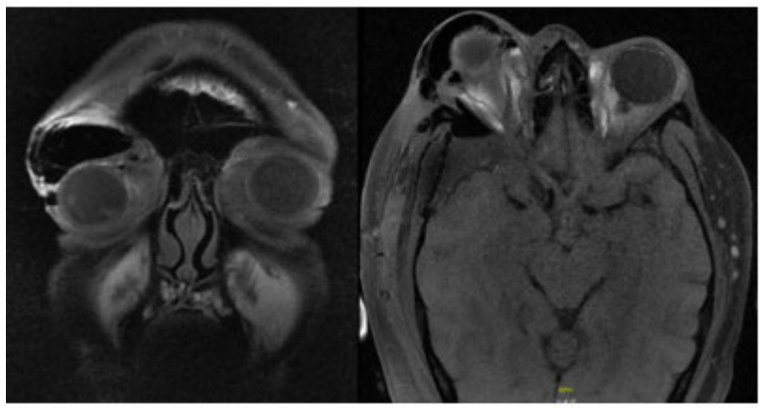
Conclusions: A recent comprehensive literature review found the majority of orbital emphysema cases are self-limited and resolve without intervention within 7-10 days[2]. This is an unusual case of acute postoperative orbital emphysema resulting in severe vision loss. We suspect that this was a result of air being transmitted to the orbit via the frontal sinus which may be seen in the setting of the patient either coughing or blowing her nose postoperatively[3]. Bedside evacuation of the air led to resolution of the optic neuropathy and subsequently her vision returned to baseline.

Figure 1



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Rare Case of Primary Orbital Ewing's Sarcoma in a Pediatric Patient

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Introduction: Ewing sarcoma family of tumors (ESFT) – malignant tumors of neuroectodermal origin arising within bone or soft tissue – are exceedingly rare and consists of Ewing tumor of bone, extraosseous Ewing tumor, primitive neuroectodermal tumor (PNET), and Askin tumor. Herein, we discuss a case of Ewing sarcoma that was initially diagnosed as primary orbital rhabdomyosarcoma.

Methods: The medical records, radiography and pathologic reports of one patient were reviewed.

Results: We report the case of an 11-year-old girl who presented to oculoplastics clinic for evaluation of a progressively enlarging right upper lid mass (Figure 1). Symptom onset was four months prior to presentation. Patient reported new intermittent diplopia. Upper lid fullness worsened despite trials of hot and cool compresses, topical and oral antihistamines, and antibiotics. On examination, visual acuity was 20/30 OU with normal intraocular pressure. There was no relative afferent pupillary defect and color vision was full bilaterally. External exam was notable for 4 to 5mm of right hypoglobus, 3mm of right proptosis, and soft palpable mass superior to medial canthus with right upper lid mechanical ptosis. Dilated fundus exam was normal. MRI demonstrated superonasal, extraconal, fairly well-circumscribed mass of the right orbit; hypointense on T1; and multicystic and heterogeneous appearance on T2 (Figure 2). These findings were most consistent with orbital rhabdomyosarcoma or venolymphatic malformation. Patient subsequently underwent urgent right anterior orbitotomy via right upper lid crease incision with right orbital mass excision. Pathology revealed a peripheral PNET, or extraosseous soft tissue Ewing sarcoma. The patient was urgently referred to pediatric hematology oncology for further workup and management. CT chest showed bilateral pulmonary nodules consistent with metastasis. Patient was started on AEWS1031 protocol treatment (consisting of either standard treatment of vincristine, doxorubicin, cytoxan, ifosfamide, and etoposide or standard treatment plus topotecan).

Conclusions: Extraosseous Ewing sarcoma is a very rare lesion that is highly aggressive. They tend to recur locally and metastasize early to regional lymph nodes, lungs, liver, bone, and bone marrow. Due to its rarity, there is no current consensus regarding optimal treatment. Although rare, Ewing sarcoma is an important differential because among solid tumors, it is the second most common cause of orbital metastasis after neuroblastoma. In addition, current evidence indicates that both extraosseous Ewing's sarcoma and peripheral PNET have similar neural phenotype and should be viewed as the same tumor. It is recommended that patients undergo surgical

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resection of tumor in addition to adjuvant chemotherapy and radiation. Our patient has completed her 20th week of chemotherapy and is currently in stable condition without recurrence.

Figure 1

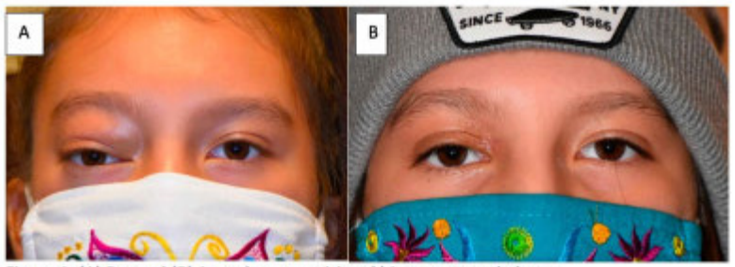

Figure 1: (A) Pre and (B) 1 week post-excisional biopsy external photos

Figure 2

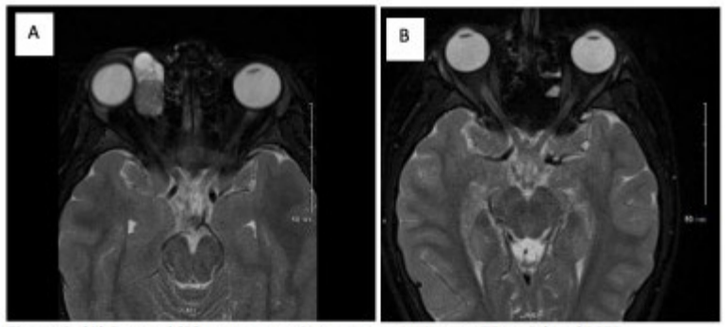

Figure 2: (A) Pre and (B) post-operative representation on T2 weighted MRI.

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Recurrent Spontaneous Retrobulbar Hemorrhage

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Introduction: Retrobulbar hemorrhage is a rare clinical condition that can be caused by orbital trauma, orbital surgery, vascular anomalies, and rarely systemic syndromes including coagulopathy, hemophilia, or prolonged anticoagulation. Case reports have demonstrated spontaneous orbital hemorrhage due to idiopathic thrombocytopenic purpura (ITP)[1], orbital pseudotumor[2], breast cancer[3], valsalva maneuver[4], and unknown causes[5,6]. Here, we describe a case of a patient with spontaneous retrobulbar hemorrhage with associated presumed low-grade disseminated intravascular coagulation (DIC).

Methods: Case Report.

Results: 80 year old female with past medical history of diabetes, hypertension, alpha thalassemia and past ocular history of pigment dispersion syndrome was initially referred to our clinic in 2015 due to an incidental finding of right retrobulbar hemorrhage on CT head. At that time, she had a reassuring eye exam and lab work, and the hemorrhage was resolved on subsequent imaging without intervention after 3 months. In April 2021, the patient presented to the emergency department with a severe headache and eye pain upon waking, without history of trauma or straining. On exam, she was found to have unchanged visual acuity and intraocular pressure (IOP) was 33mmHg in the right eye, concerning for developing compartment syndrome. There was no afferent pupillary defect (APD). Extra-ocular movements were restricted to -4 in all fields of gaze in the right eye. She had 360-degree hemorrhagic chemosis and proptosis of the right eye (Figure 1). CT head revealed a right-sided retrobulbar hemorrhage (Figure 2). Physical exam was notable for diffuse ecchymoses. Hematologic labs revealed significant thrombocytopenia (35 K/uL), decreased fibrinogen (49 mg/dL) and elevated D-Dimer (12,485ng/ml). A peripheral smear was notable for decreased platelets and rare schistocytes. The patient was immediately given topical IOP lowering agents and oral steroids. Her IOP improved to 16mmHg without development of an APD. She was admitted to the intensive care unit and given a platelet transfusion. MRI Orbits (Figure 3) demonstrated a peripherally enhancing intraconal mass, appearing contiguous with an enlarged right superior ophthalmic vein. MRA did not demonstrate arteriovenous shunting in the right orbit and there was no arterial or venous phase enhancement of the orbital lesion. Her thrombocytopenia did not resolve on steroids alone. She was given cryoprecipitate and IVIG for presumed low-grade DIC and her platelets subsequently improved. Her IOP remained stable with improvement of motility and resolution of proptosis and hemorrhagic chemosis. (Figure 4).

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Conclusions: This patient had spontaneous recurrent retrobulbar hemorrhage in both 2015 and 2021. Interestingly, the patient had an associated low-grade DIC in 2021 but no associated thrombocytopenia in 2015. It is likely that the thrombocytopenia from the low grade DIC predisposed the patient to bleed with this episode. Repeat imaging will be obtained in three months to re-evaluate for underlying vascular lesion including orbital varix. Spontaneous rupture of the superior ophthalmic vein was also considered given the contiguous nature of the hemorrhage with the SOV. Vahdani et al reported six patients with spontaneous superior ophthalmic vein rupture6 with similar presentation to our patient, but none with associated DIC. It is important to maintain an interdisciplinary approach in these cases as the hemorrhage and compartment syndrome resolved with medical management alone.

Figure 1

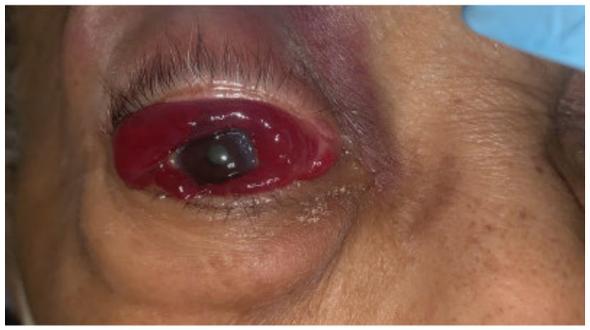
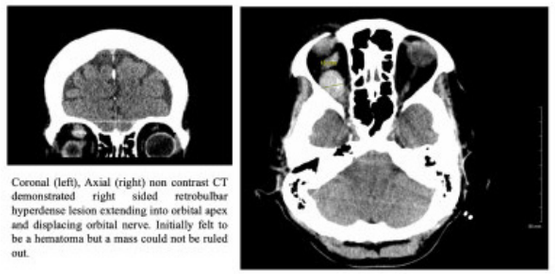
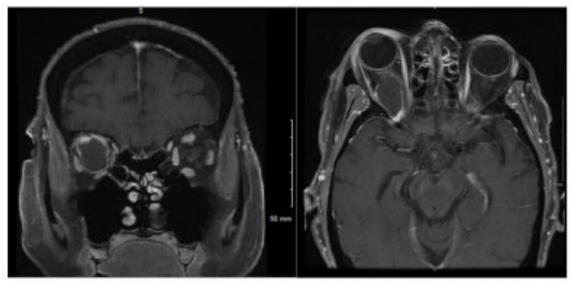


Figure 2



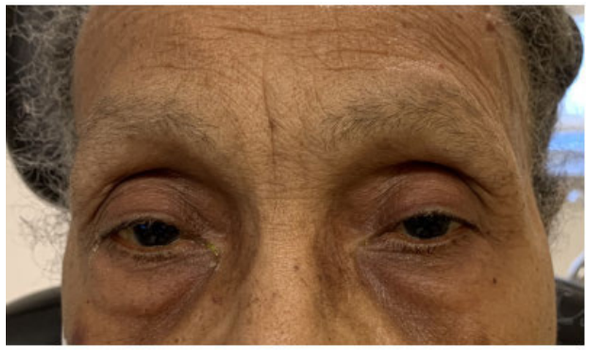
Coronal (left), Axial (right) non contrast CT demonstrated right sided retrobulbar hyperdense lesion extending into orbital apex and displacing orbital nerve. Initially felt to be a hematoma but a mass could not be ruled out.

Figure 3



Coronal (left), Axial (right) T1 weighted, fat suppressed MRI orbit demonstrating a peripherally enhancing intraconal mass, appearing contiguous with enlarged right superior ophthalmic vein. Thought to be likely that mass represented ectatic and likely thrombosed right ophthalmic vein. MRA did not demonstrate arteriovenous shunting in the right orbit and there was no arterial or venous phase enhancement of the orbital lesion.

Figure 4



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Re-Evaluating Clinical Signs of Orbital Cellulitis

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Introduction: We sought to determine clinical signs predictive of orbital cellulitis in children with periorbital swelling, in order to help guide decision making for orbital imaging.

Methods: Retrospective consecutive cohort study of children with periorbital swelling concerning for preseptal or orbital cellulitis admitted to a children's hospital over an 8-year period. All children were examined by an ophthalmologist. Primary outcomes were clinical signs predictive of orbital cellulitis diagnosed based on orbital imaging. Conventional "orbital signs" were evaluated, including conjunctival injection, conjunctival chemosis, limitation of extraocular motility, proptosis, change in vision, relative afferent pupillary defect (rAPD), and optic disc changes, such as swelling or pallor. Fever was considered as an additional sign. Chi-square tests were performed to identify predictive signs, and combinations of significant factors were evaluated for their prediction of orbital cellulitis using sensitivity and specificity, in comparison to conventional orbital signs.

Results: Three-hundred seventy-three children with periorbital swelling were studied, mean age 6.8 years (range 0.1-17). 231 (62%) children had radiographic evidence of orbital cellulitis. Clinical signs strongly associated with orbital cellulitis included motility limitation ($p<0.001$), proptosis ($p<0.001$), and moderate or severe chemosis ($p=0.02$). Both rAPD and optic disc abnormality were seen only in orbital cellulitis but were rare (2 rAPD, 1 disc abnormality) and always accompanied by at least one of the 3 strongly associated signs. Change in vision (3.5% non-orbital, 3.9% orbital) and injection (25% non-orbital, 26% orbital) were not associated with orbital cellulitis. The presence of one or more of the 7 conventional orbital signs was 61% sensitive and 70% specific for orbital cellulitis. Reducing the number of signs to only those strongly associated with orbital cellulitis (motility abnormality, proptosis, or moderate-severe chemosis) raised the specificity to 98% but lowered the sensitivity to 51%. However, adding fever improved sensitivity and specificity. The presence of one or more of motility abnormality, proptosis, moderate-severe chemosis, or temperature >100.4 within 24 hours of presentation had a sensitivity of 76% (95% CI 70%-81%) and specificity of 76% (95% CI 69%-83%) for orbital cellulitis.

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Conclusions: Consideration of only 4 clinical signs (having one or more of motility limitation, proptosis, moderate-severe chemosis, or temperature >100.4 F) as indication for orbital imaging in children with periorbital swelling results in higher sensitivity and specificity than both conventionally used orbital signs and other published clinical decision-making algorithms. Optic nerve abnormality and rAPD are highly specific but rare findings, and conjunctival injection is neither a sensitive nor specific sign of orbital cellulitis. Future studies may validate this approach and try to identify ancillary testing that helps to further improve its performance.

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Retinal Surface Macrophages Variation in a Patient with Thyroid Eye Disease Receiving Teprotumumab

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Introduction: Retinal surface macrophages play key roles in the regulation of immune reactions and tissue repair. They have been studied in diabetic retinopathy and glaucoma. Here, we examined the variation of parafoveal surface macrophage density in a thyroid eye disease (TED) patient under treatment with Teprotumumab.

Methods: A 45-year-old male with history of Graves' disease and long-term TED presented with worsening vision and light sensitivity. Upon physical examination, bilateral proptosis, eyelid edema, conjunctival injection, and chemosis were evident (Figure 1A). His Clinical activity score was 3/7. Fundus examination revealed bilateral optic nerve head (ONH) edema, more severe in the right eye (Figure 1B, 1C). Treatment with Teprotumumab was initiated. To assess retinal surface macrophages, ten 3x3mm scans centered at the fovea were acquired and averaged (PMID: 28068370) pre- and post-treatment (after fifth infusion). Semi-automated macrophage identification was performed on a 3µm OCT-Reflectance (OCT-R) slab located above the inner limiting membrane (ILM) surface using MATLAB (PMID: 32574351) (Figure 2A, 2D). OCT-Angiography (OCT-A) full vascular slab located between the ILM and 9µm below the posterior boundary of the OPL was used for FAZ delineation and capillary density measurements of the entire OCT-A scan (Figure 2B, 2E). Surface macrophage density maps were also generated in both visits to allow a rapid visualization of cell distribution across the 3x3mm scan area (Figure 2C, 2F).

Results: Orbital congestion and ONH edema improved significantly post-treatment (Figure 1D, 1E, 1F). The density, distribution, and appearance of the parafoveal macrophages also changed with treatment. Pre-treatment, there was a higher density of surface macrophages, non-uniform spatial distribution, and their appearance was round with few protrusions consistent with an "active state."(Figure 2A). Post-treatment, surface macrophage cell density decreased (e.g. from 9.10 to 6.55 cells/mm2 in the right eye). The macrophages were regularly spaced in a "quiescent" state and had a ramified appearance (Figure 2D). No significant change in capillary density was observed.

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Conclusions: Clinical OCT is capable of imaging parafoveal surface macrophages in TED patients. Surface macrophage density decreased as the inflammatory burden decreased with Teprotumumab treatment. This Suggests a potential association of these cells with an underlying retinal inflammation previously not described in thyroid orbitopathy. Cell density mapping of macrophages could be used as a rapid non-invasive method to monitor disease progression or response to therapy.

Figure 1

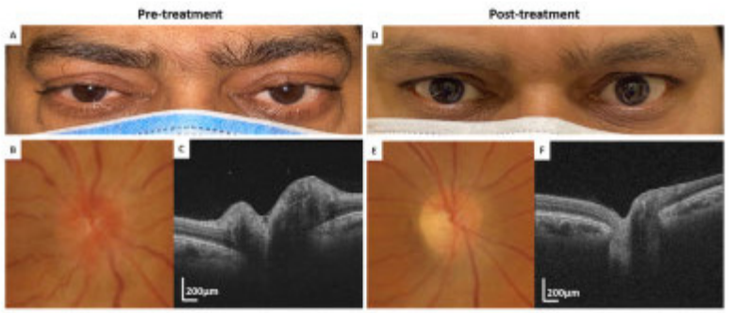

Figure 1. Pre- and post- Teprotumumab evaluation of a patient with Thyroid Eye Disease. **(A, D)** External photos. **(B, E)** Right eye, color fundus picture of the optic nerve head (ONH). **(C, F)** Right eye, OCT-scan of the ONH. Notable improvement in orbit congestion and ONH edema was observed post-treatment.

Figure 2

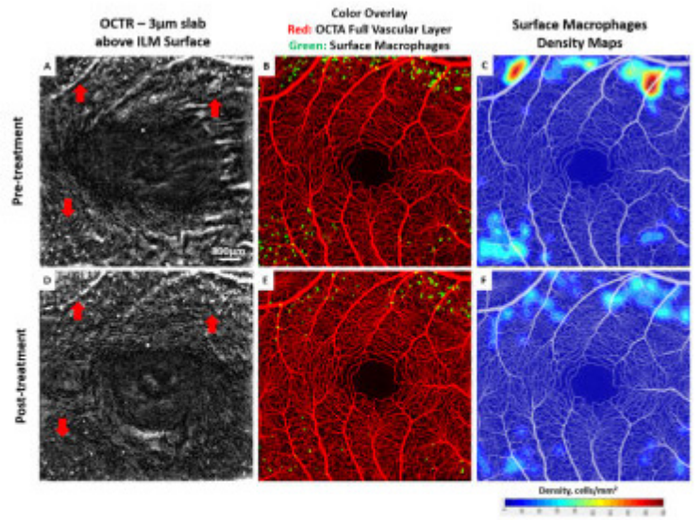

Figure 2. In vivo imaging of parafoveal surface macrophages and the underlying microvasculature pre- **(top row)** and post- Teprotumumab treatment **(bottom row),** using clinical OCT. **A, D)** 3 µm OCT-R slab located above the ILM surface shows the presence of macrophages (arrows). **B, E)** Overlaid of surface macrophages and corresponding OCT-A full vascular layer. **C, F)** Overlaid of macrophage density map and OCT-A. Surface macrophage density decreased as the inflammatory burden decreased with Teprotumumab treatment.

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Retrospective Chart Review on the Documentation of Pretibial Myxedema for Patients with Thyroid Eye Disease Receiving Teprotumumab Treatment

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Introduction: Pretibial myxedema is an uncommon extrathyroidal manifestation of thyroid disease that is almost always seen in association with thyroid eye disease (TED), affecting 13% of those with severe ophthalmopathy.[1] Severity of skin involvement varies from subtle subcutaneous nodules to debilitating elephantiasis-like plaques. Dermopathy and orbitopathy is thought to share a common underlying pathophysiology; however, empiric evidence to support this hypothesis is lacking aside from one case report of a patient receiving teprotumumab for thyroid eye disease who noted improvement in pretibial myxedema.[2,3] This retrospective study aims to evaluate the extent to which pretibial myxedema is identified and monitored in patients with thyroid eye disease.

Methods: Charts of adult patients with thyroid eye disease treated with at least one infusion of teprotumumab from January 1st, 2020 to June 4th, 2021 were reviewed. All patient visits that included a physical exam were evaluated. Documented visits older than 66 weeks prior to patients' first teprotumumab infusion date were excluded from analysis. Any specific mention of extremity or skin exam was noted. The date of documentation as well as the service evaluating the patient was collected.

Results: Twenty-four patients were identified as having had at least one infusion of teprotumumab. Existing clinical documentation was reviewed in the form of outpatient visits and emergency room visits. Of the outpatient visits, clinic notes were obtained from Endocrinology, Rheumatology, Cardiology, and Internal Medicine. Of note, there were no Dermatology notes or referrals to Dermatology. Patient notes ranged from 5 days to 66 weeks prior to each patient's first teprotumumab infusion (mean: 44 weaks, median: 40 weeks). Of these patients, 23 out of 24 patients (95.8%) had no positive or negative documentation of pretibial myxedema specifically. Fifteen patients (62.5%) had documentation of a normal lower extremity exam, including the verbiage "no edema," "no swelling," "no rash," "no nodules," or "no deformities/discoloration." Eight patients (33.3%) had no physical exam documented in any notes in the charts.

Approximately one month prior to his first teprotumumab infusion, one patient (4.2%) had an Endocrinology note documenting a "small area of left lower extremity pretibial myxedema." This exam finding was documented again approximately one month after the first infusion. Two months after the patient completed his eight infusion regime, the same endocrinologist noted "no edema" on her physical exam.

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Conclusions: Pretibial myxedema may be overlooked by providers on physical exam. Because this condition almost exclusively occurs in the setting of TED and is thought to share a common biological pathway, oculoplastic specialists may be in a unique position to not only identify but potentially aid in treatment of pretibial myxedema. Moreover, given the documented improvement of one patient's pretibial myxedema immediately following teprotumumab treatment, research on the relationship between these two may further elucidate better treatment protocols.

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Risk Factors for Surgical Complications in Oculoplastic Surgery

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Introduction: There have been limited studies evaluating risk factors associated with postoperative complications specifically in oculoplastic surgery. A search of the literature yielded one study by Homer et al. assessing risk factors for wound dehiscence following upper blepharoplasty. The authors aim to evaluate the effect of various risk factors on post-operative complication rates in oculoplastic surgery.

Methods: A retrospective chart review was conducted at a tertiary care center based on the records of patients who underwent oculoplastic surgery from 01/01/2002 to 7/15/2021. CPT codes of the most common ptosis repair, lacrimal system, orbital, and globe removal surgeries were used to perform the search, along with ICD-9 and ICD-10 codes of common risk factors and surgical complications. Data recorded include: age, sex, body mass index, lifetime smoking history, and history of diabetes mellitus, hypertension, heart disease, and/or chronic kidney disease. The primary outcome was post-operative complication rate. Odds ratios of complication rates for categorical risk factors were generated using Fisher's exact tests, while comparison of mean complication rates for continuous variable risk factors were generated using two-tailed t-tests.

Results: A total of 2,208 patient undergoing 2,610 surgeries met inclusion criteria. The total complication rate was 2.2% (57 cases). Post-operative complications included chronic pain at the surgical site, hemorrhage, surgical site infection, wound contracture, and non-healing wound/dehiscence. Positive lifetime smoking status (p = 0.001) and male gender (p = 0.002) were associated with increased post-operative complication rates. Subgroup analysis found that positive lifetime smoking history was specifically associated with a higher rate of complications in enucleation (p = 0.034) and orbitotomy (p = 0.012), and male gender in orbitotomy (p = 0.002). Age (p = 0.618), body mass index (p = 0.371), hemoglobin A1c (p = 0.243), and history of diabetes mellitus (p = 0.712), hypertension (p = 0.788), heart disease (no case of complications), and/or chronic kidney disease (p = 0.830) were not found to be associated with increased surgical complication rates.

Conclusions: Lifetime smoking history and male gender are associated with an increased rate of post-operative complications in oculoplastic surgery. Smoking is a modifiable risk factor, and this study may serve to provide oculoplastic surgeons with evidence to guide pre-operative conversations and patient education.

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Shewanella Algae Causing Pediatric Orbital Abscess with Leptomeningitis

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Introduction: Although orbital cellulitis with abscess is often secondary to *Staphylococcus aureus* and *Streptococcus spp.*, there are rare pathogens that can cause severe disease. Herein, we describe a case of acute orbital abscess with cellulitis, epidural abscess, and leptomeningitis caused by *Shewanella algae (S. algae),* following patient exposure to seawater. *Shewanella spp*. are aquatic gram-negative bacilli that can cause aggressive skin and soft tissue infections, with up to one-tthird of patients developing bacteremia and one-tenth resulting in death.[1] It is therefore important to consider *S. algae* in the differential diagnosis in patients with recent exposure to aquatic or marine environments.

Methods: Case report.

Results: A 13-year-old boy with history of chronic rhinosinusitis presented with left-sided periorbital pain, swelling, mucoid discharge, and fever of 103°F, with onset one day after swimming in the ocean. Initial examination revealed visual acuity of 20/20 in each eye, normal intraocular pressures (IOP), and no relative afferent pupillary defect. Dyschromatopsia could not be assessed due to congenital red-green colorblindness. There was moderate limitation of supraduction of the left eye (OS), eyelid edema and erythema. Computed tomography of the orbits with contrast demonstrated abnormal soft tissue attenuation within the left superomedial extraconal space and left ethmoid opacification (Figure 1 A-B). He was started on empiric ceftriaxone, metronidazole, and vancomycin.

Within twelve hours, he developed a severe headache. Repeat examination confirmed clinical deterioration with an IOP of 28, chemosis, 5 mm of proptosis, and worsening extraocular movements OS (Figure 2). Magnetic resonance imaging of the orbits demonstrated significant proptosis and stretching of the optic nerve, worsening left orbital apex inflammation, and evolution of a superomedial subperiosteal orbital abscess with adjacent epidural abscess and associated leptomeningeal and dural enhancement along the floor of the anterior cranial fossa (Figure 1 C-D). The patient underwent emergent left orbitotomy with abscess drainage and endoscopic sinus surgery. Intraoperative cultures grew *S. algae* and *Escherichia coli*. He showed rapid clinical improvement after surgical drainage and tailored antibiotic therapy with cefepime and metronidazole, and demonstrated a full recovery at six-week follow-up.

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Conclusions: This case highlights the rapid clinical deterioration often seen in patients with *S. algae* infection despite aggressive broad-spectrum antibiotic therapy. Given the aggressive nature and high associated rates of bacteremia and death from *S. algae* infections, it is important to consider it as a causative microbe in patients with orbital infection and recent aquatic exposures. Understanding the pathogens antibiotic susceptibility pattern and often fulminant course can help direct early empiric treatment and need for surgical intervention.

Figure 1

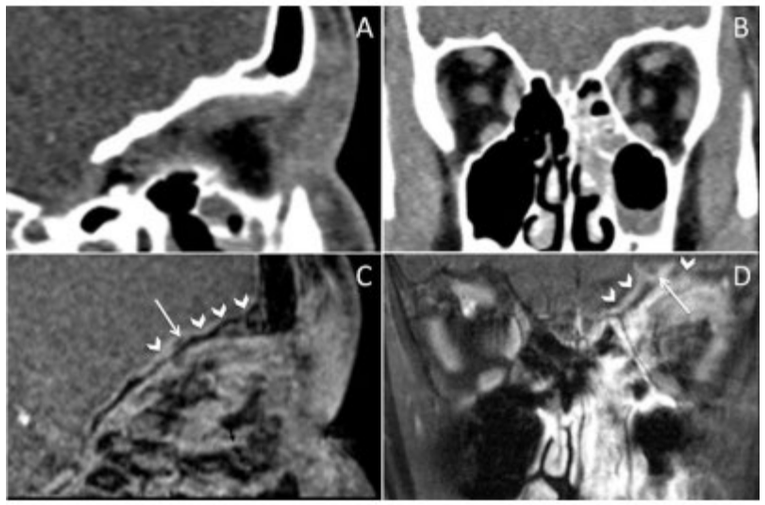
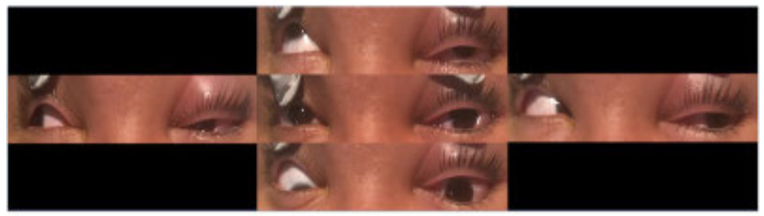


Figure 2



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Superior Limbic Keratoconjunctivitis Following Müller's Muscle-Conjunctival Resection

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Introduction: Superior limbic keratoconjunctivitis (SLK) is an ocular surface disorder commonly associated with thyroid eye disease. We report the first case of SLK following Müller's Muscle-Conjunctival Resection and review the literature regarding development of SLK after eyelid surgery.

Methods: A literature review was performed on PubMed using the following search terms: "superior limbic keratoconjunctivitis", "surgery", "eyelid". There were no language or date restrictions. No reports were excluded.

Results: A 43-year-old Hispanic female with a history of hypothyroidism developed persistent foreign body sensation and pain in the left eye six weeks following an uncomplicated Müller's Muscle-Conjunctival Resection for unilateral blepharoptosis (Figure 1). There was no lagophthalmos. Slit lamp examination revealed injection of the tarsal and bulbar conjunctiva and filaments on the superior cornea consistent with superior limbic keratoconjunctivitis (Figure 2). Thyroid studies were unremarkable. She was initially treated with lubricants and topical steroids without improvement and is currently considering surgical management with conjunctival resection.

Conclusions: SLK is an ocular surface disorder characterized by inflammation of the superior tarsal and bulbar conjunctiva with punctate staining and filaments along the superior cornea and limbus.[1,2] The exact etiology of SLK is unknown but a prevailing hypothesis relates this disorder to mechanical stress and blink-related microtrauma.[3-5] There have been two other case reports describing the development of SLK following eyelid surgery, specifically upper eyelid blepharoplasty.[6,7] However, to the authors' knowledge this is the first report of SLK developing after upper eyelid Müller's Muscle-Conjunctival Resection (MMCR). Surgeons performing MMCR should be aware of this rare complication that may be confused for benign irritation or keratoconjunctivitis sicca.

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Figure 1

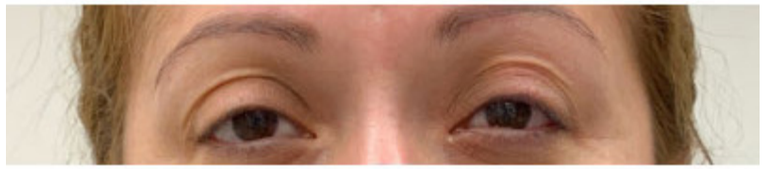
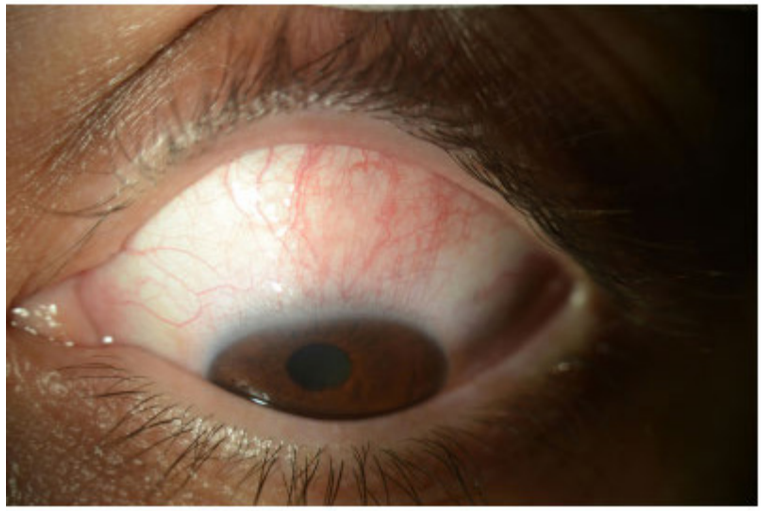


Figure 2



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Teprotumumab as Monotherapy for Dysthyroid Optic Neuropathy

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Introduction: Thyroid Eye Disease (TED) is an inflammatory autoimmune disease that can present with variable signs and symptoms. In 5-9% of patients with TED, an expansion of orbital fat and/or muscles leads to dysthyroid optic neuropathy (DON) which can result in permanent vision loss if left untreated. Conventional treatment options for DON include orbital decompression, systemic glucocorticoids, and radiotherapy, all of which have limitations. Teprotumumab is a human monoclonal antibody to the insulin-like growth factor I receptor (IGF-IR) approved by the FDA for the treatment of TED. It has been shown to decrease extraocular muscle (EOM) size on radiography and been reported for the use of DON in patients who failed conventional treatment. Herein, the authors report early experience using teprotumumab as first-line monotherapy in the treatment of patients with DON.

Methods: Retrospective single-center interventional case series of TED patients treated with teprotumumab as monotherapy for DON. DON was diagnosed based on history, exam, visual field testing and orbital radiography confirming apical crowding and effacement of the fat between the optic nerve and EOMs. Patients received infusions of teprotumumab (10 mg/kg for the first infusion followed by 20 mg/kg for subsequent infusions) every three weeks for 8 total infusions. All patients were screened with best corrected Snellen visual acuity (BCVA), pupil exam, color vision, dilated exam, and automated perimetry after the 2nd, 4th, 6th, and 8th infusions. Post-treatment imaging was not routinely performed. Exclusion criteria included age

Results: A summary of patient outcomes is illustrated in Table 1. Two males and 2 females had a mean age of 66 years (range 58-75). All pts had a known diagnosis of Graves disease and none of the patients had prior radioactive iodine treatment. All patients were in active phase of disease having a CAS >3 and a mean TED disease duration of 3.5 months (range 2-5). Two patients had bilateral DON, while two had unilateral disease, giving a total of 6 involved orbits. Average time between diagnosis of DON and first teprotumumab infusion was 3 weeks (range 2-3.5). All patients showed improvement in BCVA and HVF along with normalization of color vision and RAPD with teprotumumab treatment (Figs 1 & 2). Improvement in all patients was first noted after the 2nd infusion with marked improvement in all variables tested. This clinical improvement remained stable or continued through the follow-up period in all cases. After completion of treatment, affected eyes had a mean BCVA improvement of 0.36 LogMAR ($p = 0.035$), and HVF mean defect improvement of 13.31 db ($p = 0.025$). The only adverse event noted was mild muscle cramps in one patient. No patients required surgical decompression, steroids, or radiotherapy and there were no instances of recurrence with a mean follow-up 5.5 months after final teprotumumab infusion (range 4-7).

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Conclusions: Teprotumumab used as monotherapy resulted in drastic and rapid improvement or resolution of DON in active phase TED patients. One mild adverse event was noted and there were no cases of recurrence. Clinicians may wish to consider teprotumumab monotherapy as a treatment option for DON. Larger prospective studies are warranted to compare teprotumumab with more conventional treatments strategies to assess superiority.

Figure 1

Patient #	Age	Sex	Smoking Status	TED duration (mos)	Laterality	BCVA baseline	BCVA after treatment	APD Baseline	APD after treatment	Color VA (Ishihara) baseline	Color VA (Ishihara) after treatment	VF (MD) baseline	VF (MD) after treatment
1	75	m	Never	5	Bilateral	20/70 OD, 20/30 OS	20/30 OD, 20/25 OS	2+	0	8/15 OD, 8/15 OS	15/15 OD, 15/15 OS	-22.76 OD, -22.18 OS	-3.22 OD, -2.66 OS
2	67	f	quit 18mos ago	4	Bilateral	20/100 OD, 20/40 OS	20/28 OD, 20/28 OS	1+	0	8/15 OD, 8/15 OS	15/15 OD, 15/15 OS	-23.26 OD, -7.21 OS	-1.39 OD, -0.33 OS
3	58	m	Never	5	Unilateral	20/80	20/25	2+	0	5/15	15/15	-6.68	+0.24
4	63	f	Never	2	Unilateral	20/60	20/20	2+	0	4/15	15/15	-7.76	-0.13

Figure 2

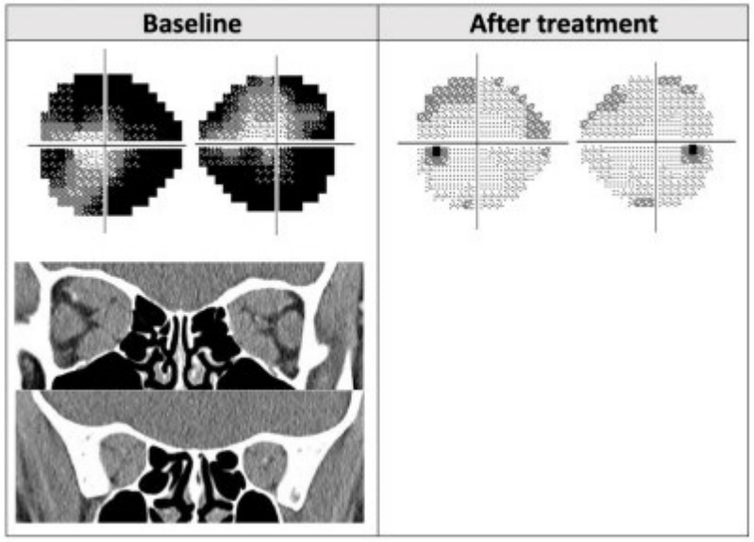
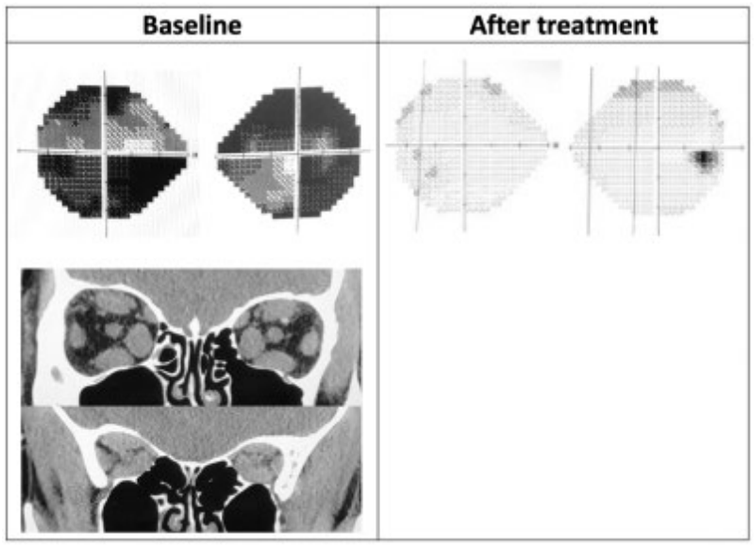


Figure 3



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The Effect of Obstructive Sleep Apnea Risk on Visual Outcomes in Thyroid Eye Disease Patients Following Orbital Decompression

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Introduction: Prior studies have shown that thyroid eye disease (TED) patients at an increased risk of obstructive sleep apnea (OSA) based on STOP-BANG scores develop more severe clinical features of TED.[1,2] The effect of OSA status on orbital decompression outcomes in TED patients has not previously been studied. The purpose of this study was to evaluate whether OSA status affects visual outcomes in TED patients undergoing orbital decompression.

Methods: This was a retrospective cohort study evaluating 57 patients (83 eyes) with TED who underwent orbital decompression at a single tertiary care institution between 2010-2020. Patients were stratified by STOP-BANG score into three groups: low-risk OSA (score 0-2), intermediate risk OSA (score 3-4), and high risk OSA (score >5). Primary outcome was best-corrected visual acuity (VA) measured pre-operatively, and at

Results: Average age was 53.7 (±SD 15.7) and 41 (72%) patients were female. Forty-one (72%) patients were in the low-risk OSA cohort, 8 (14%) in the intermediate-risk OSA cohort, and 8 (14%) in the high-risk OSA cohort. Thirty-one (54.4%) patients underwent bilateral orbital decompression and 26 (45.6%) patients underwent unilateral orbital decompression. Baseline pre-operative logMAR VA was 0.24±31 (20/34) for low-risk, 0.31±0.19 (20/40) for intermediate-risk, and 0.23±0.16 (20/33) for high-risk OSA patients (p=0.71). Visual acuity changes from baseline to <1, 1-3, 3-6, 6-9, and 9-12 month intervals post-operatively within the low-risk, intermediate-risk, and high-risk OSA cohorts are shown in Table 1. Notably, at the 9-12 month interval, post-operative logMAR VA was 0.10±0.10 (20/25) for low-risk, 0.19±0.10 (20/30) for intermediate-risk, and 0.27±0.17 (20/37) for high-risk OSA patients (p=0.08).

Conclusions: TED patients undergoing orbital decompression did not have significantly different visual outcomes over a 1-year post-operative period based on OSA status. While patients at low-risk of OSA trended toward having a better post-operative VA of 20/25 at 9-12 months in comparison to the intermediate-risk (20/30) and high-risk (20/40) groups, this did not reach statistical significance.

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(continued)

Figure 1

Table 1. Visual Acuity of Thyroid Eye Disease Patients After Orbital Decompression based on Risk of Obstructive Sleep Apnea

	Low-Risk OSA (STOP-BANG Score 0-2)			Intermediate-Risk OSA (STOP-BANG Score 3-4)			High-Risk OSA (STOP-BANG Score >5)		
	logMAR BCVA (±SD, Range)	VA Snellen	p-value	logMAR BCVA (±SD, Range)	VA Snellen	p-value	logMAR BCVA (±SD, Range)	VA Snellen	p-value
Baseline	0.24 (±0.31, 0-1.50)	20/34	-	0.31 (±0.19, 0-0.60)	20/40	-	0.23 (±0.16, 0.10-0.60)	20/33	-
<1 month	0.21 (±0.21, 0-1)	20/32	0.86	0.35 (±0.19, 0.10-0.60)	20/44	0.2	0.29 (±0.26, 0.10-1)	20/38	0.49
1-3 months	0.21 (±0.22, 0-1)	20/32	0.16	0.22 (±0.19, 0.10-0.60)	20/33	0.57	0.29 (±0.27, 0.11-1)	20/38	0.65
3-6 months	0.17 (±0.25, 0-1)	20/29	0.38	0.20 (±0.19, 0-0.55)	20/31	0.87	0.10 (±0.11, 0-0.30)	20/25	0.1
6-9 months	0.13 (±0.12, 0-0.40)	20/26	0.06	0.29 (±0.18, 0.10-0.48)	20/38	0.53	0.17 (±0.09, 0.10-0.30)	20/29	0.78
9-12 months	0.10 (±0.10, 0-0.30)	20/25	0.79	0.19 (±0.10, 0.10-0.30)	20/30	1	0.27 (±0.17, 0.10-0.48)	20/37	0.83

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Thyroid Eye Disease (TED) Reactivation Associated with COVID-19 Vaccination

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Introduction: To describe the presentation of both new-onset and reactivation of thyroid eye disease following COVID-19 vaccination.

Methods: This is a retrospective case series of patients presenting with symptoms and signs of new or reactivated thyroid eye disease (TED) coinciding with recent COVID-19 vaccination. Data collected included patient age, gender, presenting symptoms, ocular history, clinical signs, and interval duration between vaccination and onset of ocular symptoms.

Results: Three female patients were identified. All patients were over 18 years of age (range 45 to 66 years). Patients received either the Moderna or Pfizer COVID-19 vaccine and presented with symptoms of TED within 24 hours to 21 days of receiving their first or second dose. None of the patients had previous infection with SARS-CoV-2. Two patients had a history of inactive TED with stable thyroid function tests: one of these patients had stable disease for at least 15 years and the other had stable disease for 5 years. The third patient had no previous history of thyroid dysfunction or TED and presented with low levels of thyroid stimulating hormone. All three cases presented with proptosis. In two of three cases, periorbital edema, eyelid retraction, and diplopia were present. None were current smokers. One had prior facial hyaluronic acid filler injections. Symptoms in all cases were stable or improving at two to five months.

Conclusions: The American College of Rheumatology noted a possible risk of reactivation of autoimmune disease after COVID-19 vaccination due to immune activation or non-specific adjuvant effects.[1] Although there have been several reports of autoimmune disease flares following COVID-19 vaccination,[2] to the best of our knowledge, this is the first description of a TED flare or new-onset TED after COVID-19 vaccination. While the possibility of unrelated TED flaring concurrently with COVID-19 vaccination exists, questions remain on the effects of the COVID-19 vaccine in patients with autoimmune ophthalmic diseases. Physicians should be aware of this potential association and counsel patients appropriately.

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Figure 1

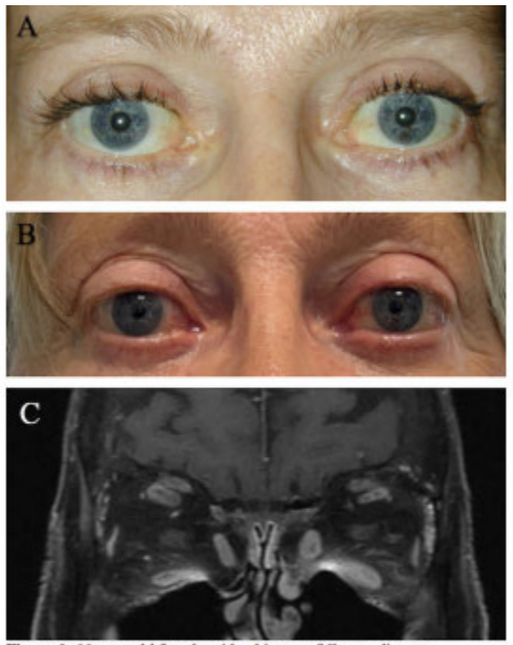

Figure 1. 66-year-old female with a history of Graves disease, stable for at least 15 years, who had undergone bilateral orbital decompression 15 years prior (A), presenting with new-onset bilateral proptosis and periorbital edema 3 weeks after the second dose of the Moderna COVID-19 vaccine (B). Coronal MRI demonstrating enhancement and edema of the inferior rectus muscles (C).

Figure 2

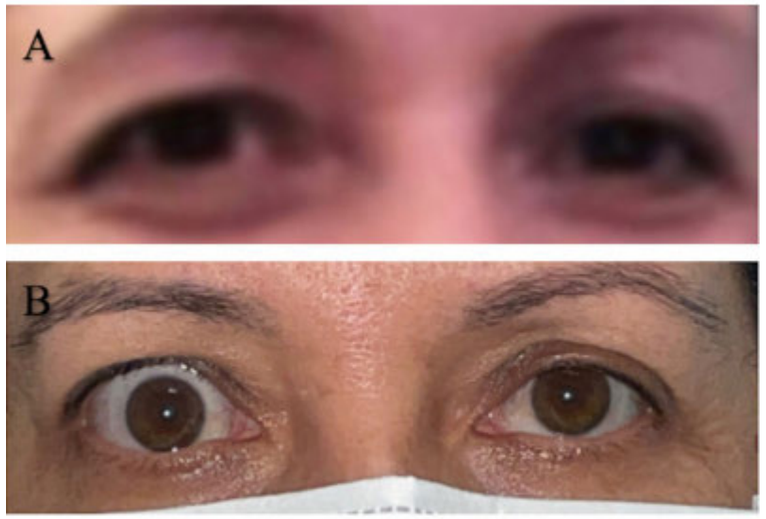

Figure 2. 53-year-old female with no previous history of thyroid eye disease (A) presenting with new-onset proptosis and upper and lower eyelid retraction in the right eye within 24 hours after the first dose of the Pfizer COVID-19 vaccine (B).

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Transient Orbital Emphysema Following Orbital Fracture Repair with Nylon Foil Implants

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Introduction: Orbital Emphysema can be a vision-threatening condition that results in the air in the orbital tissue spaces from a forceful injection of air through an open entry site commonly in the presence of orbital fractures.[1] Only a handful of cases of this condition following a fracture repair with titanium mesh and silastic sheet implants have been reported in the literature.[1-3] This study aims to identify the rate of orbital emphysema after orbital fracture repairs with nylon foil implants and present the identified cases.

Methods: A retrospective review of all orbital fracture repairs at our institution was performed from November 2011 through May 2021. Data collection included patient demographics, type of fracture repaired, type of implant material, and any postoperative orbital complications relating to the implant. Specifically, the medical records were investigated for any reports of transient proptosis, eyelid swelling, diplopia, or eye pain following a forceful pressure into the nasal cavities. Computed Tomography (CT) scans were evaluated if present.

Results: A total of 510 cases of orbital wall fracture repair surgeries with nylon foil implants were identified. Two cases (0.004%) with signs and symptoms of late postoperative orbital emphysema were identified. The first case was a 24-year-old female who presented one year after left orbital medial wall and floor fracture repair with intermittent proptosis with sinus pain and headaches immediately after sneezing. Her exam was unremarkable with normal motility and no evidence of significant enophthalmos or proptosis. A CT scan showed slippage of the superior border of the medial wall implant into the ethmoid sinus with a small prolapse of orbital tissue. The patient underwent surgery for the removal of her implant in order to fix the presumed fistulous tract from her ethmoid sinus to her orbit. In the second case, a 39-year-old female presented with intermittent lower eyelid swelling with nose-blowing two months after right orbital floor fracture repair. Her exam was otherwise unremarkable with normal motility and no enophthalmos or proptosis. CT scan was obtained without significant abnormality. She was monitored and counseled to avoid nose blowing. Her symptoms improved.

Conclusions: Transient orbital emphysema may rarely occur after orbital wall fracture repair with nylon foil implants with frequent forceful nose blowing or sneezing CT scan should be obtained to evaluate for any malposition of the orbital implant, and consideration for surgical removal of the implant should be considered.

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Understanding the Side Effect Profile of Teprotumumab

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Introduction: Teprotromumab is the first FDA-approved treatment for thyroid eye disease (TED), with clinical trials demonstrating a favorable safety profile.[1,2] We describe side effect data reported by patients with TED initiated on teprotumumab therapy at one institution.

Methods: An IRB-approved retrospective review of medical records from January 1, 2020 to present identified patients with a clinical diagnosis of TED partially or completely treated with teprotumumab. Patient demographics, clinical examination findings, and side effect profiles following teprotumumab infusions were reviewed.

Results: Twenty-six patients (17 female, mean age 62±14 years) with TED treated with teprotumumab were identified (an additional 30 patients are anticipated to be included prior to meeting presentation). Of the current patients, 73.1% (n=19) were partially treated (mean number of infusions=3.61±1.85, range=1-7) and 26.9% (n=7) completed 8 of 8 infusions. Overall, 38.5% (n=10) reported muscle spasms, 30.8% (n=8) reported fatigue, 23.1% (n=6) reported nausea, 15.4% (n=4) reported abdominal pain, 11.5% (n=3) reported hearing changes (3 experienced tinnitus, one of which also noted muffled hearing; 2 reported tinnitus prior to treatments, and all resolved after treatment completion), 11.5% (n=3) reported dysgeusia, 11.5% (n=3) reported alopecia or nail changes, 7.7% (n=2) reported diarrhea, 7.7% (n=2) reported headaches, 3.8% (n=1) reported a facial rash, 3.8% (n=1) reported an isolated episode of rectal bleeding, and 3.8% (n=1) reported infusion related symptoms; 26.9% (n=7) of patients did not report side-effects (Table 1). All patients classified side effects as mild or tolerable. One elderly patient elected to stop treatment after 7 of 8 doses due to fatigue that resolved after involuntary 4-month interruption of teprotumumab, as she had already achieved her treatment goals.

Two patients (7.7%) were diabetic and experienced worsening of hyperglycemia. Six patients (23.1%) were pre-diabetic with two experiencing hyperglycemia during treatment. One non-diabetic patient developed pre-diabetes based on pre- and post-hemoglobin A1c testing. The blood sugars of the four patients that developed hyperglycemia were either transient fluctuations or well-controlled with medication adjustments.

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Two patients experienced more serious adverse events. One patient with a history of hypertension and type 1 diabetes complicated by chronic kidney disease on hemodialysis experienced hyperglycemia, abdominal pain and diarrhea shortly after the first infusion. Nine days later he reported three episodes of emesis and continued diarrhea prompting urgent medical evaluation and a two-day hospitalization, where he was found to have pyelonephritis thought to partially explain his symptoms; symptoms abated without sequelae and the patient elected to continue teprotumumab therapy given early and significant improvement in TED symptoms. He did not experience additional episodes of similar nature after subsequent infusions. One patient with history of astigmatic and radial keratotomy on chronic ketorolac for cystoid macular edema developed a corneal ulcer and perforation two weeks after his third infusion, ultimately requiring therapeutic penetrating keratoplasty.

Conclusions: Our results parallel the known side effect profile of teprotumumab with overall mild, tolerable side effects that did not prompt treatment cessation for the vast majority of patients. Blood sugar and HbA1c should be monitored for all patients including non-diabetics, as fluctuations may be seen and can be medically controlled.

Figure 1

Adverse event	Patients (n=26)	Patients (%)	Summary of details of adverse events
Muscle spasms	10	38.5	1 reported symptomatic relief with utilization of dantrolene
Fatigue	8	30.8	1 discontinued therapy after 7 of 8 infusions as she had reached her treatment goals and her teprotumumab-associated fatigue had resolved during involuntary treatment interruption
Nausea	6	23.1	
Hyperglycemia	4	15.4	2 diabetic patients reported worsening of hyperglycemia 2 pre-diabetic patients reported hyperglycemia
Abdominal pain	4	15.4	
Hearing changes	3	11.5	3 of 3 reported tinnitus (2 noted tinnitus prior to treatment) 1 of 3 also with muffled hearing
Dysgeusia	3	11.5	
Alopecia	3	11.5	
Nail Changes	3	11.5	
Diarrhea	2	7.7	
Headaches	2	7.7	
Facial rash	1	3.8	
Rectal bleeding	1	3.8	1 reported isolated episode of bright red blood per rectum one week following infusion
Infusion reaction	1	3.8	1 reported feeling hot, flushed, and dizzy; was asymptomatic when pretreated with diphenhydramine
No side effects	7	26.9	
Serious Adverse Events	2	7.7	1 reported vomiting and diarrhea requiring a 2-day hospital admission, found to have concomitant pyelonephritis 1 with history of AK and RK developed corneal ulcer and perforation requiring therapeutic PKP

Table 1. Summary of adverse events following teprotumumab infusions.
AK = astigmatic keratotomy; RK = radial keratotomy; PKP = penetrating keratoplasty

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Unilateral Chemosis with Severe Reactive Changes Masquerading as Conjunctival Neoplasm

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Introduction: The differential diagnosis for chemosis is broad and includes etiologies including trauma, infection, inflammation, vascular pathology, and neoplasia.

Methods: The authors report the case of an unusual unilateral chemosis with an unexpected pathology.

Results: A 47-year-old African American male with autism, nonverbal at baseline, presented to the emergency department with one week of left eye swelling. Exam revealed significant chemosis with secondary lagophthalmos of the left eye (Figure 1) along with bilateral floppy eyelids. CT orbits disclosed shallow orbits bilaterally, without extraocular muscle enlargement or posterior orbital pathology (Figure 2).

Given the significant degree of chemosis and secondary lagophthalmos, biopsy of the left inferior conjunctiva with lateral permanent tarsorrhaphy and medial temporary suture tarsorrhaphy was performed to aid in diagnosis and to accelerate resolution. Pathological evaluation of the conjunctiva revealed markedly thickened epithelium with full-thickness atypia and brisk mitotic figures in superficial layers, interpreted as conjunctival intraepithelial neoplasia (CIN) with severe dysplasia (Figure 3).

Correlation of histopathology findings with review of the patient's history and prior photographs raised consideration that exuberant reactive changes may be responsible for conjunctival epithelial atypia, rather than neoplasia. Given the acuity of onset and concomitant shallow orbit configuration with secondary exposure, a reactive process was favored, and the patient was treated with topical prednisolone acetate 1% drops and, by post-operative week two, chemosis completely resolved without appreciable epithelial tumefaction (Figure 4).

The following week, the patient had a witnessed episode of globe subluxation of the right, unaffected eye. It was hypothesized that his shallow orbits and floppy eyelids predisposed him to globe subluxation, and a similar episode may have been the inciting factor for left conjunctival chemosis. The patient underwent bilateral three-wall balanced decompression, bilateral lateral permanent tarsorrhaphies, and repeat biopsy of the left conjunctiva adjacent to the prior surgical site. Histopathology revealed a mildly hyperplastic epithelium with normal maturation, no cytomorphologic atypia, and no atypical mitotic figures in the superficial layers (Figure 5). The substantia propria

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demonstrated mild fibrosis with mild chronic non-granulomatous inflammation and increased in vascularity, consistent with resolved chemosis and prior surgical site changes. Post-operatively, the patient recovered well without further episodes of globe subluxation.

Conclusions: The lessons from this case are twofold. First, severe chemosis from exposure can be histopathologically indistinguishable from conjunctival intraepithelial neoplasia (CIN). Second, there are limitations in pathologic evaluation when interpreted out of context with the clinical history. A close working relationship between clinicians and pathologists is essential to guide patient management. When in doubt, repeat biopsy may be necessary.

Figure 1

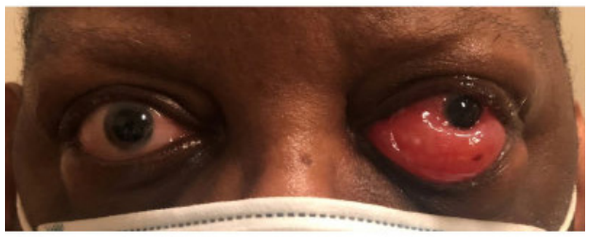
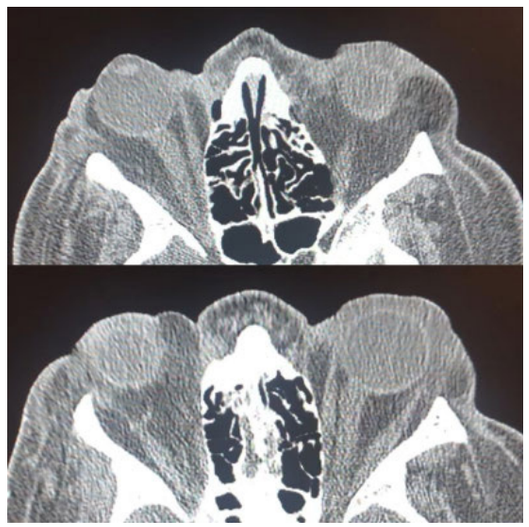


Figure 2



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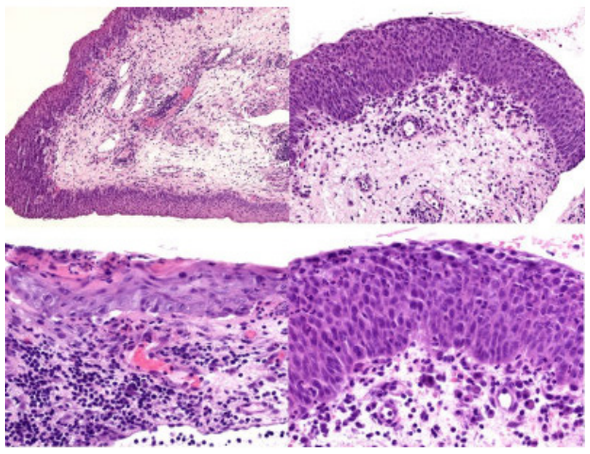

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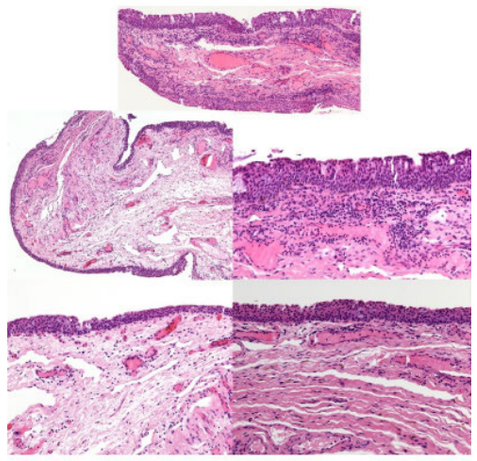

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Vertical Globe Position in Patients with Thyroid Eye Disease and Intra-Conal Tumors

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Introduction: Thyroid eye disease (TED) is characterized by a wide, variable array of disfiguring changes in the periocular area. Peri-orbital changes have significant effects on patient self-perception and lifestyle.[1,2] Although axial proptosis and widened interpupillary distance (IPD) in TED patients have been described, changes in vertical position of the eye are not well-characterized. These changes may affect relative upper and lower eyelid positions, contributing to overall aesthetic disfigurement. This study seeks to determine the extent of vertical globe displacement in TED patients relative to non-TED and intraconal tumor (ICT) patients and determine the effect of surgery on vertical globe displacement in TED and ICT patients.

Methods: In this case-control study, we queried a patient clinical database for TED clinical diagnoses. Conditions that may modify orbital anatomy were excluded (i.e., neuromuscular disease and non-TED related orbital disease). Comparison groups were drawn from separate anonymized databases consisting of: (1) patients with ptosis and normal individuals and (2) patients with ICT. Vertical position and IPD were measured from photographs and exophthalmos was measured clinically. Primary outcomes were vertical globe position (measured from a line drawn between lateral canthi to the center of the pupil in each group) compared to normal controls and vertical globe position change in TED and ICT patients who underwent orbital surgery. Secondary outcomes included the relationship between vertical globe position and both exophthalmos and IPD.

Results: 239 participants met criteria and had baseline imaging. The sample consisted of 141 TED patients, 37 ICT patients, and 61 controls. Age distribution was similar across all groups, but there were more females in the TED group relative to ICT and control groups (Table 1). Mean vertical globe position was significantly lower in TED patients relative to normal controls and ICT patients, after adjusting for race, age, and sex (Table 2). Pre- and post-operative intercanthal distances were significantly different in both ICT patients (means of 1.72mm and 2.14mm respectively, p= 0.033) and TED patients (respective means of 1.89mm and 1.44mm, p= 0.002). TED patients had a significantly lower globe position after decompression surgery (Table 3). TED individuals who underwent medial or inferior decompression had no significant change in pre- and post-operative globe position, unlike those who underwent lateral decompression (Table 3). Pre- and post-operative globe positions were not significantly different for ICT patients overall or when stratified by race (Table 3). There was no association between change in exophthalmometry, change in IPD and change in globe position with surgery for the TED group.

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Conclusions: TED and ICT patients experience hypoglobus; in the TED group, decompression was associated with increased hypoglobus, while the same was not true in the ICT population. There was no correlation between change in globe position and exophthalmos or IPD among TED patients that underwent surgery. There was, however, a significant negative relationship between change in vertical globe position and proptosis in the ICT group. Lower globe position among TED patients undergoing post-decompression surgery is a postoperative outcome for surgeons to discuss with patients.

Table 1

Table 1. Baseline demographic characteristics, vertical globe position, inter-pupillary distance (IPD), and proptosis measurements in patients with thyroid eye disease (TED), intra-conal tumors (ICT), and normal controls.

	TED	Controls	ICT
Number	141	61	37
Female (%)	113 (80.1)	41 (67.2)	22 (59.5)
Not East Asian (%)	124 (87.9)	48 (78.7)	28 (75.7)
Mean age (SD)	47.3 (13.0)	47.9 (17.5)	48.7 (17.6)
Mean vertical globe position mm (SD)	1.6 (1.3)	2.2 (1.1)	2.2 (1.0)
Mean IPD mm (SD)	62.2 (4.3)	59.6 (3.4)	62.2 (4.7)
Mean proptosis mm (SD)[1]	24.3 (3.4)	--	20.9 (4.5)

[1] Exophthalmometry was not performed on controls.

Table 2

Table 2. Globe position in all individuals overall and among East Asians and non-East Asians.

	Mean (SD) vertical globe position	p-value[1]
Overall		
Controls (n=61)	2.2 (1.1)	Ref.
TED (n=141)	1.6 (1.3)	0.005
ICT (n=37)	2.2 (1.0)	0.915
Non-East Asian		
Controls (n=48)	2.2 (1.1)	Ref.
TED (n=124)	1.7 (1.3)	0.022
ICT (n=28)	2.2 (0.8)	0.887
East Asian		
Controls (n=13)	1.9 (0.8)	Ref.
TED (n=17)	0.9 (1.3)	0.086
ICT (n=9)	2.0 (0.8)	0.614

[1] Determined using linear regression models adjusted for age, sex, ethnicity, and extra-ocular muscle involvement.

Table 3

Table 3. Mean pre- and post-operative vertical globe position in thyroid eye disease (TED) and intra-conal tumor (ICT) patients overall and stratified by race.

	Mean (SD) preoperative globe position (mm)	Mean (SD) postoperative globe position (mm)	Mean (SD) change in globe position (mm)	P-value (paired t-test)
TED				
Overall (n=63 eyes)	1.60 (1.24)	1.23 (1.21)	-0.38 (1.19)	0.0149
Non-East Asian (n=57)	1.62 (1.24)	1.23 (1.23)	-0.40 (1.18)	0.0134
East Asian (n=6)	1.39 (1.32)	1.24 (1.07)	-0.15 (1.38)	0.799
Medial or inferior decompression (n=12)	1.69 (1.26)	1.22 (1.23)	-0.47 (1.38)	0.265
Other decompression (n=51)	1.58 (1.25)	1.23 (1.22)	-0.35 (1.15)	0.034
ICT				
Overall (n=36)	2.12 (0.96)	2.25 (0.97)	0.13 (1.09)	0.479
Non-East Asian (n=27)	2.15 (1.00)	2.31 (0.98)	0.16 (1.18)	0.490
East Asian (n=9)	2.02 (0.84)	2.06 (0.95)	0.04 (0.80)	0.881

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Vision and Survival Outcomes in Infectious and Non-Infectious Cavernous Sinus Thrombosis

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Introduction: Though mortality from septic cavernous sinus thrombosis (CST) has fallen dramatically in the antibiotic era, vision loss remains common, occurring in 14-17% of cases.[1,2] We describe the etiologies, treatment, as well as visual and survival outcomes in both infectious and non-infectious CST. Additionally, we sought to describe predictors of those outcomes, which have previously not been well described.

Methods: A retrospective chart review identified 18 patients with CST confirmed on MRI or CT imaging who presented to a tertiary care center from 2007 to 2020. Patient demographics, symptoms, visual examinations, disease and imaging characteristics, interventions, and outcomes were examined. Wilcoxon or Chi-square tests were used to study the association between survival and categorical or continuous variables, respectively. Spearman's rank correlation or partial Spearman's rank correlation were reported for associations with continuous variables for visual acuity with logarithm transformation and length of stay. One patient died in-hospital and was removed from length of stay analysis.

Results: Average age at presentation was 49.3 years (range, 3-84). 11/18 (61%) patients were female, and all were white. 12/18 (67%) cases were infectious in etiology, with sources being sinusitis (4), orbital cellulitis with associated sinusitis (3), bacteremia (2), mastoiditis (2), and facial infection (1). The remaining 6 cases were aseptic, including those related to carotid-cavernous fistulae (2), to known or suspected malignancy (2), idiopathic cases (1). 6/18 patients had known immunocompromise.

Average presenting visual acuity (VA) in the worse eye was logMAR 1.1 (roughly 20/250). Worse VA at presentation was associated with worse VA at final follow-up (rho=0.577, p=0.002). Adjusting for the presenting vision, a shorter time from admission to diagnosis was associated with greater decline in visual acuity (rho=-0.353, p=0.043).

Mean time from presentation to diagnosis of cavernous sinus thrombosis was 1.2 days. Following diagnosis, all patients received broad spectrum antibiotics. Therapeutic anticoagulation was administered to 16/18 patients (89%), which included heparin drip, enoxaparin, warfarin, and apixaban. 9/18 (50%) underwent surgery, including endoscopic sinus surgery (6), mastoidectomy (2), and orbitotomy (1). Mean time from presentation to intervention (surgery or therapeutic anticoagulation) was 1.5 days. Average length of hospital admission was 11.6 days (range, 1-31 days). Longer time to intervention tended to associate with longer length of admission (rho=0.471, p=0.06).
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2/18 (11%) patients died. Survival was not significantly associated with immunocompromised status; presenting vision; or time from initial symptoms to diagnosis, from admission to diagnosis, or from admission to intervention.

Conclusions: We present the largest case series of patients with CST in the ophthalmic literature to date. Shorter time from admission to diagnosis of CST was significantly associated with greater visual decline, suggesting that such patients present more fulminantly and are diagnosed more quickly. With worse presenting vision being associated with worse vision at follow up, vision loss may not be reversible even with prompt intervention within the first 36 hours of admission. Due to small valid sample size (two deaths), the study is under powered to study the predictors for survival.

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A Case of Phakomatous Choristoma

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Introduction: Phakomatous choristoma (PC) is a rare benign congenital tumor consisting of ectopic lenticular tissue. Since Zimmerman's initial description in 1971, there remains fewer than 30 cases reported in literature worldwide. We report an interesting case of phakomatous choristoma in a pediatric patient.

Methods: The authors describe a case of a phakomatous choristoma in a 4-month-old presenting at birth as an eyelid mass with post-septal extension. The clinical history, radiographic studies, and histopathology of this rare benign tumor are discussed.

Results: This is a 4-month-old female who presented with an enlarging left lower eyelid lesion since birth. On examination, a firm, palpable mass was located nasally in the left lower lid without globe displacement (Figure 1). Magnetic resonance imaging (MRI) imaging was notable for an 11 x 8mm well-defined homogenous mass in the left lower lid with post septal extension (Figure 2). An anterior orbitotomy with excisional biopsy was performed. Intraoperatively a firm, well-demarcated mass was noted (Figure 3). Histopathological analysis showed fibrocellular tissue infiltrated with cords and aggregates of lens epithelium and associated lens protein (Figure 4). Immunohistochemical stains were positive diffusely for S100 and in the epithelial cells for cytokeratins AE1/AE3 and EMA, confirming a phakomatous choristoma. She was seen two weeks post-operatively and was healing well without complications (Figure 5).

Conclusions: Phakomatous choristoma remains a rare clinical diagnosis, typically presenting at birth as a lower lid mass with few reports of orbital involvement.[1-2] Immunohistochemical staining is positive for S-100 protein; alpha, beta, and gamma crystallines, which are lens-specific proteins, allowing for it to be correctly diagnosed and distinguished from other pediatric tumors.[3-6] MRI is also useful as it will not show any fatty or fluid components as seen in dermoid cysts or bony involvement as seen in malignant pediatric tumors. Surgical excision is curative and the post-operative clinical course is typically unremarkable as there have been no reports of recurrences.[2] Phakomatous choristoma should be considered in the differential of pediatric eyelid lesions.

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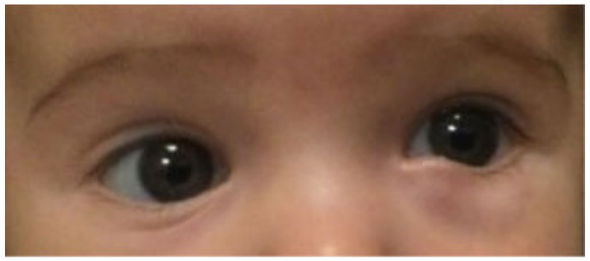
Figure 1



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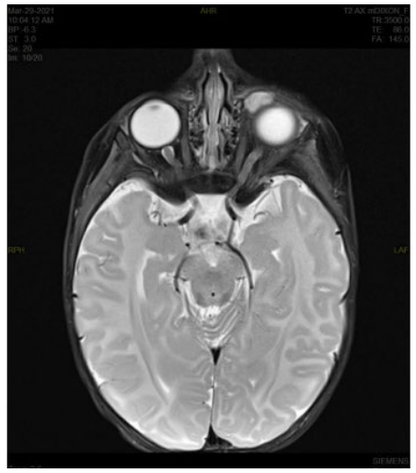

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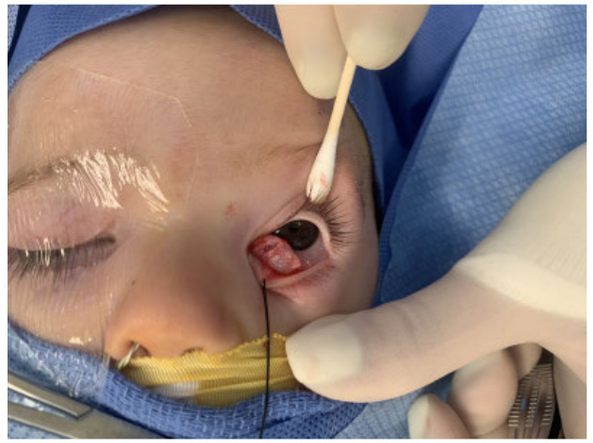

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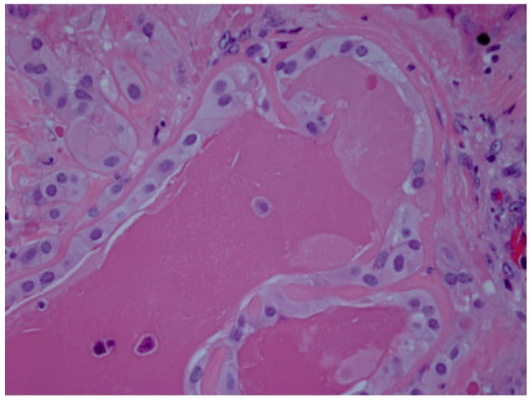
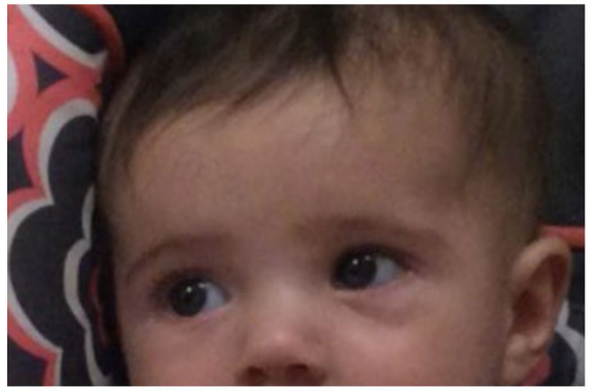


Figure 5



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Congenital Cystic Eye

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Introduction: Congenital cystic eye, or anophthalmia with cyst, is a rare anomaly resulting from an arrest in the invagination of the primary optic vesicle during fetal development.[1-3] It was first described in 1939 by Dr. Ida Mann and there has since been few reports documented in the English literature.[3] We present an interesting case of a patient born with congenital cystic eye and its surgical treatment over one year.

Methods: Case report

Results: A 1-day old full-term infant was transferred to the Children's Hospital of Atlanta for evaluation of a right orbital mass. On clinical exam, she was found to have a large translucent cyst arising from the right orbit with periorbital dermal appendages (Figure 1). The left eye was normal. MRI of the orbit showed replacement of the right orbital cavity with a large multiloculated cystic mass with bony remodeling and optic nerve atrophy (Figure 2). In addition, there were extensive congenital brain malformations. Prior to surgery, the thin-walled cyst spontaneously ruptured, releasing a yellow serous fluid. During surgery, all grossly visible cyst tissue was excised. No identifiable globe was seen. Histopathology showed an outer rim of fibrovascular connective tissue admixed with neuroglial tissue, nerve fibers, skeletal muscle and cystic spaces containing meningothelial cells, consistent with congenital cystic eye. The patient was then subsequently lost to follow-up until one year later when she presented with a new enlarging orbital mass (Figure 3). Repeat MRI showed recurrent, multi-lobulated orbital cysts (Figure 4). The patient was taken for surgery where a transconjunctival incision was made and with careful dissection, the cyst was excised and delivered in its entirety (Figure 5). Unfortunately, the patient has again been lost to follow-up.

Conclusions: Congenital cystic eye is known to present at birth with a large, blueish mass filling the entire orbit, without the presence of an eye. The differential includes congenital microphthalmos with cyst and microphthalmos with cystic teratoma, thus careful examination for a globe structure is important. Imaging with ultrasound, MRI or CT can also help establish a diagnosis, along with histology. Recurrence may be seen with incomplete resection or progressive enlargement caused by fluid produced from glial tissue. Patients with congenital cystic eye should be screened for systemic and neurological abnormalities as it is often associated with absence of the corpus collosum and other malformations. Follow-up is important to ensure proper orbitofacial development and to achieve a good cosmetic outcome.

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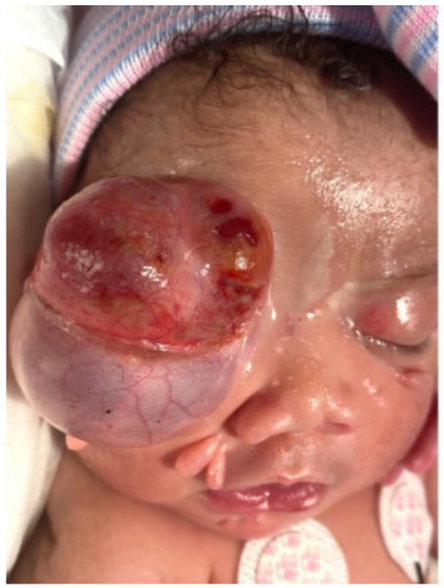
Figure 1



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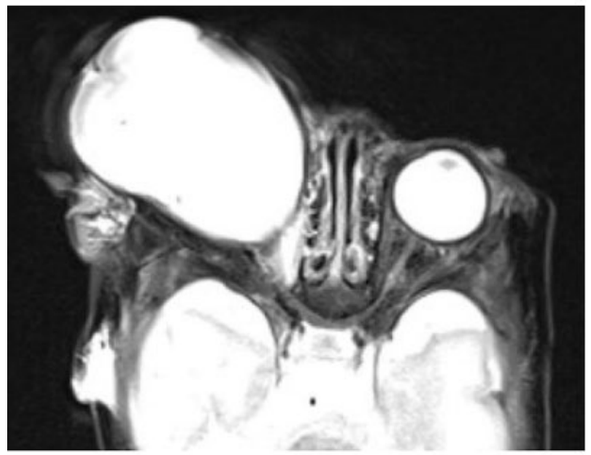

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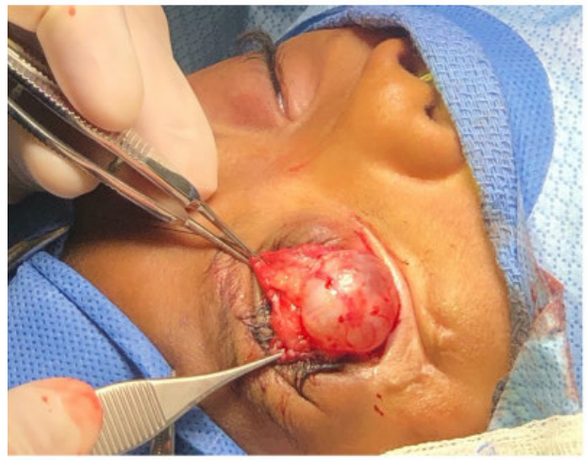

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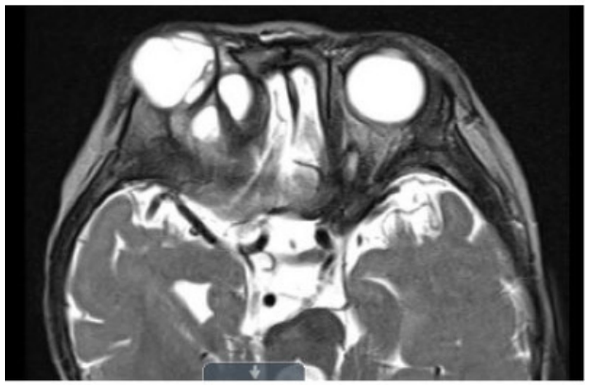

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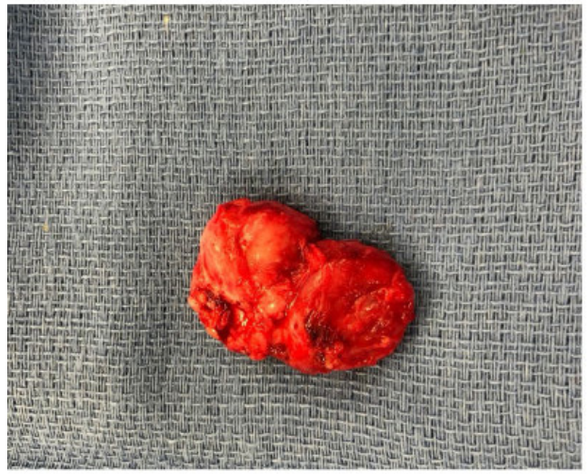

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Effect of Tarsectomy on Post-Operative Lid Crease Height in Patients with Congenital Ptosis Undergoing Mueller's Muscle Conjunctival Resection

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Introduction: Pediatric ptosis can be treated with several techniques including frontalis sling, external levator advancement or resection, and Mueller's muscle conjunctival resection (MMCR) with or without tarsectomy.[1] When appropriate, MMCR procedure may be performed safely with good results.[1-3] We aim to assess changes in lid crease height following MMCR ptosis repair with tarsectomy in patients with congenital ptosis.

Methods: A retrospective chart review of all patients who underwent MMCR surgery with or without tarsectomy between 2009 and 2021 by ASOPRS trained oculoplastic surgeons at a tertiary referral center was performed. Demographic information including age, gender, medical comorbidities, and presence or absence of facial syndromes was collected, as well as amount of MMCR and tarsectomy performed. ImageJ software (NCBI, NIH, Bethesda, MD) was used to measure pre-operative and post-operative margin reflex distance (MRD1), palpebral fissure (PF) and lid crease height (LCH) standardized with corneal white-to-white distance. Statistical analysis was performed using Microsoft Excel and R on Linux.

Results: A total of 12 eyelids in 12 patients underwent MMCR with tarsectomy; the average age was 8.1 years (SD=4.3 years), 66.7% (8 patients) were male, and 8.3% (one patient) had undergone prior ptosis surgery. All patients were diagnosed pre-operatively with unilateral or bilateral congenital ptosis, additional past ocular history in all patients was notable only for refractive error or amblyopia. All patients underwent a nine millimeter (mm) MMCR ptosis repair with tarsectomy ranging between one to two millimeters. Pre-operative PF average was 5.7 mm (SD=1.7 mm), pre-operative MRD1 was 0.9 mm (SD=0.69 mm), pre-operative LCH was 3.8 mm (SD=2.0 mm). Post-operative PF was 7.1 mm (SD=1.1), post-operative MRD1 was 2.1 mm (SD=0.5 mm), post-operative LCH was 2.8 mm (SD=1.9 mm). Seven eyelids showed a decrease in the post-operative LCH (58.3%).

For comparison, 8 eyelids in 8 patients underwent MMCR only; the average age was 10.7 years old (SD= 5.3 years), and 62.5% were male (5 patients). 12.5% (1/8) of the patients had a unilateral ptosis due to Horner's syndrome, and the rest had congenital unilateral or bilateral ptosis. Additional ocular history for these patients was notable for refractive error and in one patient, an orbital floor fracture requiring surgical repair and two subsequent strabismus surgeries. All patients underwent 8.5 or 9 mm MMCR, and pre-operative PF average was 6.5 mm (SD=1.2 mm), pre-operative MRD1 was 1.3 mm (SD= 0.7 mm), and pre-operative LCH was 5.6 mm (SD= 1.1 mm).
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Post-operative PF was 7.4 mm, post-operative MRD1 was 2.1 mm (SD= 0.7 mm), and post-operative LCH was 4.4 mm (SD = 1.4 mm). The LCH decreased in 7 of 8 cases (87.5%). This is shown in Table 1 and Figure 1.

Conclusions: In patients with congenital ptosis undergoing MMCR with and without tarsectomy, there is a trend toward a decrease in post-operative lid height. While this is not observed in all patients, this should be noted by surgeons considering this procedure in pre-operative counseling and in post-operative assessment of lid crease height and contour.

Figure 1

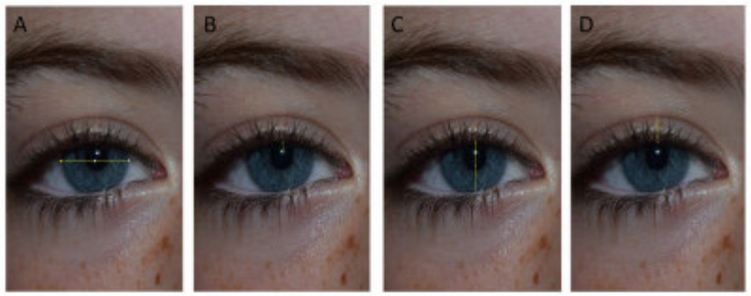

Figure 1: Using ImageJ image processing software the white-to-white distance was measured (A) and set to 11 mm. Then the MRD1, PF height, and LCH were measured (B, C, D).

Table 1

		Preop		Postop	
		Mean	**SD**	**Mean**	**SD**
MMCR + tarsectomy	PF	5.74	1.73	7.08	1.08
	MRD1	0.86	0.64	2.07	0.55
	LCH	3.82	2.00	2.83	1.92
MMCR	PF	6.54	1.16	7.44	1.03
	MRD1	1.31	0.68	2.06	0.68
	LCH	5.55	1.14	4.41	1.42

Table 1: Summary of PF, MRD1, and LCH preoperatively and postoperatively in both the MMCR+ tarsectomy group and the MMCR only group

Figure 2

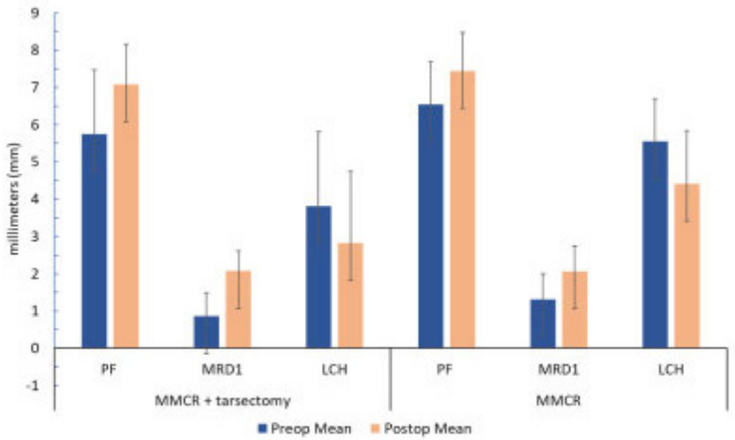

Figure 2: Summary of PF, MRD1, and LCH in mm preoperatively and postoperatively in MMCR+ tarsectomy and MMCR only groups

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Nevus Sebaceous of Jadassohn: A Case Series of 13 Patients

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Introduction: Nevus Sebaceous of Jadassohn (NSJ) includes nevus sebaceous, seizures and mental retardation, often accompanied by ocular anomalies. Ocular involvement now is recognized to occur in up to 50% of patients. This study was undertaken to study the manifestations and management of NSJ, a rare phacomatosis.

Methods: Retrospective case series of 25 eyes of 13 patients over 20 years.

Results: Mean age was 7.5+5.4 (2.1-12.9) y. 12 of 13 patients had bilateral ocular involvement including epibulbar choristoma in 24 (96%), eyelid coloboma in 14 (56%), corneal lesion (pannus, neovascularisation, scarring) in 11 (44%), choroidal osteoma in 11 (44%) and optic disc pit in 4 (16%). Systemic manifestations were: cutaneous [alopecia in all, nevus sebaceous in 12 (92.3%)]; skeletal [parietal bone defect 4 (31%), skeletal bone defects in 2 (15%)] and neurological [seizures in 2 (15%)]. Surgical intervention was with excision of epibulbar lesion with AMG in 18 (72%), SLET in 2 (8%), eyelid reconstruction in 6 (24%). Histopathology showed complex choristoma in 16 and dermolipoma in 2. Final visual acuity was >20/200 in 15 (60%) eyes. None developed malignancy.

Figure: The clinical manifestations of nevus sebaceous of Jadassohn. A. Nevus sebaceous involving the face and neck. B. Right upper eyelid coloboma. C. Right eye episcleral mass. C. Patch of alopecia. D. Right fundus with optic disc pit and sclerochoroidal hypopigmented lesion representing a hamartoma E. Histopathology of the epibulbar mass suugestive of a complex choristoma with hyaline cartilage, fibrous connective tissue, lacrimal gland acini, smooth muscle bundles, adipocytic lobules, skeletal muscle fibres and nerve bundles.

Conclusions: NSJ is characterized by a spectrum of ocular features and cutaneous, skeletal and neurological abnormalities. Excision of the epibulbar choristoma and eyelid reconstruction provide gratifying outcome.

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Pediatric Eosinophilic Granulomatosis with Polyangiitis Presenting as an Orbital Mass

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Introduction: To describe a case of a pediatric patient with a rapidly growing orbital mass with associated periocular inflammatory findings as presenting signs of Eosinophilic Granulomatosis with Polyangiitis.

Methods: Case report of a pediatric patient referred to a tertiary care eye center for left periorbital erythema and swelling.

Results: This is a case of a 6 year old female who presented with 3 weeks of redness and swelling to left upper eyelid. Of note, she had a similar but more mild episode in her right upper eyelid 2 years prior, attributed to allergies. Upon referral to tertiary eye center, an orbital mass was palpated along the superior orbit and CT imaging was notable for thickening of the left upper eyelid, superior rectus and supraorbital fat. The patient underwent anterior orbitotomy with biopsy of superior orbital mass, which showed orbital vasculitis. She had a positive p-ANCA titer and clinical evidence of peripheral eosinophilia (GERD, unilateral eustachian tube dysfunction), which in the context of orbital vasculitis is suggestive of a diagnosis of eosinophilic granulomatosis with polyangiits. The patient was treated initially with prednisone and then transitioned to methotrexate in consultation with rheumatology.

Conclusions: Pediatric orbital inflammation with associated orbital mass, although rare, can be a presenting feature of eosinophilic granulomatosis with polyangiits. Treatment involves immunosuppression.

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Figure 1

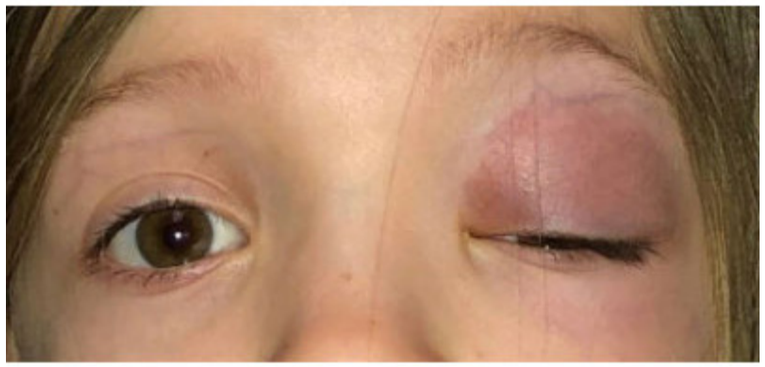


Figure 2

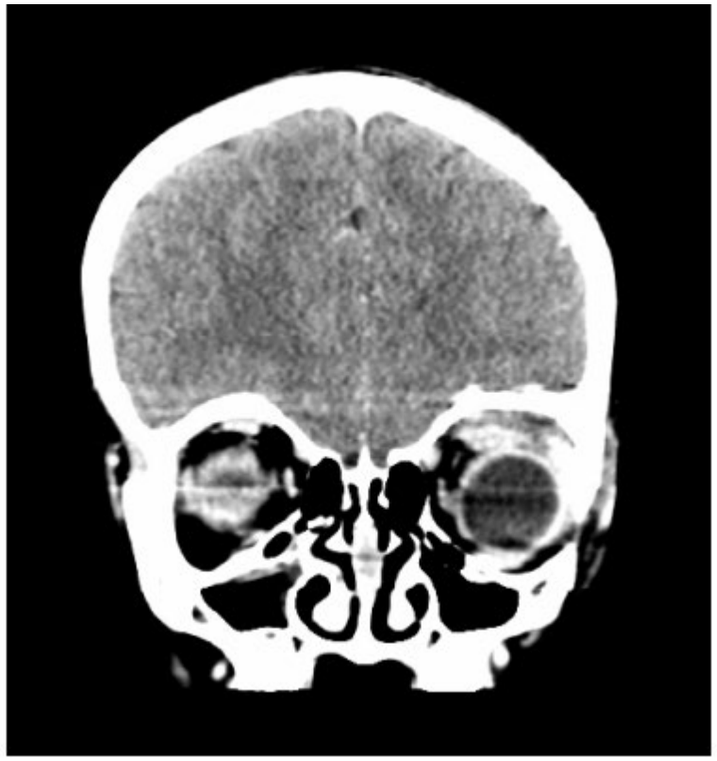
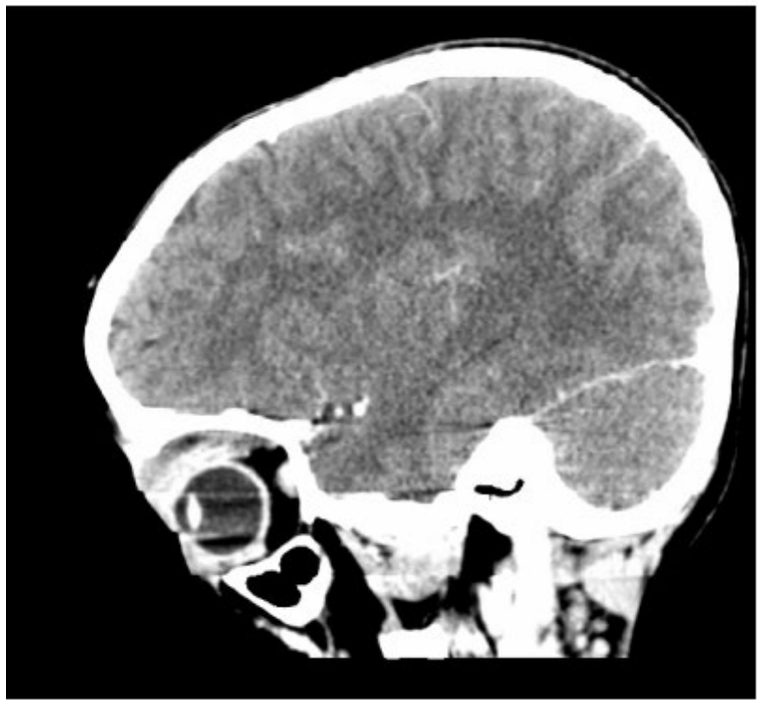


Figure 3



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Analysis of Oculofacial Plastic and Reconstructive Surgery Fellowship Program Directors

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Introduction: This study examines the demographics, educational backgrounds, and scholarly achievements of American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) fellowship program directors (PDs).

Methods: PDs of ASOPRS fellowships were identified using the ASOPRS website. PD demographics, educational background, and scholarly achievement were gathered using online clinician profiles, curricula vitae, PubMed, Scopus, the ASOPRS website, websites of high-impact journals and other publicly available sources. Fellowship program characteristics including the number of fellowship faculty, gender of department chairperson and classification of the program as academic, private practice, or a hybrid were analyzed on both the ASOPRS website and each program's website. Data was collected in Spring 2021.

Results: We reviewed the profiles of 61 PDs and their corresponding oculofacial plastic surgery programs. 62.3% of programs were classified as academic, 4.9% as private practice, and 32.8% as hybrid. Mean PD age was 57.6±9.3 years (range 41-76). Despite the proportion of female current ASOPRS fellows being 57.1%, only 14.8% of ASOPRS PDs are female. 13.1% of PDs had additional degrees to include a Master's or PhD; 95.1% were graduates of medical schools in the United States. PDs' scholarly achievements were as follows: mean number of ophthalmology publications was 43.6±35.2, mean first authorships were 5.0±5.9, mean senior authorships were 21.3±22 and mean h-index was 18.1±9.4. PDs of academic programs were more likely to have more total publications and senior authorships than those of private practice or hybrid programs (p=0.028, p=0.048, respectively). 6.6% had current or prior NIH funding. Faculty rank analysis revealed 57.4% of PDs were Professors, 31.1% were Associate Professors, 4.9% were Assistant Professors and 6.6% of PDs were Instructors. 46% of PDs were currently affiliated with the fellowship program from where they had completed their own residency, fellowship, or both. 13.1% of PDs were Heed Fellows and 36.1% had earned teaching awards. 26.2% were members of ASOPRS leadership, with 26.2% of PDs also members of the editorial board of the 3 highest impact journals in ophthalmology and the 6 highest impact journals in oculofacial plastic surgery.

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Conclusions: ASOPRS training programs have experienced an increase in female fellow representation over the past fifty years,1 in fact 57.1% of current ASOPRS fellows are female, however, of interest this is not yet mirrored by the female representation in the PD role (14.8%). Regardless, of gender, the high level of accomplishment of ASOPRS PDs as demonstrated in this study, as well as the substantial proportion of PDs involved in leadership positions, illustrates the commitment of these individual to advancing the field of Oculoplastics through both teaching and scholarly activity.

Figure 1

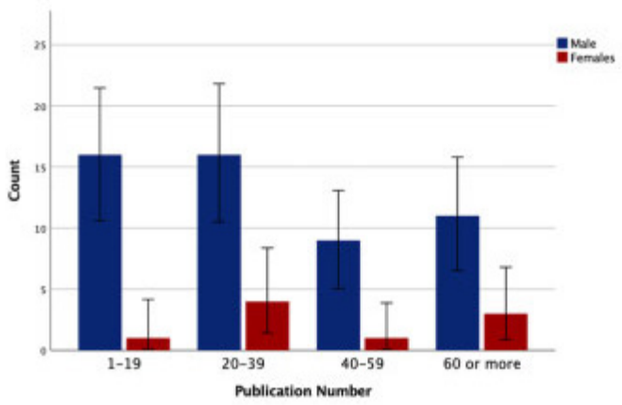


Figure 2

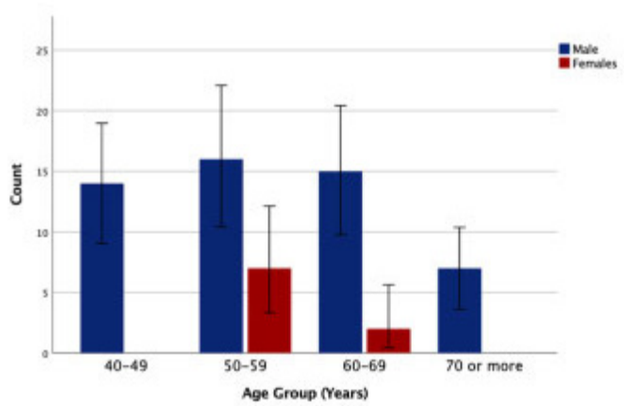
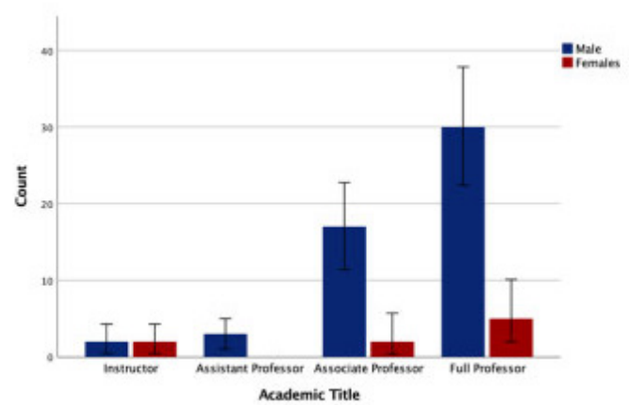


Figure 3



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Application of Telemedicine in Oculoplastics during the Covid-19 Pandemic

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Introduction: The COVID-19 pandemic presented an unpresented opportunity to rapidly expand the use of telemedicine services. Previously, the use of telemedicine in ophthalmology had been primarily implemented via an asynchronous, store and forward technique. Synchronous, or real time telemedicine visits, have been limited, in part, due to the need for expensive equipment to reliably perform the exam. Oculoplastics is a unique specialty of ophthalmology where the exam is highly visual and most pertinent exam findings do not require additional equipment. On March 18th, 2020 the AAO presented guidelines to reduce clinical volume by 70%. This prompted rapid expansion of telemedicine practices. The purpose of this paper is to explore oculoplastics patients' satisfaction with these services during the COVID-19 pandemic.

Methods: A retrospective review of medical records was conducted to identify patients who had a telehealth appointment between March and December 2020. The date parameters were identified as the emergence of severe acute respiratory syndrome coronavirus 2 disease and the declaration of a national emergency in the United States. Inclusion criteria included patients older than 18 years of age. Telephone only encounters and patients who did not utilize ZOOM via the university My Health site were excluded. A standardized electronic questionnaire was distributed to patients to assess their experiences utilizing telemedicine for oculoplastic care. Survey data in addition to patient demographic information, month of encounter, total number of telemedicine visits, visit type, and provider seen was collected. This information was entered into a password protected excel file that was accessible only by the key study personnel. This information was deidentified and then analyzed by the Department of Biostatistics. Statistical analysis performed included: descriptive statistics, univariate analysis (Wilcoxon test, proportional odds likelihood ratio test and Pearson Test), in addition to correlation studies and multivariable analysis.

Results: A total of 282 patients met the inclusion criteria. The average age was 57 years old and 66% were female. Post-operative visits represented the largest percent of encounters (43%). One hundred thirty-eight (138) patients completed the survey, representing a 49% response rate. Greater than 92% of patients rated their ease of scheduling, ease of talking with their provider and the audio-visual quality as good or very good. 91% of patients rated their overall experience as good or very good. 93% of patients responded that they would be willing to use Telehealth again and 75% of patients felt they received as good of care through Telehealth services as they would have in person. Older patients and patients with more than one oculoplastics telehealth visit were more likely to respond to the survey ($p<0.001$ and $p=0.046$ respectively). Additionally, patients who had multiple Telehealth visits were more likely to rate their overall experience as very good ($p=0.001$).

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Conclusions: Patients had a favorable experience utilizing telemedicine for Oculoplastic services, and post-operative counters which accounted for the majority of telemedicine visits may be particularly amenable to telemedicine in the future

Table 1

Table 1: Demographic Information for All and by Response

	All	Non-Respondents	Respondents
Age	57 ± 17	54 ± 18	61 ± 13
Sex			
Female	185 (66%)	96 (67%)	89 (66%)
Male	94 (34%)	48 (33%)	46 (34%)
Race			
Not Hispanic or Spanish origin	242 (87%)	121 (85%)	121 (90%)
Other Hispanic or Spanish origin	32 (12%)	11 (15%)	21 (8%)
Most Recent Visit Month	8.1 ± 2.5	8.1 ± 2.5	8.1 ± 2.5
Appointments by Month (2020)			
March	3 (1%)	0 (0%)	3 (2%)
April	22 (8%)	10 (7%)	12 (9%)
May	34 (12%)	15 (10%)	19 (14%)
June	27 (10%)	20 (14%)	7 (5%)
July	43 (15%)	23 (16%)	20 (15%)
August	28 (10%)	15 (10%)	13 (10%)
September	23 (8%)	12 (8%)	11 (8%)
October	26 (9%)	13 (9%)	13 (10%)
November	43 (15%)	19 (13%)	24 (18%)
December	30 (11%)	17 (12%)	13 (10%)
Average Number of Visits	1.34 ± 0.69	1.24 ± 0.51	1.45 ± 0.84

Figure 1

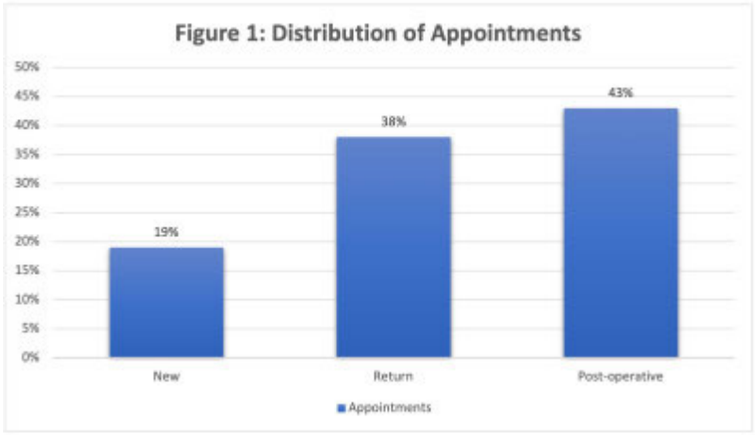

Figure 2

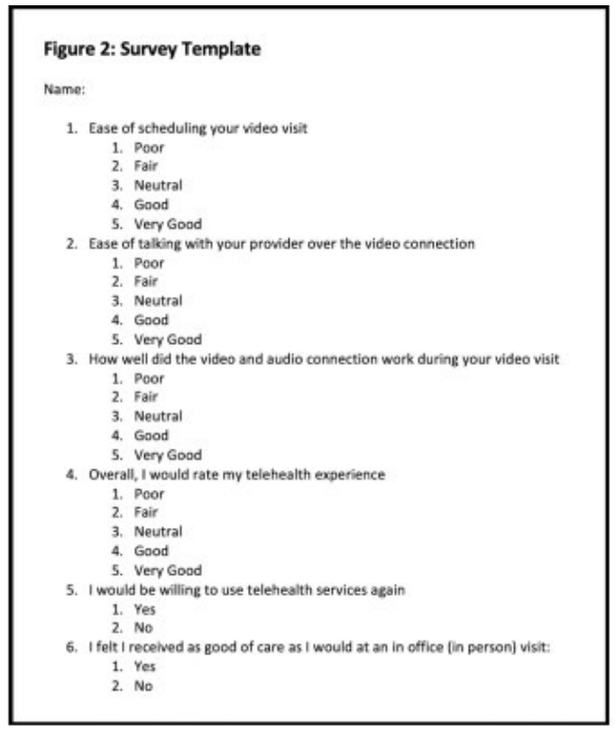

Figure 2: Survey Template

Name:

1. Ease of scheduling your video visit
    1. Poor
    2. Fair
    3. Neutral
    4. Good
    5. Very Good
2. Ease of talking with your provider over the video connection
    1. Poor
    2. Fair
    3. Neutral
    4. Good
    5. Very Good
3. How well did the video and audio connection work during your video visit
    1. Poor
    2. Fair
    3. Neutral
    4. Good
    5. Very Good
4. Overall, I would rate my telehealth experience
    1. Poor
    2. Fair
    3. Neutral
    4. Good
    5. Very Good
5. I would be willing to use telehealth services again
    1. Yes
    2. No
6. I felt I received as good of care as I would at an in office (in person) visit:
    1. Yes
    2. No

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Cosmetic Surgery Trends in a Single Oculofacial Private Practice during the COVID-19 Pandemic

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Purpose: To evaluate the effects of the COVID-19 pandemic on cosmetic surgery trends at a multicenter oculofacial surgery private practice and to compare actual volume to previously reported online search trends for aesthetic surgery.

Study Design: Retrospective observational study.

Methods: A literature review of articles showing changes in online aesthetic surgery Google search trends was conducted. Patient encounter data was collected from January 2018 to April 2021 from the NextGen Practice Management System (Horsham, PA) and was separated based upon patient fiscal class. The total encounter numbers which include new patients, follow-ups, post-ops and surgeries, total charges, and total payments were analyzed by patient fiscal class. Office and surgery center cosmetic procedure volume and type to be reported.

Results: During the January 2018 to March 2020 pre-pandemic time period there was an average of 979 total encounters per month (Table 1), with an average of 38% being cosmetic (Figure 1). Pre-pandemic cosmetic fiscal class comparison revealed an average of 41% of total revenue per month coming from cosmetics (Figure 2). During the initial shut down period (April, 2020), total encounters were 209, with an average of 23% being cosmetic. Total revenue from cosmetics was 7% in this period. In the ensuing months, the average total encounters per month was 885, a 10% decline from baseline. The average monthly percentage of cosmetic encounters during this period was 34% and the average % of collections from cosmetics dramatically increased to 56% with a peak of 68%. Overall, decreases in cosmetic encounters and collections appeared to occur closer to actual pandemic surges as compared with non-cosmetic patients. Reports on numbers of Google search words for aesthetic services varied but revealed a trend for lower searches being conducted during the initial shutdown with variable recovery to pre-pandemic numbers thereafter.

Conclusions: This is the first report to compare Google online aesthetic search volume results with actual aesthetic volume changes in a pure oculofacial plastic surgery practice. In March 2020, COVID-19 was declared a global pandemic by the World Health Organization, with a complete shutdown of nonessential medical and city-wide services through May 2020 and partially thereafter. During the shutdown, our practice saw a decline in all payments to an all-time low in April, followed by a record-breaking increase in cosmetic payments thereafter that outpaced prior cosmetic payment collections and reports of aesthetic surgery online Google search results.[1-5] Decreases in cosmetic patient encounters and collections were earlier corollaries with Summer and Fall pandemic surges than their non-cosmetic counterparts likely explained by more sensitivity and less payment lag in this fiscal class. Explanations for the dramatic
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increase in cosmetic services overall likely include more relative disposable income for cosmetics secondary to limitations on other expenditures such as dining and travel, and the increased awareness of facial aesthetics with the rise of video teleconferencing. Further study is needed to determine if online search for aesthetic services correlates with actual clinical volume during a pandemic. This data can be used to help practices plan for trend changes during future pandemic related shutdowns.

Figure 1

Fiscal Class - Total Encounters											
2018											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1174	677	951	915	992	874	890	918	833	794	974	939
2019											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1094	1029	1020	1103	1215	1150	1037	1186	928	1034	997	983
2020											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1025	1019	678	209	422	916	909	822	952	1028	939	858
2021											
Jan	Feb	Mar	Apr								
886	881	1052	952								

Table 1: Total patient encounters by month in a single oculofacial surgery private practice from January, 2018 to April, 2021.

Figure 2

Figure 1: Percentage of patient encounters by fiscal class per month from January, 2018 to April, 2021 in a single oculofacial surgery private practice.

Figure 3

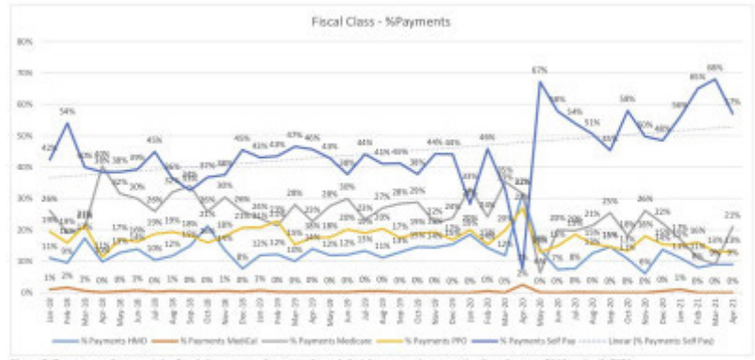

Figure 2: Percentage of payments by fiscal class per month to a single oculofacial surgery private practice from January, 2018 to April, 2021.

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First Year ASOPRS Fellows' Case Volume during COVID-19 Shut Down

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Introduction: On March 13th 2020, the American College of Surgeons released recommendations for surgeons to minimize, postpone, or cancel elective procedures.[1] The following week, on March 18th 2020, the American Academy of Ophthalmology (AAO), issued a statement strongly recommending, "all ophthalmologists provide only urgent or emergent care."[2] On March 19th 2020, the American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) executive board released a statement supporting the AAO. With these surgical mandates, ASOPRS training fellows faced a unique challenge in their training. Herein, we present an analysis of surgical cases performed by first year ASOPRS fellows during the COVID-19 quarantine.

Methods: All 2019-2021 fellows were asked to provide surgical logs from March 19th 2020 to April 30th, 2020. Procedures were organized into the following categories: eyelid, lacrimal (including DCR), orbitotomy, fracture repair, eyelid laceration repair, enucleation/evisceration/exenteration, conjunctiva and ocular surface reconstruction, temporal artery biopsy, face (including excision of lesions, facelift, cheek lift), isolated sinus procedures (endoscopic orbital decompression), and other ocular procedures. Eyelid procedures encompassed all eyelid codes including eyelid biopsy, tarsorraphy, wedge resection, tarsoconjunctival flap, skin graft, correction of trichiasis, abscess drainage, and eyelid malposition correction. Restarting elective cases varied by state, but most states resumed elective surgeries in May of 2020, as the American College of Surgeons provided guidelines on April 17th 2020.[4]

Results: Thirteen of 26 ASOPRS 2019-2021 fellows (50%) responded. The average number of surgical cases performed by an individual fellow, either as primary or assistant surgeon, from March 19th to April 30th, 2020 was 23.5 cases (range 1 to 51). Eyelid procedures represented the majority of surgeries performed (42.8%), followed by orbitotomy (18.2%), laceration repair (18%), and orbital/facial fracture repair (17.7%). Less frequently performed procedures included enucleation/evisceration/exenteration (11.0%), lacrimal procedures (9.9%), face procedures (8.5%), temporal artery biopsy (7.9%), conjunctiva and/or ocular surface reconstruction (7.1%), sinus procedures (6.4%), and other eye procedures (4.3%). Nonsurgical procedures including neurotoxin or filler injections were not included in this analysis.

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Conclusions: As expected, the COVID-19 pandemic impacted ASOPRS fellows' surgical volume. From March 19th to April 30th, 2020, fellow and attending physicians were forced to judge the medical necessity of specific surgical procedures. Decisions were made on a case-by-case basis, using the guidelines regarding level of urgency and risk of COVID-19 exposure with surgical performance. The majority of surgical cases performed by ASOPRS first year fellows during the COVID-19 quarantine included eyelid tumor excision and reconstruction, orbitotomies, and trauma related cases including fracture and laceration repairs, due to urgent/emergent nature of these surgeries. Surgical numbers varied among fellows depending on severity of the COVID-19 crisis in their state. In a survey where half of participants were 2019-2021 fellows, it was reported that the COVID-19 restrictions had a mild to moderate impact on overall training.[5] Fortunately, the two year ASOPRS fellowship affords trainees the opportunity to account for the reduction of surgical volume, in the months following the COVID-19 quarantine.

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Oculofacial Plastic Surgeon Supply in the U.S., 2021

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Introduction: Physician supply is important to understand as the population changes and grows. The authors aim to characterize the county, state, and national leverl supply of oculofacial plastic surgeons in the U.S.

Methods: The authors identified all U.S. oculofacial plastic surgeons listed in the 2021 public databases of the American Society of Ophthalmic Plastic and Reconstructive Surgery and the American Academy of Ophthalmology. Primary practice location for each individual surgeon was used to determine per capita oculofacial plastic surgeon (OPS) density at the county, state, and national level.

Results: A total of 1184 oculofacial plastic surgeons (OPS) in the U.S. were identified. There were 348 individual counties (or county equivalents) served by at least one OPS. 2795 counties, as well as two entire states – North Dakota and Wyoming, had no OPS (figure 1). The national average number of OPS per 100,000 persons was 0.3572. Of the counties with at least one OPS, the average was 0.5860 OPS per 100,000, ranging from 0.0705 to 11.26. The counties with the greatest OPS density were Pitkin County, CO, San Juan County, WA, Montour County, PA, Labette County, KS, and Albemarle County, VA. The counties with the lowest density (i.e., of those with at least one OPS) were Bronx County, NY, San Bernardino County, CA, Gwinnett County, GA, Denton County, TX, and Wayne County, MI. The top five counties with the greatest number of OPS were Los Angeles County, CA, New York County, NY, Cook County, IL, Harris County, TX, and King County, WA.

Conclusions: There exist geographic disparities in oculofacial plastic surgeon supply in the U.S. Further study of OPS supply according to population and other characteristics for demand is warranted.

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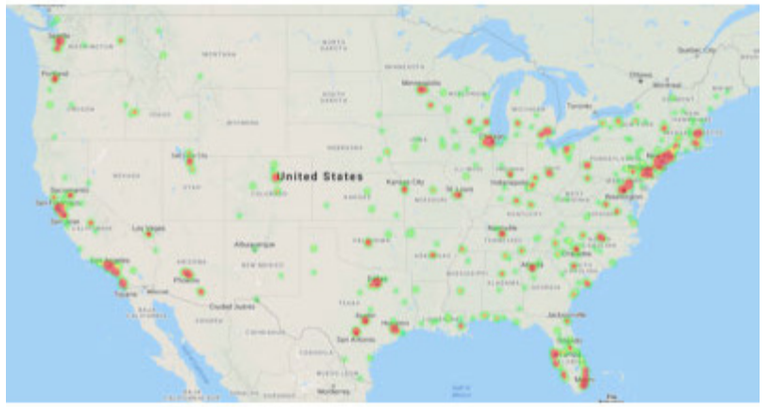
Figure 1



Oculoplastic Care in Sudan: A Survey of Training and Practice Patterns

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Introduction: This study aims to evaluate the current oculoplastic and orbital care available in Sudan.

Methods: This is an IRB-exempt, electronic survey that was distributed to members of the Sudanese Ophthalmological Society. Information regarding demographics, location and type of practice, and level of training was collected. Additionally, information regarding types of pathology and surgical procedures performed was collected. All responses were collected and analyzed using standard statistical methods.

Results: A total of 103 participants completed the survey. 31 (30.9%) were male, 72 (69.2%) were female. Most participants practiced in Khartoum (64.8%). 35 (34%) participants reported completing subspecialty fellowship training. While 58 (56.3%) participants reported that they provide oculoplastic care, only 4 (2.7%) reported completing an Oculoplastic or Orbital fellowship. The most commonly encountered oculoplastic disorders were trichiasis and distichiasis (24.5%), orbital inflammatory diseases (15.7%) and eyelid malposition (14.6%). The most and least commonly performed procedures were globe removal surgery (32.2%) and orbital fracture repair (0.83%). The lack of subspecialty exposure during residency (26.7%) and lack of trained oculoplastic surgeons (22%) were the most commonly cited barriers to pursuing training in oculoplastic surgery. Geographical restriction (28.7%) defined as distance to obtain care, or lack of transportation, was identified as the most common barrier to accessing oculoplastic services.

Conclusions: Conclusion: Oculoplastic surgery is a relatively new and emerging specialty in Sudan with limited local training opportunities. This survey highlights the need for sustainable and accessible subspecialty training programs to adequately address the burden of oculoplastic disorders in Sudan.

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Table 1

Table 1 A-B. Variations in Clinician Experience

A.

Years in Practice (N=103)	1-5: 41(39.4%)	6-10: 26 (25%)	11-15: 18 (17.3%)	>15: 26 (25%)
Type of Practice (N=129)	Academic Institution 11 (8.5%)	Government Tertiary Hospital 53 (41.1%)	Private Tertiary Hospital 51 (39.5%)	Individual Private Practice 14 (10.8%)
Current Level of Training (N=103)	Resident 19 (18.3%)	Specialist* 53 (51%)	Consultant** 26 (25.5)	

*Specialist -Physician who completed ophthalmology residency
**Consultant - Physician who completed ophthalmology residency and has a minimum of 8 years of experience

B. Subspecialty Training	N = 148
None	57 (38.5%)
Oculoplastic	4 (2.7%)
Cornea	19 (12.8%)
Glaucoma	16 (10.8%)
Medical Vitreoretina	15 (10.1%)
Surgical Vitreoretina	13 (8.8%)
Neuro-ophthalmology	2 (1.4%)
Pediatric	9 (6.1%)
Strabismus / Squint	11 (7.4%)
Ocular Oncology	2 (1.4%)

Table 2

Table 2. Distribution and Management of Oculoplastic disorders

Pathology encountered		Surgeries performed	
Eyelid tumors	33 (9.6%)	Globe removal surgery (enucleation, evisceration, exenteration)	78 (32.2%)
Eyelid malposition (entropion, ectropion, symblepharon, blepharoptosis, brow ptosis)	50 (14.6%)	Eyelid reconstruction	40 (16.5%)
Trichiasis or Distichiasis	84 (24.5%)	Ptosis repair	14 (5.7%)
Nasolacrimal system disorders (nasolacrimal duct obstruction, dacryocystitis)	36 (10.5%)	Eyelid repositioning (ectropion, entropion repair)	51 (21.1%)
Orbital trauma	33 (9.6%)	Orbitotomy	9 (3.7%)
Orbital inflammatory diseases (Idiopathic Orbital inflammation, Thyroid eye disease)	54 (15.7%)	Nasolacrimal drainage procedures	22 (9.1%)
Orbital fractures	16 (4.7%)	Cosmetic procedures	4 (4.3%)
Orbital tumors	22 (6.4%)	Orbital fracture repair	2 (0.83%)
Blepharospasm	13 (3.8%)	Orbital decompression	9 (3.7%)
None	2 (0.58%)	None	13 (5.4%)

Table 3

Table 3 A-B Barriers to Oculoplastic care

A. Barriers to access	
Lack of subspecialty trained surgeons	66 (23.7%)
Long referral wait times	61 (21.9%)
Geographical restrictions	80 (28.7%)
Financial cost	72 (25.8%)

B. Barriers to pursuing a subspecialization in Oculoplastics	
Lack of trained oculoplastic and orbital surgeons	66 (22%)
Lack of subspecialty exposure during residency	80 (26.7%)
Lack of subspecialty training opportunities after residency	54 (18%)
Lack of access to equipment	50 (16.7%)
Less demand of services by patients	6 (2%)
Not considered a priority subspecialty	25 (8.3%)
Not considered a prestigious subspecialty	12 (4%)
Not considered a lucrative subspecialty	7 (2.3%)

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Oculoplastic Publication Trends in General Ophthalmology Journals

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Purpose: To examine the publication trend of oculoplastic articles throughout the last decade, in general ophthalmology journals.

Methods: A review of all abstracts published between January 2010 to December 2019 in general, clinical ophthalmic journals was conducted. Articles that were categorized as original articles in general and clinical journals were included in the study.

Results: Ten thousand two hundred eighty-one abstracts were included. Of them 465 (4.5%) were oculoplastic publications. The mean number of annual-publications was 46.5 and the mean annual-rate of oculoplastic publications was 4.51%. A significant decreasing trend in the number of oculoplastic publication in the last decade was found ($p<0.01$, $R2=0.770$). However, there was no significant change in the annual-rate of oculoplastic publications during the last decade ($p=0.191$, $R2=0.203$).

From the 465 oculoplastic articles: 179 (38.5%) were articles about eyelid diseases, 160 (34.40%) were about orbit diseases, 92 (19.80%) were about lacrimal-diseases and 34 (7.30%) were about Thyroid-eye-disease (TED). A significant decreasing trends in the number of orbital and eyelids publications were found ($p<0.01$, $p<0.01$). However, there were no significant changes in the annual-rate of orbital, eyelids, TED and lacrimal-diseases publications throughout the last decade.

Conclusions: Oculoplastic subspecialty deal with a wide range of pathologies in different ages. However, less than 5% of the articles in general, clinical, high impact factor ophthalmology journals are about oculoplastic diseases. One of the best way for ophthalmologists from different suspecilties, nowadays, to be updated, is to read high-impact-factor, general ophthalmology journals. Therefore, it is important that those journals will include articles about breakthroughs in oculoplastic.

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Figure 1

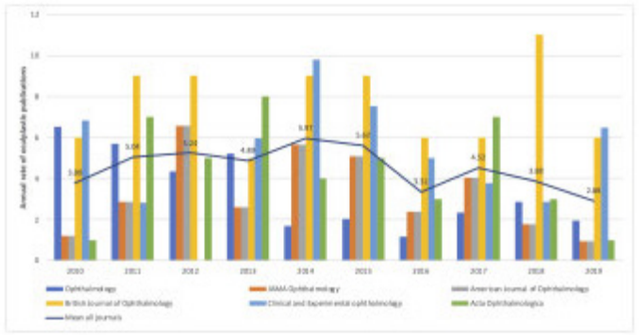
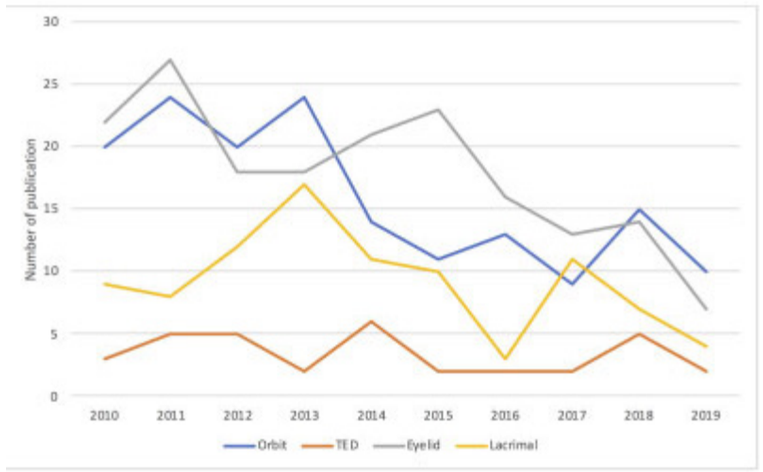


Figure 2



Perioperative Anticoagulation in Facial Plastic Surgery

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Introduction: Oral anticoagulation is used for the management of several common medical conditions. There are no evidence-based guidelines for preoperative management of anticoagulation in facial plastic surgery. Furthermore, there is minimal sharing of best practices among different specialty-trained facial plastic surgeons. We sought to review the recommendations regarding anticoagulation in the literature from different facial surgery specialties and to survey surgeons from these various specialties to examine perioperative anticoagulation practice patterns.

Methods: We conducted a literature review on the impact of anticoagulation on the risk of bleeding and thromboembolic complications in facial plastic surgeries. This literature review included recommendations from ophthalmic, dermatologic, plastic, and ENT trained facial plastic surgeons. We also conducted a survey of surgeons from the four aforementioned groups to examine how real-life practice patterns differed among the groups and aligned with recommendations in the literature.

Results: The survey was completed by 20 oculoplastic, 5 dermatologic, 6 ENT, and 6 plastic surgeons for a total response rate of 44%. 100% of dermatologic, 63% of oculoplastic, 50% of plastic, and 33% of ENT surgeons who perform office-based excisions and biopsies continue anticoagulation. 75% of dermatologic, 60% of oculoplastic, 17% of plastic, and 40% of ENT surgeons who perform cutaneous preseptal surgeries continue anticoagulation. 100% of surgeons who perform postseptal surgery stop all anticoagulation preoperatively.

Conclusions: The literature suggests that the bleeding risk in anticoagulated patients may be overestimated.[1-2] A majority of intraoperative bleeding events that do occur are not classified as severe, with few leading to long term sequelae.[3-4] In addition, many studies have shown that the risk of bleeding complications is the same regardless of whether the patient is anticoagulated or not.[3-5] However, strong evidence suggests that stopping anticoagulation leads to a significant increase in the risk of thromboembolic events, many of which are catastrophic.[1-2] It has been suggested that all anticoagulation should be continued for oculoplastic surgeries at low risk for hemorrhagic complications, such as preseptal surgeries.[2,6] The evidence in favor of continuing anticoagulation perioperatively is growing in our peers' literature as well.[7] The dermatology literature advocates for continuing anticoagulation for cutaneous surgeries and plastic surgery research has shown no increase in the risk of "serious" surgical complications with continued anticoagulation.[5,8,9] Despite the evidence suggesting we should more strongly consider continuing anticoagulation preoperatively, a lack of standardized guidelines and best practice sharing among facial plastic specialists has led to a slow adoption of this practice, with many oculoplastic surgeons in

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our survey preferring to stop anticoagulation before all procedures. When surveying other specialties, while difficult to draw meaningful conclusions from a small sample size, it was evident that dermatologists, whose literature most strongly advocates for continuing anticoagulation perioperatively, are the most likely to follow such a practice. This is not to say anticoagulation should be continued for all surgeries; rather, it is important to acknowledge that we must more strongly consider a patient's medical risk factors for thrombotic events and discuss shifting our practice pattern towards continuing anticoagulation for surgeries at lower risk of bleeding.

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The All of Us Database as a Unique Oculoplastics Research Tool

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Introduction: The National Institutes of Health's *All Of Us* Research Program provides one of the largest, most accessible and diverse datasets based on the enrollment of patients across the United States.1 Participants share deidentified data that can subsequently be utilized for future studies.

Methods: The *All Of Us* database browser was searched for 5 broad terms related to oculoplastics: "eyelid," "lacrimal," "nasolacrimal," "exophthalmos," and "orbit". The reported prevalence of each resulting diagnosis was recorded and additionally stratified by gender and age. Diagnoses occurring in fewer than 20 participants are reported in the database as <20 to maintain patient privacy. In these instances we rounded to 20 for ease of data analysis. Diagnoses were condensed for simplicity (e.g. combining the same diagnosis of left and right sides) and grouped into clinically relevant categories. For example "thyroid eye disease," "thyrotoxic exophthalmos," and "exophthalmos due to thyroid eye disease" were grouped into one category.

Results: The database comprises 316,760 participants as of October 2020, the last national database update. Of these, 192,000 have a diagnosable health condition. Demographics of the study population include: 61.6% female, 59.2% white, 21.6% black/African American, 3.3% Asian, and 45% between age 40-64. We identified 302 unique oculoplastics diagnoses with 47,180 occurrences in the database. Certain diagnoses were excluded for being non-specific (e.g. "eyelid edema") or if they were determined to have little clinical relevance (e.g. "elephantitis of eyelid"). Two hundred and thirty-three clinically relevant diagnoses were grouped into 34 clinical categories. The percentage of participants in the database assigned to each category is displayed in Tables 1-3. The most commonly encountered oculoplastics conditions in the database were blepharitis (7.50%), orbital inflammation (3.96%) and hordeolum (2.34%).

Conclusions: The *All of Us* database provides a unique tool to evaluate the prevalence and basic demographics of commonly seen oculoplastics conditions in a larger and more diverse population than has previously been available. This database will continue to improve with additional participant enrollment and continuous data gathering over participant lifetimes. Further studies can be conducted from this platform to infer the prevalence of many diverse diseases and ultimately improve clinical care.

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Figure 1

		Prevalence in *All of Us* Database	
Table 1. Orbit and lacrimal disorders.		n	%
ORBIT	Orbital Inflammation	7600	3.96
	Orbital Fracture	1000	0.52
	Floor	*320*	*0.17*
	Medial Wall	*100*	*0.05*
	Lateral Wall	*20*	*0.01*
	Disorder of Lacrimal Gland	920	0.48
	Exophthalmos	720	0.38
	Benign neoplasm of orbit	280	0.15
	Thyroid Eye Disease	140	0.07
	Malignant neoplasm of orbit	100	0.05
	Orbital Cellulitis	100	0.05
	Orbital Trauma	100	0.05
LACRIMAL	Disorder of lacrimal system	2660	1.39
	Nasolacrimal Duct Obstruction	400	0.21
	Acquired	*360*	*0.19*
	Congenital	*40*	*0.02*
	Dacryocystitis	300	0.16
	Canaliculitis	180	0.09
	Canalicular Laceration	20	0.01

Figure 2

		Prevalence in *All of Us* Database	
Table 2. Eyelid malposition.		n	%
EYELID	Ptosis	3060	1.59
	Acquired	*3000*	*1.56*
	Congenital	*60*	*0.03*
	Dermatochalasis	2200	1.15
	Ectropion	1460	0.76
	Senile	*180*	*0.09*
	Cicatricial	*100*	*0.05*
	Spastic	*20*	*0.01*
	Entropion	620	0.32
	Senile	*100*	*0.05*
	Cicatricial	*40*	*0.02*
	Spastic	*20*	*0.01*
	Lagophthalmos	80	0.04
	Floppy Eyelid Syndrome	40	0.02
	Blepharophimosis	40	0.02

Figure 3

		Prevalence in *All of Us* Database	
Table 3. Eyelid lesions and disorders.		n	%
EYELID	Blepharitis	14400	7.50
	Hordeolum	4500	2.34
	Malignant Eyelid Neoplasm	1400	0.73
	Basal cell carcinoma	*420*	*0.22*
	Melanoma	*80*	*0.04*
	Squamous cell carcinoma	*60*	*0.03*
	Sebaceous adenocarcinoma	*20*	*0.01*
	Chalazion	1240	0.65
	Eyelid Laceration	900	0.47
	Benign Eyelid Neoplasm	880	0.46
	Seborrheic Keratosis	*300*	*0.16*
	Nevus	*80*	*0.04*
	Papilloma	*60*	*0.03*
	Neurofibroma	*20*	*0.01*
	Eyelid Abscess	800	0.42
	Blepharospasm	380	0.20
	Xanthoma/Xanthelasma	200	0.10
	Meibomian Gland Dysfunction	80	0.04
	Preseptal Cellulitis	60	0.03
	Blepharochalasis	20	0.01

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