American Society of Ophthalmic Plastic and Reconstructive Surgery

Chicago 2024

55th Annual Fall Scientific Symposium

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SYLLABUS

GENERAL INFORMATION

Continuing Medical Education

ASOPRS is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor the Continuing Medical Education (CME) for physicians. The American Society of Ophthalmic Plastic and Reconstructive Surgery designates this live activity for a maximum of ***14.5 AMA PRA Category 1 Credits™***. Physicians should claim only the credit commensurate with the extent of their participation in the activity. Self-assessment CME credit may be claimed if the physician completes the self-assessment questionnaire at the end of the online meeting evaluation.

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The purpose of the American Society of Ophthalmic Plastic and Reconstructive Surgery's Continuing Medical Education (CME) program is to present oculofacial plastic surgeons with the highest quality learning opportunities in the areas of aesthetics, eyelid, lacrimal, and orbital diseases that promote positive change in physician performance or competence, thus enabling such physicians to maintain or improve the knowledge, skills, and professional performance needed to provide the best possible care for their patients. Ongoing assessment of the impact of the CME program is important in determining modifications to existing activities and the development of new activities. Specific expected results include increased knowledge across the ASOPRS community, a desire among practicing ophthalmologists to pursue lifelong learning, the refinement of already employed techniques or skills, and the application of new techniques or skills for the improvement of practice and patient care.

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Kristin Tarbet	Panelist	InMode	Consultant/Advisor	No
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Sandy X. Zhang-Nunes	Abstract Reviewer, Co-Author	1-Amgen 2-Tarsus	1-Consultant/Advisor 2-Consultant/Advisor	1-No 2-No

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Christopher R. Dermarkarian	Presenter	Bryn Mawr Communications	Advisory Board	No
Vikram D. Durairaj	Co-Author	Stryker	Consultant/Advisor	No
Kian Eftekhari	Moderator	1-Roche 2-Sling	1-2 Researcher	1-2 No
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Sasha Hubschman	Presenter, Co-Author	Horizon Surgical Systems	Equity	No
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Bobby S. Korn	Co-Author	1-Horizon/Amgen 2-Immunovant 3-Viridian	1-3 Consultant/Advisor	1-3 No

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Louise A. Mawn	Co-Author	1-Amgen 2-Genentech	1-2 Consultant/Advisor	1-2 No
Timothy J. McCulley	Moderator	Genentech	Researcher	No
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Sathyadeepak Ramesh	Presenter	1-Poriferous 2-Amgen 3-Viridian	1-Royalties or Patent beneficiary 2-Speakers Bureau 3-Researcher	1-3 No
Andrew Rong	Moderator	Amgen	Consultant/Advisor	No
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Theodore Schwartz	Co-Author	1-MIVI 2-Serentity Medical 3-Bendit Technology 4-Endostream Medical 5-Precision Neuroscience	1-5 Ownership interests	No
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Erin M. Shriver	Co-Author	Amgen	Consultant/Advisor	
Dane H. Slentz	Co-Author	Amgen	Speakers Bureau	No
Terry Smith	Co-Author	1-Amgen 2-Viridian Therapeutics	1-2 Consultant/Advisor	No
Rachel Sobel	Moderator, Thesis Committee	Kriya Therapeutics	Consultant/Advisor	No
Jeremy F. Tan	Co-Author	1-AMGEN 2-MariGen	1-2 Consultant/Advisor	1-2 No

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Ann Q. Tran	Moderator, YASOPRS Committee, Co-Author	1-Genetech 2-Viridian	1-2 Researcher	1-2 No
Roger Turbin	Co-Author	1-Amgen 2-Viridian Therapeutics	1-2 Researcher	1-2 No
Shoaib Ugradar	Presenter	1-Viridian Therapeutics 2-Acelyrin 3-Amgen 4-Jenssen	1-4 Consultant/Advisor	1-4 No
Lilly H. Wagner	Co-Author	Genentech	Consultant/Advisor	Yes
Edward (Ted) J. Wladis	Co-Author	1-Praxis Biotechnology 2-FuzeHub 3-Amgen 4-Roche/Genentech	1-Ownership interests 2-Grant support 3-Consultant/Advisor 4-Consultant/Advisor	1-4 No
Julie A. Woodward	Co-Author	1-Allergan 2-Galderma 3-Merz 4-Prollenium 5-SkinCeuticals	1-Consultant/Advisor 2-Consultant/Advisor 3-Consultant/Advisor 4-Consultant/Advisor 5-Consultant/Advisor	1-5 No
Micheal T. Yen	Co-Author	1-Viridian Therapeutics 2-Amgen 3-Lassen Therapeutics 4-Argenx 5-Sling Therapeutics 6-Ipsen	1-4 Researcher 5-6 Consultant/Advisor	
Michael K. Yoon	Moderator, Introducer, Co-Author	1-Viridian Therapeutics 2-Sling Therapeutics	1-2 Researcher	1-2 No
Sandy X. Zhang-Nunes	Co-Author	1-Amgen 2-Tarsus	1-2 Consultant/Advisor	1-2 No

All other individuals in control of content have declared that they had no financial relationships with ineligible companies in the last 24 months.

7:01-7:05 am

Rapidly Progressive Orbital Compartment Syndrome from Ischemic Reperfusion Injury and Rhabdomyolysis

Soufiane Azargui, Julia Xia, Caroline Vloka, Amy Huang, Eric Hink
Aurora, Colorado, United States

Introduction: Rhabdomyolysis is the rupture of skeletal muscles due to drugs, toxins, infections, trauma, ischemia, or compression[1]. We describe two unique cases of orbital compartment syndrome due to soft tissue swelling caused by ischemic reperfusion injury and rhabdomyolysis after prolonged immobilization following drug overdose.

Methods: Retrospective case report of two patients under the care of the oculoplastics service at a large tertiary care center in Colorado. Consent for publication was obtained from the patients.

Results: Case 1: 44-year-old woman with depression and a history of prior suicide attempt was brought to the emergency department by ambulance after she was found down at home after an intentional amitriptyline and codeine overdose. On arrival she had mild edema and erythema of her right eyelids that rapidly progressed over the course of four hours to severe proptosis, periorbital swelling, and chemosis with complete ophthalmoplegia. Her vision in the affected eye was NLP. Her intraocular pressure was too high to measure, requiring canthotomy and cantholysis which normalized the eye pressure but did not improve vision. Her fundus exam was unremarkable.

CT orbits showed diffuse expansion of all extraocular muscles out of proportion to the amount of post septal fat stranding, which was minimal. There was no orbital abscess, mass, retrobulbar hemorrhage, or sinus disease. Her workup was remarkable for a creatine kinase of 59,250.

On re-examination 4 hours later, the patient's edema and erythema had progressed, and pressures were once again too high to measure, requiring expansion of canthotholysis.

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The patient remained in the hospital for 5 days. After the first day, her eye exam was stable, and IOP remained in the mid-teens. Her vision remained no light perception at discharge.

Case 2: A 38-year-old man with history of IV drug use presented with acute vision loss, ophthalmoplegia and right sided paresthesia of V1/V2. Symptoms started after patient awoke after being passed out in the bathroom, though he denied any intoxication. On initial evaluation, he had NLP vision and complete ophthalmoplegia in the affected eye, IOP was normal. The morning after presentation, he had worsening pain, chemosis and periorbital swelling. IOP was elevated to 21.

Imaging in this patient showed mild diffuse edema and enhancement of the right extraocular muscles out of proportion to the amount of orbital fat stranding. Lab workup showed elevated CK (9678). He was discharged in stable condition. His vision remained NLP.

Conclusions: Conclusion: Drug induced loss of consciousness can result in muscle compression and ischemia. Compressive ischemia can lead to muscle swelling and increased compartment pressure exacerbated by rebound hyperperfusion. As intermuscular pressure rises above 30mmHg, venous and lymphatic drainage can be compromised, leading to even higher compartment pressures[2]. Orbital compartment syndrome due to ischemic reperfusion injury and rhabdomyolysis is an extremely rare event, with only two published cases found in the literature[3,4]. The history of presentation, rapidly progressive swelling, serum creatine kinase, and CT findings of severe extraocular muscle swelling without associated orbital stranding, mass or sinus disease, should raise suspicion for rhabdomyolysis which can cause permanent vision loss and acute renal failure.

References:

1. Efstratiadis G, Voulgaridou A, Nikiforou D, Kyventidis A, Kourkouni E, Vergoulas G. Rhabdomyolysis updated. Hippokratia. 2007 Jul;11(3):129-37. PMID: 19582207; PMCID: PMC2658796.
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4. Wi, Jae Min, and Mijung Chi. “Rhabdomyolysis Presenting as Orbital Apex Syndrome.” *The Journal of Craniofacial Surgery*, vol. 27, no. 1, Jan. 2016.

7:05-7:09 am

Clinical Characteristics, Evaluation, Management, and Prognosis of Primary Eyelid Merkel Cell Carcinoma: A Systematic Review

Alisha Kamboj[1], Mikayla Baker[2], Michael Lause[3], Ali Mokhtarzadeh[2], Andrew Harrison[2,4]
[1]Department of Ophthalmology and Visual Neurosciences, University of Minnesota, Minneapolis, Minnesota, United States, [2]Minneapolis, Minnesota, United States, [3]Department of Dermatology, HealthPartners Institute, Minneapolis, Minnesota, United States, [4]Department of Otolaryngology and Head and Neck Surgery, University of Minnesota, Minneapolis, Minnesota, United States

Introduction: A systematic review was conducted to describe the clinical characteristics, evaluation, management, and prognostic features associated with primary eyelid Merkel cell carcinoma (MCC), a rare and highly aggressive skin cancer.

Methods: PubMed and Cochrane Database of Systematic Reviews were searched following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines to identify published cases of primary eyelid MCC. An advanced search with keywords “Merkel cell carcinoma” and “eyelid” revealed 216 articles. Reports were included when the primary lesion involved the eyelid and when biopsy was consistent with MCC. Exclusion criteria included non-primary eyelid involvement, absence of data involving individual cases, and non-English publications.

Results: A total of 83 articles describing 175 cases of primary eyelid MCC were included in this review. The mean patient age was 74.7 years and patients were predominantly female (64.2% of cases) and Caucasian (82.1%); six patients had a history of immunosuppression. The average size of the MCC lesions was 19.9 mm, by largest dimension. Lesions most frequently involved the upper eyelid (71.8%), followed by lower eyelid (26.2%), and medial canthus (1.3%); one case occurred at the lateral canthus. The most commonly described color of the primary lesion was red/pink (63.1%), followed by blue/violaceous (29.2%), yellow/white (4.6%), and skin-colored (3.1%). The majority of patients (64.7%) reported rapid growth of their lesion within the preceding three months. The average interval from appearance of the lesion to time of biopsy was 4.5 months. Adjunctive imaging for disease evaluation included computed tomography (18.3%), magnetic resonance imaging (8.6%), and positron emission tomography (8.0%). Sentinel lymph node biopsy was recorded in 6.9% of cases. Among cases with data regarding disease extent, 30.9% demonstrated evidence of metastasis at presentation. Surgical excision was completed in 89.7% of cases, 4.5% of which employed Mohs micrographic surgery. Exenteration was completed in four cases and parotidectomy/neck dissection in nine cases. Additional treatment modalities included radiotherapy (30.9%), chemotherapy (5.7%), and immunotherapy (1.1%). Among reports with information regarding follow-up, 42.5% of patients experienced disease recurrence, and 62.2% of those patients had evidence of metastasis at recurrence that was not present at

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presentation. Mean time to recurrence was 8.0 months. Overall, 81.9% of reported patients were alive at the time of publication; mean time to death for the remaining patients was 27.0 months.

Conclusions: To our knowledge, this is the first systematic review of primary eyelid MCC. It highlights salient clinical characteristics of MCC eyelid lesions, which are concordant with the AEIOU features (asymptomatic/lack of tenderness, expanding rapidly, immune suppression, older than 50 years, and ultraviolet-exposed site on a person with fair skin) described in the dermatology literature. Moreover, it provides robust information regarding workup, management, and prognosis, to offer a valuable resource for ophthalmologists and oculofacial surgeons who encounter this disease process.

References:

1. Heath M, Jaimes N, Lemos B, et al. Clinical characteristics of Merkel cell carcinoma at diagnosis in 195 patients: the AEIOU features. J Am Acad Dermatol. 2008;58(3):375-381.
2. Lewis DJ, Sobanko JF, Etzkorn JR, et al. Merkel Cell Carcinoma. Dermatol Clin. 2023;41(1):101-115.
3. Merritt H, Sniegowski MC, Esmaeli B. Merkel cell carcinoma of the eyelid and periocular region. Cancers (Basel). 2014;6(2):1128-1137.
4. North VS, Habib LA, Yoon MK. Merkel cell carcinoma of the eyelid: A review. Surv Ophthalmol. 2019;64(5):659-667

7:09-7:13 am

Diagnostic Value of Platelet-to-Lymphocyte and Monocyte-to-Lymphocyte Ratios in Differentiating Idiopathic Orbital Inflammation from Orbital Infectious Disease

Carisa Bohnak[1], Robert Thomson[2], Edward (Ted) Wladis[1]
[1]Ophthalmology, Albany Medical Center/Ophthalmic Plastic Surgery, Albany, New York, United States, [2]Ophthalmology, Albany Medical Center, Albany, New York, United States

Introduction: Monocyte-lymphocyte (MLR) and platelet-lymphocyte (PLR) ratios are emerging biomarkers in systemic conditions,[1-3] although they have not been widely utilized in orbital disease. This study investigated the role of these ratios in distinguishing orbital inflammation from infection.

Methods: A retrospective review of medical records was conducted to identify adult patients who presented acutely to a single emergency department at an academic medical center and were diagnosed with serologically and biopsy-proven idiopathic orbital inflammation (IOI), orbital cellulitis (OC), or necrotizing fasciitis (NF). MLR and PLR were calculated from the first blood draw on presentation to the emergency department. Statistical analysis was performed via Mann-Whitney test with a dedicated computerized software package (GraphPad Prism, La Jolla, CA), and group differences with p values <0.05 were considered statistically significant.

Results: Nine patients with IOI (5 males, 4 females, mean age = 42 years, standard deviation [SD] = 13.2 years), 12 patients with NF (5 males, 7 females, mean age = 56.1 years, SD = 18.8 years), and 14 patients with OC (8 males, 6 females, mean age = 51.7 years, SD = 24.8) who presented acutely to the emergency department were included. No statistically significant differences were noted between groups regarding gender and age ($p>0.05$ for each parameter). Mean PLRs were 194.90 (SD = 118.01), 304.21 (SD = 341.39), and 203.38 (SD = 196.32) for IOI, NF, and OC, respectively (Figure 1). These differences were not statistically significantly different ($p>0.05$ for each group). Mean MLRs were 0.40 (SD = 0.24), 1.74 (SD = 2.41), and 0.75 (SD = 0.40) for IOI, NF, and OC, respectively (Figure 2). MLR was significantly lower in the IOI group compared to the NF group ($p = 0.018$) and OC group ($p = 0.020$); however, differences in MLR between OC and NF groups were not statistically significant ($p = 0.43$).

Conclusions: While MLR showed no significant difference between different infectious etiologies, it was significantly higher in infectious processes (i.e., NF and OC) than in IOI, and thus appears to distinguish inflammation from infection. MLR could be a valuable addition to the diagnostic toolkit for triaging patients in the emergency department and initiating prompt, focused therapy.

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Figure 1

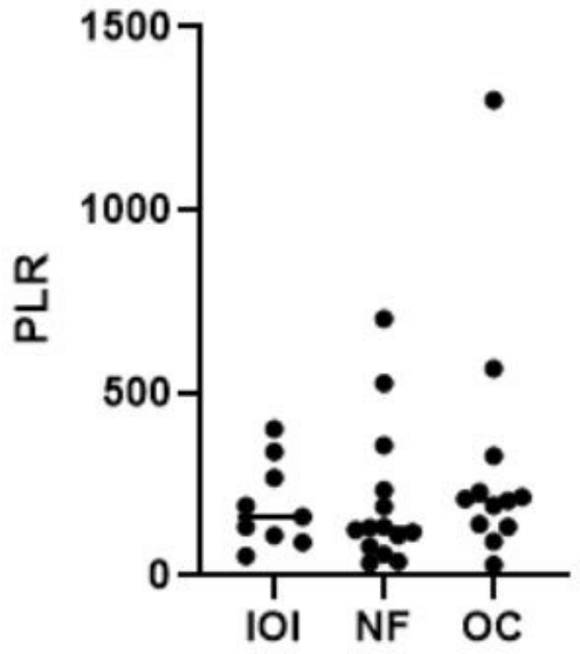
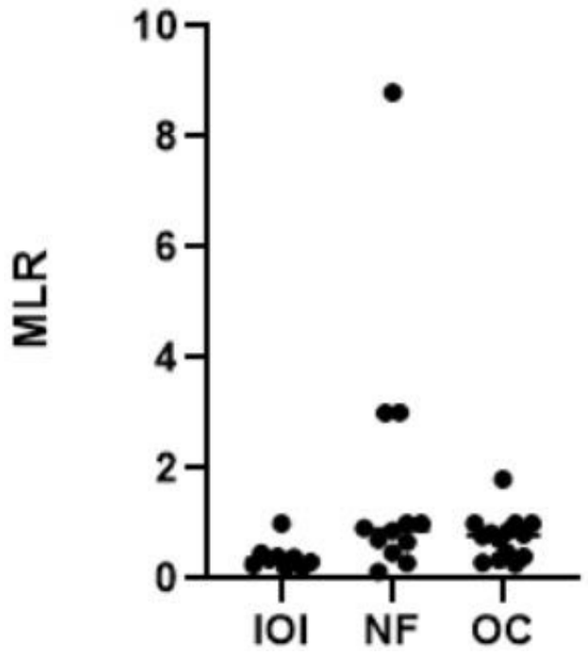


Figure 2



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7:13-7:17 am

Intraoperative Titration of Eyelid Height and/or Contour during Sutureless Conjunctiva-Sparing Mullerectomy

Liane Dallalzadeh[1], Preston Choi[2], Valentina Morakis[3], Ronald Mancini[1], Phillip Tenzel[1]
[1]Division of Oculoplastic and Orbital Surgery, Department of Ophthalmology, University of Texas Southwestern Medical Center, Dallas, Texas, United States, [2]Department of Ophthalmology, University of Texas Southwestern Medical Center, Dallas, Texas, United States, [3]School of Medicine, University of Texas Southwestern Medical Center, Dallas, Texas, United States

Introduction: To demonstrate eyelid height and/or contour can be titrated intraoperatively during sutureless conjunctival-sparing Mullerectomy (CSM) when performed under monitored anesthesia care (MAC).

Methods: This is an IRB-approved retrospective study of patients undergoing sutureless CSM. Inclusion criteria included age greater than or equal to 18 years, unilateral or bilateral CSS performed under MAC, and post-operative follow-up greater than or equal to 3 months with adequate photos demonstrating eyelid height pre- and post-operatively. Patients with concurrent upper eyelid surgery (i.e. blepharoplasty or brow lift) and/or sutureless CSM performed under general anesthesia were excluded.

Sutureless CSM was performed for all patients as previously described.[1] Over correction of eyelid height was addressed with gentle stretch of the eyelid in resting position (Figure 1). Under correction of eyelid height was addressed by re-everting the upper eyelid with additional grasp of Muller's muscle and levator within the hemostat followed by additional bipolar cautery to the crush zone. When addressing contour abnormality, these changes were applied focally (Figure 2, available as Video).

The primary outcome measure was post-operative symmetry (difference in MRD1 between patients' two eyes) with acceptable symmetry defined as a difference of less than 1 mm. Secondary outcome measure included difference in pre- vs post-operative MRD1 in operative eyes. Pre- and post-operative photographs were analyzed by two independent reviewers using ImageJ to measure MRD1. Outcome measures are reported as the average between two reviewers' measurements and analyzed via two-tailed t-test.

Results: Ten patients (16 operative eyelids) are included in analysis to date. The mean age of patients 64.4 ± 16.5 years, with 70% female. Etiology of ptosis included 9 aponeurotic and 1 neurogenic. Six cases consisted of bilateral sutureless CSM and of these all had planned resection lengths that differed by at least 2mm between eyelids. Mean pre-operative asymmetry between right and left eyelids measured 1.4 ± 0.7 mm.

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Eighty percent of patients underwent intraoperative titration, and of these all required 1 titration attempt to achieve acceptable intraoperative eyelid height, contour, and symmetry. Reasons for titration included under corrected height (50%), contour abnormality (37.5%), and 1 case of both under corrected height and contour abnormality.

Mean ΔMRD1 in operative eyes was 1.8 ± 1.1mm. Post-operative symmetry within 1mm was observed in all 10 cases, with mean post-operative symmetry of 0.5 ± 0.4 mm (p=0.002). There were no complications and no re-operations.

Conclusions: Sutureless CSM is advantageous over traditional Muller's muscle conjunctival resection given its preservation of the conjunctiva, shorter operative time, and low complication rate with positive long-term outcomes previously reported. [1-3] Here we add an additional advantage in that sutureless CSM can be titrated intraoperatively to achieve optimal eyelid height and contour when performed under MAC, a feature traditionally limited to anterior ptosis repair.

Figure 1

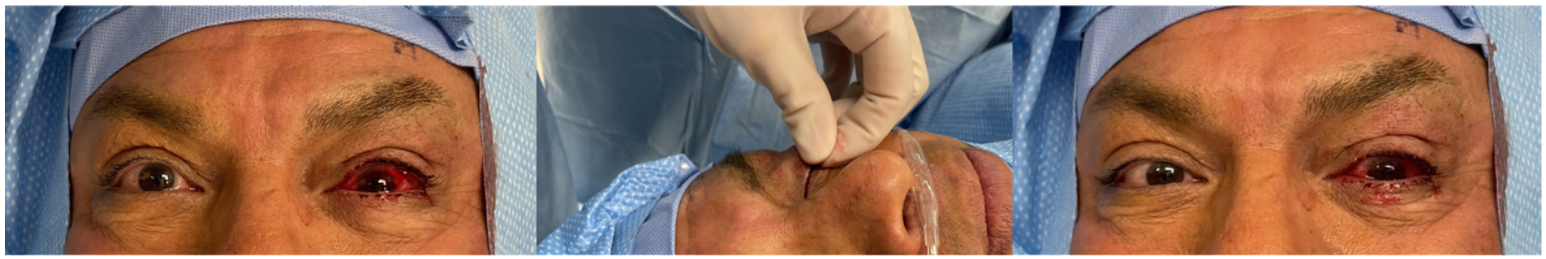

Figure 2

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7:17-7:21 am

Triangular Anterior Lamellar Optimization Flap for Wedge Resection Repairs of Eyelid Colobomas

Shazia Dharssi[1], Colin Bacorn[1], Richard Redett[2], Nicholas Mahoney[1]
[1]Department of Ophthalmology, Johns Hopkins Hospital, Baltimore, Maryland, United States, [2]Department of Plastic and Reconstructive Surgery, Johns Hopkins Hospital, Baltimore, Maryland, United States

Introduction: The full-thickness pentagonal wedge resection is a common technique used in the treatment of a variety of eyelid abnormalities, often involving the margin[1]. While the pentagonal wedge closure does lead to some anterior lamellar lengthening, this may not be sufficient for patients with significant anterior lamellar shortening, such as those with eyelid colobomas. The authors propose a new method for skin closure, which draws upon techniques previously described by Fisher, et al. for repair of unilateral cleft lip[2]. This technique provides both vertical and horizontal anterior lamellar lengthening, while minimizing cutaneous excess or "dog ear" formation at the apex of the flap.

Methods: A retrospective case-series of patients who underwent eyelid reconstruction using this technique were included. The surgical technique involves modification of the traditional pentagonal wedge resection with a cutaneous triangular flap at the top of the tarsal border (figure 1). A back-cut is made on the opposite side to allow for advancement of the flap and ideal distribution of tension (figure 1).

Results: 6 patients (6 eyelids) were identified to have undergone this technique from to 02/2023-10/2023. Patients were followed for an average of 20 weeks. Indications for surgery were eyelid coloboma (2), pseudo-coloboma from unrepaired full thickness margin laceration (1), floppy eyelid syndrome (1), and neoplastic lesions (2). There were no complications. All patients had a satisfactory outcome including both cosmesis and function (figure 2).

Conclusions: Fisher's method for reconstruction of unilateral cleft lip with utilization of a triangular flap for augmentation of anterior lamella can be applied to both upper and lower eyelid defects with good results. This technique is most beneficial for patients with anterior lamellar shortening, such as eyelid colobomas, however can be applied to patients with other eyelid pathology.

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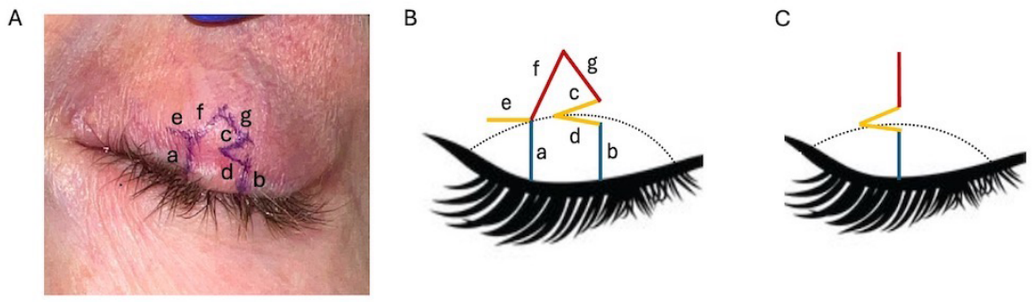

Figure 1:
A-B: Two straight full-thickness vertical incisions from the eyelid margin to the top of tarsus
C-D: An isosceles triangle is drawn at the top of line B. This cutaneous flap is undermined. The amount of horizontal anterior lamellar lengthening is determined by the horizontal height of the triangle (E). The base height of the triangle (G-B) can be modified to increase vertical anterior lamellar augmentation.
E: A back-cut is drawn to match the horizontal length of the triangle. This allows for advancement of the triangle cutaneous flap. This is typically drawn along the lid crease.
F-G: Similar to the pentagonal wedge resection, the incisions are extended at a 45-degree angle from each side to meet together at a single point.

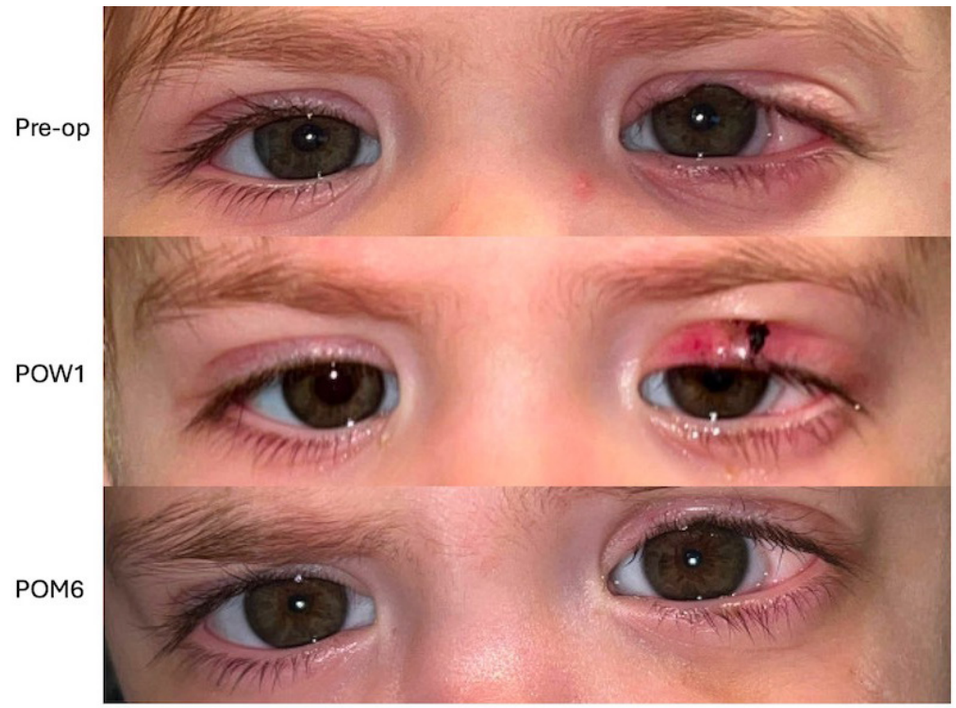

Figure 2: Representative photographs of an 18-month old boy with history of Goldenhar syndrome with a left upper eyelid coloboma who underwent repair using the above described technique. Post operative week 1 and month 6 photographs are shown noting excellent cosmetic and functional outcome.

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7:30-7:34 am

Orbital Arteriovenous Fistula Treated with "Altitude Therapy"

Alexander Engelmann[1,2], John Cheng[2], Alfredo Sadun[1]
[1]Department of Ophthalmology, UCLA Doheny Eye Center, Pasadena, California, United States, [2]Department of Ophthalmology, UCLA Jules Stein Eye Institute, Los Angeles, California, United States

Introduction: This report intends to interrogate the nature of low flow arteriovenous fistulas (AVF), such as indirect carotid-cavernous fistulas (CCF), by describing a case of orbital AVF which resolved with high altitude/low oxygen exposure and consider the implications this may have for treatment.

Methods: A 66-year-old man, an ophthalmologist, with hypertension presented with blurred vision, redness, and proptosis of the left eye as well as vertical diplopia. Recent trials of oral prednisone and NSAIDS provided no relief. MRI and MRA of the brain and orbits had been performed. The patient planned to drive to Palm Springs for vacation. He was advised to take the aerial tramway to the top, 8,516 feet above sea level, and spend several hours at altitude.

Results: Visual acuity was 20/20 in each eye, intraocular pressure in the left eye was 4 mmHg greater than the right, color plates were full, and no rAPD was present. There was a small right hypertropia in primary and -1 upgaze limitation in the left eye. External exam demonstrated 3 mm of proptosis as well as mild ptosis, chemosis, and arterialization with corkscrewing of the episcleral vessels in the left eye (Figure 1). The optic nerve head appeared normal. MRI and MRA of the brain and orbits demonstrated enlargement of the left superior rectus and dilation of the left superior ophthalmic vein (SOV). Together these findings were felt to be consistent with a diagnosis of indirect CCF.

1 hour after descending from elevation the patient noted an improvement in symptoms, which resolved entirely over the days the followed. Repeat imaging following the patient's climb to high altitude demonstrated reduction in caliber of the left superior rectus and SOV.

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His symptoms recurred over 2.5 years later and he was seen in the emergency department. MRI revealed left orbital hyperenhancement as well as thrombosis and enlargement of the left SOV (Figure 2). Digital subtraction angiography revealed hypervascularity around the left ophthalmic artery and direct filling of the SOV by the left lacrimal artery without early venous filling, suggesting a small thrombosed left orbital AVF (Figure 3). Extensive laboratory testing only revealed elevated triglycerides. Thyroid, lipid, and hypercoagulability testing, including TSH, free T4, TSI, antithrombin, antithrombin III, Protein C and S, DRVVT, beta-2-glyoprotein, homocysteine, factor VIII, and fibrinogen were all normal. At his follow-up visit, the patient was asymptomatic. Examination revealed no proptosis or duction limitation and optic nerve function was intact.

Conclusions: The goal of this report is not to recommend that oculofacial plastic surgeons send indirect CCF patients to Palm Springs, but to consider why time at elevation might be therapeutic for low-flow AVF and how this might apply to practice. Our theory is that rapid, steady changes in atmospheric pressure and oxygen tension cause vasoconstriction of small vessels and promote thrombosis of small fistulae. Therapeutic hypoxemia has demonstrated efficacy in treatment of mitochondrial disease in animal models[1] and we intend to study its effects on low flow AVF.

Figure 1

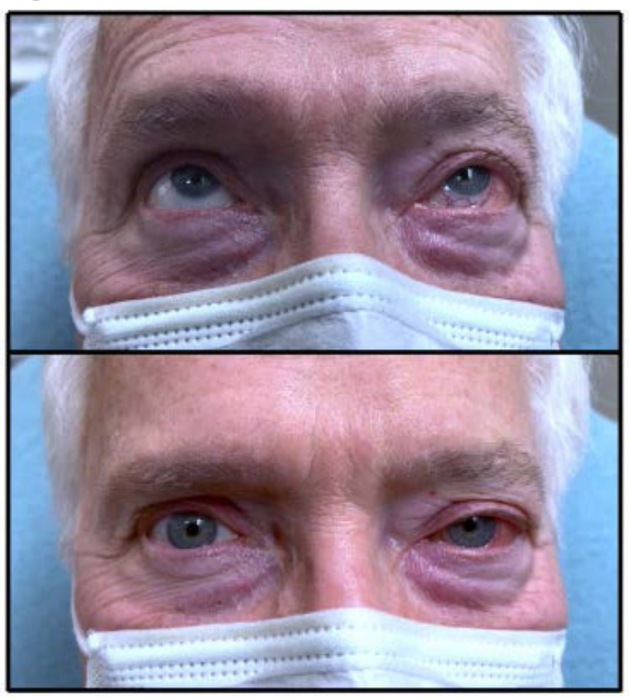


Figure 2

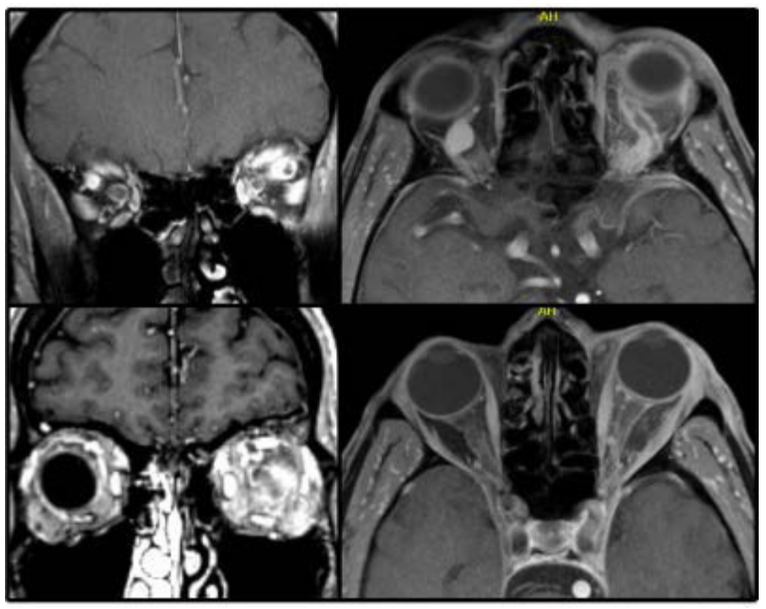
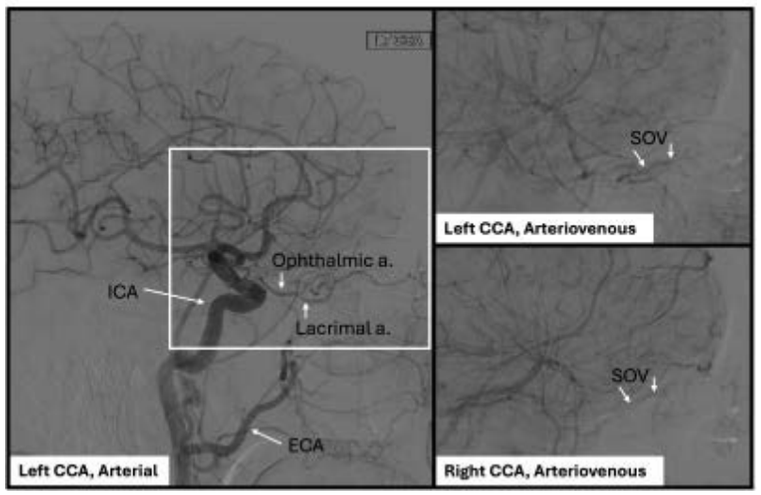


Figure 3



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7:34-7:38 am

A Large-Language-Model Trained Using the ASOPRS Oculofacial Plastic Surgery Education Center Web Textbook

Tiffany Hu[1], Fahim Mahmud[2], Justin Karlin[3]
[1]University of California, Irvine, Irvine, California, United States, [2]David Geffen School of Medicine, UCLA, Los Angeles, California, United States, [3]Stein and Doheny Eye Institutes, UCLA, Los Angeles, California, United States

Introduction: Large language models (LLMs) are artificial intelligence systems that are able to respond to user prompts with human-like answers. While LLM chatbots have demonstrated the ability to achieve passing scores on medical board examinations, previous studies have revealed significant limitations in LLM accuracy and reliability with respect to medical knowledge. Moreover, there is a large variability in output quality based on even minor permutations in user prompt wording. In this study, we aim to circumvent these limitations by developing "AEBot," an oculoplastic surgery knowledge engine trained using peer-reviewed educational information, the ASOPRS Oculofacial Plastic Surgery Education Center web textbook (asoprseducation.org).

Methods: We created 'AEBot' using prompt engineering and data ingestion, training OpenAI's ChatGPT with three asoprseducation.org articles (infantile hemangioma, acne rosacea and orbital cellulitis). We then compared AEBot (AE) to untrained ChatGPT (GPT) and Google Bard (GB). The three models were asked to produce information about the diagnosis, treatment, prevention and prognosis for each condition. Oculoplastic surgeons masked to the source of the answers ranked each response a 3-point Likert scale ranging from 1 (best) to 3 (worst).

Results: 15 sets of answers were generated, 8 specialists responded, yielding 360 observations. Overall average rankings were 1.45 GPT, 1.80 AE, 2.74 GB (Figure 1). GB underperformed in all domains. GPT outperformed AE for prognosis, treatment, and summary (Figures 2-4). AE outperformed GPT for prevention (Figure 5).

Conclusions: GPT outperformed overall, while GB underperformed. Training of AE did not result in improved performance compared to GPT. LLM training with domain-specific high-quality educational information and prompt engineering did not improve the quality of AE's answers over the baseline GPT model.

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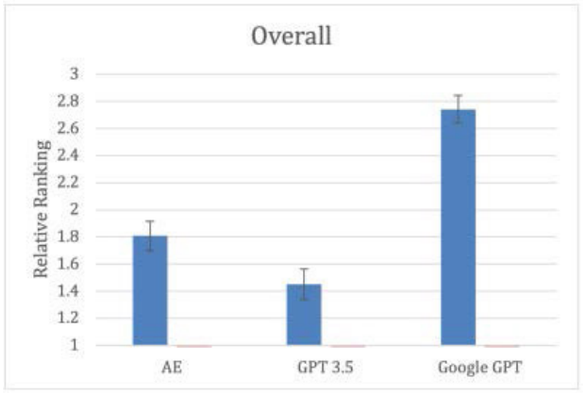
Figure 1



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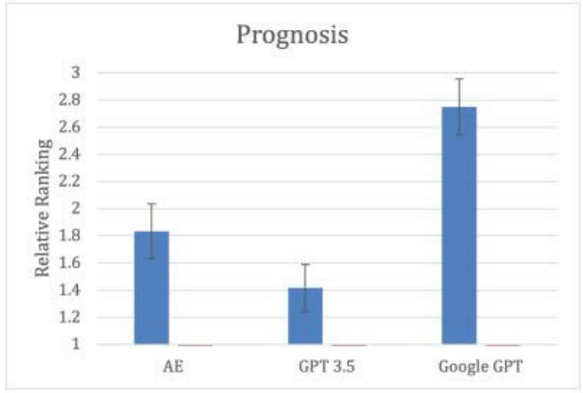

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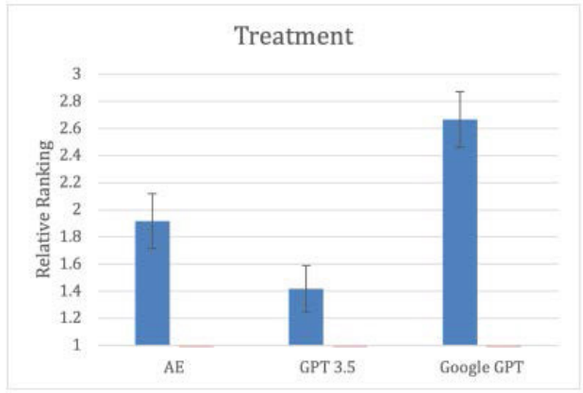
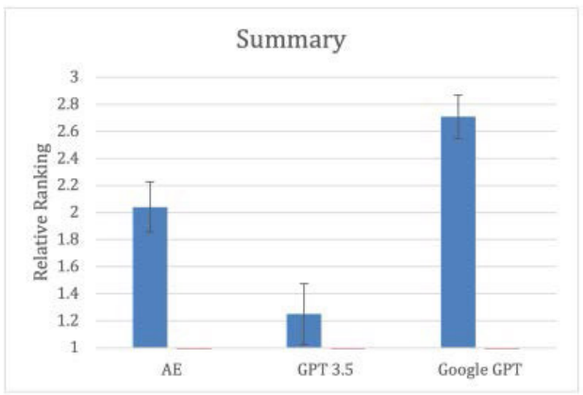


Figure 4



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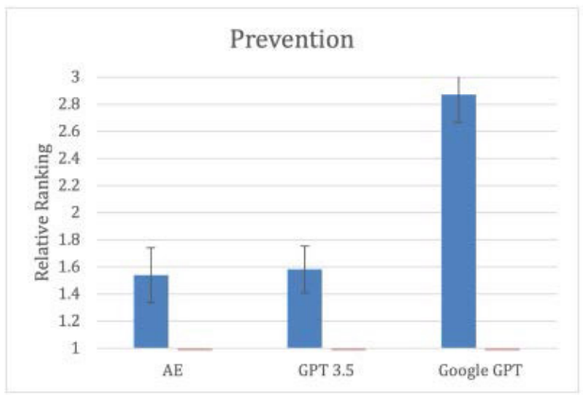

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7:38-7:42 am

Pickleball-Related Eye Injuries Presenting to United States Emergency Departments, 2010-2023

Alisha Kamboj[1], Sandhya Kistamgari[2], Ali Mokhtarzadeh[1], Andrew Harrison[1,3], Gary Smith[2,4]
[1]Department of Ophthalmology and Visual Neurosciences, University of Minnesota, Minneapolis, Minnesota, United States, [2]Center for Injury Research and Policy at the Abigail Wexner Research Institute, Nationwide Children's Hospital, Columbus, Ohio, United States, [3]Department of Otolaryngology and Head and Neck Surgery, University of Minnesota, Minneapolis, Minnesota, United States, [4]Department of Pediatrics, The Ohio State University College of Medicine, Columbus, Ohio, United States

Introduction: This report characterizes the epidemiology of pickleball-related eye injuries in the United States (US).

Methods: Data from the National Electronic Injury Surveillance System were analyzed for individuals treated in US emergency departments (ED) for pickleball-related eye injuries from 2010 through 2023. Each case narrative was manually reviewed to ascertain that only injuries to the globe and to the ocular adnexa were included; injuries solely involving other parts of the face were excluded.

Results: From 2010 through 2023, there were an estimated 6,015 individuals treated in US emergency departments for a pickleball-related eye injury. From 2022 to 2023, the rate of injuries increased by 37.3%. The mean age of individuals treated in the ED for pickleball-related eye injuries was 60 years. Approximately 54.7% of individuals were male and 48.7% were White. The most common mechanisms of injury were fall with facial trauma (60.7%), direct impact from a pickleball paddle (15.4%), and direct impact from the pickleball itself (10.3%). The most frequently associated diagnoses were laceration (accounting for 38.5% of injuries), contusions or abrasions (23.1%), internal organ injury (14.5%), and fractures (12.0%); specific ocular surface or intraocular diagnoses that were denoted were corneal abrasions (6.0%), iritis (3.4%), hyphema (1.0%), and vitreous detachment (1.0%). The majority of individuals, 98.3%, were treated and released or examined and released without treatment; 1.0% of patients were treated and admitted for hospitalization and 1.0% of patients were treated and transferred to another hospital.

Conclusions: This study utilized a national database to investigate the epidemiology of eye injuries associated with pickleball. As the popularity of this sport has surged, so too has the frequency of associated eye injuries. The injuries described herein have the potential to cause substantial ocular morbidity and underscore the need for preventative efforts; while many ocular injuries were minor, the narratives included in the database highlight injuries that may necessitate ophthalmologic therapies and intervention. Eye protection, specifically polycarbonate safety goggles, should be worn by all individuals participating in this sport.

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7:42-7:46 am

An Analysis of 333 Space-Occupying Lesions of the Orbit at a Comprehensive Pediatric Cancer Center

Jacquelyn Laplant[1,2], William Edwards[2], Fabliha Mukit[2], Stephen Dryden[2], James Fleming[1,2], Mattew Wilson[1,2]
[1]Division of Ophthalmology, Department of Surgery, St. Jude Children's Research Hospital, Memphis, Tennessee, United States,
[2]Department of Ophthalmology, The University of Tennessee Health Science Center, Memphis, Tennessee, United States

Introduction: Pediatric orbital lesions represent a different spectrum of disease compared to adults. Several studies have reported on the demographics of orbital lesions in this population although significant variability exists secondary to the nature of the reporting center, geographic location, and whether the diagnosis was made clinically or by biopsy. The purpose of this study is to characterize 333 space-occupying lesions of the orbit in patients seen at a comprehensive pediatric cancer center in the United States.

Methods: A retrospective review of 333 patients referred to a single institution for evaluation and treatment of orbital space-occupying lesions between 1963-2023 was performed. The final diagnosis was established by a combination of history, exam findings, radiologic assessment, and histopathologic analysis if biopsy was performed. The number and percentage of benign and malignant tumors were determined. The age at diagnosis, sex, clinical presentation, duration of symptoms, and ophthalmologic exam findings were extracted from the patients' records. The surgical specialty and biopsy technique were recorded. Radiographic studies were also reviewed for tumor laterality, location within the orbit, and local extension.

Results: Of the 333 patients identified with orbital lesions, 167 (50.2%) were female and 166 (49.8%) were male. The median age at diagnosis was 4.6 years (range, 0 to 24.9) and median follow-up was 50 months (range, 1-516). Of all lesions, 217 (65%) were malignant and 116 (35%) were benign. Biopsy was performed for 286 (86%) cases. The most common biopsy techniques were orbitotomy (42%), bone marrow biopsy (17%), and endoscopic techniques (12%). The most frequent malignant orbital tumors were metastatic neuroblastoma (27%) (Figure 1), rhabdomyosarcoma (26%) (Figure 2), and retinoblastoma (14%) (Figure 3). The most common benign orbital tumors were optic nerve gliomas (56%), plexiform neurofibromas (7%) and dermoid and orbital cysts (6%).

The orbital distribution of the most common tumors was neuroblastoma in the superolateral quadrant (43 cases), embryonal rhabdomyosarcoma in the superomedial quadrant (11 cases), alveolar or secondary rhabdomyosarcoma in the inferomedial quadrant (16 cases), and rhabdomyosarcoma (all subtypes) in the inferolateral quadrant (13 cases). The superolateral quadrant was the most frequent site of malignancy and metastatic disease.

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The average duration of symptoms leading to presentation for all orbital lesions was 12.4 weeks (range: 0-73). The most common presenting complaints in the malignant group were eyelid swelling (35%), systemic symptoms (24%), and proptosis (23%). The most common ophthalmology exam findings in this group were proptosis (34%), periorbital edema (23%) and altered extraocular muscle motility (20%).

Conclusions: Our findings highlight the orbital oncology experience at a comprehensive pediatric cancer center. We found a higher rate of malignancy (65% of all tumors) than previous studies but found that the most common primary, secondary, and metastatic pediatric orbital malignancies were similar to those previously reported in the literature. Increasing our knowledge of the relative distribution, early signs and symptoms, and radiologic characteristics of pediatric orbital lesions can help providers recognize a potentially malignant lesion.

Table 1. Classification of 333 patients with orbital lesions

Category	No. patients (%)*	No. biopsy proven (%)*	% Total biopsy proven*	Mean age in years (range)
Neurogenic	77 (23.1%)	35 (45%)	12	5.25 (0.21 - 17.99)
Metastatic	68 (20.4%)	68 (100%)	24	4.42 (0.48 - 20.36)
Secondary	65 (19.5%)	65 (100%)	23	7.04 (0.07 - 19.67)
Mesenchymal	58 (17.4%)	58 (100%)	20	8.91 (0.31 - 24.96)
Lymphoid, leukemic	20 (6.0%)	20 (100%)	7	7.6 (0.78 - 24.35)
Histiocytic	16 (4.8%)	16 (100%)	6	6.42 (0.53 - 16.97)
Cystic	9 (2.7%)	5 (56%)	2	4.93 (0.23 - 15.74)
Inflammatory	9 (2.7%)	8 (89%)	3	9.95 (1.18 - 23.48)
Vasculogenic	7 (2.1%)	7 (100%)	2	4.88 (0.14 - 14.48)
Epithelial lacrimal gland tumor	3 (0.9%)	3 (100%)	1	13.78 (10.97 - 15.62)
Notochordal	1 (0.3%)	1 (100%)	<1	3.76
Total orbital lesions	**333**	**286**	**86**	**6.51 (0.07 - 24.96)**

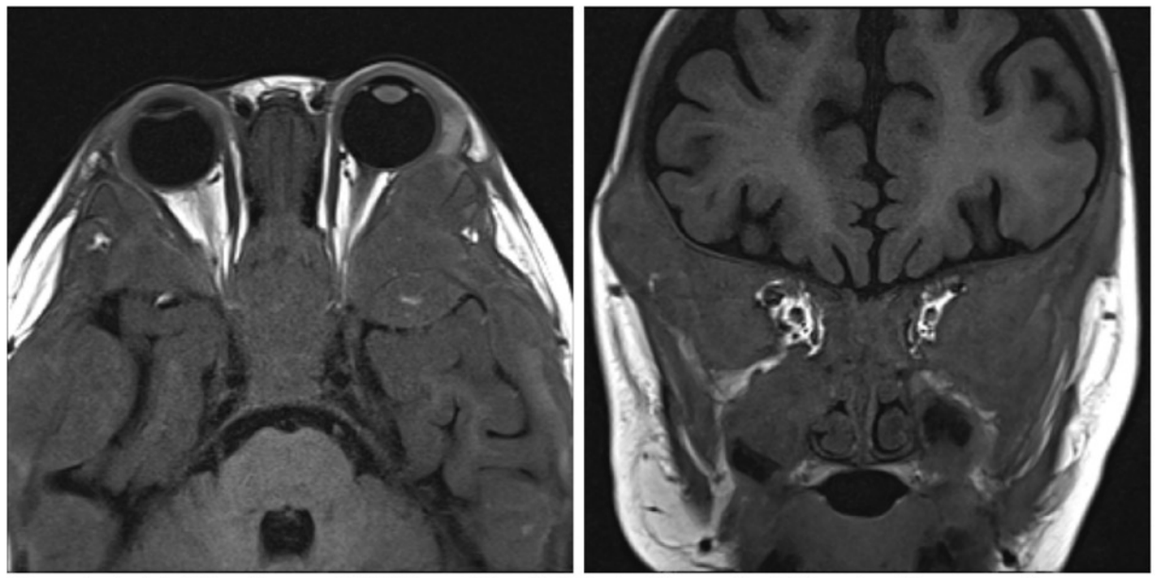

Figure 1. Axial (A) and coronal (B) T1-weighted MRI of a 17-month-old female with metastatic neuroblastoma demonstrating extensive osseous metastasis with associated soft tissue components involving the skull base, calvarium, and medial and lateral orbits, with compression of bilateral orbital apices and optic canals.

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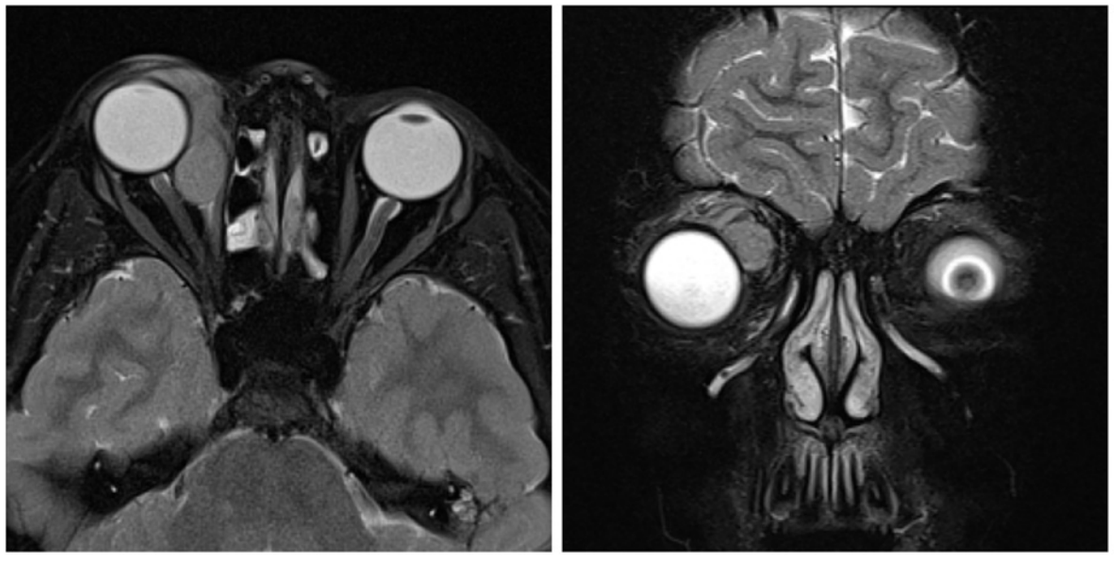

Figure 2. Axial (A) and coronal (B) fat-suppressed T2-weighted MRI of a 12-year-old male with primary orbital rhabdomyosarcoma demonstrating a mildly hyperintense and homogenous mass of the superomedial orbit with intraconal and extraconal involvement.

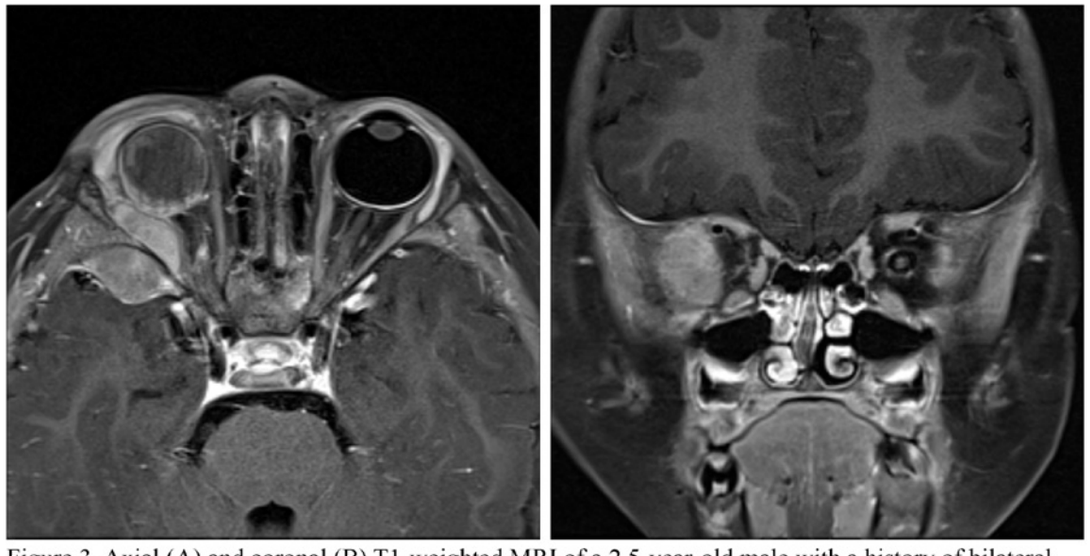

Figure 3. Axial (A) and coronal (B) T1-weighted MRI of a 2.5-year-old male with a history of bilateral retinoblastoma. MRI imaging demonstrates an orbital implant with postsurgical changes after enucleation and a new enhancing mass encasing the lateral wall of the orbit with an extraosseous component extending into the orbit and right middle cranial fossa representing recurrence.

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Insurance Status Impacts the Rate of Orbital Fracture and Eyelid Laceration Repair

Katherine Lucarelli[1], Persiana Saffari[2], Lucia Chen[3], Connie Sears[1], Kelsey Roelofs[4]
[1]Department of Ophthalmology, University of California, Los Angeles, Los Angeles, California, United States, [2]David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, California, United States, [3]Department of Medicine Statistics Core, University of California, Los Angeles, Los Angeles, California, United States, [4]Department of Ophthalmology, University of Alberta, Edmonton, Alberta, Canada

Introduction: Race/ethnicity and insurance status have been associated with disparities in trauma care,[1] and one study of facial trauma found patients with private insurance were more than twice as likely to receive an ophthalmology consultation than patients with Medicaid.[2] Reported rates of orbital fracture repair range widely, from 18-41%[3,4] and may vary amongst surgical specialties. The primary outcome of this study is to identify whether insurance type is associated with rate of surgical intervention for patients presenting with orbital fractures or eyelid lacerations. The secondary outcomes include timing of procedure, hospital admission and length of stay.

Methods: A cohort study was conducted using International Classification of Disease (ICD) 10 primary diagnoses codes to identify patients of all ages who presented to the Emergency Department from January, 2015 to June, 2023. Primary diagnosis ICD-10 codes for orbital fractures and eyelid lacerations (S02.3, S02.83, S02.84, S02.30XA, S01.111, S01.112, and S01.119 and all appropriate modifiers) were included. Demographic data including sex, age, race, and insurance type were obtained. Data regarding surgical procedure, hospital admission, length of stay and time from diagnosis to surgery were collected. Univariate and Multivariate regression analyses were performed.

Results: 5,157 patients were identified with a primary diagnosis of orbital fracture (1180) or eyelid laceration (3977). Race varied significantly by insurance type (Table 1). In both the orbital fracture and eyelid laceration cohorts, patients with commercial insurance were more likely to identify as White ($p<0.001$), whereas those with Medi-Cal insurance were more likely to identify as Hispanic (38% versus 14%, $p<0.001$; 40% versus 12%, $p<0.001$, respectively). Patients with Medi-Cal insurance were more likely to be admitted to the hospital, both in the fracture group (37% versus 29%, $p<0.025$) and eyelid cohort (27% versus 9%, $p<0.001$) than patients with commercial insurance, however, there was no difference in length of stay ($p=0.248$ and $p=0.254$) (Table 2).

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Despite more frequent hospital admission, patients with Medi-Cal insurance were ultimately less likely to undergo a surgical procedure (orbital fracture repair: 11% versus 17%, p=0.015; eyelid laceration repair: 65% versus 74%, p<0.001) compared to those with commercial insurance. On multivariate analysis, controlling for age, sex, language, and race, those with Medi-Cal insurance were approximately half as likely to undergo orbital fracture repair (OR 0.55; 95%CI [0.34-0.88]; p=0.012) and a quarter less likely to undergo eyelid laceration repair (OR 0.73; 95%CI [0.60-0.89]; p<0.001, Table 4) than patients with commercial insurance (Table 3). Race, age, sex and language were not significantly associated with orbital fracture repair in the multivariate model.

Conclusions: Insurance type was a significant predictor of surgical intervention for periocular trauma, even when other variables including age, sex and race were accounted for. This finding could be due to several factors, including logistical barriers limiting outpatient follow up, variation in procedure renumeration, and other socioeconomic factors not captured in this dataset. Regardless of the root cause, awareness of the associations between insurance status and rate of intervention is an important first step minimizing implicit bias in surgical decision making for patients with orbital and eyelid trauma.

Table 1. Demographic data of patients presenting with orbital fractures and eyelid lacerations with pair-wise comparisons between insurance type.

			All Patients	Commercial	HMO	Medi-Cal	Medicare	Other	Overall P-value	P-value for HMO vs. Commercial	P-value for Medi-Cal vs. Commercial	P-value for Medicare vs. Commercial	P-value for Other Insurance vs. Commercial
			(N=1180)	(N=305)	(N=83)	(N=404)	(N=267)	(N=121)					
Orbital Fractures	Age								<0.001	0.427	**0.004**	<0.001	<0.001
		Mean (SD)	49.8 (20.9)	39.7 (16.1)	41.5 (16.1)	42.6 (14.5)	76.7 (13.6)	45.3 (15.7)					
		Median (Q1-Q3)	47.0 (33.0-65.0)	36.0 (27.0-51.0)	38.0 (28.0-55.5)	42.0 (31.0-54.0)	78.0 (70.0-86.0)	42.0 (34.0-58.0)					
		Min-Max	5.0-102.0	7.0-95.0	17.0-85.0	5.0-97.0	31.0-102.0	20.0-95.0					
	Sex								<0.001	0.269	0.149	<0.001	0.075
		Male	847 (71.8%)	226 (74.1%)	56 (67.5%)	319 (79.0%)	146 (54.7%)	100 (82.6%)					
		Female	333 (28.2%)	79 (25.9%)	27 (32.5%)	85 (21.0%)	121 (45.3%)	21 (17.4%)					
	Race/Ethnicity								<0.001	**0.026**	<0.001	**0.015**	<0.001
		Asian	92 (7.8%)	42 (13.8%)	11 (13.3%)	10 (2.5%)	21 (7.9%)	8 (6.7%)					
		Black or African American	152 (12.9%)	18 (5.9%)	9 (10.8%)	84 (20.8%)	26 (9.7%)	15 (12.6%)					
		Hispanic or Latino	282 (24.0%)	42 (13.8%)	19 (22.9%)	153 (38.0%)	22 (8.2%)	46 (38.7%)					
		White or Caucasian	463 (39.3%)	145 (47.5%)	25 (30.1%)	117 (29.0%)	141 (52.8%)	35 (29.4%)					
		Other/Unknown	188 (16.0%)	58 (19.0%)	19 (22.9%)	39 (9.7%)	57 (21.3%)	15 (12.6%)					
	Language								<0.001	0.871	<0.001	<0.001	<0.001
		English	1055 (89.4%)	295 (96.7%)	80 (96.4%)	351 (86.9%)	234 (87.6%)	95 (78.5%)					
		Spanish	86 (7.3%)	4 (1.3%)	1 (1.2%)	47 (11.6%)	16 (6.0%)	18 (14.9%)					
		Other Language	39 (3.3%)	6 (2.0%)	2 (2.4%)	6 (1.5%)	17 (6.4%)	8 (6.6%)					
			(N=3977)	(N=1522)	(N=320)	(N=877)	(N=964)	(N=293)					
Eyelid Lacerations	Age								<0.001	**0.05**	<0.001	<0.001	<0.001
		Mean (SD)	46.4 (27.0)	32.5 (20.2)	36.7 (24.9)	37.1 (18.5)	80.5 (12.4)	44.1 (18.8)					
		Median (Q1-Q3)	41.0 (25.0-70.0)	29.0 (18.0-45.0)	31.0 (18.0-54.0)	35.0 (24.0-53.0)	82.0 (74.0-89.0)	40.0 (30.0-59.0)					
		Min-Max	1.0-114.0	1.0-98.0	3.0-104.0	1.0-91.0	23.0-108.0	4.0-114.0					
	Sex								<0.001	0.265	<0.001	<0.001	<0.001
		Male	2647 (66.6%)	1028 (67.6%)	206 (64.4%)	658 (75.0%)	512 (53.1%)	242 (82.6%)					
		Female	1329 (33.4%)	493 (32.4%)	114 (35.6%)	219 (25.0%)	452 (46.9%)	51 (17.4%)					
	Race/Ethnicity								<0.001	<0.001	<0.001	<0.001	<0.001
		Asian	276 (7.0%)	152 (10.0%)	29 (9.1%)	23 (2.6%)	53 (5.5%)	19 (6.6%)					
		Black or African American	336 (8.5%)	69 (4.5%)	31 (9.7%)	126 (14.4%)	67 (7.0%)	43 (14.9%)					
		Hispanic or Latino	759 (19.1%)	183 (12.0%)	73 (22.8%)	346 (39.5%)	79 (8.2%)	78 (27.1%)					
		White or Caucasian	1888 (47.6%)	801 (52.7%)	119 (37.2%)	280 (31.9%)	596 (61.9%)	91 (31.6%)					
		Other/Unknown	711 (17.9%)	316 (20.8%)	68 (21.2%)	102 (11.6%)	168 (17.4%)	57 (19.8%)					
	Language								<0.001	0.852	<0.001	<0.001	<0.001
		English	3714 (93.4%)	1486 (97.6%)	314 (98.1%)	774 (88.3%)	887 (92.0%)	252 (86.0%)					
		Spanish	163 (4.1%)	14 (0.9%)	3 (0.9%)	94 (10.7%)	24 (2.5%)	28 (9.6%)					
		Other Language	100 (2.5%)	22 (1.4%)	3 (0.9%)	9 (1.0%)	53 (5.5%)	13 (4.4%)					

Table 2. Comparison of clinical and surgical outcomes for patients presenting with orbital fractures and eyelid lacerations with pair-wise comparisons between insurance type.

		All Patients	Commercial	HMO	Medi-Cal	Medicare	Other	P-value	P-value for HMO vs. Commercial	P-value for Medi-Cal vs. Commercial	P-value for Medicare vs. Commercial	P-value for Other Insurance vs. Commercial
Orbital Fractures	***Days from Dx to Procedure (Orbital)***							0.127				
	Mean (SD)	16.0 (59.7)	22.6 (79.7)	4.2 (3.2)	11.7 (52.5)	9.6 (15.1)	26.2 (57.6)					
	Median (Q1-Q3)	3.0 (1.0-8.0)	3.0 (1.0-8.5)	4.0 (2.0-6.0)	2.0 (1.0-4.0)	6.0 (1.0-12.0)	7.0 (3.0-10.0)					
	Min-Max	0.0-548.0	0.0-548.0	0.0-9.0	0.0-354.0	0.0-70.0	1.0-179.0					
	Days from Admission to Procedure (Orbital)							0.198				
	Mean (SD)	7.7 (22.5)	15.3 (37.6)	1.7 (2.9)	4.0 (6.9)	2.8 (4.5)	9.0 (7.6)					
	Median (Q1-Q3)	2.0 (0.0-5.0)	1.5 (0.0-7.0)	0.0 (0.0-2.5)	2.0 (1.0-3.0)	1.0 (0.0-3.0)	6.5 (4.5-11.0)					
	Min-Max	0.0-131.0	0.0-131.0	0.0-5.0	0.0-27.0	0.0-15.0	3.0-20.0					
	Number of Hospital Admissions (Orbital)							**<0.001**	0.757	**0.024**	**<0.001**	0.951
	Mean (SD)	0.4 (0.5)	0.3 (0.5)	0.3 (0.5)	0.4 (0.5)	0.5 (0.5)	0.3 (0.5)					
	Median (Q1-Q3)	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.0 (0.0-1.0)					
	Min-Max	0.0-2.0	0.0-2.0	0.0-1.0	0.0-2.0	0.0-2.0	0.0-2.0					
	Hospital Admission Y/N (Orbital)							**<0.001**	0.89	**0.025**	**<0.001**	1
	No	765 (64.8%)	216 (70.8%)	60 (72.3%)	253 (62.6%)	150 (56.2%)	86 (71.1%)					
	Yes	415 (35.2%)	89 (29.2%)	23 (27.7%)	151 (37.4%)	117 (43.8%)	35 (28.9%)					
	Average LOS (Orbital)							0.248				
	Mean (SD)	8.4 (10.5)	8.1 (11.0)	9.6 (10.2)	9.6 (12.6)	6.8 (7.4)	8.7 (7.9)					
	Median (Q1-Q3)	5.0 (2.0-10.0)	3.0 (2.0-11.0)	5.0 (3.0-11.0)	5.0 (2.5-10.0)	5.0 (3.0-8.0)	6.0 (3.0-12.0)					
	Min-Max	0.0-91.0	0.0-73.0	0.0-38.0	1.0-91.0	1.0-47.0	0.0-31.0					
	Procedure for Orbital Fracture							**0.004**	0.179	**0.015**	**0.001**	**0.006**
	No	1040 (88.1%)	251 (82.3%)	74 (89.2%)	359 (88.9%)	244 (91.4%)	112 (92.6%)					
	Yes	140 (11.9%)	54 (17.7%)	9 (10.8%)	45 (11.1%)	23 (8.6%)	9 (7.4%)					
Eyelid Lacerations	***Days from Dx to Procedure (Eyelid)***							**<0.001**	0.086	**<0.001**	**0.033**	**0.001**
	Mean (SD)	7.5 (94.7)	3.7 (63.1)	0.0 (0.2)	5.7 (81.0)	16.3 (135.8)	15.2 (153.7)					
	Median (Q1-Q3)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-0.0)					
	Min-Max	0.0-2076.0	0.0-1788.0	0.0-2.0	0.0-1363.0	0.0-2076.0	0.0-2063.0					
	Days from Admission to Procedure (Eyelid)							**0.011**	0.399	0.574	**0.008**	0.307
	Mean (SD)	9.4 (92.6)	0.6 (1.5)	0.2 (0.6)	13.7 (120.0)	11.8 (96.2)	0.8 (1.6)					
	Median (Q1-Q3)	0.0 (0.0-0.0)	0.0 (0.0-1.0)	0.0 (0.0-0.0)	0.0 (0.0-1.0)	0.0 (0.0-0.0)	0.0 (0.0-1.0)					
	Min-Max	0.0-1324.0	0.0-8.0	0.0-2.0	0.0-1324.0	0.0-839.0	0.0-7.0					
	Number of Hospital Admissions (Eyelid)							**<0.001**	0.095	**<0.001**	**<0.001**	**0.029**
	Mean (SD)	0.2 (0.4)	0.1 (0.3)	0.1 (0.3)	0.3 (0.5)	0.3 (0.5)	0.1 (0.3)					
	Median (Q1-Q3)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.0 (0.0-0.0)					
	Min-Max	0.0-3.0	0.0-2.0	0.0-1.0	0.0-3.0	0.0-2.0	0.0-1.0					
	Hospital Admission Y/N (Eyelid)							**<0.001**	0.113	**<0.001**	**<0.001**	**0.038**
	No	3271 (82.2%)	1387 (91.1%)	282 (88.1%)	639 (72.9%)	707 (73.3%)	255 (87.0%)					
	Yes	706 (17.8%)	135 (8.9%)	38 (11.9%)	238 (27.1%)	257 (26.7%)	38 (13.0%)					
	Average LOS (Eyelid)							0.254				
	Mean (SD)	7.6 (13.3)	9.0 (15.8)	4.8 (6.8)	8.5 (14.1)	6.5 (12.4)	7.8 (9.2)					
	Median (Q1-Q3)	4.0 (2.0-8.0)	4.0 (2.0-8.5)	2.0 (1.0-4.8)	4.0 (2.0-8.0)	4.0 (2.0-6.0)	4.0 (2.0-9.8)					
	Min-Max	0.0-173.0	0.0-111.0	0.0-37.0	0.0-147.0	0.0-173.0	0.0-39.0					
	Procedure for Eyelid Laceration							**<0.001**	0.778	**<0.001**	**0.002**	**0.017**
	No	1170 (29.4%)	389 (25.6%)	79 (24.7%)	304 (34.7%)	303 (31.4%)	95 (32.4%)					
	Yes	2807 (70.6%)	1133 (74.4%)	241 (75.3%)	573 (65.3%)	661 (68.6%)	198 (67.6%)					

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Table 3. Multivariate analysis of predictors for orbital fracture repair

Outcome: Procedure for Orbital Fracture				
Predictor	OR	95% CI Lower	95% CI Upper	P-value
HMO vs. Commercial	0.54	0.25	1.15	0.111
Medi-Cal vs. Commercial	0.55	0.34	0.88	**0.012**
Medicare vs. Commercial	0.58	0.29	1.16	0.122
Other Insurance vs. Commercial	0.38	0.18	0.81	**0.013**
Age	0.99	0.98	1.00	0.141
Male vs. Female	0.73	0.49	1.08	0.119
Other Language vs. English	0.51	0.12	2.21	0.370
Spanish vs. English	1.44	0.67	3.08	0.352
Asian vs. White	1.13	0.56	2.25	0.737
Black vs. White	1.24	0.68	2.24	0.487
Hispanic vs. White	1.22	0.71	2.11	0.474
Other/Unknown vs. White	1.16	0.68	1.97	0.597

Table 4. Multivariate analysis of predictors for eyelid laceration repair

Outcome: Procedure for Eyelid Laceration				
Predictor	OR	95% CI Lower	95% CI Upper	P-value
HMO vs. Commercial	1.12	0.85	1.49	0.416
Medi-Cal vs. Commercial	0.73	0.60	0.89	**0.001**
Medicare vs. Commercial	1.06	0.82	1.36	0.663
Other Insurance vs. Commercial	0.83	0.63	1.10	0.198
Age	0.99	0.99	1.00	**<0.001**
Male vs. Female	1.02	0.88	1.18	0.792
Other Language vs. English	1.05	0.66	1.65	0.841
Spanish vs. English	0.80	0.56	1.15	0.227
Asian vs. White	1.27	0.93	1.73	0.135
Black vs. White	0.77	0.60	0.99	0.042
Hispanic vs. White	0.84	0.68	1.03	0.096
Other/Unknown vs. White	0.79	0.65	0.96	0.016

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8:03-8:08 am

Stereotactic Radiosurgery Versus Radiotherapy for Primary Optic Nerve Sheath Meningioma: Outcomes, Complications and Prognostic Factors

Shang-Te Ma[1,2], Kyung-In Woo[3]
[1]Ophthalmology, Oculoplastic, Taipei Medical University-ShuangHo Hospital, New Taipei City, Taiwan (Greater China), [2]Ophthalmology, Oculoplastic, Samsung Medical Center, Seoul, Republic of Korea, [3]Ophthalmology, Oculoplastic, Samsung Medical Center, Sungkyunkuan University School of Medicine, Seoul, Korea, Republic of

Introduction: Primary optic nerve sheath meningioma (ONSM) is a benign tumor that stems from the growth of menigoepithelial cells lining the optic nerve sheath. Despite it is slow growing, vision impairment can develop in >85% of patients. Herein, we compared the outcomes, complications and prognostic factors for primary ONSM treated with either stereotactic radiosurgery (GKRS) or radiotherapy.

Methods: We performed a 20-year retrospective cohort study in a tertiary center from January 2004 to October 2023. Patients with primary ONSM treated with GKRS or radiotherapy were included. Patient demographics, pre- and post-treatment examination results, tumor features in orbital magnetic resonance imaging, and post-treatment complications were collected and analyzed.

Results: There were 25 patients receiving GKRS and 10 patients receiving radiotherapy in this study. The mean age was 48.0±13.8 and 48.1±12.1 in GKRS group and radiotherapy group, respectively (p = 0.983). Intracranial extension of the tumor was noted in 11 patients (9 in GKRS group and 2 in radiotherapy group, p = 0.4470). Stable (unchanged or improved) post-treatment vision was achieved in 64% (n = 16) patients after GKRS and 70% (n = 7) patients after radiotherapy (p > 0.999). Ninety-six percent (n = 24) in GKRS group and 100% (n = 10) had successful tumor local control. The median shrinkage ratios of gross tumor volume (GTV) were 41% and 29% in GKRS and radiotherapy groups, respectively (p = 0.571). Post-treatment cataract was noted in 12.5% (3 of 24) patients in GKRS group and 20% (2 of 10) in radiotherapy group (p = 0.618). Only 2 patients had post-treatment radiation retinopathy: a stage 1 patient (4.0%) after GKRS and a stage 3 patient (10.0%) after radiotherapy (p = 0.496). Among the clinical and imaging features in all ONSM patients, pre-treatment visual acuity (p <0.001), post-treatment GTV (p = 0.031) and intracranial extension (p = 0.049) were significantly correlated with final visual outcomes.

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Conclusions: To our knowledge, this is the first single-center study providing a direct comparison of GKRS and radiotherapy for primary ONSM. Our experience reveals that the treatment outcomes and complications were similar for both treatment modalities. Poor visual prognosis is anticipated in patients with worse pre-treatment vision, larger post-treatment GTV, and intracranial extension.

Figure 1

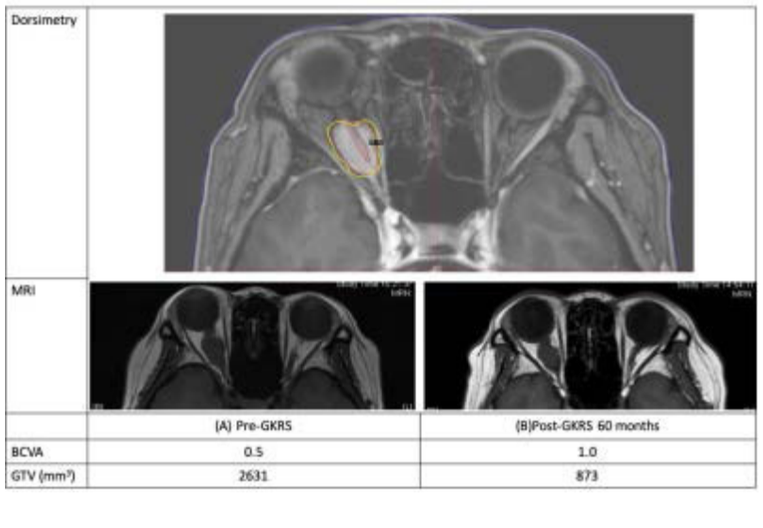
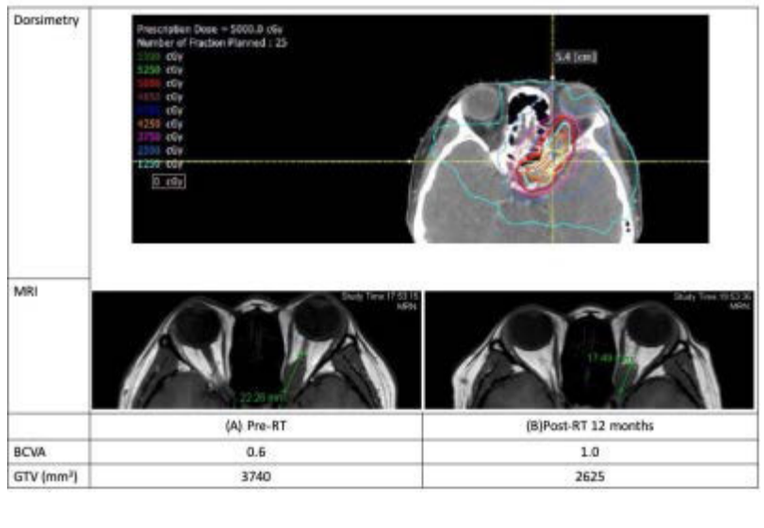


Figure 2



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8:08-8:13 am

Atypical Imaging Characteristics in Patients with Epithelial Tumors of Lacrimal Gland

Bita Esmaeli[1], Tracy Lu[1], Oded Sagiv[2], Matthew Debnam[3]
[1]Orbit and Ophthalmic Plastic Surgery, Department of Plastic Surgery, The University of Texas M.D. Anderson Cancer Center, Houston, Texas, United States, [2]Ophthalmology section, Department of Head and Neck Surgery, The University of Texas M.D. Anderson Cancer Center, Houston, Texas, United States, [3]Neuroradiology, The University of Texas M.D. Anderson Cancer Center, Houston, Texas, United States

Introduction: Epithelial lacrimal gland tumors are rare. The initial surgical decision to do an incisional biopsy vs. gross total resection ("lumpectomy") depends to a great extent on the radiologic characteristics of the lacrimal gland mass. Occasionally, the reported radiologic and clinical features attributed to benign vs. malignant lacrimal gland tumors do not hold. In this presentation, we will focus on these atypical presentations to help the orbital surgeon with better surgical planning.

Methods: Epithelial lacrimal gland tumors diagnosed in 101 consecutive patients (59 adenoid cystic carcinomas, 24 other carcinomas, and 18 pleomorphic adenomas) and treated by the primary author were included in this study. The clinical and radiologic records were retrospectively reviewed. The clinical parameters analyzed included age, gender, histologic type, and surgical treatment. The radiologic data analyzed included radiologic characteristics of the lacrimal gland mass on the initial magnetic resonance imaging (MRI) and/or computed tomography (CT) at presentation. Cases that did not follow the reported imaging characteristics of carcinoma or pleomorphic adenoma were further analyzed.

Results: : Overall, two possible atypical radiologic patterns were identified: 1) 11 of 59 (19%) cases of adenoid cystic carcinoma and 5 of 24 (21%) of other carcinomas were identified where the lesion was round and well-circumscribed , lacked a posterior extension or other aggressive features, and could not be reliably be distinguished from pleomorphic adenoma but after total gross surgical resection were found to be adenoid cystic carcinoma or other types of lacrimal gland carcinoma 2) 5 of 18 (28%) cases of pleomorphic adenoma, particularly "cellular " pleomorphic adenomas that presented with large multi-lobular masses and could not be reliably distinguished from a carcinoma but in fact were found to be of benign nature on histologic evaluation.

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Conclusions: Our findings suggest some overlap in radiologic features between pleomorphic adenomas and lacrimal gland carcinomas. Given the risk of multifocal benign or malignant recurrence of pleomorphic adenomas if excised incompletely, it seems prudent to err on the side of gross total resection for most well-circumscribed lesions of the lacrimal gland that lack aggressive radiologic features. Some of these well-circumscribed lesions will end up being adenoid cystic carcinoma or other types of lacrimal gland carcinomas upon pathologic evaluation of the surgical specimen and may require additional adjuvant treatments.

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8:13-8:18 am

Immune Checkpoint Inhibitors for Periocular Squamous Cell Carcinoma with Perineural Spread into Orbit and Skull Base

Oded Sagiv[1], Tracy Lu[2], Janet Fan[2], Hila Goldberg[2], Lorena Gomez Bolanos[3], Sharia Hernandez[3], Luana Guimaraes de Sousa[4], Neal Akhave[4], Renata Ferrarotto[4], Bita Esmaeli[2]
[1]Section of Ophthalmology, Department of Head and Neck Surgery, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States, [2]Orbital Oncology and Ophthalmic Plastic Surgery, Department of Plastic Surgery, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States, [3]Department of Translational Molecular Pathology, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States, [4]Department of Head and Neck Medical Oncology, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States

Introduction: Periocular squamous cell carcinoma (SCC) with perineural spread (PNS) to the orbit and skull base is often surgically non-resectable. Historically, such patients were treated with high-dose radiation therapy with or without chemotherapy with moderate rates of disease control and with significant associated ocular toxicity. Immune checkpoint inhibitors (ICI), specifically PD-1 inhibitors Cemiplimab and pembrolizumab, are FDA-approved for treating patients with locally advanced cutaneous SCC that is not curable by surgery or radiation. We present our experience using ICI as a single-agent drug therapy without radiation in patients with periocular SCC and perineural spread into the orbit and skull base.

Methods: The study included all patients with periocular SCC and PNS who were treated with ICI without radiation at a single tertiary cancer center. We retrospectively recorded the clinical and radiologic data at presentation, ICI treatment duration, treatment response, follow-up data, and treatment-related adverse events.

Results: Ten patients (Nine men and one woman), with a median age of 68 years (range: 55 to 81 years), were included in the study. Most of the patients had recurrent cutaneous SCC previously treated with surgery, radiation therapy, chemotherapy, or a combination of these modalities. All patients had PNS along cranial nerve V1; other cranial nerves involved included V2 (n=1), V3 (n=2), III (n=1), VII (n=2), and VIII (n=1). Cemiplimab and pembrolizumab were used in 9 patients and 1 patient, respectively. The treatment duration ranged from 2 to 24 months (median, nine months). Four had a complete response, and 6 had a partial response to treatment based on MRI imaging. Radiation therapy was avoided in all ten patients during the follow-up period. At the last follow-up (range: 3 – 41 months, median=18 months after completion of treatment), all patients remain without evidence of recurrence.

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Conclusions: Treatment with a single agent, Cemiplimab or Pembrolizumab, without radiation therapy, resulted in a clinically meaningful response in patients with periocular SCC and PNS to the orbit and skull base. This treatment approach provides the benefit of avoiding high-dose radiation therapy with its associated ocular toxicity. Careful long-term follow-up, including serial imaging, is warranted to assess the long-term durability of response to treatment.

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8:18-8:23 am

Culprits Beside the Sun: Basal Cell Carcinoma of the Face and Eyelid: A National Institutes of Health All of Us Research Program Study

Sarah Cheng[1], Kelsey Roelofs[2]
[1]Department of Ophthalmology, University of California, Los Angeles, Los Angeles, California, United States, [2]Department of Ophthalmology, University of Alberta, Edmonton, Alberta, Canada

Introduction: Existing on literature on modifiable risk factors for basal cell carcinoma (BCC) finds sun exposure as the main culprit but is limited in its representation of a diverse population[1-4]. Although ultraviolet exposure is widely accepted as an important etiologic factor in BCC, body-site distribution of histopathologic sub-types[5] and patterns of relative tumor density[6] suggest that more complex relationships involving a variety of risk factors are at play. The introduction of the National Institutes of Health (NIH) All of Us Research Program[7] gives us the opportunity to re-examine risk factors for BCC in the highest non-white population of all published BCC literature. This study breaks BCC down by eyelid, face, and body location in the context of white and non-white patients, finding risk factors unique to non-white populations.

Methods: Cases of BCC within the All of Us database were identified by ICD9 and ICD10 coding and sub-divided by anatomical location (eyelid, face, vs non-facial) and race (white vs non-white). Exclusion criteria include a history of Gorlin syndrome, xeroderma pigmentosum, albinism, or organ transplantation. To assess the impact of modifiable risk factors within the context of socioeconomic data, 29 survey questions related to smoking, alcohol, access to care, and income were utilized. Univariate and multivariate logistic regression was performed, and minimal AIC was used to select for the best multivariate model.

Results: A total of 7342 patients with BCC and 29,728 age-matched controls were included. 48.7% (3623) of patients had basal cell carcinoma on the body (non-face), 47.2% had basal cell carcinoma on the face (3505), and 4.1% (304) had basal cell carcinoma of the eyelid. (Table 1). White race (OR 13.69 CI 6.97 – 32.16, $p < 0.001$) and male sex (OR 1.24 CI 1.15 – 2.34, $p < 0.001$) were non-modifiable risk factors for BCC and patients with facial BCC were significantly older ($p < 0.001$) (Table 2). However, Non-white patients with BCC were on average 9 years younger, and significantly more likely to have non-facial BCC (Table 3). On multivariate analysis, alcohol intake also showed a dose-dependent increased risk for BCC (OR 1.54 CI 1.14-2.13 $P<0.001$) of the face (Table 4).

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Conclusions: Non-white patients were significantly younger and were more commonly diagnosed with non-facial BCC, suggesting that BCC pathogenesis may not be as closely related to cumulative sun-exposure in this population as for White patients. Alcohol appears to be an important modifiable risk factor, and a positive, dose-dependent relationship with the risk of BCC was observed. These differences highlight the utility of mining databases to understand how diseases affect diverse populations of patients.

	BCC (n = 7432)	Control n = 29728	P-value
Age			
Mean (SD)	73.1 (10.7)	73.0 (10.7)	0.193
Median [Min, Max]	74.0 [22.0, 105]	74.0 [21.0, 107]	
Sex			
Female	3537 (47.6%)	16346 (55.0%)	<0.001
Male	3895 (52.4%)	13382 (45.0%)	
Race			
Asian Middle Easter or North African	23 (0.3%)	926 (3.1%)	<0.001
Black or African American	53 (0.7%)	5185 (17.4%)	
White	7356 (99.0%)	23617 (79.4%)	
Ethnicity			
Hispanic or Latino	35 (0.5%)	315 (1.1%)	<0.001
Not Hispanic or Latino	7397 (99.5%)	29413 (98.9%)	
Tumor Location			
Body	3623 (48.7%)	0 (0%)	<0.001
Eyelid	304 (4.1%)	0 (0%)	
Face excluding eyelids	3505 (47.2%)	0 (0%)	
Control	0 (0%)	29728 (100%)	

Table 1. Demographics of patients included in the study. Control patients were age-matched to basal cell carcinoma patients and selected at a 4:1 ratio. Patients with basal cell carcinoma were predominantly White, however this study includes a significant number of non-White patients. Basal cell carcinoma was well represented in the face despite smaller surface area than the body.

	Body (n = 3623)	Face excluding eyelid (n=3505)	Eyelid (n = 304)	P-value
Age				
Mean (SD)	72.4 (10.5)	73.9 (12.1)	73.0 (10.7)	<0.001
Median [Min, Max]	73.0 [22.0, 105]	75.0 [23.0, 102]	74.0 [32.0, 97]	
Sex				
Female	1804 (49.8%)	1576 (45.0%)	157 (51.6%)	<0.001
Male	1819 (50.2%)	1929 (55.0%)	147 (48.4%)	
Race				
Non-White	>56 (>1.4%)	<20	<20	<0.001
White	<3567 (<98.5%)	>3485	>284	

Table 2. Body BCC patients were slightly younger than face BCC patients. Patient counts under 20 are expressed as “<20” in compliance with the All of Us privacy policy against reporting values <20. To avoid having multiple groups with under 20 patients, Asian, Middle Eastern, African, and African American patients were combined into the “Non-White” race category.

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	Non-White (n = 76)	White (n = 7356)	P-value
Age			
Mean (SD)	64.8 (11.0)	73.0 (10.7)	<0.001
Median [Min, Max]	65.0 [31.0, 86]	74.0 [21.0, 105]	
Sex			
Female	37 (48.7%)	3500 (47.6%)	0.939
Male	39 (51.3%)	3856 (52.4%)	
Tumor Location			
Body	>56 (>73.6%)	3562 (48.4%)	<0.001
Eyelid	<20	302 (4.1%)	
Face excluding eyelid	<20	3492 (47.5)	

Table 3. Non-White patients were significantly younger than White patients with BCC, with an average 9 year age difference. Non-white patients with BCC also had nearly double relative BCC in the body instead of the face. Patient counts under 20 are expressed as "<20" in compliance with the All of Us privacy policy against reporting values <20. To avoid having multiple groups with under 20 patients, Asian, Middle Eastern, African, and African American patients were combined into the "Non-White" race category.

	Univariable		Multivariable	
Variable	Odds Ratio (95% CI)	P value	Odds Ratio (95% CI)	P value
Race				
Asian, Middle Eastern, or African	Reference		Reference	
Black or African American	0.41 (0.25-0.69)	p<0.001	0.63 (0.25-1.7)	p=0.336
White	12.54 (8.5-19.54)	p<0.001	11.79 (5.99-27.73)	p<0.001
Sex				
Male	1.35 (1.28-1.42)	p<0.001	1.23 (1.14-1.33)	p<0.001
Alcohol Intake Frequency in last year				
Never	Reference		Reference	
Monthly or less	1.03 (0.95-1.12)	p=0.412	1.03 (0.91-1.18)	p=0.616
2-4 drinks / month	1.35 (1.24-1.48)	p<0.001	1.22 (1.07-1.40)	p=0.003
2-3 drinks/week	1.47 (1.34-1.61)	p<0.001	1.30 (1.13-1.49)	p<0.001
≥4 drinks per week	1.60 (1.47-1.74)	p<0.001	1.26 (1.10-1.43)	p=0.001
Smoking	0.93 (0.88-0.98)	p=0.004	0.94 (0.87-1.02)	p=0.146
Annual Income				
≤25K	Reference		Reference	
25-50K	1.69 (1.53-1.88)	p<0.001	0.92 (0.77-1.09)	p=0.338
50-100K	2.08 (1.89-2.30)	p<0.001	1.06 (0.91-1.25)	p=0.469
100-200K	2.68 (2.43-2.96)	p<0.001	1.28 (1.09-1.51)	p=0.003
>200K	3.36 (3.01-3.76)	p<0.001	1.57 (1.31-1.88)	p<0.001
Can't afford specialist care	0.77 (0.65-0.92)	p=0.005	1.06 (0.87-1.28)	p=0.563

Table 4. Dose dependent effect of alcohol intake on risk of basal cell carcinoma development. Univariate and multivariate logistic regression examining the effect of race, sex, alcohol intake frequency, smoking, annual income, and access to specialty care when comparing patients with basal cell carcinoma to age-matched controls. When alcohol use is examined by frequency of drinks over the past year, increased drink frequency is associated with higher odds of basal cell carcinoma.

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8:23-8:28 am

Mohs Micrographic Surgery with Immunohistochemistry for Periocular Melanoma In-Situ

Kerri McInnis-Smith[1], Kannan Sharma[2], Caroline Yu[1], Eucabeth Asamoah[3], Addison Demer[3], Lilly Wagner[1]
[1]Department of Ophthalmology, Mayo Clinic, Rochester, Minnesota, United States, [2]Alix School of Medicine, Mayo Clinic, Rochester, Minnesota, United States, [3]Department of Dermatology, Mayo Clinic, Rochester, Minnesota, United States

Introduction: Mohs micrographic surgery (MMS) with immunohistochemistry (IHC) offers maximal tissue conservation and expedited confirmation of tumor-free margins for melanoma, thereby facilitating next-day reconstruction.[1] Our study aims to describe the reconstructive details of periocular melanoma in-situ (MIS) treated with MMS with IHC, and compare outcomes between eyelid and periorbital tumors.

Methods: This retrospective case series included all patients with melanoma in-situ affecting the eyelids or periorbital region and treated with MMS with IHC from 2008-2018 at a single institution. Tumors were assigned to the eyelid group if the clinically visible tumor involved the skin inside the orbital rim. Demographic data, clinicopathologic characteristics, and surgical/reconstructive details were collected and compared between eyelid and periorbital cohorts.

Results: 165 cases were identified, including 24 eyelid tumors and 141 periorbital tumors (upper cheek, nasal sidewall, lateral canthus adjacent, brow). Eyelid tumors were more likely to be >2 cm (p=0.0017) and represent recurrent melanoma (p=0.0026). The average initial surgical margin for all tumors was 5.34 1.54 mm and more than 1 stage was required to clear the margins in 24.2% of all patients. The average defect size for eyelid tumors was larger than that for periorbital tumors (14.0 13.3 cm^2 vs 7.7 5.4 cm^2, p=0.0302). Risk factors for complex reconstructive techniques included: initial tumor diameter > 2 cm (OR 3.84, 95% CI 1.95-7.57, p=0.0001), eyelid involved by initial tumor (OR 4.88, 95% CI 1.94-12.28, p=0.0008), and defect area > 10 cm^2 (OR 6.95, 95% CI 3.24-14.94, p<0.0001). Negative surgical margins were achieved in all cases. At an average follow up of 4.8 years (range 0-13.9 years), there were no melanoma-related deaths and only one local recurrence (<1%).

Conclusions: MMS with IHC achieves excellent local control rates for periocular melanoma in-situ. The standard initial surgical margin of 5 mm is frequently insufficient to achieve clear margins. Resulting defects are large, and complexity of reconstruction as well as need for multidisciplinary collaboration can be predicted by tumor size and clinical involvement of eyelid skin.

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8:28-8:33 am

Association between Neighborhood Deprivation and Periocular Skin Cancers Treated with Mohs Micrographic Surgery

Kiara M. Corcoran Ruiz[1], Cory Shohsany[2], Karla L Valdes Morales[3], Daniela Frankel[3], Mara Trifoi[3], Christopher J. Miller[3], Jeremy Etzkorn[3], Jocelyn He[1], Gui-Shuang Ying[1], César A. Briceño[1]
[1]Ophthalmology, Scheie Eye Institute, University of Pennsylvania, Philadelphia, Pennsylvania, United States, [2]Perelman School of Medicine, Philadelphia, Pennsylvania, United States, [3]Dermatology, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania, United States

Introduction: To analyze the association of neighborhood-level disadvantage with differences in skin cancer sizes and interval time to surgery for patients with periocular malignancies treated with Mohs micrographic surgery (MMS).

Methods: Biopsy-proven periocular basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma treated with MMS were identified from a prospectively maintained database from a single institution from Philadelphia, Pennsylvania from July 2006 to July 2023. Periocular skin cancers included primary lesions of the eyelid, brow or infraorbital cheek and multi-focal lesions involving periocular areas. The Area Deprivation Index (ADI) uses 17 employment, education, housing quality, and poverty metrics to rank neighborhoods by socioeconomic disadvantage based on United States Census blocks.[1,2] Using the patient's residential address, the Census block-level ADI score was calculated and reported as national percentiles. Higher national ADI scores are indicative of greater neighborhood-level deprivation. ADI scores were categorized into quartiles for statistical analysis. Primary outcomes included pre- and post-operative defect size and time to treatment from diagnosis date. Chi-square tests were used for categorical variables and analysis of variance for continuous variables. Univariate analyses were conducted with the use of multivariable generalized linear regression models to adjust for confounders. Statistical analyses were performed in SAS 9.4 (SAS Institute, Cary, NC). P-values less than 0.05 were considered significant.

Results: Our study evaluated a total of 2,637 patients who met inclusion criteria. There were more non-White ($p < 0.001$), Hispanic or Latino ($p<0.001$), and younger patients ($p<0.031$) in the highest ADI quartile compared to lower ADI quartiles. Mean pre- and post-operative cancer size was greater in the highest ADI quartile for those diagnosed with BCC ($p<0.001$) and for patients in the high ADI quartile with SCC ($p=0.016$) adjusted for age, gender, race, and ethnicity. The time interval between diagnosis to treatment was longer in the highest ADI quartile for patients with BCC ($p<0.001$) which remained significant after adjustment for demographic confounders.

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Conclusions: To the best of our knowledge, this is the first study to analyze the association between periocular malignancies treated with MMS and neighborhood-level socioeconomic status using ADI in a United States population.[3] The disparities in tumor size of non-melanoma skin cancers and delay in treatment time for BCC, the most common periocular skin malignancy, provide opportunities for further study and interventions to promote earlier diagnosis of periocular cutaneous malignancies and improved access to dermatology and oculoplastic providers.[4]

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8:33-8:38 am

Comparison of Different Treatment Modalities for Periocular Cutaneous Squamous Cell Carcinoma with Perineural Spread

Sarinee Juntipwong[1], Mehriban Alizada[1], Kirsten Simmons[1], Almila Sarigul Sezenoz[1], Victor Elner[1], Denise Kim[1], Christine Nelson[1], Francis Worden[2], Hakan Demirci[1]
[1]Ophthalmology and Visual Science, Kellogg Eye Center, University of Michigan, Ann Arbor, Michigan, United States, [2]Internal medicine-Hematology/Oncology, Rogel Cancer Center, University of Michigan Health, Ann Arbor, Michigan, United States

Introduction: Management of patients with periocular cutaneous squamous cell carcinoma (pcSCC) with perineural spread(PNS) when PNS reaches skull base is challenging due to patients have poor prognosis. The current management strategy employed for several decades, patients typically undergo palliative therapies such as radiation therapy, chemotherapy, or observation. The introduction of immunotherapy and targeted therapy may improve the clinical outcome and prognosis. The aim of this study is to compare different modalities for pcSCC with PNS including immunotherapy, targeted therapy ,radiation therapy, and observation.

Methods: Cases with pcSCC with PNS (21 cases) who were treated with immunotherapy, EGFR blocker with radiotherapy (RT), RT, and observation were retrospectively reviewed.

Results: 12 cases had immunotherapy (Cemiplimab in 6, Pembrolizumab in 1, combined with chemotherapy/EGFR blocker/RT in 5). 11 cases showed response without recurrence and 1 stable disease after 32-month mean follow-up. 92% showed clinical improvement and 50% gained nerve function. After the treatment, the results of the treatement showed improvement in trigeminal neuralgia in 83%, ptosis and motility in 50%, sensation in 31%, keratopathy in 25%, facial palsy in 22%, Survival rate in immunotherapy group was 100% in 1 year, 88% in 2 years, and 75% in 3 years. The second group , 3 cases, received EGFR blocker (cetuximab) with RT, 2 showed a response and 1 stable disease after a 31-month mean follow-up. In this group, the patient can not gain the nerve function. Only neuropathic pain improved in all cases. Survival rate of targeted therapy combine with RT group was 100% at 1 year and 33% at 2 years. The third group,4 patients, had RT. 3 pateints had progressive disease and 1 stable disease after 13-month mean follow-up. In 4 cases treated with RT and 2 cases with no therapy, no clinical improvement or nerve function gain was observed and mean survival time was less than 2 years. The 2-year survival rate was 88% in immunotherapy group, 33% in cetuximab/RT, and 0% in RT and no treatment.

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Conclusions: Immunotherapy provided the best clinical outcome in pcSCC with PNS. Immunotherapy can improve clinical symptoms, nerve function, MRI results, and increase survival outcome compared to other treatment protocols. Cetuximab is another treatment alternative when using immunotherapy is limited. Concurrent cetuximab and radiation showed better outcomes compared to only radiation therapy.

Figure 1

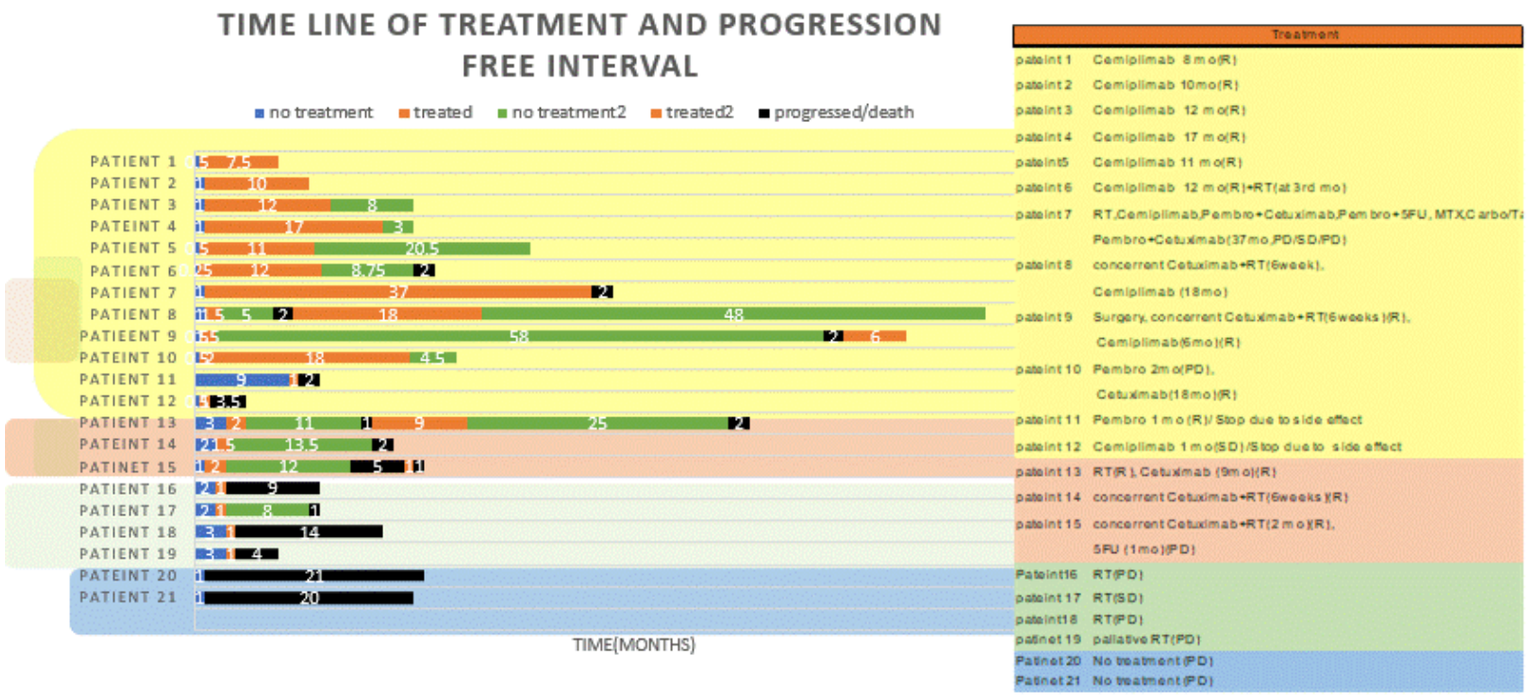

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Figure 2

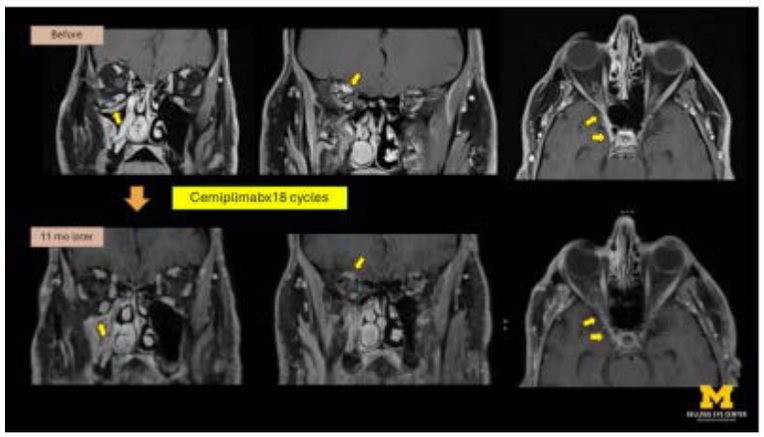

Figure 3

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ASOPRS FOUNDATION MICHAEL J. HAWES LECTURE

Moderator: Eric A. Steele

Thursday, October 17

9:02-9:45 am

Impossible Dreams - The East Face of Mt. Everest and Eradicating World Blindness

Geoffrey Tabin, MD, FACS

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10:21-10:27 am

A Paradigm Shift in Congenital Orbital Teratoma: Globe Preserving Surgery vs. Exenteration

Jocelyne Kohn[1,2], Cristina Hidalgo[3,4], Joaquin Gonzalez Barlatay[5], Mirtha Ramírez Dittrich[6,7], Hugo González Valdivia[8], George Charonis[9]
[1]Oculoplastics, Clinica Thea, Santiago, Chile, [2]Universidad de Valparaíso, Santiago, Chile, [3]Oculoplastics, Hospital Clínico Guillermo, Concepcion, Chile, [4]Oftalmosur, Concepcion, Chile, [5]Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, [6]Klinic Medicina Estética y Oculoplástica, Asuncion, Paraguay, [7]Universidad Nacional de Asunción, Asuncion, Chile, [8]Hospital Sant Joan de Déu, Barcelona, Spain, [9]Athens Vision Eye Institute, Athens, Greece

Introduction: Congenital Orbital Teratoma is a rare orbital tumor that arises from the 3 germinal cell layers, most typically mature and benign in nature but with generally devastating and disfiguring surgical results. The scarcity of literature, follow up, poor functional prognosis and fear of developing malignancy has historically led to management of these cases with exenteration. Nevertheless based on previous isolated reports, we present a considerable size case series that includes globe preserving surgery. This might be the beginning of a paradigm change in the treatment of these tumors.

Methods: Case series of 6 female patients with congenital teratoma at birth, 4 affecting the left eye and 1 of which was diagnosed intrauterine at 35 weeks (Figure 1). All presented rapidly expanding proptosis, chemosis and severe expansion of the eyelids. Severe corneal exposure with poor visual prognosis in 4 cases. Diagnosis was confirmed by CT and/or MRI imaging showing a heterogeneous multilobulated mass with solid and cystic components. 1 case also had extraorbital involvement (Figure 2).

Results: Surgery was performed ranging from day 1 to 6 months, median: 12 days. 2 cases underwent exenteration with eyelid preservation and 4 cases tumor resection with globe preservation, 3 of which the tumor was completely resected and 1 that was partially debulked twice, at 4 and 14 months old. Pathology confirmed all were mature in nature and none recurred nor underwent malignant transformation during an average of 6.8 years of follow up, ranging between 3 months and 21 years. In the globe preserving group 2 patients developed vision acuity of 0.2 and excellent cosmetic outcome (Figure 3), one has no vision and uses a scleral shell with a good cosmesis. The fourth patient is still undergoing ocular surface rehabilitation with poor visual prognosis (Figure 4).

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Conclusions: Orbital teratomas seem to behave differently than elsewhere, with immature histology and malignant transformation being extremely rare. Therefore exenteration and even complete tumor resection may not be mandatory in all cases. Because there is literature questioning the previous belief of malignant transformation and the previous axioma of exenteration, in the context of visual potential 3 of the authors opted for globe preservation.They encountered easy dissection of the tumor with a significant cystic component that was aspirated to facilitate the resection and allowing preservation of the orbit major structures, even when the optic nerve was difficult to identify in imaging. This should be taken into consideration and all efforts must be made to preserve the globe. This includes protecting the ocular surface from an early stage and prompt surgery, key in achieving better cosmetic and visual prognosis.

As previously reported, in our cases size and extraorbital involvement seems to be critical when deciding to preserve the globe. It seems that quickly growing tumors correlate with histology of cystic tissues, probably these are derived mainly from the mesodermal layer and would be the ones that require intervention earlier to prevent further ocular damage and extra orbital involvement, thereby improving outcome.

Figure 1

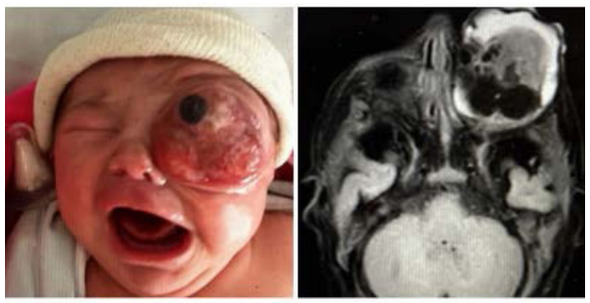


Figure 2

Figure 3

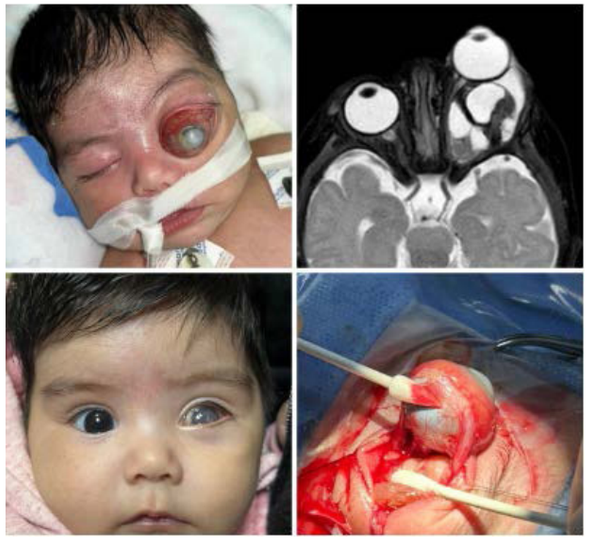
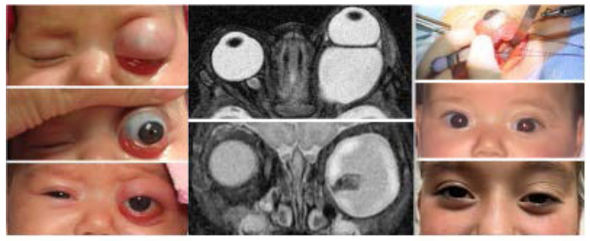


Figure 4



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10:27-10:33 am

Ophthalmic Outcomes of Transorbital Skull Base Surgery

Quillan Austria[1], Allison Coombs[1], Shanlee Stevens[1], Gary Lelli[1], Theodore Schwartz[2], Kyle Godfrey[1,2]
[1]Department of Ophthalmology, Weill Cornell Medicine, New York, New York, United States, [2]Department of Neurological Surgery, Weill Cornell Medicine, New York, New York, United States

Introduction: Transorbital approaches to the skull base provide minimally invasive access with decreased surgical morbidity in appropriately selected cases. The authors' prior studies have reported intermediate term neurosurgical outcomes.[1] This study expands on the current understanding of transorbital neurological surgery by providing additional cases, longer follow up, and more detailed ophthalmologic outcomes, considerations, and analyses.

Methods: A retrospective consecutive case review was performed. Included subjects underwent combined multidisciplinary transorbital approaches with oculoplastic and neurological surgery at a single center between 2016 and 2024. Patient demographics, hospitalization length, time under anesthesia, and pre and postoperative ophthalmologic outcomes including visual acuity, color vision, extraocular motility, intraocular pressure, binocular diplopia, Hertel exophthalmometry, and orbital reconstruction via abdominal fat grafting were analyzed. Static perimetry visual fields were analyzed pre and post-operatively when obtained and interpreted by a single reviewer.

Results: 39 patients met inclusion criteria. Tumor locations included sphenoid wing (30.8%), orbit (15.4%), cavernous sinus (12.8 %), Meckel's cave (10.3%) middle fossa (7.7%), anterior fossa (5.1%), petrous apex (2.6%), Sella turcica (2.6%) and temporalis fossa (2.6%). For tumors, the extent of resection was subtotal (46.2%), gross total (33.3%) and biopsy (15.4%) of tumors. The average surgery length was 5.75±2.4 hours. The average hospitalization was 4.69±5.7 days.

Pre and postoperative best corrected logMAR visual acuity averaged 0.16±0.20 and 0.18±0.27 respectively (*p=0.42*). Pre and postoperative intraocular pressure averaged 14.33±2.9 mmHg and 15.56±4.0 mmHg respectively *(p=0.56*). Pre and postoperative color vision deficits were present in 21.7% and 18.8% respectively (*p=0.82*). Pre and postoperative diplopia were present in 40% and 30% of patients respectively (*p=0.92*). Pre and postoperative extraocular motility deficits were demonstrated in 43% and 38% of patients respectively (*p=0.64*). Pre and post operative Hertel exophthalmometry measurements were 19.63±3.2mm and 18.64±2.6mm respectively (*p=0.02*). The authors utilized orbital fat grafts for reconstruction in 89% of subjects; additional results are summarized in Table 2.

Pre and postoperative static perimetry visual field mean deviation scores were −3.51±5.9dB and −2.15±3.0dB respectively (*p=0.10*).
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Conclusions: To the authors' knowledge, this is the first study dedicated to assessing comprehensive ophthalmic outcomes in patients undergoing transorbital skull base surgery. Overall, patients' visual function improved or remained unchanged in nearly all cases. These results provide evidence that transorbital approaches to the skull base are safe and may have a favorable morbidity profile when performed by expert, multidisciplinary teams in appropriately selected cases. Further studies with increased patient numbers and longer follow-up intervals are necessary to support these findings.

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10:33-10:39 am

Necrobitic Xanthogranuloma: Clinical Presentation and Management in a Single Center

Hakan Demirci0, Sarinee Juntipwong, Mahriban Alizada, Christine Nelson, Buse Guneri Beser, Almila Sezenoz Sarigul, Aslan Aykut, Brittany Simmons, Vinay Aakulu, Denise Kim, Elaine Downie
Kellogg Eye Center, University of Michigan, Ann Arbor, Michigan, United States

Introduction: Necrobiotic xanthogranuloma is a type of non-Langerhans cell histiocytosis with multisystem involvement. It commonly affects the skin and periorbital structures. It is usually associated with plasma cell dyscrasias and lymphoproliferative disorders. Management of periocular necrobiotic xanthogranuloma is challenging. Systemic and local therapies are used alone or in combination in the management. In this study, we reviewed our experience with 9 cases of necrobiotic xanthogranuloma in a single center.

Methods: Medical records of 9 cases with necrobiotic xanthogranuloma managed at Kellogg Eye Center, University of Michigan were retrospectively reviewed. Demographic features, clinical findings, systemic disorders, management, and outcomes were reported.

Results: Of 9 cases, 7 (78%) were women and 2 (22%) were men. The mean age was 62 years (range; 51-80 years). Monoclonal gammopathy of unknown significance (MGUS) and multiple myeloma were observed in 3 (33%) cases, MGUS in 2 (22%), chronic lymphocytic leukemia in 1 (11%), and common variable immune deficiency in 1 (11%) case. One case had asthma and one case had no systemic disorder. Eyelid involvement was observed in 7 (78%) cases, anterior orbital involvement in 6 (67%), lacrimal gland involvement in 5 (56%), and uveitis in 2 (22%) cases. Half of the eyelid involvement was upper eyelid, and the other half was lower eyelid. Other involved organs were the lung, liver, and lymph node in 1 (11%) case, each. The mean follow-up was 63 months. Four cases were only treated with local injections because they did not have any active systemic disease. One case was treated with intralesional triamcinolone injection followed by rituximab injection and showed complete response. Another case treated similarly had a partial response. One case treated with low-dose radiotherapy followed by rituximab injection had stable disease. One case received an intralesional rituximab injection showed progressive disease. Three cases were treated with systemic therapy including methotrexate and corticosteroid in 1 case, cyclophosphamide, and lenalidomide in 1 case, bortezomib, mycophenolate mofetil, mycophenolic acid in 1 case. All these cases had a partial response. One case was treated in a combination of systemic therapy (methotrexate and corticosteroid) and local injection (rituximab) and had a partial response. One case did not receive any treatment and passed away due to other medical problems.

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Conclusions: Necrobiotic xanthogranuloma was more common in women who were older than 50 years old. Eyelid and anterior orbital involvements are the most common periocular manifestations. In most caseseither local injection of triamcinolone and rituximab injections or systemic immunosuppressive therapy provided a partial response. Intralesional rituximab injections provided a better control in cases with partial response to triamcinolone.

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10:39-10:45 am

Factors Predicting Mortality and Skull Base Involvement in Patients with Invasive Fungal Sino-Orbital Disease

Reem Karmouta[1], Ashley Shirriff[1], Connie Sears[1], Maxwell Weng[2], Abdulrahman Almalouhi[2], Katherine Lucarelli[1], Jakob Fischer[3], Nikitha Kosaraju[3], Marilene Wang[3], Daniel Rootman[1]
[1]Division of Orbital and Ophthalmic Plastic Surgery, Stein Eye Institute, University of California, Los Angeles, Los Angeles, California, United States, [2]David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, California, United States, [3]Department of Otolaryngology – Head and Neck Surgery, University of California, Los Angeles, Los Angeles, California, United States

Introduction: Identifying prognostic factors, especially modifiable risk factors, is essential in improving outcomes for patients affected by invasive fungal sino-orbital disease. Our study aims to identify modifiable and non-modifiable risk factors for skull base involvement and disease mortality in a cohort of patients diagnosed with invasive fungal sino-orbital disease.

Methods: In this cohort study performed at a single academic medical center, patients presenting between 2014 and 2024 were screened. Participants met inclusion criteria if they had a confirmed diagnosis of invasive fungal sino-orbital disease. Risk factors collected were classified as “non-modifiable” and “modifiable.” Non-modifiable risk factors included: sex, age, diagnosis of diabetes, immunosuppressed status, hyperglycemia at time of hospital admission, imaging findings, and surgical findings. Modifiable risk factors included type of surgery performed, days to blood glucose control during hospitalization, number of total surgeries performed, and length of hospitalization. Primary outcomes of interest were mortality and skull base involvement. Primary care physicians, rehabilitation facilities and patients were contacted via telephone interview to establish current mortality status.

Results: A total of 89 subjects met inclusion criteria for this study. Of this sample 46% (n=41) are currently alive. The risk factor model predicting mortality was significant (chi-square = 20.77; p=0.0001). In this model immunosuppression was associated with a 3.6x increased risk of mortality (p=0.004; 95% CI 1.46 – 8.85) and the performance of endoscopic sinus surgery (ESS) was associated with an approximately 15x increased likelihood of survival (p=0.0005; 95% CI 1.91 – 125.57). Each additional surgery was associated with a 0.32 reduction in likelihood of mortality (p=0.02; 95% CI 0.50 – 0.96) (Table 1). In a multivariable model, both immunosuppression (p=0.004; OR 4.12; 95% CI 1.55 – 10.97) and ESS were significant (p=0.009; OR 17.72; OR 2.05 – 152.45) (Table 2)

In the model predicting skull base involvement, orbital extension identified on imaging (p=0.049; OR 2.67, 95% CI 1.00 – 7.17) and cavernous sinus involvement identified on imaging (p=0.03; OR 3.48, 95% CI 1.04 – 11.65) were found to be significantly associated with skull base involvement. The number of sinuses involved (p= 0.0009; OR 2.07, 95% CI 1.28 – 3.32) and total number of surgeries (p=0.03;

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OR 1.48, 95% CI 1.00 – 2.19) were also positively associated with increased likelihood of skull base involvement. Age (p=0.02; OR 0.97, 95% CI 0.94 – 0.99) and HbA1c (p=0.04; OR 1.18, 95% CI 1.00 – 1.40) were also positively associated with increased risk of skull base involvement (Table 3) No variables remained significant in a multivariable model for skull base involvement (Table 2).

Conclusions: Our study highlights immunosuppression as an important prognostic factor in patients diagnosed with invasive fungal sino-orbital disease, and furthermore highlights the importance of ESS and debridement in improving mortality in this patient population, though orbital debridement was not associated with survival. Numerous risk factors for skull base involvement were found, including number of surgeries and imaging findings, however these findings did not maintain significance in a multivariable model. Sinus debridement was the only modifiable risk factor found to associated with improved survival.

Variable	Odds Ratio	Lower 95% CI	Upper 95% CI	P-value
Demographic and clinical factors				
Sex (male)	1.01	0.43	2.37	0.99
Diabetes	0.88	0.36	2.14	0.77
Immunosuppression	3.60	1.46	8.85	0.004*
Hyperglycemic on hospital admission	1.05	0.44	2.48	0.92
Age (*per 1 year increase*)	1.02	1.00	1.05	0.13
Length of hospitalization (*per 1 day increase*)	1.01	0.99	1.03	0.14
HbA1c (*per 1 point increase*)	0.88	0.76	1.03	0.095
Days to glucose control (*per 1 day increase*)	0.87	0.74	1.03	0.077
Imaging findings				
Bone erosion	0.81	0.34	1.96	0.64
Orbital extension	0.76	0.29	1.96	0.57
Cavernous sinus involvement	0.65	0.25	1.70	0.38
Intracranial extension	1.42	0.50	4.02	0.51
Types of surgery performed				
ESS surgery (no surgery vs surgery)	15.48	1.91	125.57	0.0005*
Orbital exenteration	1.80	0.49	6.67	0.37
Total number of surgeries performed	0.68	0.50	0.96	0.02*
Surgical findings				
Pterygopalatine fossa involvement	0.34	0.09	1.19	0.077
Infratemporal fossa involvement	0.27	0.028	2.50	0.19
Septum involvement	0.90	0.33	2.45	0.84
Skull base involvement	1.74	0.66	4.60	0.26
Number cranial nerves involved (per 1 CN increase)	0.49	0.21	1.14	0.09
Number of sinuses involved (*per 1 sinus increase*)	0.99	0.70	1.37	0.89
Number turbinates involved surgery (*per 1 turbinate increase*)	0.70	0.42	1.18	0.18

Table 1. Univariable analyses modeling mortality as outcome variable. * *denotes p < 0.05.*

Variable	Odds Ratio	Lower 95% CI	Upper 95% CI	P-value
Mortality as outcome variable				
Immunosuppression	4.12	1.55	10.97	0.005*
ESS (no surgery vs surgery)	17.72	2.06	152.45	0.009*
Total number of surgeries performed	-	-	-	0.25
Skull base involvement as outcome variable				
Age (*per 1 year increase*)	-	-	-	0.17
HbA1c (*per 1 point increase*)	-	-	-	0.13
Orbital extension on imaging	-	-	-	0.47
Cavernous involvement on imaging	-	-	-	0.62
Total number of surgeries performed	-	-	-	0.33
Number of sinuses involved (*per 1 sinus increase*)	-	-	-	0.69

Table 2. Multivariate analyses modeling mortality and skull base involvement as outcome variable. * *denotes p < 0.05.*

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Variable	Odds Ratio	Lower 95% CI	Upper 95% CI	P-value
Demographic and clinical factors				
Sex (male)	0.80	0.32	1.99	0.62
Diabetes	0.57	0.21	1.54	0.26
Immunosuppression	1.23	0.49	3.08	0.65
Hyperglycemic on hospital admission	0.94	0.37	2.37	0.89
Age (*per 1 year increase*)	0.97	0.94	0.99	0.02*
Length of hospitalization (*per 1 day increase*)	1.01	0.99	1.03	0.26
HbA1c (*per 1 point increase*)	1.18	1.00	1.40	0.04*
Days to glucose control (*per 1 day increase*)	1.17	0.97	1.42	0.07
Imaging findings				
Bone erosion	0.73	0.28	1.88	0.51
Orbital extension	2.67	1.00	7.174	0.04*
Cavernous sinus involvement	3.48	1.04	11.65	0.03*
Intracranial extension	1.49	0.47	4.79	0.49
Types of surgery performed				
ESS surgery (no surgery vs surgery)	0.36	0.06	2.30	0.27
Orbital exenteration	3.38	0.68	16.63	0.09
Total number of surgeries performed	1.48	1.00	2.19	0.03*
Surgical findings				
Pterygopalatine fossa involvement	1.69	0.48	5.91	0.39
Infratemporal fossa involvement	2.35	0.25	22.10	0.42
Septum involvement	0.95	0.35	2.57	0.92
Number cranial nerves involved (per 1 CN increase)	0.72	0.31	1.67	0.45
Number of sinuses involved (*per 1 sinus increase*)	2.07	1.28	3.32	0.0009*
Number turbinates involved surgery (*per 1 turbinate increase*)	1.46	0.85	2.51	0.17

Table 3. Univariable analyses modeling skull base involvement as outcome variable. * *denotes* $p < 0.05$.

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10:45-10:51 am

Corneal Neurotization for Neurotrophic Keratitis in Congenital Trigeminal Aplasia: A Case Series

Jane Spadaro[1], Nahrain Schumaier[2], Alon Kahana[1,2]
[1]Kahana Oculoplastic and Orbital Surgery, Livonia, Michigan, United States, [2]Ophthalmology, Corewell Health William Beaumont University Hospital, Royal Oak, Michigan, United States

Introduction: We present the results of corneal neurotization for neurotrophic keratitis (NK) in the setting of congenital trigeminal aplasia. In two cases, the surgical technique included end-to-end coaptation ("daisy-chain") of two acellular nerve allografts (ANA) with umbilical cord amniotic membrane overlay.

Methods: A retrospective case series was performed with evaluation of clinical outcomes.

Results: Figure 1 demonstrates the patient characteristics and clinical outcomes.

Case 1 is a 16-month-old female who presented with recurrent corneal ulcers in the left eye, with no improvement following therapy with cenegermin-bkbi (Dompé US Inc., San Mateo, CA). She underwent corneal neurotization using the contralateral supraorbital nerve with a 70 mm allograft. At 9 months post-op, she underwent successful superficial keratectomy to improve her irregular astigmatism. At 26.6 month follow-up, she was found to have subjective improved corneal clarity, improved visual function, and a healthy corneal surface.

Case 2 is a 8-month-old male with medical comorbidities of polymicrogyria and encephalocele who presented with recurrent corneal ulcers in the right eye, leading to amblyopia and manifest nystagmus. He underwent right corneal neurotization using the contralateral supraorbital nerve. Intraoperatively, 70- and 50-mm allografts were connected ("daisy-chained") using 9-0 vicryl sutures to complete an end-to-end coaptation. Umbilical cord amniotic membrane was then wrapped around both the allograft and donor nerve coaptation sites. At 6.5 months follow-up, his nystagmus had dampened and he was able to maintain an intact corneal epithelium.

Case 3 is a 51-year-old female who presented for recurrent corneal ulcers in the right eye. Since childhood, she had undergone multiple tarsorrhaphies and treatment with serum tears, without long-term success. She underwent right corneal neurotization using the contralateral frontal nerve. Intraoperatively, 70- and 50-mm allograft were connected ("daisy-chained) using 8-0 nylon to complete an end-to-end coaptation. Umbilical cord amniotic membrane was then wrapped around both the allograft and donor nerve coaptation sites. While her Cochet-Bonnet testing remained stable, her ocular surface significantly improved despite reversal of her tarsorrhaphy without recurrence of epithelial erosions at 10.6 months post-operatively.

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Conclusions: Complications of NK can be profound, with severe visual consequences due to corneal ulceration, scarring, neovascularization, and perforation.[1–3] There are few cases of NK associated with trigeminal aplasia successfully treated in the literature.[4–7] Acellular nerve allografts (ANA) have been shown to have comparable rates of success when compared to autologous nerve grafts, and have the benefit of greater processing convenience without the complications associated with a secondary surgical site.[4,7] The use of end-to-end coaptation of two allografts ("daisy-chaining") lengthens the graft and improves options for donor site selection. While the success of axonal regrowth is inversely associated with allograft length, when compared to motor or mixed nerves, sensory nerves are reported to regenerate more readily, possibly due to greater plasticity or less complex fiber subtypes.[8,9] In addition, we used umbilical cord amniotic membrane, which contains a high level of pentraxin-3, and provides anti-inflammatory, anti-fibrotic, and aiit-angiogenic properties; the umbilical amniotic membrane may enhance the overall results of corneal neurotization.[10–13] Further study into this technique is warranted.

Figure 1

Case	Age	Sex	Comorbidity	Eye	Comorbidity	Preop corneal Sensation (cm)	Donor nerve	Length of allograft (mm)	Coapatation Type	Follow-up (months)	Postop BCVA	Postop corneal Sensation (cm)
1	16 month	F	None	OS	CSM	UA	Contralateral supraorbital	70	End-to-side	26.6	20/100	UA, subjectively improved
2	8 month	M	Polymicrogyria, encephalocele	OD	UC, US, UM	UA	Contralateral supraorbital	70+50	End-to-side	6.5	UC, US, UM	UA, subjectively improved
3	51 year	F	None	OD	20/40	0.5	Contralateral frontal	70+50	End-to-side	10.6	20/40	0.5, subjectively improved

OD, right; OS left
BCVA, Best-corrected visual acuity
CSM, central steady maintained
UC US UM, uncentral unsteady unmaintained
UA, unable

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10:51-10:57 am

The Use of Dilute Hypochlorous Acid in the Treatment of Periorbital Necrotizing Fasciitis

Jonathan Siktberg, Louise Mawn
Department of Ophthalmology and Visual Sciences, Vanderbilt University Medical Center, Nashville, Tennessee, United States

Introduction: The purpose of this study is to report the outcomes of a case series of patients with periorbital necrotizing fasciitis (PONF) treated with dilute hypochlorous acid by the same oculoplastic surgeon at an academic medical center from 2015-2024.

Methods: Traditionally, the treatment of PONF has solely consisted of serial surgical debridement and administration of antibiotics. However, this paradigm was challenged at one academic medical center by the addition of a third treatment component—direct toxin neutralization with dilute hypochlorous acid. Records of patients treated for PONF with dilute hypochlorous acid at an academic medical center were pulled from the electronic medical record. Data were collected on basic demographics, treatment course, infectious pathogen, surgical interventions, visual acuity, clinical course, and mortality. Descriptive statistics were employed and compared to values reported in the literature.

Results: 17 orbits from 14 patients were found to have been treated for PONF with dilute hypochlorous acid. 64% of the patients were male, and the median age was 59 (range 19-82). The median follow-up time since first presentation was 187 days (range 45-3,421). Streptococcus pyogenes was the most common causative organism, diagnosed in 57% of the cases. The average number of debridements underwent by patients was 2.79 (range 1-5). 4 of the 14 (29%) patients underwent 5 or more debridements, compared to 74% reported by Rajak et al.[1] 5 out of 14 (39%) patients underwent skin graft surgery, and 9 patients (64%) underwent surgery for eyelid repair. 4 out of 17 (24%) eyes had worse vision at last follow up than at initial presentation. 3 of these eyes had lost one Snellen line of vision, while 1 (6%) lost more than 3 lines of vision, which occurred due to of exposure keratopathy after recovery from PONF. 0/17 eyes from the 14 patients were exenterated, compared to 2/10 eyes reported by Rothschild and 7/104 cases reported by Lazerri.[2,3] Finally, 0 of the 14 patients died as a result of the necrotizing fasciitis, while the literature reports a mortality rate of 3.4%-14.4% for PONF.[1-7]

Conclusions: The outcomes in this case series of patients treated for periorbital necrotizing fasciitis with dilute hypochlorous acid compare favorably to outcomes reported in the literature of patients treated traditionally. The addition of a third treatment component—dilute hypochlorous acid—to directly neutralize toxin in patients with periorbital necrotizing fasciitis may contribute to favorable treatment outcomes and should be considered by clinicians treating this aggressive and deadly disease.

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11:11-11:17 am

Laudable Pus, Cocaine, and the Evolution of Wound Closure

Philip Custer
Department of Ophthalmology and Visual Sciences, Washington University in St Louis, St Louis, Missouri, United States

Introduction: Oculofacial surgeons regularly use a variety of sutures and other methods to close wounds of the eyelids, face, trunk, and extremities. Previously surgeons faced many challenges in caring for patients with iatrogenic or traumatic wounds. Asepsis and modern anesthesia radically changed the approach to these patients. In this presentation we will review the long history of wound management, with special emphasis on periocular techniques.

Methods: Literature searches and cross-referencing were used to identify historic reports addressing the management of wounds. Foreign manuscripts were translated with online resources. Staff of the Bernard Becker Medical Library and its Archives and Rare Books Division assisted in obtaining research material.

Results: The first written description of suturing dates to around 3000 BC and involved repair of an eyebrow wound. A wide variety of materials have since been used as ligatures (tie off tissue or a vessel) or to stitch wounds, including animal intestines, tendons, hair, silk, linen, plant fibers, and metal wire (Figures 1,2). For much of recorded history, sutures were a primary cause of wound infection and morbidity. There was a time when the resultant drainage was viewed as being beneficial (laudable pus). Many of the discoveries that ultimately led to the practice of asepsis were coincidental. Prior to the development of topical and infiltrative anesthesia in 1884, patients had to endure the discomfort of surgery, occasionally with the sedative effects of wine or cannabis. In this presentation we will answer questions, such as:

- Who thought pus was “laudable?”
- How is a fibula used to insert a “twisted suture?”
- What is the difference between “bloody” and “dry” sutures?
- What were the roles of ants, rats, and kangaroos in wound closure?
- How do they make catgut, and why is it called “catgut?”

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- What does a Scottish pharmacist have to do with polyester fiber sutures?
- How was the first successful buried absorbable suture discovered?
- How was Sigmund Freud involved with an ophthalmology intern who changed the course of medicine?
- How did the “Father of American Surgery” become dependent on morphine?
- Why did dentist, Horace Wells, commit suicide while incarcerated?
- How did romance impact the development of operating room sterile technique?
- What does Oliver Wendell Holmes have to do with any of this?

Conclusions: Throughout much of history surgeons struggled with wound management. They had to constantly balance the need for wound closure and the risk of infection. Purulence was felt to be advantageous during the age of “laudable pus.” Many innovative methods were developed to achieve hemostasis and approximate wound edges. A wide variety of “bloody” and “dry” suturing methods were employed. Holmes, Lister, Halsted, Bloodgood and others helped introduce asepsis, transforming wound management. Meanwhile Koller, Halsted, Knapp, and Bell introduced the modern age of anesthesia, improving patient comfort and allowing surgeons to be more aggressive in their care. While several of these figures paid a heavy personal price, their efforts transformed medicine and laid the foundation for our current practices.

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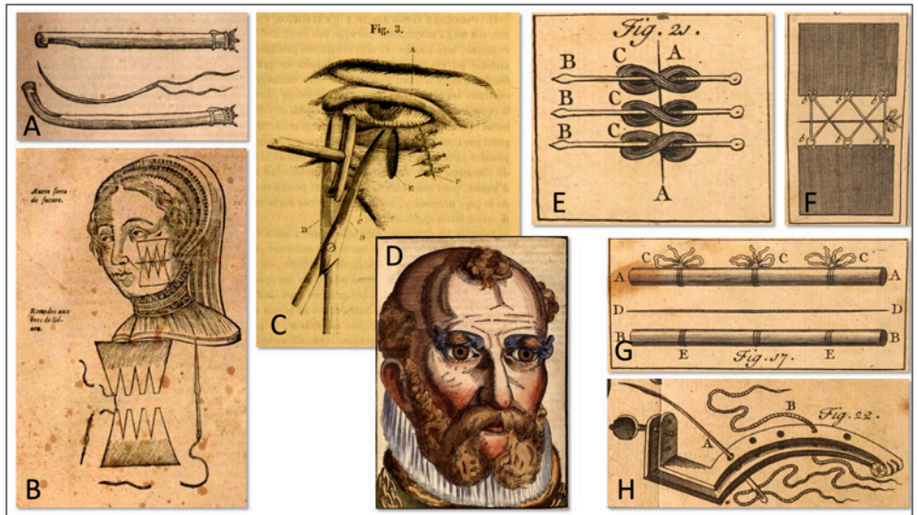

Figure 1: A. Needle, thread and several cannula to recover needle (from Paré 1633).
B. Dry suture technique involving suturing adhesive strips (from Paré 1633).
C. Lisfranc method of using twisted suture for entropion repair (from Desmarres 1847.)
D. Necrosing eyelid skin with clamps (from Bartisch 1583).
E. Twisted sutures (wound closure with fibula) (from Heister 1745).
F. Joining hooked plasters with thread (from Heister 1745).
G. Compound or "quill" suture (from Heister 1745).
H. Fenestrated clamp for placement of sutures prior to eyelid skin resection (from Heister 1745).

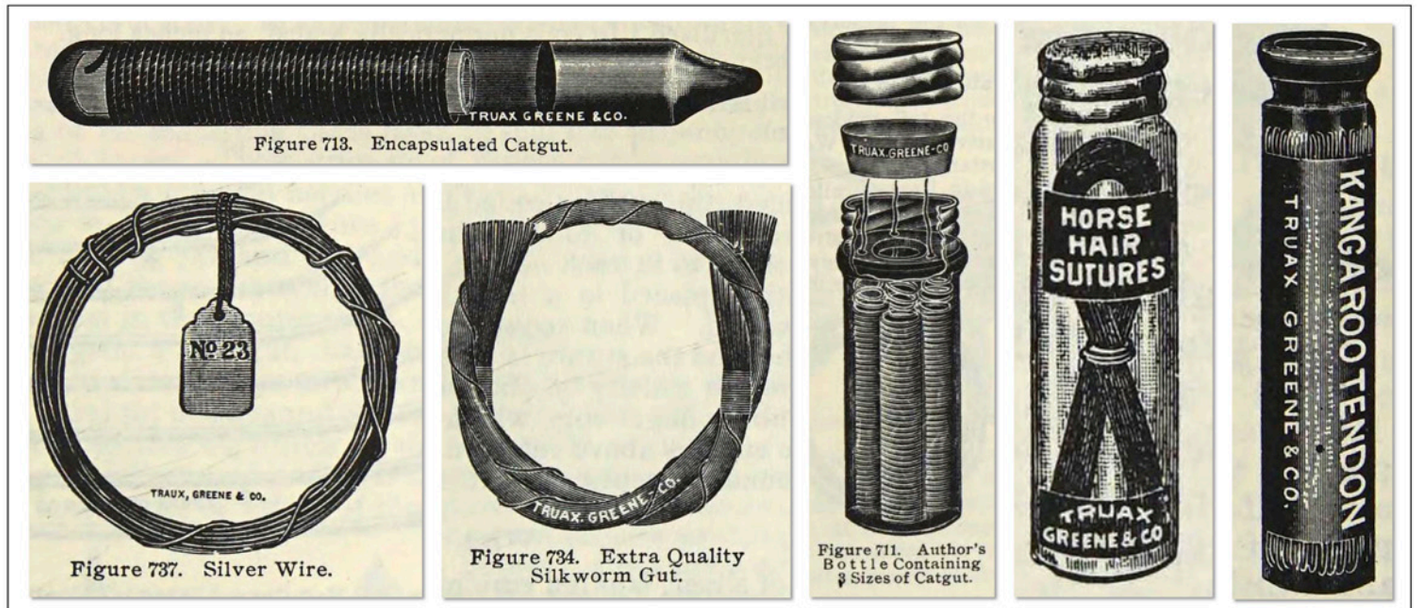

Figure 2: Various sutures available in 1899 (from Traux 1899).

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11:17-11:23 am

Xanthelasma Palpebrarum is Not Associated with Dyslipidemia or Cardiovascular Disease in a Large Cohort: A Case Control Study

Yael Lustig, Daphna Landau Prat, Inbal Goldshtein, Shlomo Segev, Guy J. Ben Simon
Tel Aviv, Israel

Introduction: Xanthelasma Palpebrarum (XP) is a benign condition involving yellowish cutaneous lesions in the periocular region. Various studies have suggested associations between XP and systemic disorders, mainly dyslipidemia and cardiovascular disease (CVD). It is believed that associated lipid disorders appear in nearly half of the patients, and XP patients are commonly referred for further evaluation. Our aim was to inspect whether XP is associated with dyslipidemia or CVD in a large cohort.

Methods: Medical records of all patients who were examined in a single medical screening institute between 2001-2020 were retrospectively analyzed. Patients with XP in at least one eye were identified. Controls were matched on a 1:10 ratio for robust statistical comparisons. Data regarding ophthalmic evaluations, blood tests, and systemic diagnoses was collected and analyzed. Main outcome measure included the associations of XP with dyslipidemia and CVD.

Results: 35,678 patients were included, 203 patients (0.6%) had XP and were matched with 2030 control cases. The prevalence of dyslipidemia diagnosis and the usage rates of statins, fibrates, or other cholesterol-lowering medications was similar between the two groups. Lipid profiles were similar between the groups, including median total cholesterol levels, HDL, LDL, and triglyceride (P>0.05 for all). The rate of CVD was similar as well (P>0.05). The prevalences of related conditions including HTN, DM, and history of CVA were similar between groups.

Conclusions: XP was not associated with dyslipidemia or CVD. This questions current clinical management concepts regarding the need to send all XP patients for blood tests and cardiovascular workups.

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11:23-11:29 am

Single Suture Frontalis Muscle Flap Advancement: A Modified Technique for Congenital Ptosis Repair

Wenyu Deng[1], Michael Kozlov[2,1], Roman Shinder[1,3]
[1]Ophthalmology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States, [2]CUNY Brooklyn College, Brooklyn, New York, United States, [3]Otolaryngology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States

Introduction: Frontalis flap advancement is an alternative to other frontalis suspension techniques for the treatment of congenital ptosis (CP) with poor levator function (LF). Various techniques have been reported that differ in flap creation/division, number/location of incisions, dissection planes, and tarsal fixation.[1,2,3] The authors report our experience using a modified single suture frontalis flap for the repair of poor LF CP.

Methods: This is a retrospective single-center interventional case series of children who underwent a single suture frontalis flap advancement for the repair of primary poor LF myogenic CP by the senior author (RS) from 2018–2023. Exclusion criteria included age >18, follow up < 12 months, poor Bell's phenomenon, LF > 4 mm, secondary causes of ptosis, and prior ptosis repair. All cases were done under general anesthesia. The procedure begins with an eyelid crease incision (Fig. 1B), followed by superior dissection along the preseptal plane to the superior orbital rim using blunt Stevens tenotomy scissors (Fig. 1C). Dissection continues superiorly in a subcutaneous superficial plane 2 cm above the superior orbital rim (Fig. 1D), forming a tunnel (dimensions in Fig. 1A) and freeing the frontalis muscle anterior surface (Fig. 1E). The superior tarsus is then exposed (Fig. 1F). The frontalis muscle is attached to the superior tarsus with a single central 6-0 polypropylene horizontal mattress suture (Fig. 1G-H). Lid height is assessed with a goal of 1 mm below the superior limbus. Crease reforming sutures were placed only if the patient had an inapparent crease pre-operatively using 6-0 polyglactin sutures from the pretarsal orbicularis muscle to the frontalis flap. The eyelid crease was closed with a running 6-0 plain gut suture. Tobramycin/dexamethasone ointment was used to the crease wound and lubricating ointment was used to the ocular surface 4 times daily prior to the 1st postoperative visit. Patients were seen post-operative week 1, month 1, month 3, and thereafter. Primary outcome measures included MRD1, lid symmetry, and lagophthalmos. Complications were noted.

Results: 24 patients (18 male, 6 female) with a mean age of 5.4 ± 3.7 (1-17) years and a mean MRD1 and LF of 0.4 ± 1.2mm and 2.9 ± 0.4mm, respectively, were included. Twenty patients underwent unilateral repair, while 4 required bilateral surgery totaling 28 operated lids. A summary of patient outcomes is illustrated in Table 1. At POM 3 and POM 12, patients had improved lid position and symmetry to the fellow upper lid with mild lagophthalmos that improved over time (Fig 2). Two patients had asymptomatic dry eye that resolved by POM3. Residual improved ptosis occurred in 2 lids (7.1%) at 18 and 26 months, but the parents elected to defer revision in both cases. There were no cases of facial palsy, hypoesthesia, lid retraction, ec- or entropion.

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Conclusions: The modified single suture frontalis flap advancement showed significant improvement in lid position and symmetry for poor LF CP. Advantages of this technique include speed of surgery, quick learning curve, low complication rate, and high rate of patient/parent satisfaction.

Figure 1

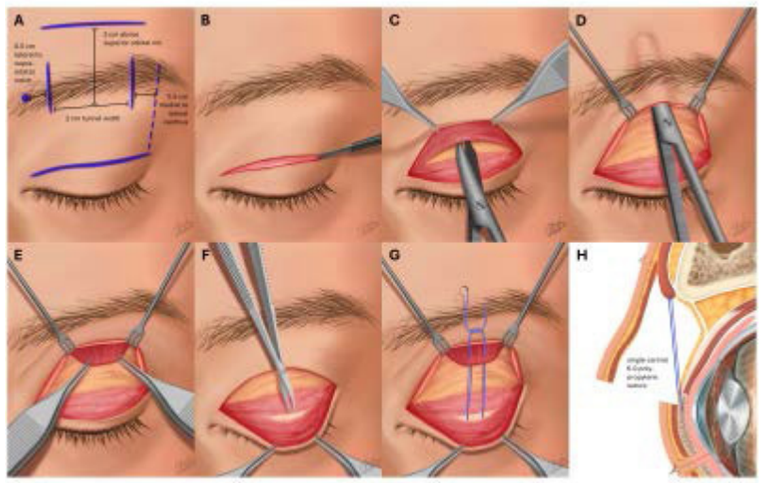

Figure 2

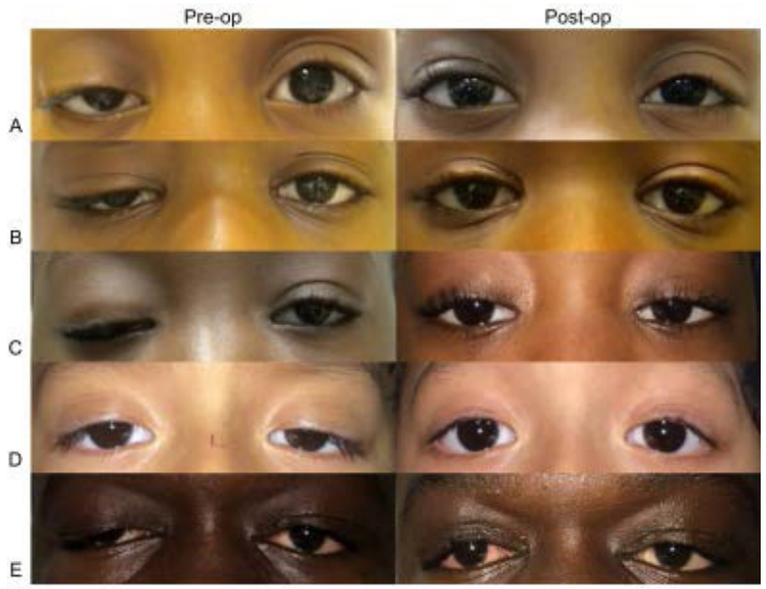

Table 1

Table 1.

	MRD1 (mm)	*Lagophthalmos (mm)*	*Difference in MRD1 between upper lids (mm)*
Pre-op	0.4 ± 1.3	0.3 ± 0.7	–
POM3	3.2 ± 1.3 ($p < 0.0001$)	0.5 ± 0.4	0.8 ± 0.7
POM12	3.0 ± 0.8	0.3 ± 0.4	1.0 ± 0.7

References:

1. Dallalzadeh LO, Park KS, Korn BS, Kikkawa DO, Liu CY. Minimal Dissection Direct Frontalis Muscle Advancement Flap for Congenital Ptosis Repair. *J Craniofac Surg*. 2021;32(7):2358-2361. doi:10.1097/SCS.0000000000007761
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3. Medel R, Vasquez L, Wolley Dod C. Early frontalis flap surgery as first option to correct congenital ptosis with poor levator function. *Orbit*. 2014;33(3):164-168. doi:10.3109/01676830.2014.881396

11:29-11:35 am

Periorbital Distance Prediction and Disease Classification of Oculoplastic Images Using Deep Learning

George R. Nahass[1,2], Ghasem Yazdanpanah[2], Madison Cheung[3], Alex Palacios[3], Mariah Diaz[3], Allison Kufta[3], Amy Song[3], Kevin Heinze[2], Sasha Hubschman[2,1], Chad Purnell[4], Pete Setabutr[2]
[1]Richard and Loan Hill Department of Biomedical Engineering, University of Illinois Chicago, Chicago, Illinois, United States, [2]Department of Ophthalmology, University of Illinois Chicago, Chicago, Illinois, United States, [3]University of Illinois Chicago College of Medicine, Chicago, Illinois, United States, [4]Department of Plastic Surgery, University of Illinois Chicago, Chicago, Illinois, United States

Introduction: This work aims to evaluate and optimize multiple deep learning methods for the periorbital segmentation and distance prediction in oculofacial patients.

Methods: *Periorbital Segmentation and Distance Prediction*: Two deep learning methods were evaluated for segmentation and periorbital distance calculation. For the first method, datasets of images were collected from the Chicago Facial Dataset (CFD) for healthy faces, and from our institution's clinical photographs for thyroid eye disease (TED) patients and patients with various craniofacial disorders (including Apert and Goldenhaar syndromes). Mediapipe was used to fit a 468-point facemesh to every image. Using the facemesh, bounding boxes were obtained for bilateral scleras, brows, and irises. These boxes were submitted to the Segment Anything Model (SAM) for segmentation (Figure 1). For the second method, a UNET was trained on 30,000 open-source images from the CELEB-HQ-A dataset (Figure 2). UNET was trained for brow and eye segmentation, and SAM was used for iris segmentation. The segmentation masks from both methods were used to predict periorbital distances. Trained annotators generated ground truth segmentation masks to generate ground truth periorbital distances (Figure 3). We evaluated marginal reflex distance (MRD) 1, MRD2, vertical and horizontal palpebral fissure (VPF, HPF), inner canthal distance, outer canthal distance, interpupillary distance, brow height, canthal tilt, inferior and superior scleral show (ISS, SSS), and vertical dystopia. Dice scores were calculated for sclera and brow segmentation for both pipelines using various size training sets (Figure 4).

Thyroid Eye Disease Classification Based on Periorbital Measurements: Images of 544 TED patients and 528 healthy patients were evaluated with the UNET pipeline. Following segmentation with the UNET and calculation of the periorbital distances, feature vectors were created using the predicted MRD1, MRD2, VPF, HPF, ISS, SSS, and scleral area. A train and test set was generated using an 80/20 split. A K-means clustering model was fit with the training data and each cluster was labeled based on majority vote of constituent feature vectors. The test set was then evaluated by assigning the label of the closest cluster measured by Euclidean distance.

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Results: For segmentation, the UNET achieved better performance than SAM after training with only 1000 labeled images on most datasets. The UNET outperformed SAM for distance prediction for every measurement on every dataset evaluated, except for MRD2 on the healthy dataset. The UNET predicted MRD1 and MRD2 with an average error of 0.5mm across all datasets. On TED images, the UNET predicted ISS and SSS with an average error of 0.5 and 0.2 mm. Longer periorbital distances such as canthal and brow distance have a higher average error of 3 mm when predicted using the UNET. Using the distances predicted by the UNET pipeline, TED images were classified with 82% accuracy. Figure 5 represents TED images that failed to be classified.

Conclusions: UNET predicted periorbital distances with more accuracy than SAM. These predicted distances can be used by UNET to classify disease states such as TED. This pipeline has immense clinical utility for objectively measuring diseased eyes in various clinical settings.

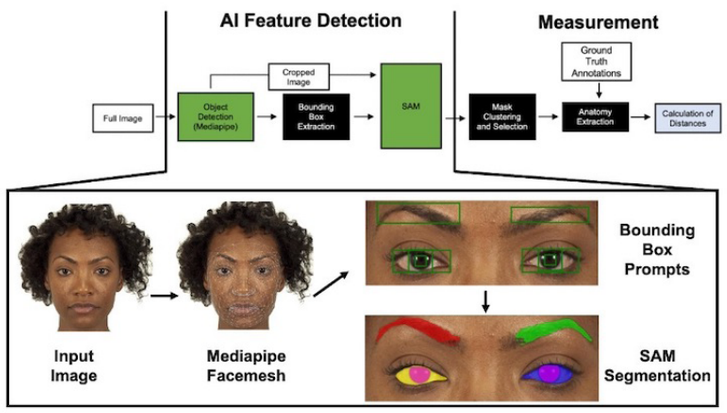

Figure 1: Schematic overview of the foundational model pipeline. Briefly, input images have a Facemesh fit to them using the open-source weights released by Google. Using the Facemesh coordinates, bounding boxes for the iris, brow, and sclera are identified, and the input image is cropped. These bounding boxes and the cropped image are then submitted as inputs to the Segment Anything Model (SAM) for segmentation. The resulting segmentation masks are used in the measurement pipeline to identify relevant anatomical landmarks and predict the periorbital distances.

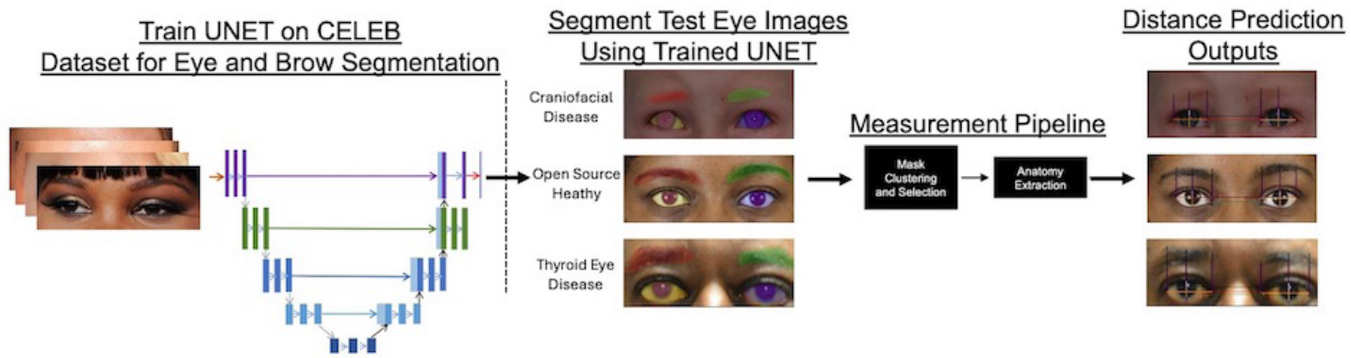

Figure 2: Schematic of the UNET Pipeline. A UNET semantic segmentation network is trained using 30,000 cropped images from the CELEB-HQ-A Dataset. The trained model is then evaluated on both open source and clinical data, and the resulting segmentation masks are used for distance prediction.

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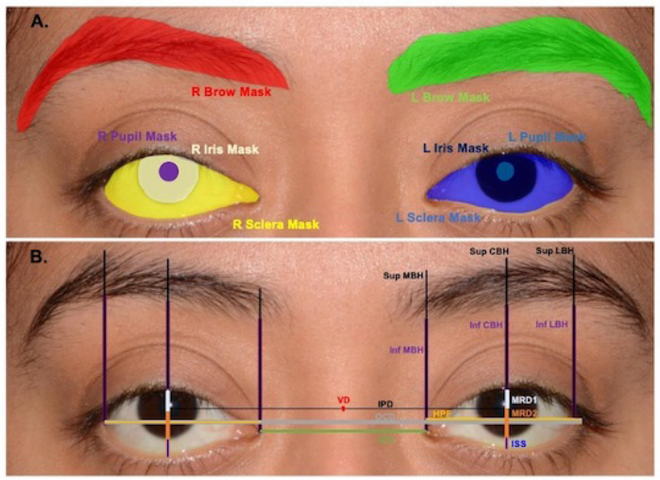

Figure 3: (A) Ground truth masks of the anatomical regions used for evaluating the networks and for deriving ground truth distance measurements on the face. Scleral area was calculated by taking the ratio of sclera mask to the iris mask. In both pipelines, distance measurements are calculated using the segmentation masks. Pixels were converted to mm using 11.86 mm as the standard diameter for the iris. (B) Distances measured are shown by linear lines. **Key:** Sup – Superior; Inf – Inferior; VD – Vertical Dystopia; IPD – Inner Pupillary Distance; OCD – Outer Canthal Distance; HPF – Horizontal Palpebral Fissure; MRD1 – Margin Reflex Distance 1; MRD2 – Margin Reflex Distance 2; ISS – Inferior Scleral Show; MBH – Medial Brow Height; CBH – Central Brow Height; LBH – Lateral Brow Height. The colored lines and text correspond to the periorbital measurement.

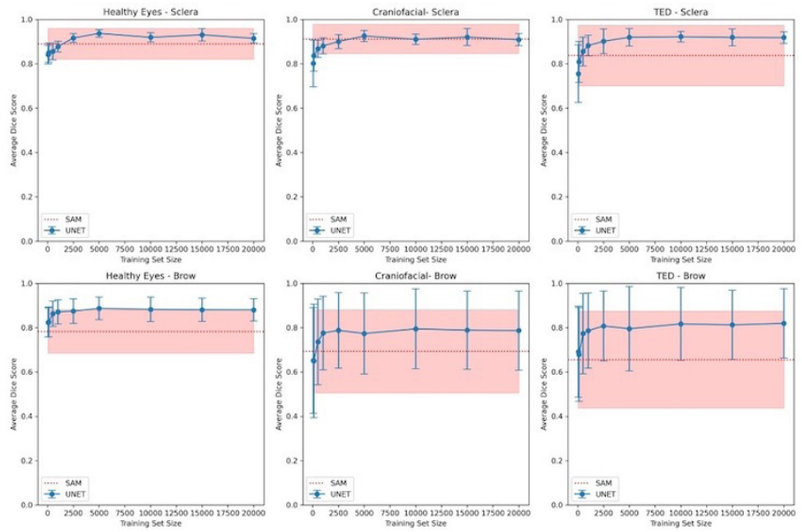

Figure 4: Dice scores for both the UNET (blue line) and SAM (red line) of sclera and brow segmentation in the healthy eyes from the open-source Chicago Facial Dataset, diseased eyes from the craniofacial data set, and TED eyes from TED clinical patient photos. Key – Dots represent average; Blue Bars represent standard deviation from the UNET; Red shaded area represents standard deviation from SAM.

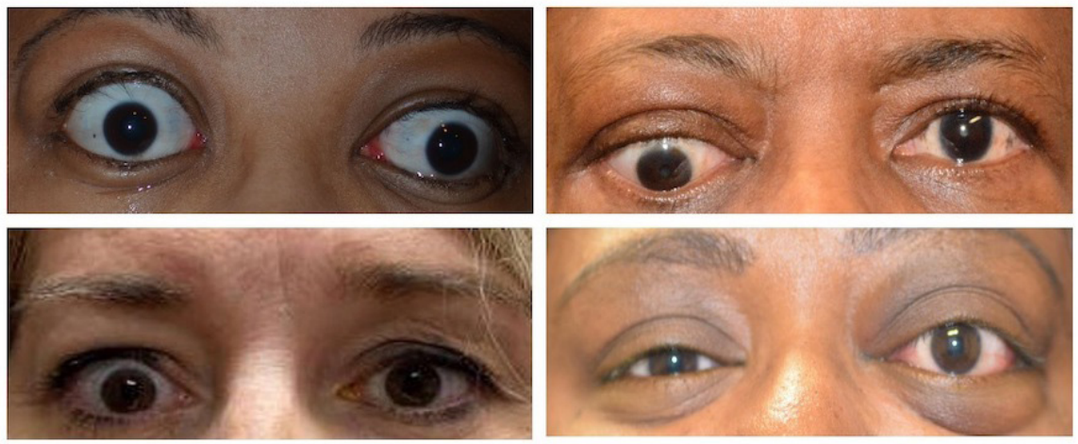

Figure 5: Thyroid eye disease images that failed classification via K-means clustering based on periorbital measurements.

11:35-11:41 am

Evaluating AI-Generated Educational Videos for Postoperative Care in Oculofacial Surgery

Eman M. Al-Sharif[1,2], Jimmy Chen1, Marissa K. Shoji[1], Catherine Y. Liu1, Don O. Kikkawa[1,3], Bobby S. Korn[1,3]
[1]Division of Oculofacial Plastic and Reconstructive Surgery, Viterbi Family Department of Ophthalmology, UC San Diego Shiley Eye Institute, San Diego, California, United States, [2]Surgery Department, College of Medicine, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia, [3]Division of Plastic and Reconstructive Surgery, Department of Surgery, UC San Diego School of Medicine, San Diego, California, Saudi Arabia

Introduction: Recent advancements in artificial intelligence (AI) have transformed various sectors, including healthcare. While numerous studies have evaluated the effectiveness of AI chatbots in various medical domains, there is a gap in assessing AI-generated videos for patient education. This study explores the use of next-generation AI to produce specific patient educational videos for aftercare following eyelid surgery.

Methods: We conducted a prospective single-center study involving patients aged 18 years or older undergoing eyelid surgery. An educational video was generated using the Visla AI-powered platform, integrated with ChatGPT for scripting. The provided prompt was: "Develop a comprehensive educational video on postoperative instructions following eyelid surgery," with minimal adjustments by the authors. The video was shown to patients alongside traditional written postoperative instructions. Post-viewing, patients completed a survey to evaluate the effectiveness and uhnderstandability of the video compared to traditional methods. Institutional IRB approval was obtained.

Results: Forty patients participated and completed the study protocol. The majority preferred the video instructions, citing the ability to rewatch them at their convenience, which clarified post-operative care more effectively than written instructions. The video was found engaging and easy to understand, particularly the sections demonstrating ice pack application. However, some patients felt that the written instructions were adequate, and others suggested that the video was too generalized and needed more specificity for eyelid surgery. Despite these concerns, most would recommend the video to others undergoing similar procedures, citing video-based learning as superior to written instructions.

Conclusions: AI-generated videos hold substantial potential for enhancing patient education. This pilot study validates the efficacy of currently available AI tools in providing effective and efficient patient instructions. Although current AI-generated content relies on stock video footage enhanced with text and audio, rapid advancements in generative AI for video production are expected to enable the

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creation of fully original, AI-generated content. This content will be tailored to specific medical procedures based on user prompts and may soon be indistinguishable from videos created by human experts.

Figure 1

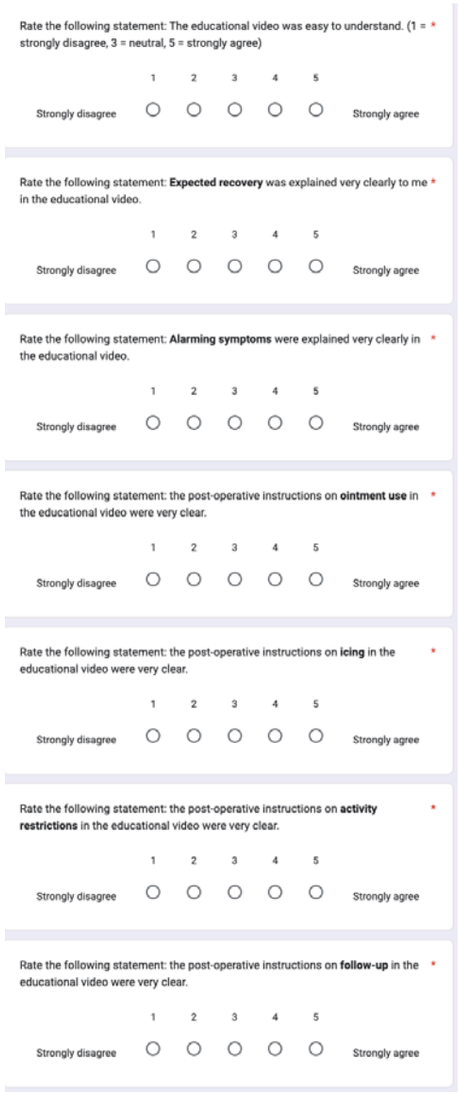

Figure 2

References:

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2. Antaki F, Touma S, Milad D, El-Khoury J, Duval R. Evaluating the Performance of ChatGPT in Ophthalmology: An Analysis of Its Successes and Shortcomings. Ophthalmol Sci. 2023 May 5;3(4):100324.
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11:41-11:47 am

Change in Upper Eyelid Contour following Sutureless Conjunctiva-Sparing Mullerectomy

Liane Dallalzadeh[1], Maria Morrow[2], Shyamal Waghwala[3], Phillip Tenzel[1], Ronald Mancini[1]
[1]Division of Oculoplastic and Orbital Surgery, Department of Ophthalmology, University of Texas Southwestern Medical Center, Dallas, Texas, United States, [2]Department of Ophthalmology, University of Texas Southwestern Medical Center, Dallas, Texas, United States, [3]School of Medicine, University of Texas Southwestern Medical Center, Dallas, Texas, United States

Introduction: To determine change in upper eyelid contour if any following sutureless conjunctiva-sparing Mullerectomy (CSM).

Methods: This is an IRB-approved retrospective study of patients who underwent sutureless CSM with one surgeon (RM) from 10/2019 to 4/2021. Inclusion criteria included age greater than or equal to 18 years, unilateral or bilateral sutureless CSM, and post-operative follow-up greater than or equal to 6 weeks. Patients with concurrent upper eyelid surgery (i.e. blepharoplasty or brow lift) were excluded. Sutureless CSM was performed as previously described, with no intraoperative titration specific to address contour abnormality in this cohort.[1]

Pre- and post-operative external photographs were analyzed using ImageJ. Eyelid curvature was determined by plotting points along the upper eyelid margin at 15° intervals from 0° to 180° respective to the reflex. A 4th degree polynomial *(a, b, c, d, e)* was created for each eyelid and each polynomial coefficient was analyzed via two-tailed paired t-tests.[2,3] All images were scaled using average male corneal diameter of 11.77mm and average female corneal diameter of 11.64mm.[4] All points were standardized relative to the reflex center making the y intercept, *e,* equivalent to MRD1.

Results: Sixteen patients (21 eyelids) were included (65% female, 55.8 ± 19.9 years old). Five cases were bilateral for which both eyelids were analyzed separately for a total of 9 right and 12 left upper eyelids.

Although patients did experience an increase in MRD1 after sutureless CSM in both eyelids ($p<0.001$), no significant alterations were seen in any of the other polynomial coefficients (Table 1). Altogether this suggests that no alteration in eyelid contour was observed with sutureless CSM (Figures 2-5).

Conclusions: Sutureless CSM is an attractive alternative to traditional Muller's muscle conjunctival resection (MMCR) as an approach to posterior ptosis repair because it spares the conjunctiva, offers shorter operative time, and like MMCR lacks upper eyelid scar formation.[1] Here we provide a quantitative analysis that demonstrates sutureless CSM improves MRD1 while also maintaining upper eyelid contour.

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Figure 1

Right eye polynomial (n=9)				Left eye polynomial (n=12)			
Coefficient	**Preoperative**	**Postoperative**	**p-value**	**Coefficient**	**Preoperative**	**Postoperative**	**p-value**
a	-1.9E-04	-8.1E-05	0.405	a	3.6E-04	1.0E-04	0.602
b	-3.9E-04	-6.2E-04	0.757	b	5.7E-04	9.0E-04	0.673
c	-0.028	-0.030	0.646	c	-0.039	-0.039	0.964
d	0.015	-1.3E-03	0.534	d	0.065	0.076	0.511
e/MRD1	1.13	2.925	**<0.001**	e/MRD1	1.43	3.59	**<0.001**

Figure 2

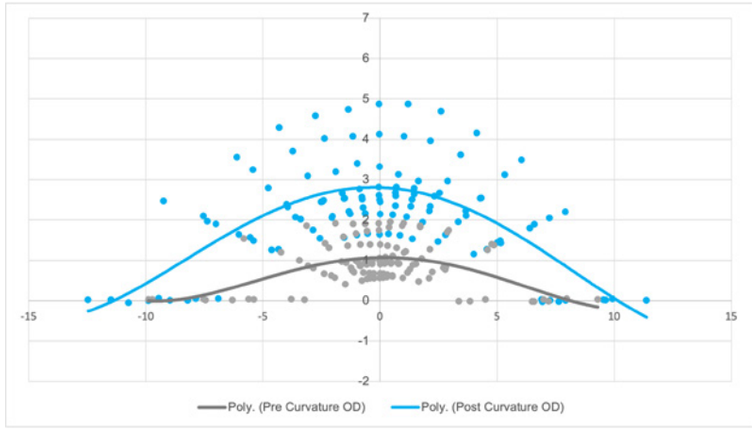


Figure 3

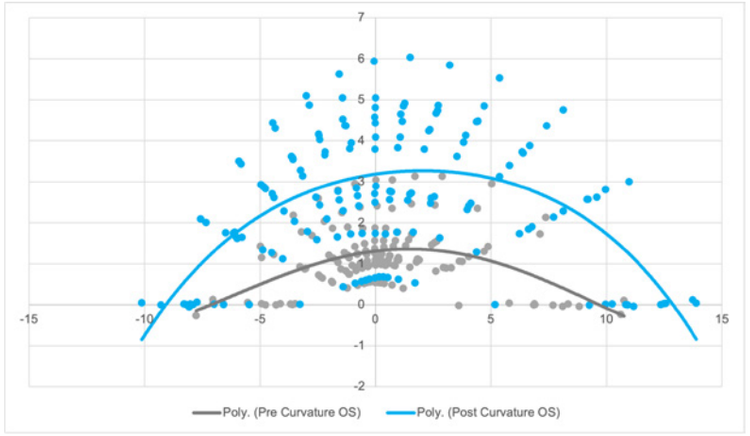
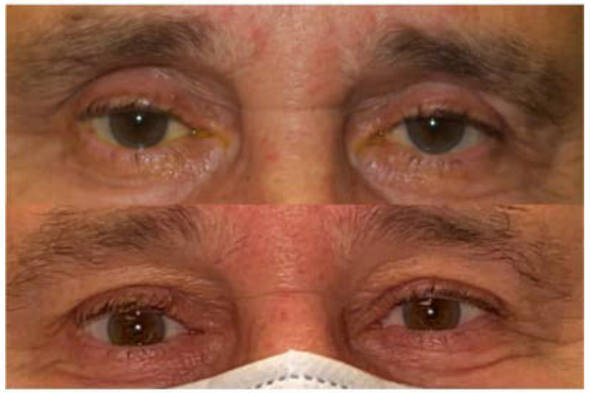


Figure 4

Figure 5



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4. Rüfer F, Schröder A, Erb C. White-to-white corneal diameter: normal values in healthy humans obtained with the Orbscan II topography system. Cornea. 2005 Apr;24(3):259-61.

12-1 pm

Starting or Building Your Practice in Private Practice or Academia - Tips from the Experts

12-12:10 pm	Introduction by Ann Tran and Seanna Grob, Moderators
12:10-12:20 pm	Expanding your Academic Practice – Keith D. Carter
12:20-12:25 pm	Q and A
12:25-12:35 pm	Starting a Solo Private Practice – Robert G. Fante
12:35-12:40 pm	Q and A
12:40-12:50 pm	Growing a Cosmetic Practice – Julie A. Woodward
12:50-12:55 pm	Q and A

FEATURED PRESENTATION: ROGER A. DAILEY, MD

Thursday, October 17

Moderator: Eric A. Steele

1:02-1:27 pm

Tearing – Nothing to Cry About

Roger A. Dailey, MD

Jones tubes for upper tear system drainage problems were developed via collaboration of Lester T. Jones, MD and Gunther Weiss, a glass blower trained in Germany. The started working on this project together in the early 1960's. This talk will review the history of the Jones tube development and changes that have been made along the way.

In addition, the diagnosis for need, the correct surgical placement of the tube, care and follow-up, along with outcomes experience will also be presented.

1:36-1:41 pm

Teprotumumab Treatment for Thyroid Eye Disease-Associated Compressive Optic Neuropathy

Tatiana R. Rosenblatt, Carolina A. Chiou, Michael K. Yoon, N. Grace Lee, Natalie Wolkow, Suzanne K. Freitag
Ophthalmology, Massachusetts Eye and Ear, Boston, Massachusetts, United States

Introduction: While previous small studies report successful treatment of compressive optic neuropathy (CON) with teprotumumab in thyroid eye disease patients, the timing and duration of CON improvement remains unclear.[1] This study analyzed the efficacy, timing, and durability of teprotumumab treatment for thyroid eye disease-associated CON.

Methods: A retrospective study of patients with CON from thyroid eye disease who completed eight infusions of teprotumumab at one institution from 1/1/20-12/31/22. Primary outcome was CON resolution after teprotumumab. Secondary outcomes included number of infusions to first documentation of CON improvement or resolution, factors impacting CON resolution, and CON regression rates at late follow-up. Mixed effects models were used.

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Results: Of 129 patients who completed teprotumumab, 35 (13.6%) eyes of 21 patients had CON at time of first infusion (Table 1). Three (14.3%) patients were active smokers and 5 (23.8%) were former smokers compared to 8.5% active and 27.9% former smokers in those without CON (p=0.687). Eight (22.9%) eyes of 5 patients had decompression prior to teprotumumab (average 5.0 years prior to first infusion, range 0.1–15.3); one patient underwent urgent bilateral decompression while awaiting teprotumumab. Eight (38.1%) patients were on steroids at teprotumumab initiation. CON was mild in 21 (60.0%) eyes, 12 (34.3%) moderate, and 2 (5.7%) severe. Four (11.4%) eyes had disc edema, 15 (42.9%) had dyschromatopsia, and 33 (94.3%) had static perimetry visual field (HVF) defects. Urgent teprotumumab referral was employed for 3 (14.3%) patients. Of the 31 eyes of 19 patients with CON clinical data after initiating teprotumumab, 100% of eyes had CON improvement after a mean of 2.3 infusions (range 1–7, SD 1.8), with improvement after only one infusion in 35.4% (Figure 1). CON resolved in 24 (77.4%) eyes of 16 patients after a mean of 4.8 infusions (1–8, SD 2.7) (Figure 2). Seven (22.6%) eyes of 5 patients had residual HVF defects at immediate post-treatment follow-up. There was no significant impact of age, race, smoking status, pre-treatment clinical activity score, or pre-treatment proptosis on the odds of having pre-teprotumumab CON or CON resolution after treatment. Male sex decreased odds of post-treatment CON resolution by 48.7% (CI 26.4–88.7%, p=0.023). Proptosis improved after teprotumumab in 34 (94.3%) eyes averaging 3.5 mm (range 0.5–10.0, SD 2.1). Nineteen (90.5%) CON patients had long-term follow-up averaging 17.3 months (range 4.2–33.3, SD 8.4) after last teprotumumab infusion. Despite proptosis regression at most recent follow-up compared to immediately post-treatment in 15 (39.5%) eyes of 8 patients averaging 3.3 mm (range 0.5–6.0, SD 1.8), only 4 (10.5%) eyes of 2 patients had recurrence of CON.

Conclusions: All patients had CON improvement with teprotumumab, typically over a rapid time course, and the vast majority had complete CON resolution. Despite proptosis regression, nearly all patients remained CON free at long-term follow-up. These results suggest that teprotumumab can be an effective treatment for thyroid eye disease-associated CON. The urgent referral system can be used to expedite teprotumumab initiation while awaiting insurance approval for patients with vision-threatening CON.

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Table 1

Table 1. Demographics of Compressive Optic Neuropathy Patients

Demographic Categories	N (%)
Sex	
Female	14 (66.7)
Male	7 (33.3)
Race/Ethnicity	
White, non-Hispanic	19 (90.5)
White, Hispanic	1 (4.8)
Asian	1 (4.8)
Black	0 (0.0)
Smoking Status	
Never smoker	13 (61.9)
Former smoker	5 (23.8)
Active smoker	3 (14.3)
Thyroid Disease	
Graves	21 (100.0)
Hashimoto's	0 (0.0)

Figure 1

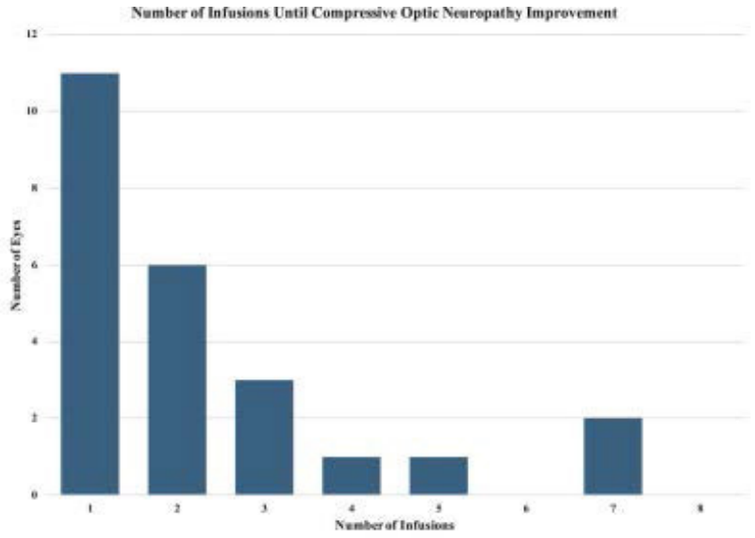
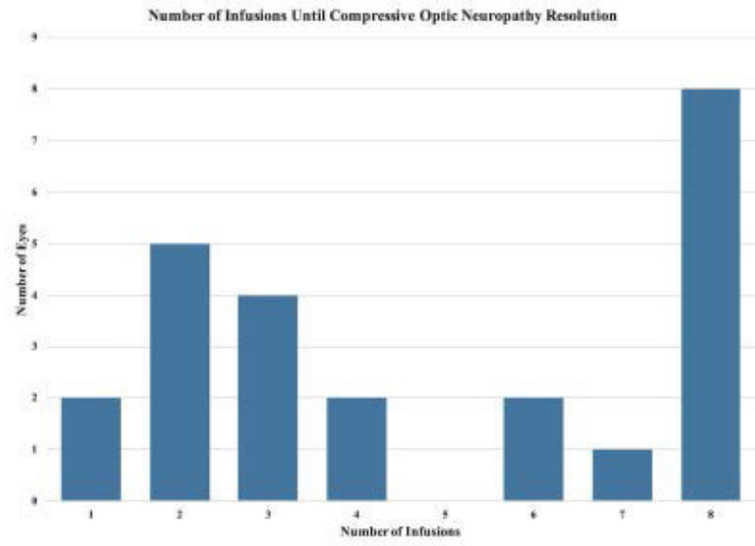


Figure 2



References:

1. Chiou CA, Reshef ER, Freitag SK. Teprotumumab for the treatment of mild compressive optic neuropathy in thyroid eye disease: a report of two cases. *Am J Ophthalmol Case Rep*. 2021;22:101075.

1:41-1:46 pm

Effect of Smoking in Thyroid Eye Disease: Smokey Fat is a Bulky Broken Fat - An Electron Microscopic and Histopathological Study

Kasturi Bhattacharjee[1], Komal Sawarkar[1], Aditi Mehta[1], Dipankar Das[2]
[1]Ophthalmic Plastic and Reconstructive Surgery and Facial Aesthetics, Sri Sankaradeva Nethralaya, Guwahati, India, [2]Ophthalmic Pathology, Sri Sankaradeva Nethralaya, Guwahati, India

Introduction: Cigarette smoking is widely recognized as a modifiable risk factor influencing the onset, advancement, and progression of Thyroid Eye Disease (TED). Its impact is linked to the production of free radicals, resulting in heightened oxidative stress, adipogenesis, and increased production of glycosaminoglycans (GAGs). The present study aims to demonstrate the effect of smoking on orbital fat cell dysadepogenesis by Electron Microscopic and Histopathological examination in both thyroid and non-thyoid patients.

Methods: A prospective observational study was conducted from February 2023-January 2024. The orbital fat samples were obtained from the patients undergoing Orbital decompression for thyroid eye disease and Blepharoplasty surgery for non-thyroid patients. These samples were further categorized into 4 groups: non-thyroid and non-smoker (group 1), thyroid non-smoker (group 2), non-thyroid smoker (group 3), thyroid smoker (group 4). Each sample underwent Histopathological examination (HPE) and Field Emission Scanning Electron Microscopy (FESEM). Our primary objective was to compare parameters such as adipocyte cell size, cell number, HPE findings, and FESEM characteristics among these groups. Secondary objectives included studying chemical analysis and elemental composition using Energy dispersive X-ray (EDX).

Statistical analysis of Continuous variables was compared across the groups using unpaired t- test/ one way ANOVA Test as appropriate and categorical variables were compared across the groups using Pearson's Chi Square test for Independence of Attributes/ Fisher's Exact Test as appropriate.

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Results: A total of 40 patient samples (10 samples from each group) were collected and categorized based on their smoking and thyroid history. Group 1 served as the control group. Analysis revealed a significant increase in adipocyte cell size among smokers (mean 110 ± 12.60µm, $p < 0.001$) compared to non-smokers (mean 60.40 ± 7.84µm, $p < 0.001$) group. Notably, the thyroid smoker group exhibited the highest cell size (117 ± 11.54µm, $p < 0.002$). Additionally, both thyroid and non-thyroid smokers demonstrated significantly higher cell numbers (mean 356.90/10x ± 37.16, $p < 0.001$). Histopathological examination showed mature adipose tissue with broad broken fibrous septa in 15 out of 20 smoker samples, with additional increase in the number of congested and dilated vessels in both the thyroid groups. FESEM analysis revealed broken cell membrane in 16 out of 20 smoker samples ($p < 0.001$), 80% amongst thyroid smokers and 70% amongst non thyroid smokers ($p= 0.093$). However no significant differences were observed between the nonsmoker groups in FESEM analysis. EDX composition analysis demonstrated elevated levels of zirconium and carbon in both non-thyroid smoker and thyroid smoker samples ($p < 0.001$).

Conclusions: Cigarette smoking is recognized as a significant risk factor for the progression of Thyroid Eye Disease (TED). This observational study has revealed that smoking induces dysadipogenesis in both Thyroid and Non thyroid patientts, though more in thyroid patients which is characterized by an increase in both cell size and cell number, broken cell membrane and fibrous collagenous septea as demonstrated by FESEM examination. Additionally, EDX study have shown increased levels of zirconium and carbon in smokers, which could be hypothetised as an additional factor exacerbating dysadipogenesis.

Figure 1

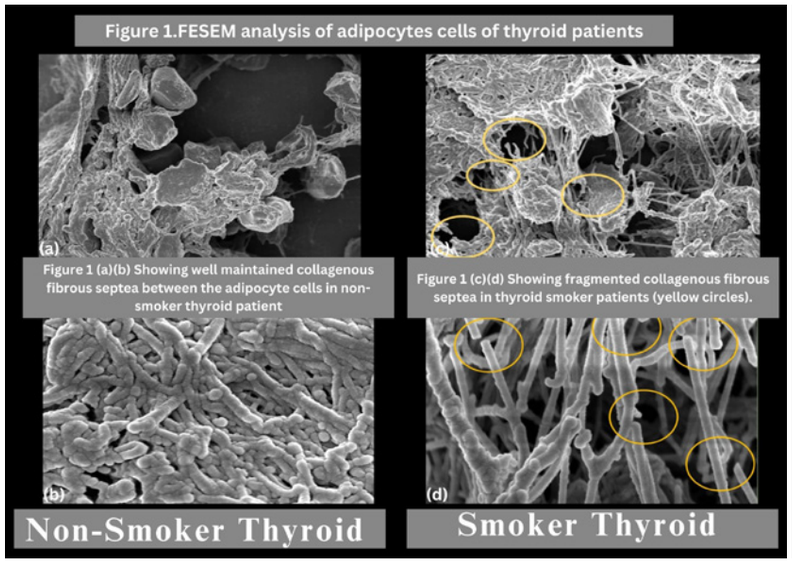

Figure 2

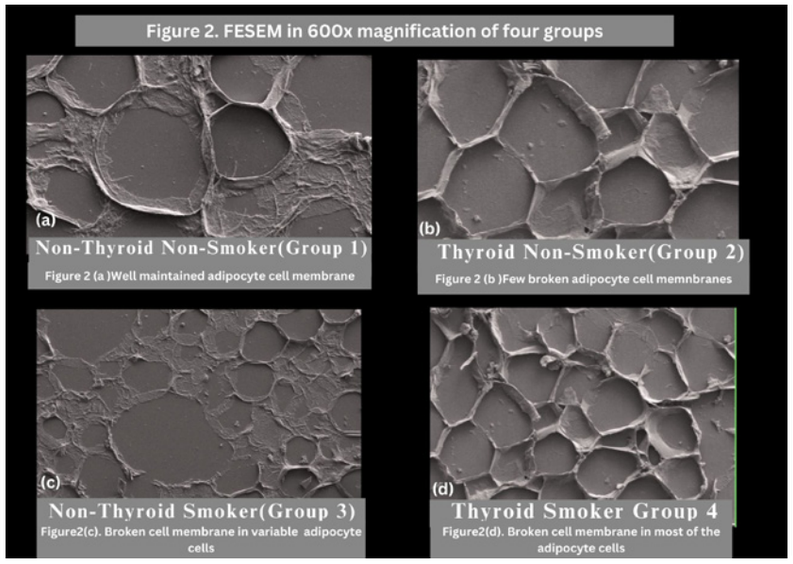

Figure 3

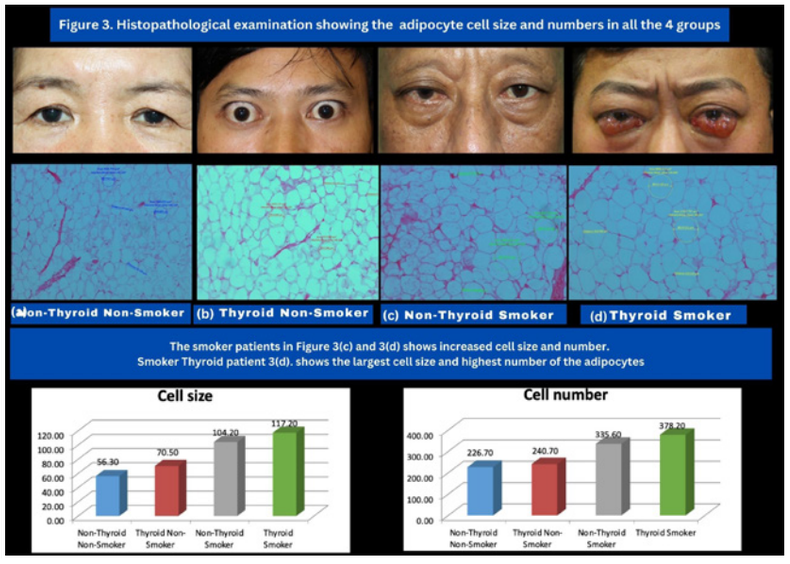

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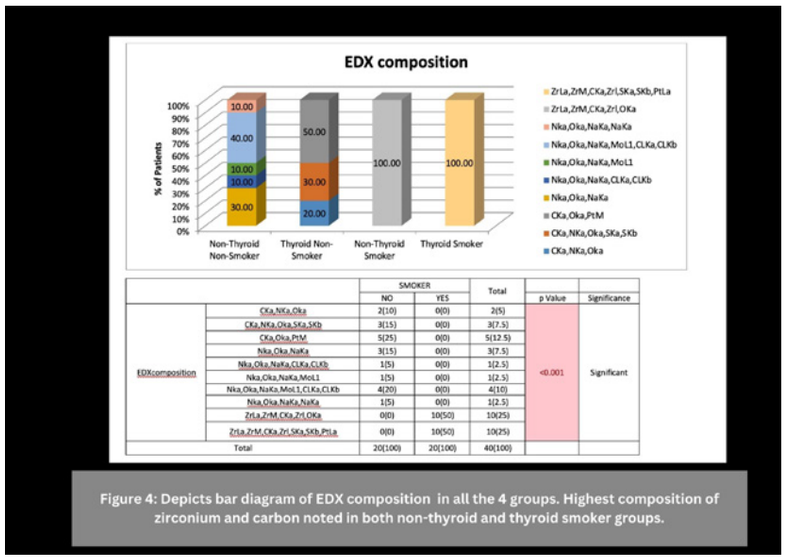
Figure 4



		SMOKER NO	SMOKER YES	Total	p Value	Significance
EDXcomposition	CKa,NKa,Oka	2(10)	0(0)	2(5)	<0.001	Significant
	CKa,NKa,Oka,SKa,SKb	3(15)	0(0)	3(7.5)		
	CKa,Oka,PtM	5(25)	0(0)	5(12.5)		
	Nka,Oka,NaKa	3(15)	0(0)	3(7.5)		
	Nka,Oka,NaKa,CLKa,CLKb	1(5)	0(0)	1(2.5)		
	Nka,Oka,NaKa,MoL1	1(5)	0(0)	1(2.5)		
	Nka,Oka,NaKa,MoL1,CLKa,CLKb	4(20)	0(0)	4(10)		
	Nka,Oka,NaKa,NaKa	1(5)	0(0)	1(2.5)		
	ZrLa,ZrM,CKa,ZrLOKa	0(0)	10(50)	10(25)		
	ZrLa,ZrM,CKa,ZrLSKa,SKb,PtLa	0(0)	10(50)	10(25)		
Total		20(100)	20(100)	40(100)		

Figure 4: Depicts bar diagram of EDX composition in all the 4 groups. Highest composition of zirconium and carbon noted in both non-thyroid and thyroid smoker groups.

Figure 5

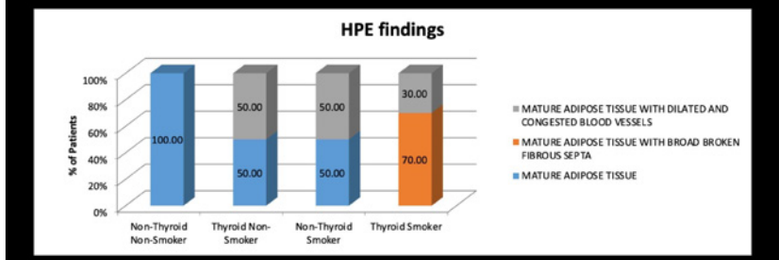


Figure 5.Depicts a bar diagram of HPE findings showing high percentage of mature adipocytes in non-thyroid non-smoker group, mature adipocytes with dilated congested blood vessles in both the smoker groups and additional broad broken fibrous band in the thyroid smoker group.

References:

1. Burch HB, Lahiri S, Bahn RS, Barnes S. Superoxide radical production stimulates retroocular fibroblast proliferation in Graves' ophthalmopathy. Exp Eye Res. 1997;65(2):311-316.
2. Cawood TJ, Moriarty P, O'Farrelly C, O'Shea D. Smoking and thyroid-associated ophthalmopathy: A novel explanation of the biological link. J Clin Endocrinol Metab. 2007;92(1):59-64.
3. Chng CL, Lai OF, Chew CS, et al. Hypoxia increases adipogenesis and affects adipocytokine production in orbital fibroblasts-a possible explanation of the link between smoking and Graves' ophthalmopathy. Int J Ophthalmol. 2014;7(3):403-407.

1:46-1:51 pm

Preliminary Safety and Efficacy of Subcutaneous Lonigutamab (Anti–IGF-1R) from a Phase 1/2 Proof of Concept Study in Patients with Thyroid Eye Disease

Shoaib Ugradar[1], David A. Kostick[2], Jane Spadaro[3,4], Jwu Jin Khong[5,6]
[1]Department of Orbital and Oculoplastic Surgery, Private Practice, Beverly Hills, California, United States, [2]Florida Eye Specialists, Jacksonville, Florida, United States, [3]Department of Ophthalmology, Corewell Health William Beaumont University Hospital, Royal Oak, Michigan, United States, [4]Kahana Oculoplastic and Orbital Surgery, Ann Arbor, Michigan, United States, [5]Centre for Eye Research Australia, Royal Victorian Eye and Ear Hospital, Melbourne, Australia, [6]Department of Surgery, University of Melbourne, Melbourne, Australia

Introduction: Thyroid eye disease (TED) is a chronic, debilitating, autoimmune condition with limited effective therapies, affording the opportunity for increased depth and durability of response with long-term subcutaneous treatment. Overexpression of the insulin-like growth factor 1 receptor (IGF-1R) pathway underpins the pathophysiology of TED. We present data from the first 2 cohorts of an ongoing, phase 1/2, dose-ranging study of subcutaneous lonigutamab, a high-affinity, humanized, anti–IGF-1R monoclonal antibody, in patients with TED (NCT05683496).

Methods: Eligible patients are 18–75 years old and have active TED, with proptosis of ≥3 mm above normal range in the study eye and a Clinical Activity Score (CAS) of ≥4 (on a 7-item scale). Cohort 1 (completed) was double-masked and randomized 3:1 to lonigutamab (40 mg every 3 weeks) or matching placebo for 2 doses; week 6 (on-treatment) and week 12 (off-treatment follow-up) efficacy data are reported. Cohort 2 received open-label lonigutamab for 12 doses (50-mg loading dose, then 25 mg weekly for 11 weeks); 6-week data are reported. Missing data were handled using nonresponder imputation for calculating response rates.

Results: In cohort 1, 8 patients were enrolled (lonigutamab, n=6; placebo, n=2 [1 with evaluable post-baseline data]). Treatment-emergent adverse events (TEAEs) occurred in 4/6 (67%) patients receiving lonigutamab and 2/2 (100%) receiving placebo. All but 1 TEAE were grade 1 (1 grade 2 event), with no serious TEAEs. In the lonigutamab group, 3 patients had AEs of special interest (AESIs; all tinnitus, no changes on audiogram); 1 patient receiving placebo discontinued due to dysthyroid optic neuropathy. At weeks 6 and 12, 3/6 (50%) patients receiving lonigutamab and 0/2 (0%) receiving placebo had a proptosis response. Among patients with baseline diplopia (lonigutamab, 4/6; placebo, 2/2), 1/4 (25%) and 0/2 (0%) patients, respectively, had a diplopia response at weeks 6 and 12. In the lonigutamab group, 6/6 (100%) patients achieved a clinically meaningful reduction (≥2 points) in CAS in the study eye at week 6, which was retained through week 12 (vs 0/2 patients for placebo); mean (SD) change in CAS for the study eye with lonigutamab was -3.5 (0.8) at week 6 and -3.7 (1.0) at week 12 (vs 0 and -1.0 in 1 placebo patient).
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In cohort 2, 6 patients receiving lonigutamab had 6-week data. TEAEs (all grade 1–2) were reported in 5/6 (83%) patients; there were no AESIs or serious TEAEs. At week 6, 4/6 (67%) patients had a proptosis response. Among patients with baseline diplopia (5/6), 2/5 (40%) had a diplopia response. At week 6, 5/6 (83%) patients achieved a ≥2-point reduction in CAS in the study eye.

Conclusions: These findings with lonigutamab demonstrate proof of concept for a subcutaneous anti–IGF-1R in patients with TED (cohort 1). Patients achieved early clinical responses that were maintained over the time points evaluated, including the week 12 off-treatment time point, supporting the potential for longer dosing intervals. Data from cohort 2 further substantiate the efficacy seen in cohort 1. Lonigutamab was well tolerated and warrants further investigation for the treatment of TED.

1:51-1:56 pm

VRDN-003, Next-Generation Full Antagonist Antibody to IGF-1R: Two Proposed Randomized Placebo-Controlled Clinical Studies in Patients With TED (REVEAL-1 and REVEAL-2)

Steven Leibowitz[1], Thomas Ciulla[2], Antonio Manuel Garrido Hermosilla[1]
[1]Los Angeles, California, United States, [2]Waltham, Massachusetts, United States

Introduction: VRDN-001 and VRDN-003 are full antagonist antibodies to the IGF-1 receptor (IGF-1R). These antibodies have the same binding domain, but VRDN-003 contains half-life extension modifications. Prior phase 2 proof-of-concept data for VRDN-001 showed clinically meaningful improvements in thyroid eye disease (TED) signs and symptoms after 2 intravenous (IV) infusions administered every 3 weeks (Q3W). Phase 1 data for VRDN-003 in healthy volunteers showed that its half-life is 4-5 times that of VRDN-001, potentially enabling low-volume subcutaneous dosing as infrequently as Q8W, while achieving exposures in the range of those observed with VRDN-001 IV dosing Q3W. The safety and efficacy of subcutaneous administration of VRDN-003 are planned to be evaluated in 2 randomized placebo-controlled clinical studies in patients with moderate-to-severe active TED (REVEAL-1) and chronic TED (REVEAL-2).

Methods: The planned studies aim to evaluate VRDN-003 vs placebo administered as a subcutaneous injection in at least 1 of 3 dosing regimens: Q2W, Q4W, and Q8W. For REVEAL-1, patients must have a clinical activity score (CAS) of ≥3 and onset of signs/symptoms within 15 months of enrollment; for REVEAL-2, patients can have any CAS and must have onset of signs/symptoms at least 15 months prior to enrollment. Efficacy assessments will include measures of proptosis, diplopia, CAS, eyelid retraction, and quality of life. Safety and tolerability will be assessed through the full study period. Patients who are nonresponders at the end of the treatment phase will have the option to receive a full course of one of the treatment regimens of VRDN-003.

Conclusions: VRDN-003 is in development as a subcutaneous treatment for TED with the goal of reducing the treatment burden currently associated with IV infusions. The REVEAL-1 and REVEAL-2 randomized, double-masked, placebo-controlled trials will be the first to assess subcutaneous VRDN-003 in patients with TED.

1:56-2:01 pm

Intravenous Steroids Versus Teprotumumab for the Management of Thyroid Eye Disease. Is Teprotumumab a Game-Changer?

Cigdem Yasar, Anna Bettina Toth, Andrea Lora Kossler
Ophthalmology, Byers Eye Institute at Stanford, Palo Alto, California, United States

Introduction: To compare the efficacy of IV steroids versus teprotumumab for the treatment of active moderate-severe TED.

Methods: This was a single-center retrospective study at a tertiary TED clinic. Patients with TED diagnosis who received complete IV treatment (at least 75% of the infusions) of steroids since January 2012 or teprotumumab since January 2020 were enrolled into groups1 and 2, respectively. The efficacy of both treatments was analyzed by evaluation of various parameters, including a reduction in proptosis (RP), improvement in Gorman score (IGS), improvement in CAS (ICAS) at month-3/month-6/year-1/year-2 follow-up, and need for additional treatments, surgery, and treatment response or reactivation during year-2 follow-up periods.

Results: 70 patients, 32 in group1 and 38 in group 2, were selected and analyzed. 68.7% of group 1 and 73.7% of group 2 were female. Mean ages were 60.8 in group1 and 55.4 in group2. The proptosis, CAS, and Gorman score at baseline were 22.7 mm, 4.4, 2.0 in group1 and 22.0, 4.5, 2.3 in group2, respectively, (p=0.645, 0.353, and 0.258, respectively). Mean follow-up in year-1 was 13.7 months and 13.0 months in group 1 and group 2, respectively. Mean follow-up in the year-2 was 25.2 months and 26.7 months in group 1 and group 2, respectively.

At month-3 follow-up, the RP was 0.76 and 3.04, ICAS was 2.62 and 3.85, and IGS was 0.09 and 0.65, in group 1 and group 2, respectively, (p=0.000, 0.011, and 0.146, respectively). The statistical results for RP, ICAS, and IGS at month-6 were comparable to those at month-3. At year-2 follow-up, the RP was 1.85 and 2.97, ICAS was 4.00 and 4.00, and IGS was 0.53 and 1.10, in group 1 and group 2, respectively, (p=0.582, 1.00, and 0.136, respectively).

The percentage of patients who needed surgery during year-1/year-2 follow-up period was 25/5.3 % and 37.5/50 % in groups1 and 2, respectively (p=0.036/0.294). 59.4 % of patients in group1 and 34.2 % in group 2 need additional treatments during the year-2 follow-up period and 75% of patients in group1 and 68.4% in group2 need additional treatments or surgery during the late follow up, which showed no significant differences between the 2 groups (p=0.035 and 0.544, respectively). In group 1, 8 patients (25%) did not respond to the treatment, whereas none of the patients in group 2 were non-responders. Two patients (6.2%) experienced a flare-up in group 1 when 12 patients (31.6%) in group2 (p= 0.009) during year-2 follow-up, which was statistically significant in both groups.

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Conclusions: Teprotumumab is an effective treatment compared to steroid in short term to improve clinical findings including CAS, proptosis, and Gorman diplopia score. There was no significant long-term reduction in the need for surgical or medical rehabilitation when comparing teprotumumab and IV steroids. During the second year of follow-up, patients receiving teprotumumab for active moderate-severe TED may encounter increased flare rates after treatment response compared to those receiving IV steroid therapy. However, the steroid group has a higher proportion of non-responders to treatment. The main limitation for the study is the low sample size.

References:

1. R.S. Douglas, G.J. Kahaly, A. Patel, et al.Teprotumumab for the treatment of active thyroid eye disease N Engl J Med, 382 (2020)
2. Douglas RS, Kahaly GJ, Ugradar S, et al. Teprotumumab efficacy, safety, and durability in longer-duration thyroid eye disease and re-treatment: OPTIC-X Study. Ophthalmology 2022
3. Douglas RS, Dailey R, Subramanian PS, et al. Proptosis and diplopia response with teprotumumab and placebo vs the recommended treatment regimen with intravenous methylprednisolone in moderate to severe thyroid eye disease: a meta-analysis and matching-adjusted indirect comparison. JAMA Ophthalmol. 2022
4. Bartalena L, Kahaly GJ, Baldeschi L, et al.; EUGOGO. The 2021 European Group on Graves' Orbitopathy (EUGOGO) clinical practice guidelines for the medical management of Graves' orbitopathy. Eur J Endocrinol. 2021

2:01-2:06 pm

Monocytes Express a Functional Thyrotropin Receptor

Shoaib Ugradar[1], Tunde Mester[2], Terry Smith[3], Raymond Douglas[1]
[1]Orbital and Oculoplastic Surgery, Office of Dr Raymond Douglas, Beverly Hills, California, United States, [2]Office of Raymond Douglas MD, Beverly Hills, California, United States, [3]Los Angeles, California, United States

Introduction: Monocytes are a first line of host defense against pathogens but they are also involved in autoimmune disease. We studied the expression and function of the thyrotropin receptor (TSHR) in all subsets (classical: $CD14^{++}$, $CD16^{-}$; intermediate: $CD14^{++}$, $CD16^{+}$; nonclassical: $CD14^{+}$, $CD16^{++}$), because the functional consequences of TSHR signaling induced by TSHR autoantibodies may contribute to thyroid- associated ophthalmopathy (TAO).

Methods: TSHR, intracellular IL-6 and IL-8, Akt phosphorylation, caspase 3, reactive oxidative species (ROS) production by monocytes were determined by flow cytometry from isolated peripheral blood mononuclear cells (PBMCs). Real time PCR was used to measure the mRNA of TSHR, IL-6, and IL-8 from enriched monocytes.

Results: Monocytes express TSHR and its expression was induced by its ligand, thyroid stimulating hormone (TSH), and a Graves' disease (GD)-specific monoclonal autoantibody, M22. Basal pAkt levels were greater in monocytes from patients with thyroid-associated ophthalmopathy (TAO). TSHR signaling in monocytes was mediated through Akt. Monocytes produced reactive oxygen species (ROS) and pro-inflammatory cytokines IL-6 and IL-8 in response to TSHR signaling. Cytokine expression was greater in classical and intermediate monocytes of GD patients than in those of healthy controls stimulated with TSH and M22. TSH and M22 promoted apoptosis in intermediate and nonclassical monocytes but not in classical monocytes. Apoptosis of nonclassical and intermediate monocytes appears to be mediated through caspase 3 since TSH stimulated caspase 3 activation.

Conclusions: Our results demonstrate functional TSHR on monocytes, and TSHR signaling stimulates inflammatory response. This suggests an important role for stimulatory autoantibodies -TSHR interaction in monocyte function and activation which may be relevant to Graves' disease development.

2:06-2:11 pm

Teprotumumab Associated Menstrual Changes

Hila Goldberg[1,2], Patrick Hunt[1,3], Andrea Kossler[4], Roman Shinder[5], Tracy Lu[1,6], Amina Malik[1]
[1]Department of Ophthalmology, Houston Methodist Hospital, Houston, Texas, United States, [2]Orbital Oncology and Ophthalmic Plastic Surgery, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States, [3]Medical Scientist Training Program, Baylor College of Medicine, Houston, Texas, United States, [4]Department of Ophthalmology, Byers Eye Institute, Stanford University School of Medicine, Palo Alto, California, United States, [5]Department of Ophthalmology & Otolaryngology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States, [6]Orbital Oncology and Ophthalmic Plastic Surgery, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States

Introduction: Teprotumumab is a fully human monoclonal antibody with inhibitory effect on insulin-like growth factor-1 receptor (IGF-1R) approved for treatment of TED. In two large scale clinical trials, menstrual disorders were reported in 23% of menstruating women treated with teprotumumab, compared to 4% of menstruating women treated with placebo.[1,2,3] The exact role of IGF-1 receptor inhibitors on menstruation is not known. Studies investigating IGF in gene expression in human endometrium during the menstrual cycle found that the IGF system plays a fundamental role in endometrial biology.[4] There is limited data in the literature on teprotumumab associated menstrual changes, with only one previous study reporting 9 of 12 patients (75%) who experienced menstrual changes during treatment with teprotumumab. [5] The goal of this study is to further evaluate the incidence and characteristics of menstrual changes associated with teprotumumab treatment for TED among female patients.

Methods: A retrospective chart review of female patients aged 18-51 years was performed among three institutions between 1/2020-12/2023. Inclusion criteria included treatment with 8 infusions of teprotumumab, normal menstruation prior to treatment, and minimum follow up period of 6 months after cessation of therapy. Data collection included age, ethnicity, thyroid history, type of menstruation prior to treatment, form of contraception, thyroid levels before and after treatment, type of menstrual changes including: 1) amenorrhea (absence of menstruation), 2) metrorrhagia (abnormal bleeding between regular menstrual periods), 3) oligomenorrhea (irregular or inconsistent blood flow), 4) dysmenorrhea (pain associated with menstruation), or menorrhagia (heavy menstrual bleeding that lasts longer than 7 days). If menstrual changes occurred, further data collection included onset and duration of change.

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Results: 44 female patients with a mean age of 36 (range 18-51) were included. 45% (20 of 44) of patients experienced a change in menstruation. Among these patients, 70% (14) had amenorrhea, 25% (5) had oligomenorrhea and 5% (1) had menorrhagia. Two patients did not experience a return to normal menstruation at time of last follow up. The average number of days between first infusion and first change in menstruation was 53 days (range 7-112). The average numbers of days between change in menstruation to return to normal menstruation was 260 days (range 119-384). Mean follow up was 16 months after last infusion.

Conclusions: Our study reports menstrual changes in 45% of females receiving teprotumumab therapy. The most common changes seen were amenorrhea and oligomenorrhea. The majority of patients regained normal menstruation after cessation of therapy. It is important for providers to be aware of and counsel patients about this potential adverse effect when treating women with thyroid eye disease.

References:

1. Smith TJ, Kahaly GJ, Ezra DG, et al. Teprotumumab for Thyroid-Associated Ophthalmopathy. N Engl J Med. 2017;376(18):1748-1761. doi:10.1056/nejmoa1614949
2. Douglas RS, Kahaly GJ, Patel A, et al. Teprotumumab for the Treatment of Active Thyroid Eye Disease. N Engl J Med. 2020;382(4):341-352. doi:10.1056/nejmoa1910434
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4. Zhou J, Dsupin BA, Giudice LC, Bondy CA. Insulin-Like Factor System Gene Expression during the Menstrual Cycle *. J Clin Endocrinol Metab. 1994;79(6):1723-1734.
5. Terrarosa AK, DeMaria LN, North VS, Garcia MD, Kim ET, Belinsky I. Menstrual Irregularities and Amenorrhea in Thyroid Eye Disease Patients Treated With Teprotumumab. Ophthalmic Plast Reconstr Surg. 2024;2022-2025.

2:11-2:16 pm

Orbital Decompression in the Biologic Era: Is There a Role for Surgery?

Amina Malik[1], Daniel Gorelik[2], Najm Khan[2], Hila Goldberg[1], Mas Takashima[2], Omar Ahmed[2], Tracy Lu[1]
[1]Ophthalmic Plastic and Reconstructive Surgery, Houston Methodist Hospital, Houston, Texas, United States, [2]Otolaryngology, Houston Methodist Hospital, Houston, Texas, United States

Introduction: Thyroid eye disease (TED) is an autoimmune, inflammatory condition of the orbit that can lead to proptosis, diplopia, eyelid retraction and vision loss. Treatment modalities include surgery, external beam radiation, and medications including corticosteroids and immunomodulatory therapy. In January of 2020, teprotumumab became the first medication approved by the Food and Drug Administration (FDA) specifically for the treatment of TED. This study aims to explore changes in incidence and prevalence of orbital decompression surgery in TED patients following teprotumumab approval.

Methods: A cross-sectional analysis was performed using 2014-2023 data from TriNetx, a population database comprised of 63 large healthcare organizations in the US. All patients with ICD-10 codes related to TED were included. Univariate analysis was performed to assess trends in orbital decompression among TED patients pre-approval (January 2014 to December 2019) and post-approval (January 2020 to December 2023). To account for decreased incidence related to COVID-19 restrictions, trends in rates of cataract surgery and upper lid blepharoplasty over the same time period were assessed for comparison.

Results: 18,844 patients with TED ICD-10 codes were included, of which 8,740 (46.4%) were in the post-approval period. The prevalence of orbital decompression among TED patients over the study period was 11.9%. TED patients were significantly less likely to undergo decompression in the post-approval period (RR=0.59, 95% CI [0.54-0.64]; p<.0001) compared to the pre-approval period (Figure 1). The incidence of patients with cataracts undergoing cataract surgery and patients with upper lid dermatochalasis undergoing upper lid blepharoplasty experienced an expected decline in 2020 due to the pandemic that then increased; an overall increase in incidence of these two procedures was found in the post-approval period compared to pre-approval (RR>1). Compared to TED patients pre-approval, TED patients undergoing surgical decompression after approval were younger (57.5 vs. 59.7) (p = 0.002), and less likely to have glaucoma or be smokers (p < 0.001 and p = 0.02, respectively). There were no other significant demographic differences between pre- and post-approval study groups.

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Conclusions: Although surgical incidence has decreased following approval of teprotumumab for TED, there is still a role for orbital decompression. Future trends in rates of decompression may be dictated by the long-term durability outcomes of teprotumumab and future biologic therapies. This is the first population based study to evaluate incidence in orbital decompressions following the introduction of the first FDA-approved biologic therapy for TED.

Figure 1

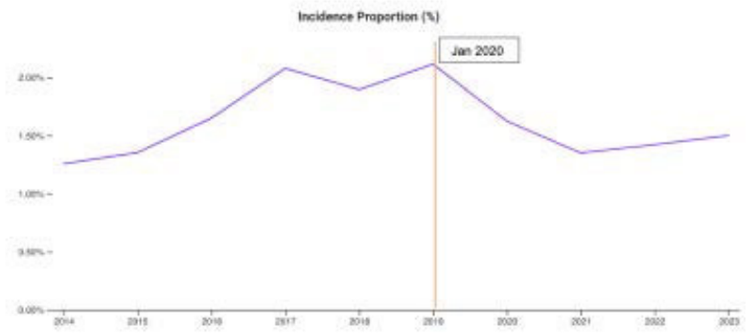

Figure 1: Incidence of orbital decompression among TED patients from 2014-2023.

Figure 2

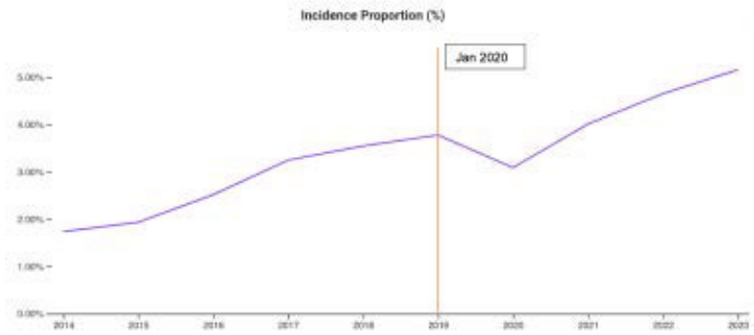

Figure 2: Incidence of cataract surgery among patients diagnosed with cataracts from 2014-2023.

Figure 3

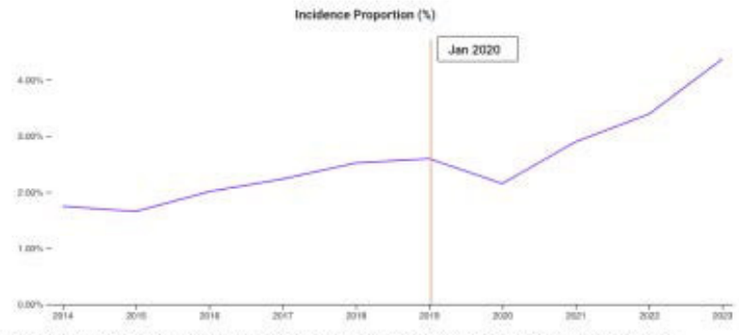

Figure 3: Incidence of upper lid blepharoplasty among patients diagnosed with upper lid dermatochalasis from 2014-2023.

FEATURED SPEAKER: AARON LEE, MD, MSCI

Thursday, October 17

Moderator: Michael K. Yoon

2:32-2:55 pm

Applications of Deep Learning in Ophthalmology

Aaron Lee, MD, MSCI

FEATURING! SPECIAL INTEREST GROUP BREAKOUT SESSIONS

Thursday, October 17

3:30-5 pm

Cases will be presented for discussion by panelists and audience.

Orbit – Grand Ballroom

Moderator: Jill A. Foster
Facilitators: Louise A. Mawn, Catherine J. Hwang, Michael Kazim, Suzanne K. Freitag, and Robert C. Kersten

Aesthetics – Adams (6th Floor)

Moderator: Kenneth E. Morgenstern
Facilitators: Jocelyne C. Kohn, Evan H. Black, Patrick M. Flaharty, John J. Martin, and Kristin J. Tarbet

Eyelid – Monroe (6th Floor)

Moderator: Tamara Fountain
Facilitators: Sara Wester, Diego Strianese, David R. Jordan, and Jeremiah P. Tao

7:01-7:05 am

Patterns and Management of Nodal Metastasis in Patients with Eyelid Sebaceous Carcinoma

Tracy Lu[1], Casey Anthony[1], Hila Goldberg[1], Xinyang Jiang[2], Jing Ning[2], Ryan Goepfert[3], Bita Esmaeli[1]
[1]Orbital Oncology and Ophthalmic Plastic Surgery, MD Anderson Cancer Center, Houston, Texas, United States, [2]Biostatistics, MD Anderson Cancer Center, Houston, Texas, United States, [3]Head and Neck Surgery, MD Anderson Cancer Center, Houston, Texas, United States

Introduction: The goal of this report is to describe the patterns of regional nodal metastasis, results of sentinel lymph node (SLN) biopsy, and management of positive nodes in patients with eyelid sebaceous carcinoma (SC).

Methods: A retrospective review of consecutive patients with eyelid SC who either had SLN biopsy or were found to have nodal metastasis based on clinical findings between 1999 and 2023, and a sub-analysis of patients who had SLN biopsy during the same period, was carried out.

Results: 138 patients (82 women, 59 men; median age = 69) with eyelid SC were treated during the study period. Thirty patients (22%) had nodal involvement either at presentation or during follow-up. Fifteen patients had lymph node metastasis at initial diagnosis of eyelid carcinoma; 18 patients (15 without nodal involvement at presentation) had lymph node metastasis found during the follow up period at a median time of 12 months after initial surgical resection of the eyelid carcinoma with clear margins (range: 1 to 132 months) (Figure 1). Among patients with lymph node metastasis, the T category was T1 in 1 (3.3%), T2 in 5 (16.7%), T3 in 15 (50.0%) and T4 in 9 (30.0%) at presentation. There was a significant correlation between T category and nodal metastasis ($p<0.001$) (Figure 2). The most common nodal basins involved were parotid (n=17; 55%), submandibular (n=4; 13%), preauricular (n=4; 13%), jugular (n=1; 3%) and other cervical nodes (n=5; 16%).

Thirty-eight patients had a SLN biopsy performed at the time of initial management of the eyelid SC at our institution; 5 out of 38 (13.2%) had a positive SLN. In patients with a positive SLN, the T category was T2 in 1 (20.0%), T3 in 2 (20.0%), and T4 in 2 (40.0%).

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Treatment of nodal metastasis included parotidectomy plus neck dissection (n=20; 67%), neck dissection (n=5; 17%), and resection of a single lymph node (n=1; 3%). Twenty of 26 patients (77%) had post-op adjuvant radiotherapy, and 7 of the 20 patients (35%) had concurrent chemoradiation. One patient declined surgical intervention and was treated with chemoradiation, and 2 patients with unresectable disease were treated with palliative radiation. Four of 15 (27%) patients with lymph node metastasis at initial diagnosis developed further lymph node metastasis during follow up; 3 of 15 (20%) experienced distant metastasis during follow-up. In those with nodal metastasis, the two-year and 5-year disease-specific survival rates were 87.5% and 75.4%, respectively.

Conclusions: About a quarter of patients had nodal metastasis; over half of these were found during the follow-up period despite negative findings at initial presentation, highlighting the importance of continued lymph node surveillance in patients with eyelid SC. Most cases of lymph node metastasis occurred within the first two years of follow-up. The SLN positivity rate of 13% is in line with acceptable yield for the procedure across cancer types and supports its continued use for eyelid SC that are T2 or more advanced at presentation. However, continued lymph node surveillance may be appropriate despite an initial negative result given the risk of late onset nodal metastasis.

Figure 1

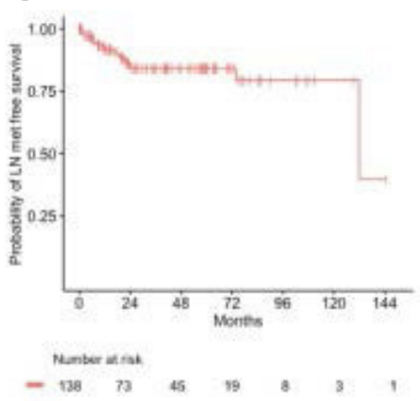

Figure 1. Time from initial surgical resection to lymph node (LN) metastasis

Figure 2

	Total (N=138)	Nodal Involvement (N=31)	p value
T category			< 0.001
1	44	1 (2.3%)	
2	30	5 (16.7%)	
3	40	15 (37.5%)	
4	21	9 (42.9%)	
unknown	3	0	

Figure 2. Nodal involvement by T category at presentation

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7:05-7:09 am

Immune Checkpoint Inhibitor Therapy for Locally Advanced or Metastatic Periocular Merkel Cell Carcinoma

Tracy Lu[1], Joshua Hohlbein[1], Janet Fan[1], Hila Goldberg[1], Anastasios Maniakas[2], Michael Wong[3], Bita Esmaeli[1]
[1]Orbital Oncology and Ophthalmic Plastic Surgery, MD Anderson Cancer Center, Houston, Texas, United States, [2]Head and Neck Surgery, MD Anderson Cancer Center, Houston, Texas, United States, [3]Melanoma Medical Oncology, MD Anderson Cancer Center, Houston, Texas, United States

Introduction: Merkel cell carcinoma (MCC) is an aggressive neuroendocrine cancer of the skin that has high recurrence, metastasis, and mortality rates compared to other cutaneous malignancies[1,2]. Traditionally, wide surgical excision with possible adjuvant radiation is used for local treatment. Recently, immune checkpoint inhibitors (ICI) have been FDA-approved for MCC[3]. We herein present four patients with locally advanced and/or metastatic periocular MCC who were successfully treated with ICI.

Methods: The clinical records of four patients with periocular MCC who were treated with ICI were retrospectively reviewed. Clinical and radiologic data at presentation, duration of ICI, response to treatment, and follow-up data were analyzed. Treatment related side effects were reviewed.

Results: Four patients (3 male and 1 female, age range: 52-73) were included with a T category of T1 in 1 patient, T3 in 2 patients, and T4 in 1 patient (AJCC 8th edition); three patients were treated with pembrolizumab and one with avelumab. Three patients were treated with ICI in the neoadjuvant setting prior to surgery. In patient 1, surgery was avoided altogether due to complete resolution of both the primary periocular mass (Figure 1) and metastatic neck mass (Figure 2) after 1 year of ICI treatment and radiation to the neck (Figure 3). In the other two patients, surgical morbidity was significantly decreased: patient 2 had no evidence of residual carcinoma upon surgical excision, and patient 3 had only a small focus of residual carcinoma with clear margins. Of note, patient 3 also had nodal metastasis that completed resolved with ICI and thus avoided adjuvant radiation. The fourth patient had recurrence in the right cheek after the primary eyelid tumor was resected; this in-transit metastasis was treated with ICI and completed resolved. Overall, three patients had complete response with ICI and the other had a significant partial response. All four patients tolerated ICI well without notable side effects. The two patients who avoided surgery received ICI for a year and had no signs of recurrence 6 months and 1 year after end of treatment, respectively. In the two patients who underwent surgery after ICI, one has adjuvant ICI planned for one year duration, and the other is on surveillance given the small size of the initial lesion (T1) and clear surgical margins.

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Conclusions: Our observations in these four patients highlight the dramatic response to immune checkpoint inhibitors in patients with locally advanced and/or metastatic periocular Merkel cell carcinoma. Judicious use of ICI in selected patients with periocular MCC can decrease surgical morbidity, avoid the need for radiation, and potentially improve survival in patients with metastatic disease.

Figure 1

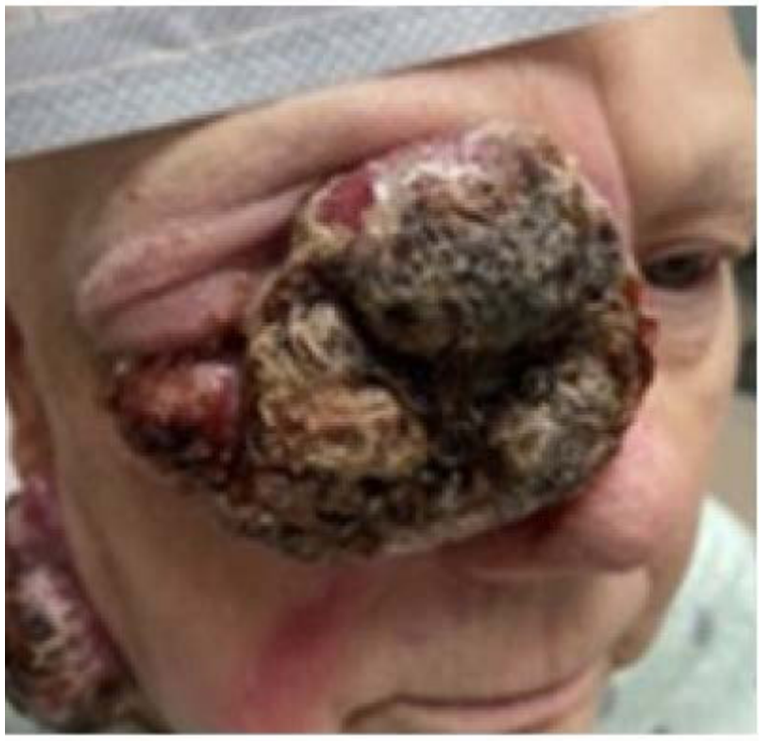


Figure 2

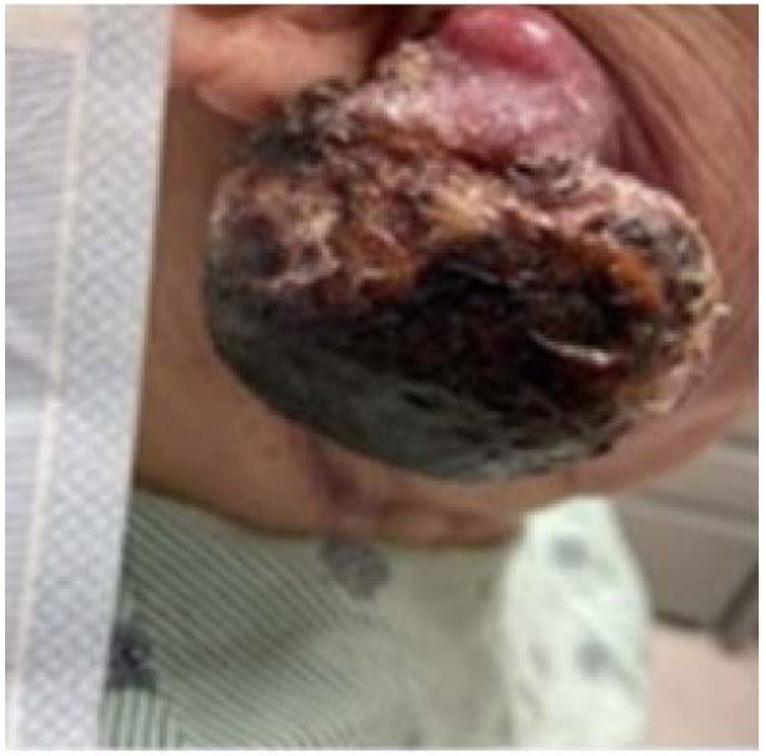
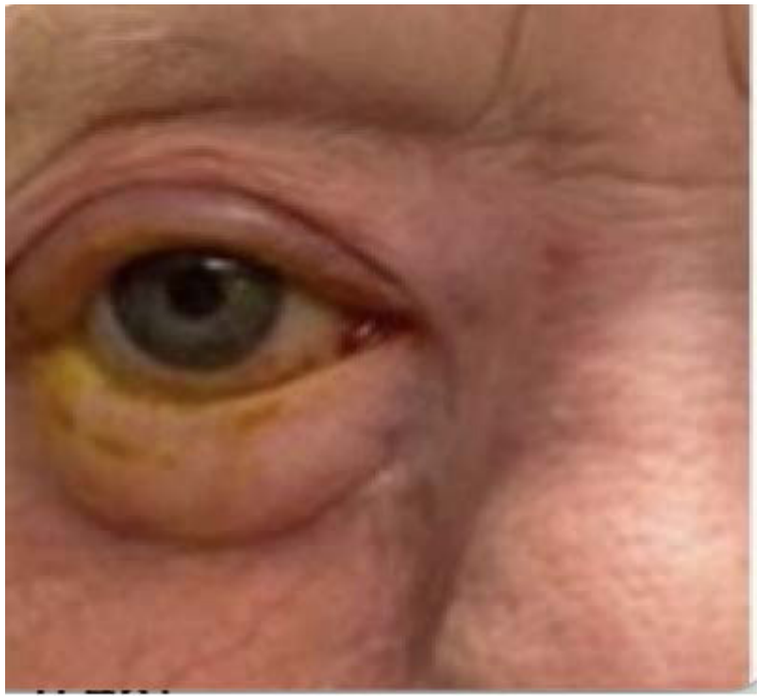


Figure 3



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7:09-7:13 am

Pre-Operative Ethylene Vinyl Alcohol Copolymer Embolization of Large Facial Intraosseous Hemangioma

Makayla McCoskey[1], Karen Brown[1], Anish Abrol[1], Donovan Reed[2,1]
[1]TOC Eye and Face, Austin, Texas, United States, [2]Department of Ophthalmology, Wilford Hall Eye Center, Lackland Air Force Base, San Antonio, Texas, United States

Introduction: Intraosseous hemangiomas are rare, benign vascular neoplasms that are uncommonly found in the facial bones. Surgical resection of these tumors can be challenging due to the risk of large-volume hemorrhage. Pre-operative embolization by interventional radiology can mitigate the risk of intra-operative hemorrhage[1,2]; however, in the absence of an appropriate feeding vessel for catheterization, alternative embolization options are available. Ethylene vinyl alcohol copolymer is a non-absorbable, non-adhesive, permanent liquid embolic agent initially approved for treatment of cerebral vascular malformations.[3] There are limited reports of ethylene vinyl alcohol copolymer use for orbital lesions, including venous malformations, meningiomas, and solitary fibrous tumors.[4–6] We present the use of ethylene vinyl alcohol copolymer for pre-operative embolization of a facial intraosseous hemangioma and the subsequent uncomplicated surgical debulking.

Methods: Case report and review of the literature.

Results: A 72-year-old female presented with a slowly enlarging bony tumor of the right midface (Figure 1) for greater than 30 years. CT imaging confirmed the presence of this mass lesion involving the maxillary and zygomatic bones, extending into the lateral and inferior orbit and the maxillary sinus (Figure 2). She underwent orbitotomy with biopsy of this lesion, and intra-operatively the tumor appeared consistent with an intraosseous hemangioma, which was confirmed on histopathologic evaluation. Options were discussed with the patient, who preferred to avoid total excision requiring extensive reconstruction. Instead, she elected for partial surgical debulking of the tumor in an effort to improve her hyperglobus, diplopia, and poor fit of her glasses. She was referred to interventional radiology for pre-operative embolization. Attempted traditional catheterization of a dominant feeder artery to the tumor was unsuccessful due to the small size and tortuosity of the branches of the right internal maxillary artery to the tumor. As such, the decision was made by the interventional radiologist intraoperatively to proceed with direct, ultrasound-guided, transcutaneous intralesional injection of ethylene vinyl alcohol copolymer (Figure 3). The patient was brought to surgery the following day, and the intra-orbital and anterior maxillary extensions of the tumor were sculpted to restore appropriate orbital and maxillary face contour. This was achieved via combined swinging eyelid anterior orbitotomy and gingivobuccal sulcus incision to access the anterior maxillary face. Minimal bleeding was encountered, and intralesional ethylene vinyl alcohol copolymer material was visualized throughout the debulking (Figure 4). Post-

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operative CT confirmed improvement of globe position and orbital contour (Figure 5). The patient experienced improvement in diplopia and fit of her spectacles immediately post-operatively and she was noted to be healing very well with improved globe position, motility, and midfacial projection at postoperative month four follow-up.

Conclusions: While definitive management of intraosseous hemangiomas requires complete surgical excision, some patients with large facial tumors may prefer to avoid the morbidity of such surgery and the resulting reconstruction. As in this case, debulking the clinically symptomatic portion of the tumor can result in sustained subjective improvement in patient quality of life. Pre-operative embolization of these vascular tumors can significantly improve the safety of surgical intervention. As demonstrated, the novel use of direct intralesional ethylene vinyl alcohol copolymer injection is an effective, viable option for embolization of orbital intraosseous hemangiomas.

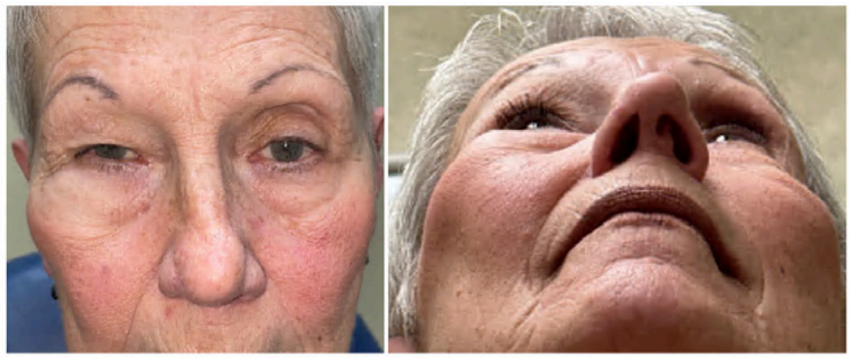

Figure 1: External photograph of patient at presentation with right midfacial bony tumor.

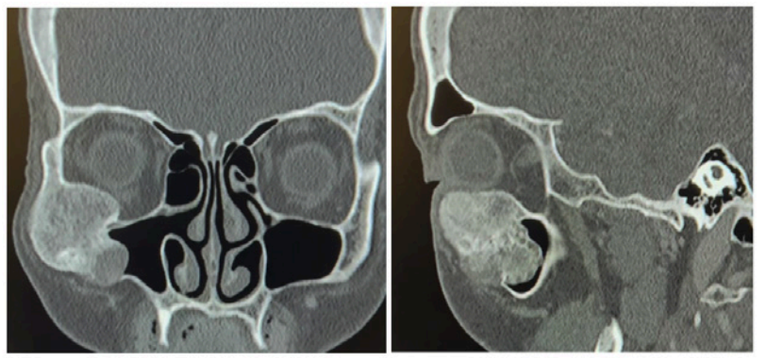

Figure 2: Pre-operative CT imaging (left: coronal, right: sagittal) demonstrating intraosseous lesion of the maxillary and zygomatic bones, extending into the lateral and inferior orbit and the maxillary sinus.

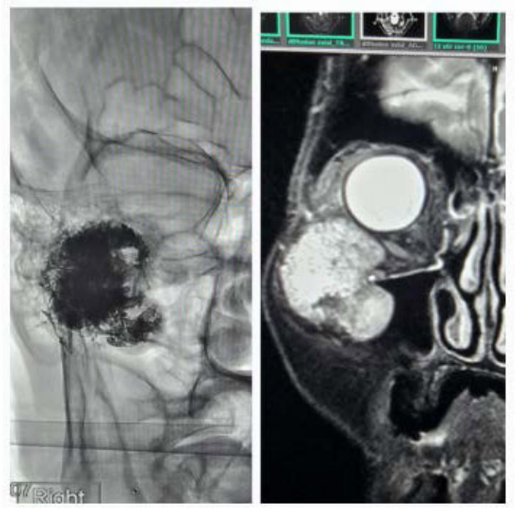

Figure 3: Intra-operative angiography during Onyx embolization of intraosseous hemangioma.

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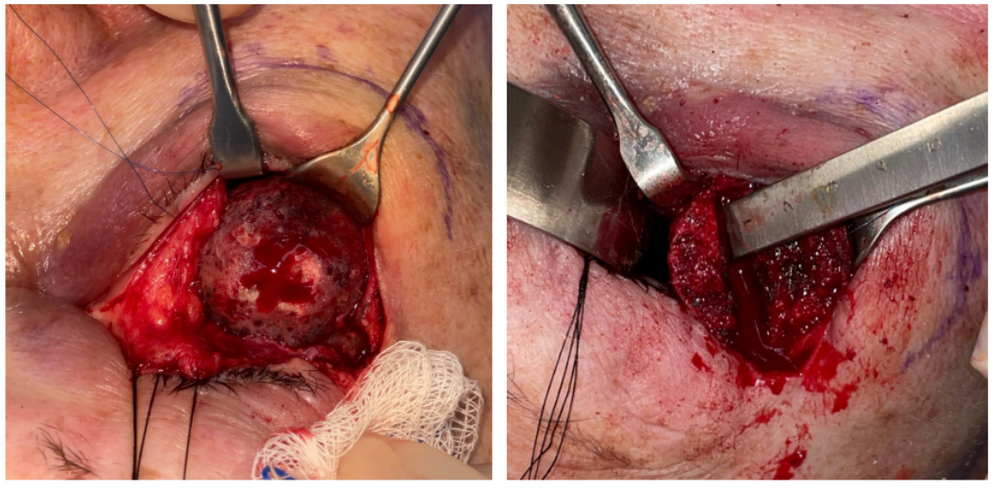

Figure 4: Intra-operative photographs of post-embolization tumor appearance (right) and debulking (left).

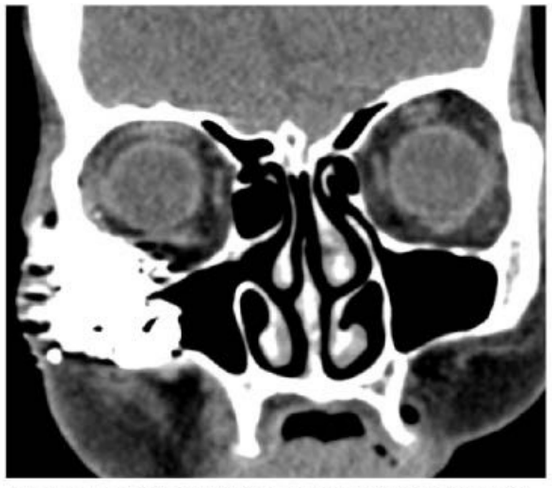

Figure 5: Post-operative coronal CT imaging of debulked tumor, improved globe position and orbital contour.

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7:13-7:17 am

Outcome Comparison of Sphenoid Wing Meningioma Resection with and without Lateral Orbital Wall Reconstruction

Anzhela Moskalik[1], Edward Strong[2], Kiarash Shahlaie[1], Natalie Homer[3]
[1]Neurosurgery, U.C. Davis Medical Center, Sacramento, California, United States, [2]Otolaryngology, U.C. Davis Medical Center, Sacramento, California, United States, [3]Ophthalmology, Stanford Medical Center, Palo Alto, California, United States

Introduction: Sphenoid wing meningiomas (SWM) frequently present with hyperostosis and lateral orbital compression with ensuing globe proptosis.[1,2]. The lateral orbital wall is often resected for tumor debulking and to gain access to the orbital space. Currently, no guidelines exist regarding lateral orbital wall reconstruction (LOWR), although some practitioners advise reconstruction to avoid delayed enophthalmos and asymmetrical eye positioning[3,4]. In this study, we compare the clinical outcomes and complications in patients with and without lateral orbital wall reconstruction following SWM resection.

Methods: A retrospective study from a single institution by the same surgical team was used to analyze clinical outcomes, complications, and long-term results in patients who underwent surgical resection of SWMs including lateral orbital wall resection, with or without reconstruction. Patient demographics, disease characteristics and surgical data were collected. Lesion volume, orbital volume and globe position were measured on pre and post-operative CT imaging using treatment planning imaging software (Figure 1).

Results: A total of 16 patients who underwent SWM and lateral orbital wall resection with (n = 5) or without (n = 11) lateral orbital wall reconstruction were included. The two groups were similar in age, gender, disease grade, and follow up time (Table 1). Patients in both groups underwent gross total resection of the tumor and hyperostotic lateral orbital wall.

The operative times in the LOWR group were significantly longer than in the no LOWR group, with a mean time of 689 minutes compared to 470 minutes (p = 0.036, Figure 3). Length of hospitalization was similar between the two groups (mean 3.6 and 3.0 days, respectively, p = 0.15).

The relative change in total orbital soft tissue and globe volume in the LOWR group was 4.20 cm^3, compared to 1.73 cm^3 in those without LOWR (p = 0.065, Figure 2A, Table 2). Proptosis improvement was 0.58 mm in the LOWR group compared to 1.07 mm in the no LOWR group (p = 0.89, Figure 2B).

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Similar rates of visual acuity and diplopia improvement were found between the two groups. Complication and revision rates also compared similarly. One patient without LOWR was acutely returned to the operating room due to a post-operative epidural hematoma. One patient in the LOWR group underwent delayed surgery for recurrent symptomatic disease. Other complications included trigeminal hypersensitivity in one patient in each group and a temporary CN VI palsy in one patient in the no LOWR group.

Conclusions: In the study presented herein, LOWR and no LOWR were similar in regard to symptom improvement and complication rates. A trend was noted in the LOWR group towards more total orbital soft tissue and globe volume increase with associated increase in proptosis, but the difference was not statistically significant. While LOWR was associated with significantly longer operative times in our patient population, small patient numbers did not allow for a sufficiently-powered multivariate analysis to fully exclude confounding factors. However, it is logical that the introduction of hardware would increase surgical time and theoretic potential for surgical and post-operative morbidity that may be independently confirmed in a larger study. Thus, the present study does not find justification for lateral orbital wall reconstruction in SWM resections given similar clinical outcomes. We call for larger studies with long-term outcome assessment to confirm these results.

Table 1

	No LOW Reconstruction (n = 11)	LOW Reconstuction (n = 5)	p-value
Age, years (mean, CI)	60 (51.55 - 68.45)	47.67 (42.54 - 52.80)	0.
Gender			
Female	8	3	
Male	3	2	
Ethnicity			0.
Hispanic/Latino	1	2	
Lateality			0.7
Left	7	2	
Right	4	3	
Lesion volume (cm3)	34.75 (18.83 - 50.68)	53.72 (4.11 - 103.33)	0.3
Meningioma Grade			
Grade 1	7	3	
Grade 2	4	2	

Table 2

Table 2. Operative and clinical characteristics and outcomes.

	No LOW Reconstruction (n = 11)	LOW Reconstuction (n = 5)	p-value
Pre-operative orbital volume (cm3)	28.91 (30.75 - 27.07)	28.2 (24.31 - 32.09)	0.53
Post-operative orbital volume (cm3)	30.64 (29.28 - 31.99)	32.4 (28.03 - 36.77)	0.64
Orbital volume change (cm3)	1.72 (1.24 - 2.10)	4.2 (2.51 - 5.89)	0.065
Pre-operative FND			1
Yes	3	1	
No	8	4	
New post-operative FND			0.84
Yes	2	0	
No	9	5	
Pre-operative relative proptosis (mm)	3.82 (1.91 - 5.73)	4.14 (0.72 - 7.56)	0.83
Post-operative relative proptosis (mm)	2.7 (1.41 - 3.99)	3.06 (0.59 - 5.53)	0.66
Relative proptosis change (mm)	1.12 (-0.34 - 2.58)	1.08 (-0.49 - 2.65)	0.91
Visual acuity change			0.72
Improved	4	1	
Stable	6	3	
Worse	1	0	
Unknown	0	1	
Diplopia			1
Stable	1	1	
Improved	1	1	
Resolved	0	0	
Worse	0	0	
Estimated blood loss (mL)	150 (82.5 - 325)	700 (350 - 4500)	0.016
Operative time (min)	470.09 (374.06 - 566.12)	689.2 (604.05 - 774.35)	0.036
Extent of resecton			1
Gross total resection	7	3	
Subtotal resection	4	2	
Return to OR			0.44
Yes	1	2	
No	10	3	
Complications			1
yes	3	2	
no	8	3	
Length of stay, days	3.00 (2.25 - 3.75)	3.6 (3.12 - 4.08)	0.15

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Figure 1

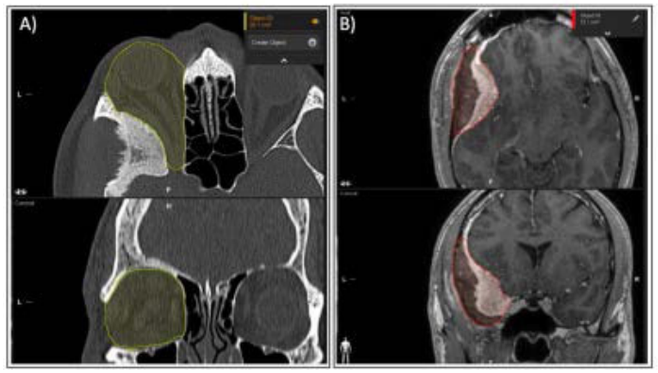


Figure 2

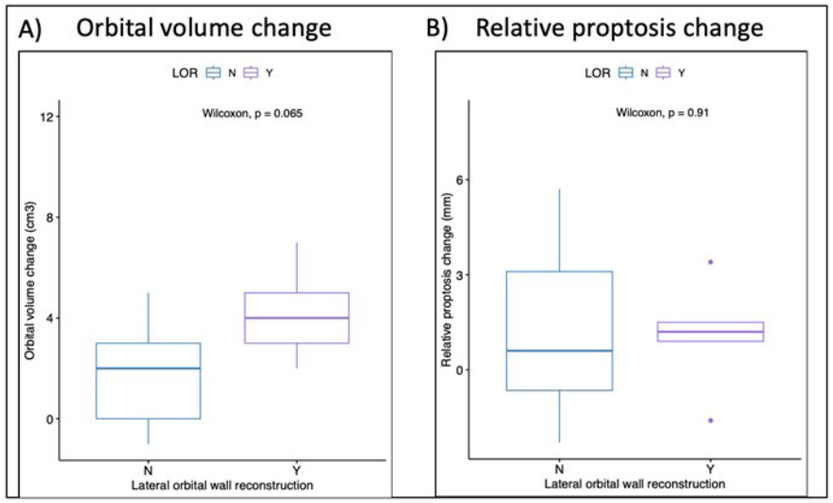
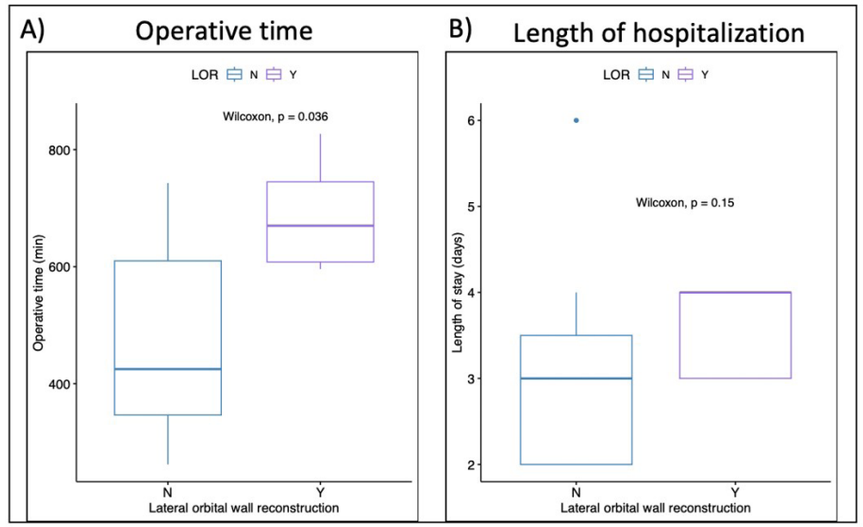


Figure 3



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7:17-7:21 am

Thyroid Stimulating Immunoglobulin as a Biomarker for Thyroid Eye Disease Prognosis Following Teprotumumab Therapy

Adam Neuhouser[1], Alisha Kamboj[1], Ali Mokhtarzadeh[1], Andrew Harrison[1,2]
[1]Department of Ophthalmology and Visual Neurosciences, University of Minnesota, Minneapolis, Minnesota, United States, [2]Department of Otolaryngology and Head and Neck Surgery, University of Minnesota, Minneapolis, Minnesota, United States

Introduction: We assess the efficacy of thyroid stimulating immunoglobulin (TSI) as a biomarker for thyroid eye disease (TED) clinical activity and response to teprotumumab therapy.

Methods: A retrospective cohort analysis at a single institution was completed. Demographic information, clinical data, and TSI values were recorded for patients with active, moderate-to-severe TED who had undergone teprotumumab therapy. Laboratory values were quantified via a recombinant bioassay (Mayo Clinic Laboratories, Rochester, MN). Clinical activity score (CAS), proptosis, margin reflex distance 1 (MRD1), and Gorman diplopia scores were recorded pre- and post- completion of teprotumumab therapy. Logistic regression was utilized to ascertain the likelihood of CAS components being present, and persisting, in the setting of elevated TSI levels. The statistics were performed using DATAtab: Online Statistics Calculator.

Results: Among 50 patients who underwent teprotumumab therapy, mean pre-treatment TSI and CAS scores were 4.0 TSI index units and 5.0 points, respectively. Preliminary analysis indicated a positive correlation between TSI and total CAS (r = 0.18) as well as proptosis (OD r = 0.09, OS r = 0.14), with a positive, statistically significant correlation between TSI and right eye MRD1 (r = 0.42, p = 0.002). Logistic regression demonstrated a substantial association of elevated TSI with eyelid swelling (OR = 1.26) and caruncle inflammation (OR = 1.29). Among the 44 patients who completed all eight infusions of teprotumumab, higher TSI levels pre-treatment were associated with increased odds of post-treatment persistence of eyelid swelling (OR = 1.09) and chemosis (OR = 1.09). In this group, higher TSI values pre-treatment were marginally associated with post-treatment elevations in MRD1 (MRD1 OD OR = 0.28, MRD1 OS OR = 0.19) and Gorman diplopia score (Gorman OR = 0.27).

Conclusions: Thyroid stimulating immunoglobulin demonstrates a moderate, positive correlation with CAS, proptosis, and MRD1, suggesting its utility as a biomarker for clinical activity among patients with active, moderate-to-severe TED. Moreover, elevated TSI levels pre-treatment may offer value in predicting post-treatment persistence of eyelid swelling, chemosis, upper eyelid retraction, and diplopia in patients undergoing teprotumumab therapy. This is the first study, to our knowledge, that explores the role of TSI as a prognostic biomarker for response to teprotumumab therapy.

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7:30-7:34 am

Penetrating Transorbital Intracranial Injury Due To Ballpoint Pen

Marissa Shoji[1], Eman Al-Sharif[1,2], Rafaella Penteado[3], Maria Solbes-Gochicoa[3,4], Bobby Korn[1], Don Kikkawa[1], Catherine Liu[1]
[1]Oculofacial Plastic and Orbital Surgery, Shiley Eye Institute, San Diego, California, United States, [2]Princess Nourah bint Abdulrahman University, Riyadh, [3]Ophthalmology, Shiley Eye Institute, San Diego, California, United States, [4]School of Medicine and Health Sciences, Tec de Monterrey, Monterrey

Introduction: This report highlights a rare transorbital intracranial penetrating injury due to ballpoint pen.

Methods: Case report and PubMed systematic literature review.

Results: A 45-year-old man with no significant medical history presented with confusion, right-sided weakness, and right orbital swelling after being assaulted nine days prior in Mexico with right orbital and head trauma initially suspected to be a gunshot wound. He reportedly presented to an outside hospital and was observed for four days without surgical intervention before discharge home. At that time, he was walking, communicative, and could void independently. After discharge, he progressively deteriorated, prompting emergency room evaluation. Exam demonstrated right upper eyelid edema surrounding a laceration previously closed (Figure 1) and right hemiplegia with aphasia. There was no afferent pupillary defect, extraocular muscle motility abnormalities, or ruptured globe. Neuroimaging demonstrated a tubular foreign body extending from the right superior orbit, through right frontal lobe, and terminating in the left frontal lobe with surrounding hyperintensity concerning for intracranial abscess and edema without vascular injury (Figure 2 A,B).

He underwent emergent surgery with neurosurgery and oculoplastic surgery. Right anterior orbitotomy through a lid-crease incision was performed with dissection to the orbital roof, which revealed a plastic ink cartridge extending intracranially through an orbital roof defect (Figure 3A). Attempts to remove it via the orbit resulted in resistance. Thus, a left craniotomy and corticectomy under neuro-navigation was performed with copious thick purulence drained that grew *Streptococcus* strains and *Provetella* (Figure 3B). Further dissection identified a pen cap attached to a ballpoint pen, which was carefully extracted (Figure 3C-E, supplementary video available to demonstrate technique). Careful orbital exploration ensured no pen fragments remained. The patient tolerated the procedure well and received an extended course of intravenous antibiotics. Three months post-operatively, he had 20/20 vision with resolved eyelid swelling, no optic nerve compromise, and subjective neurologic return to baseline (Figure 4).

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Conclusions: Intraorbital trauma may occur from high-velocity trauma with retained foreign bodies including metal, glass, or organic material. Systematic literature review identified 13 prior cases of transorbital intracranial penetrating injury due to a ballpoint pen, most of which resulted in death or neurologic/ophthalmic sequelae (Table 1). Only one other reported case was associated with intracranial abscess in a child with retained pen-nib after fall, who had residual ptosis but resolution of abscess and neurologic symptoms. Our patient also fortunately recovered with complete neurologic return to baseline likely due to the critical vascular structures avoided by the pen, prompt surgical extraction and drainage of over 20 mL of intracranial purulence, and extended intravenous antibiotics course. Prompt identification and multidisciplinary removal of intraorbital foreign bodies is critical due to the significant morbidity and mortality associated with intracranial edema and infection.

Figure 1

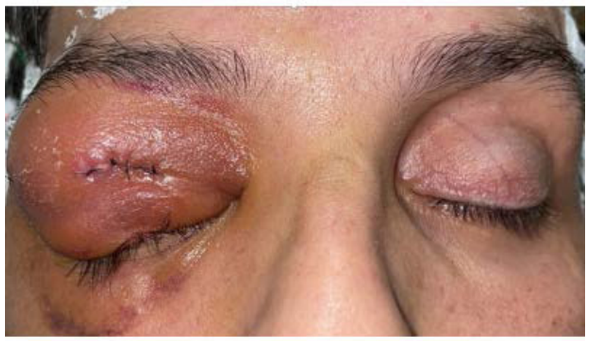

Figure 2

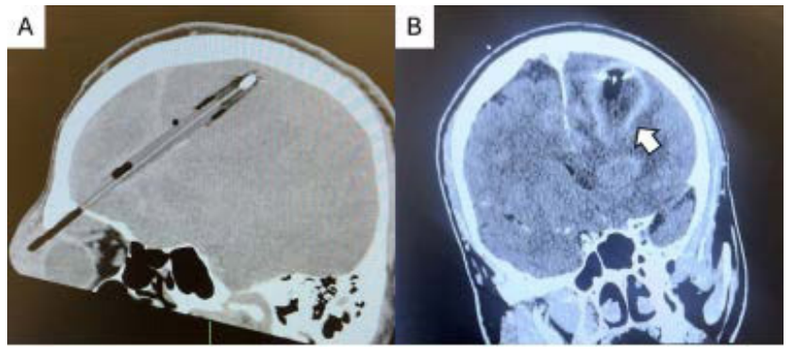

Figure 3

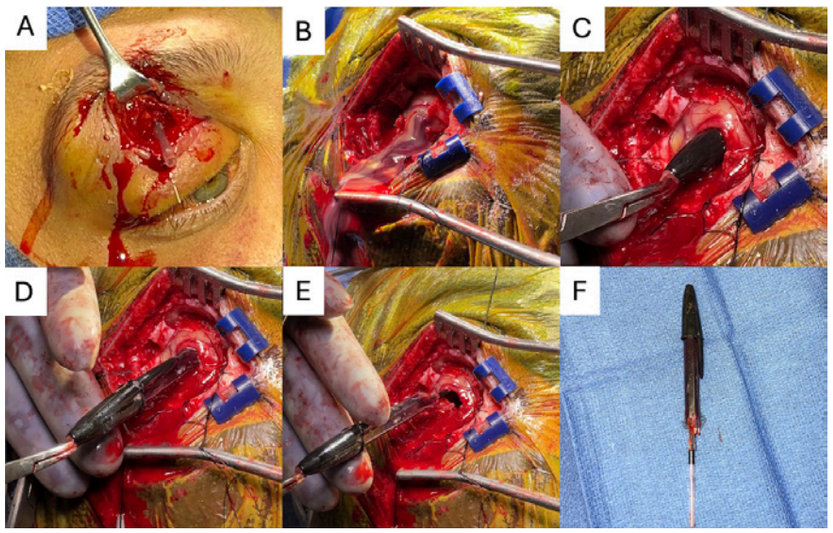

Figure 4

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Table 1

Table 1. Systematic literature review of previous transorbital intracranial ballpoint pen injuries

Author	Patient Age/Sex	Mechanism of Injury	Foreign Body	Presentation	Ocular injury?	Imaging Characteristics	Infection	Vascular injury	Surgery	Outcome
Abdulbaki et al. (2012)	5y/F	Accidental Fall	Pen-nib	Right eye pain, restricted upgaze	No	20 mm × 15 mm metallic foreign body in the medial right orbital roof with penetration of the right frontal lobe inferior surface and surrounding abscess formation	Yes	No	Combination case with neurosurgery and oculoplastic surgery; lid-crease approach	Mild residual right upper eyelid ptosis; resolution of brain abscess
Bowen (1971)	44y/M	Self-inflicted Suicide Attempt	Pen	Unconscious, right sided spasticity	Conjunctival laceration in medial canthi	Ball point pen through right orbit into left temporo-occipital region	No	No	Combination case with neurosurgery and oculoplastic surgery, orbitotomy approach NS	Second surgery required due to aerocele; continued right hemiparesis and decreased vision (6/9)
Cvetkovic et al. (2018)	40y/M	Self-inflicted Suicide Attempt	Pencil	Death, examination at autopsy	No	Autopsy: cylinder shaped object in subcutaneous tissue piercing through right ethmoid bone, passing through sphenoid and clivus, stopping in brain, with laceration of brainstem and transection of basilar artery	No	Yes	NA	Death
Davila et al. (2021)	34y/M	Self-inflicted Suicide Attempt	Pen	Right orbital medial pen, adduction deficit of right eye	No	Medial right orbital foreign body crossing intracranially to posterior fossa piercing the pons	No	No	Right frontal craniotomy and Ferguson approach for removal of the foreign body	Persistent limited adduction right eye, left facial palsy, right hemiparesis
Davis et al. (2000)	10y/M	Assault by Classmate	Pen	Decreased vision right eye, discharging sinus tract along left orbital margin	No	Pen from left orbit into right orbit and right middle cranial fossa to right temporal lobe with severing of right optic nerve	No	No	Combination case neurosurgery and plastic surgery; anterior orbitotomy and bicoronal scalp flap	Unremarkable recovery, preserved vision in left eye
Greene et al. (1993)	34y/M	Self-inflicted Suicide Attempt	Pen	Right pupil fixed, complete ophthalmoplegia, blindness, right facia droop, decreased right pharyngeal sensation, mild right upper extremity dysmetria, left tongue deviation, decreased sensation I all areas of V3	No	Ballpoint pen along right inner canthus through superior orbital fissure and right cavernous sinus in superior cerebellar peduncle, with intimal flap of right intracavernous carotid artery	No	Yes	Combination case with ophthalmology and neurosurgery	Continued cranial nerve and visual deficits, persistent right upper extremity dysmetria
Koyonagi et al. (2012)	2y/F	Accidental Fall	Pen cap	Bleeding from right eye	Conjunctival laceration	Residual foreign body in the frontal lobe	No	No	Bifrontal craniotomy	No neurologic deficit
LaFrentz et al. (2000)	22m/M	Accidental Fall	Pen-nib	Right eye inferomedial penetration; mother attempted to extricate	No	Nib lodged in anterior wall of sphenoid sinus with ball point abutting clivus	No	No	Endoscopic sinus surgery	Uneventful recovery
Lunetta et al. (2002)	25y/M	Self-inflicted	Pen	Bilateral ophthalmoplegia	Right conjunctival medial abrasion, bilateral retinal hemorrhages	Plastic ballpoint from right orbit extraconally along medial orbital wall through superior orbital fissure terminating in cerebellum	No	No	NA	Death
Nguyen et al. (2016)	56y/F	Self-inflicted	Pen	Pen lodged in left nostril	No	Foreign body entering left nasal cavity through ethmoid and sphenoid sinuses, right superior orbital fissure and cavernous sinus, with distal tip terminating near right atrium with right carotid injury	No	Yes	Coil embolization of right ICA, right frontotemporal craniotomy with transnasal endoscopic removal of pen	Persistent right cranial nerve III, IV, VI, V1 palsy
O'Donoghue et al. (2005)	48y/M	Assault	Pen cap	Loss of consciousness, eye pain and vision loss	Ruptured globe, ruptured optic nerve	Foreign body from medial aspect of left eye, rupturing the optic nerve, penetrating the anterior aspect of the left temporal lobe	No	No	Combined neurosurgical and maxillofacial procedure with foreign body removal	Continued neurologic deficit
Su et al. (2016)	60y/M	Self-inflicted Suicide Attempt	Pen	Left ophthalmoplegia	No	Tubular foreign body located in anteroposterior plane from orbital apex into parasellar region with metal foreign body in left optic canal	No	No	Removal at bedside	Complete left ophthalmoplegia and ptosis, intact vision
Van Everdingen and Mourits (2003)	21y/M	Self-inflicted Suicide Attempt	Pen	Right pain	Medial rectus avulsion	Pen present in right orbit extending medially, hitting pons of brain then right cerebellar peduncle	No	No	Removal via anterior orbitotomy	Persistent extraocular motility defects and no light perception vision in right eye, partial lesion of V1, temporary difficulty in wiring and sports

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11. O'Donoghue et al. 2005.
12. Su et al. 2016.
13. Van Everdingen and Mourits 2003.

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7:34-7:38 am

Secondary Sebaceous Carcinoma in Retinoblastoma Survivors: A Case Series

Kirsten Simmons, Zhenyang Zhao, Hakan Demirci, Christine Nelson, Victor Elner, Vinay Aakalu
Department of Ophthalmology and Visual Sciences, W.K. Kellogg Eye Center, University of Michigan, Ann Arbor, Michigan, United States

Introduction: The aim of this study is to review the clinical presentations, histopathological findings, and management of retinoblastoma (RB) survivors with secondary biopsy-proven sebaceous carcinoma (SC). Prior studies have reported an incidence rate of 2.4 SC cases per million persons within the general population. As one of the largest case studies to date, this study will aid in demonstrating the increased incidence of sebaceous carcinoma in retinoblastoma survivors, particularly in the setting of prior irradiation.

Methods: A retrospective case review was performed at the Kellogg Eye Center of University of Michigan between January 2000 and April 2024. This study included all RB patients with secondary biopsy-proven SC. The study was IRB exempt and complied with all tenets of the Declaration of Helsinki.

Results: We analyzed 3 RB survivors with secondary SC; 1 female and 2 males. All patients had bilateral disease diagnosed within 6 weeks to 1 year from birth. 2 patients had confirmed RB-1 genetic mutations. All patients had a prior history of external beam radiation therapy (EBRT) to the area of subsequent SC development. The mean age of SC diagnosis was 18.2 years old (range, 19-52). One patient was documented to have a masquerading presentation of recurrent chalazion for several years prior to undergoing biopsy which yielded diagnosis of SC. The primary sites of SC lesions were right upper eyelid, left upper eyelid including canthus and superior conjunctival fornix, and left lower eyelid. Of the 2 patients with lesions confined to the eyelid, one was treated with surgical excision and one was treated with surgical excision and cryotherapy. One patient had extensive orbital involvement and underwent exenteration.

Conclusions: Patients with histories of RB and prior radiation to the orbital region warrant close observation for SC which can present much earlier in life. While diagnosing SC can be challenging given masquerading presentations, physicians should carefully examine all lid lesions and have a low threshold to seek histopathologic diagnosis.

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7:38-7:42 am

Umbilical Amniotic Membrane (AM-UC) as a Skin Substitute in Periocular Reconstruction: A Case Series

Jane Spadaro[1], Komalpreet Tur[2], Alon Kahana[1,2]
[1]Kahana Oculoplastic and Orbital Surgery, Livonia, Michigan, United States, [2]Ophthalmology, Corewell Health William Beaumont University Hospital, Royal Oak, Michigan, United States

Introduction: Periorbital soft tissue reconstruction remains a challenge for oculoplastic surgeons due to the susceptibility of tissue contracture and scar formation, which can result in poor functional and aesthetic outcomes. In this case series, we describe the successful use of cryopreserved umbilical cord amniotic membrane (AM-UC) as a wound covering and scaffold for periorbital anterior lamellar defects.

Methods: This is a retrospective case series of 4 patients who underwent periocular reconstruction with AM-UC to reconstruct anterior lamellar soft tissue loss.

Results: Figure 1 provides details of the clinical cases, including surgical technique, post-operative course, and outcomes. Case 1 is a 9 year-old-male who presented with a congenital nevus along the right upper cheek (3 x 2 cm; Fig 2A), which was progressively enlarging in size. Following excision of the lesion (Fig 2B), the area of the skin defect was repaired with both a post-auricular skin graft and AM-UC (Fig 2C). He is noted to be healing well at postoperative month 12, and is pending dermatology evaluation for laser skin resurfacing (Fig 2D). Case 3 is a 25 year-old-female who suffered third-degree burns to 80% of her body and presented to us 3 months following the initial injury with bilateral cicatricial lagophthalmos to all four eyelids, resulting in corneal exposure keratopathy and scarring (Fig 3A). She underwent debridement of the periorbital burn eschar with resultant forehead and eyelid skin defects, which were repaired with AM-UC as a temporizing measure over her inflamed, burned tissue (Fig 3B) prior to definitive skin grafting at postoperative month 5 (Fig 3C). She has significantly improved eyelid position at postoperative month 18 (Fig 3D). Case 4 is a 30 year-old-male who suffered a complex right stellate forehead, lateral canthus, and cheek lesion (Fig 4A), which was repaired with AM-UC for the avulsed forehead and cheek skin at the time of laceration repair (Fig 4B). He is noted to be healing well at postoperative month 10 (Fig 4C-D).

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Conclusions: AM-UC has been successfully utilized in multiple aspects of ocular surface reconstruction, eyelid and forniceal reconstruction, and cicatricial eyelid repair, as well as in combination with full-thickness skin grafting in periorbital trauma and thermal burns.[1–4] Outside of ophthalmology, AM-UC has been successfully utilized in skin transplantation and wound healing.[5–7] Its ability to retain extracellular matrix structure as a scaffold for cell adhesion and growth, provide biological factors (including epidermal growth factor, vascular endothelial growth factor, and fibroblast growth factor) which promote cell proliferation and remodeling, its antibacterial and anti-inflammatory properties, and its biocompatibility make it an ideal skin substitute.[7,8]

In this case series, we demonstrate that AM-UC is an effective tool for full-thickness skin grafting in the periocular area. This may be particularly useful in the acute or subacute period following periorbital thermal burns as a temporizing measure to allow for subcutaneous tissue healing.

Figure 1

Clinical Features and Outcomes

Case no.	Age / Gender	Fitzpatrick Skin Type	Mechanism of Skin Defect	Location	Surgery	Size of skin defect (cm) repaired with AM-UC	Complications / Additional Intervention	Clinical Outcome
1	9 / M	III	Excision of congenital mole	Right upper cheek	Lesion excision and reconstruction with cheek myofascial flap, postauricular skin graft	1.3 x 0.4	None	Pending laser skin resurfacing at 12 months follow-up
2	20 / M	VI	MVA	Left forehead, eyelid, brow, and upper cheek	Exploration and closure of stellate forehead, eyelid, and midface laceration	Forehead 1.0 x 2.0; Upper Eyelid 1.0 x 0.75; Lower eyelid 1.0 x 0.75; Cheek and 1.0 x 2.0	None	Stable at post-operative month 22
3	25 / F	II	Thermal burn	Bilateral upper eyelids, bilateral periorbital/brow area	Debridement of bilateral upper and lower eyelid burn eschar, release of scar contracture, 5-fluorouracil injection to all 4 eyelids, ocular surface and fornix reconstruction with ST-AMG, and temporary tarsorrhaphy	Right eyelid 1.7 x 3.25; Left eyelid 2.5 x 5; Right periorbita 3 x 4; Left periorbita 3 x 5	Bilateral upper and lower eyelid cicatricial retraction repair with excision and release of scar, bilateral full-thickness skin graft placement	Significantly improved eyelid position at post-operative 18, pending consideration of left lower eyelid retraction repair
4	30 / M	II	MVA	Right forehead and cheek	Exploration and closure of stellate forehead, lateral canthus, and cheek laceration	Right forehead, 2 x 1.2; Right cheek 2 x 1.5	None	Pending laser skin resurfacing at 10 months follow-up

MVA, motor vehicle accident
AM-UC, cryopreserved umbilical cord amniotic membrane

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Figure 2

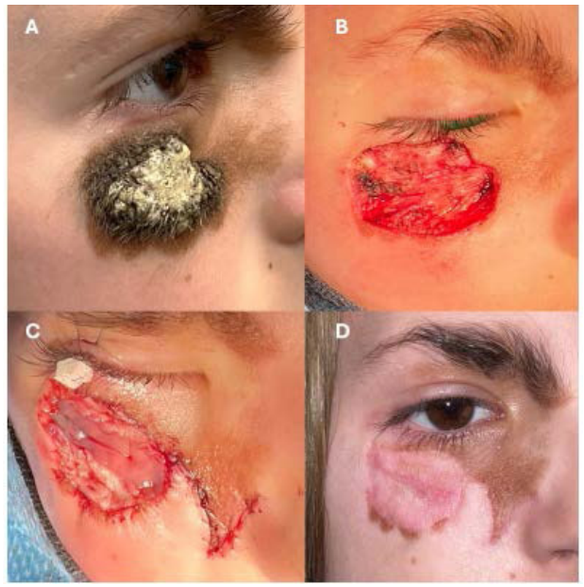


Figure 3

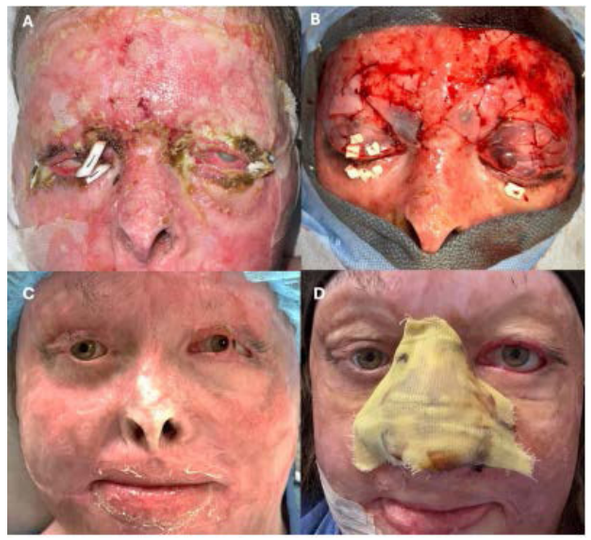
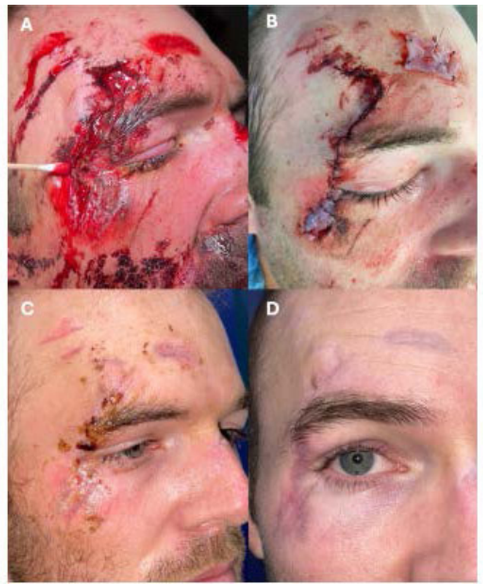


Figure 4



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7:42-7:46 am

Sutureless Conjunctiva-Sparing Mullerectomy: Pearls and Pitfalls from our First 500 Cases

Phillip Tenzel[1], Liane Dallalzadeh[1], Zachary Keenum[2], Ronald Mancini[1]
[1]Ophthalmology, UT Southwestern Medical Center, Dallas, Texas, United States, [2]Sioux Falls, South Dakota, United States

Introduction: Sutureless conjunctiva-sparing mullerectomy (CSM) is a novel approach to a common oculoplastic complaint. Early results have been promising.[1] As with any novel surgical technique, there are critical differences to acknowledge to shorten the learning curve for the surgeon wishing to adopt this new procedure. This collection of "pearls and pitfalls" with procedural photos and videos is presented to aid in this effort.

Methods: Representative photos and videos will be discussed to demonstrate notable differences from traditional ptosis repair surgeries.

Results: CSM is a powerful eyelid lift which has many advantages over both traditional mullerectomy and levator advancement. A narrated surgical video along with select pre- and post-operative photos (Figure 1) will show the differences in technique, assessment, and post-operative care of patients undergoing CSM.

Preoperative evaluation still may include phenylephrine testing, but patients with significant ptosis, decreased levator function (Figure 1a-e), or without a significant phenylephrine response (Figure 1c-e) may still respond well to CSM.

Intraoperatively, the depth of the conjunctival incision is critical, as disinsertion (even segmental) of muller's muscle may lead to variability. Without the support of the conjunctiva, the grasps of muscle should be held closer together as compared with traditional mullerectomy, as it may otherwise sag centrally. Both of these are more important to CSM than traditional mullerectomy as the eyelid contour can be changed with CSM (Figure 1f-h). Bipolar cautery supratarsal centrally is most important, and excessive spread medially should be avoided for risk of medial peaking. Surgery can then be titrated to effect by having the patient open their eyes.

Postoperatively, we have noted edema being less with CSM than traditional sutured ptosis methods, likely due to edema and bruising leaving the eyelid tissues in the early postoperative course via the open conjunctival wound (Figure 1i).

Conclusions: Sutureless conjunctiva-sparing mullerectomy, like any other new surgery, does have a learning curve for surgeons to overcome. However, due to its predictability, speed, and limited side effects, CSM has become the most common approach to ptosis repair in some practices (PT, ZK, RM). Herein we have presented common pearls and pitfalls learned over our first 500+ cases.

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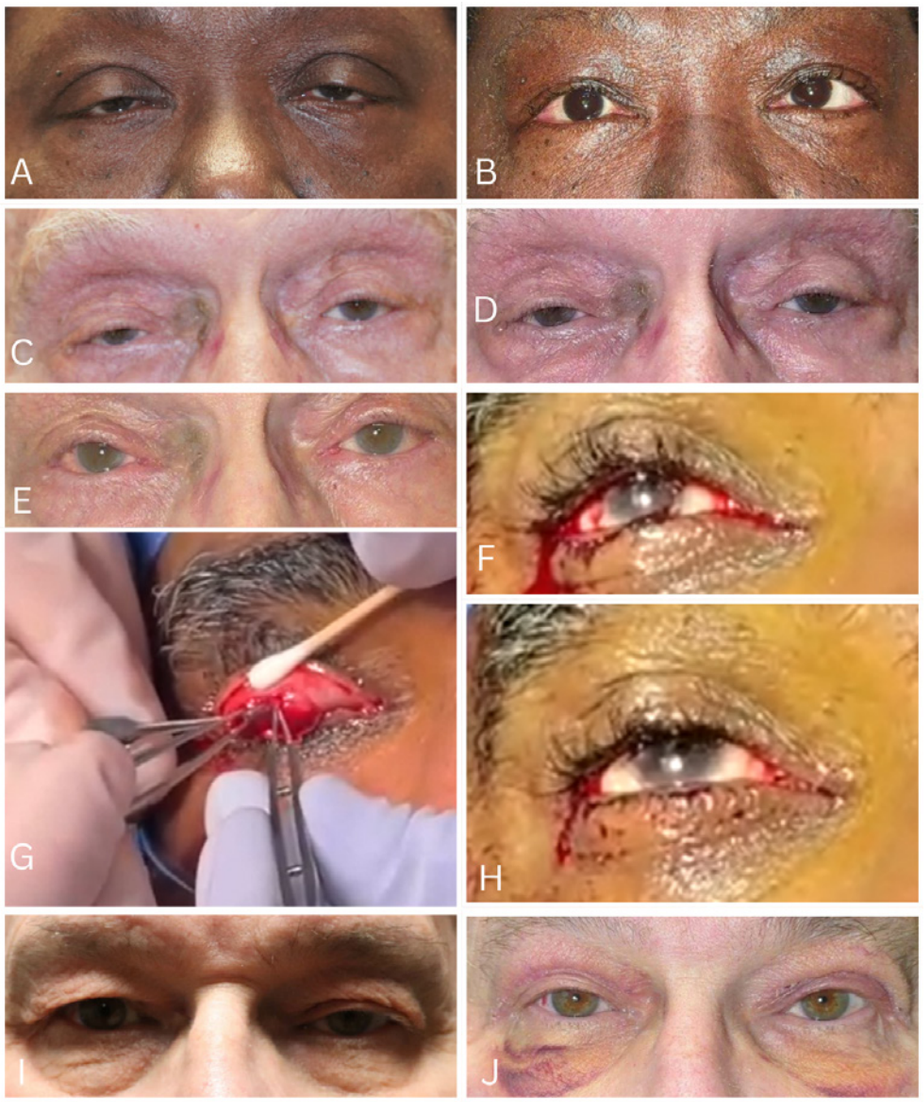
Figure 1



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7:46-7:50 am

A Case of Orbital Compartment Syndrome without Evidence of Retrobulbar Hemorrhage or Venous Sinus Thrombosis

Stephen Winkler[1,2], Fae Kayarian[3], Sammy Khalili[2], Amin Kassam[2], Melanie Fukui[2]
[1]Chicagoland Oculoplastic Consultants, Des Plaines, Illinois, United States, [2]Intent Medical Group, Arlington Heights, Illinois, United States, [3]Chicago, Illinois, United States

Introduction: In this case report, we describe a 42-year-old female with an orbital compartment syndrome (OCS) secondary to meningioma vascular ligation with no evidence of retrobulbar hemorrhage, orbital thrombosis or dural sinus thrombosis to suggest the underlying etiology, representing a rare and unusual presentation of OCS.

Methods: A 42-year-old female with a frontal meningioma underwent bilateral ligation of the anterior and posterior ethmoid arteries along the cribriform plate in preparation for an olfactory groove meningioma resection. A post-operative computed tomography (CT) scan of the brain 4 hours following the procedure demonstrated normal interval surgical changes with no evidence of retrobulbar hemorrhage, venous thrombosis, or orbital injury. Despite these findings, the patient developed right eye proptosis, chemosis and restricted ductions in all directions and pain. Her visual acuity decreased to 20/100 compared to her baseline of 20/40 and she was found to have elevated intraocular pressure (IOP) of 51 mmHg. An emergency cantholysis was completed at the bedside, with IOP of 33 measured 30 minutes following procedure.

Results: A CT venogram and angiogram were completed 24 hours post procedure and found to be negative for thrombosis within the orbit, venous congestion or dural sinus thrombosis. The patient was initiated on maximal eye drop therapy to optimize IOP. She underwent an orbitozygomatic approach to intracranial tumor three days later without complication. No orbital hematoma was present during the orbitotomy portion of the procedure, however the fat prolapsed rapidly through any minor tear within the periosteum. Venous channel engorgement within the orbital bone was also noted at the time of resection. In addition, the right posterior ethmoidal artery significantly enlarged and dilated in comparison to normal at the time of the ligation.

Conclusions: To our knowledge, this is the first case OCS as a result from an intracranial tumor staged surgery. We believe that the staged vascular ligation caused a sudden loss of volume contained within the collateral vasculature leading to abrupt venous stasis and secondary OCS. Orbital compartment syndrome is an ocular emergency that threatens sight and requires emergent care to prevent irreversible damage to the optic nerve due to prolonged ischemia [1, 2]. Any mechanical process that results in an increase in mass effect in the fixed volume of the orbit can cause OCS; most commonly retrobulbar hemorrhage [3].

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Our case represents a rare presentation of OCS. While the patient had imaging negative for retrobulbar hemorrhage and venous sinus thrombosis, her physical exam findings were consistent with OCS, including increased IOP, proptosis and limited extraocular movements. Given the lack of radiologic and surgical evidence, we believe that venous backup secondary to meningioma vascular ligation led to the development of OCS. Ultimately, this case emphasizes the importance of following the conventional interventions for OCS with emergent canthotomy and cantholysis, even when imaging does not suggest evidence for clear etiology.

Figure 1

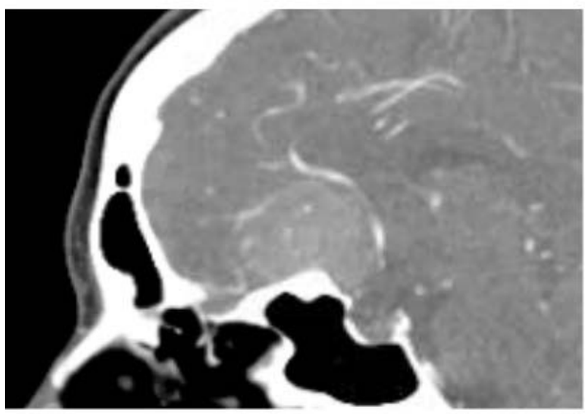


Figure 2

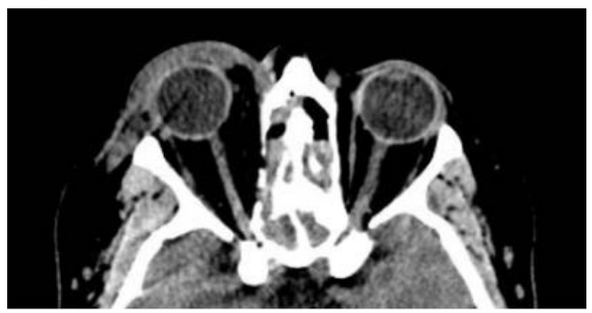
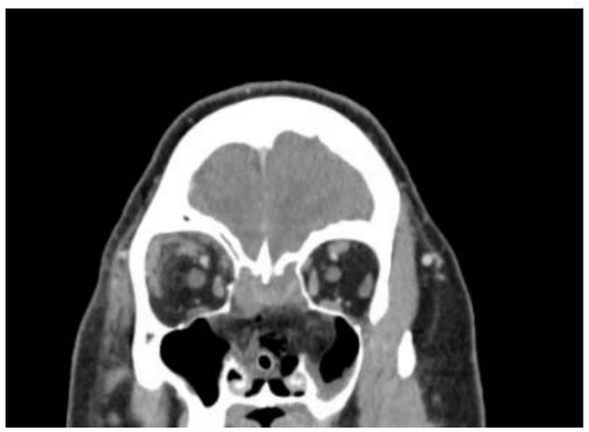


Figure 3



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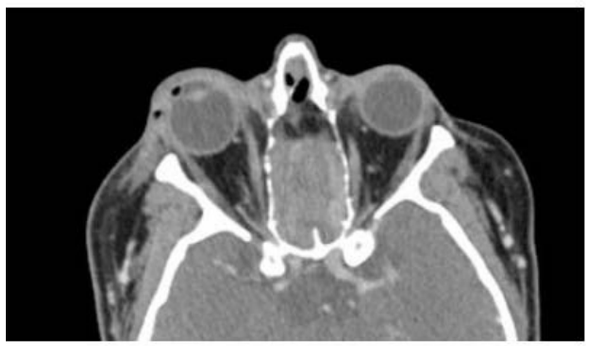

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8:04-8:09 am

Finesse in Forehead Lifting – Asymmetric Release for Asymmetric Ptosis

Sathyadeepak Ramesh, MD[1,2]

[1]The Center for Eye and Facial Plastic Surgery, Somerset, New Jersey, United States, [2]Division of Oculoplastics, Wills Eye Hospital, Philadelphia, Pennsylvania, United States

Introduction: Asymmetric brow position is a challenging aesthetic condition to treat[1]. Various brow lift techniques have been suggested to address brow asymmetry, including endoscopic brow lift[2,3]. While this technique is a mainstay of brow lifting, traditional dogma is that a full deep-plane release of the forehead retaining ligaments is necessary for adequate brow elevation[4,5]. In the author's practice, titrated ligamentous release tailored to the patient's specific asymmetries, as well as asymmetric fixation techniques, can help address brow ptosis and achieve improved symmetry.

Methods: All patients with asymmetric brow position (defined as >2mm asymmetry between the highest point of the brow), who underwent endoscopic forehead lifting with the author from 2022 – 2023 were analyzed. The extent of lateral release, release medial to the supraorbital notch, and unilateral paramedian fixation with bone tunnels were assessed as variables to control asymmetry. Digital photographs pre- and post-operatively were analyzed. Postoperative symmetry (<2mm of asymmetry between the highest point of the brow) and complications were analyzed. No patients had botulinum toxin injection during the study period.

Results: 23 consecutive patients with asymmetric brows were identified. Mean age was 60.3 years (range 30 – 74 years) and all patients were female. Preoperative brow asymmetry was an average of 4.6mm ± 2.0mm. Mean follow-up was 6.2 months (range 3 – 19 months).

Wider release of the lateral brow retaining ligaments to the root of the helix was performed in all patients on the more ptotic side. Dissection medial to the supraorbital notch and into the glabella was performed in 47% of patients on the more ptotic side only. Unilateral fixation on the more ptotic side was performed on 26% of patients. 87% of patients achieved symmetry at a minimum of 3 months after surgery (Figures 1-2).

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No patients reported wound dehiscence, alopecia, wound infection, or permanent sensory or motor nerve deficit. 3 (13%) patients had post-operative asymmetry >2mm (mean 2.5mm) (Figures 3-4), although all 3 of these patients had improved symmetry from their pre-operative position and 2 of these patients had perfectly symmetric brow position at post-operative week 1, suggesting that this might be related to frontalis muscle tone and could potentially be improved with botulinum toxin. 2 patients (8%) reported prolonged frontalis muscle paresis ipsilateral to the more ptotic side, resolving an average of 8 months after surgery. 1 patient (4%) reported prolonged sensory deficit ipsilateral to the more ptotic side, resolving 12 months after surgery.

Conclusions: Asymmetric release of the deep-plane forehead retaining ligaments should be performed for patients with pre-operative asymmetric brow position. Additional techniques to adjust brow position include limiting dissection medial to the supraorbital notch for the less ptotic side, as well as unilateral brow fixation on the more ptotic side.

Figure 1. Representative pre- and post-operative month 15 photos of a woman who underwent bilateral endoscopic brow lifting with unilateral (left) fixation and left glabellar release.

Figure 2. Representative pre- and post-operative month 4 photos of a woman who underwent bilateral endoscopic brow lifting with unilateral (right) fixation and left glabellar release.

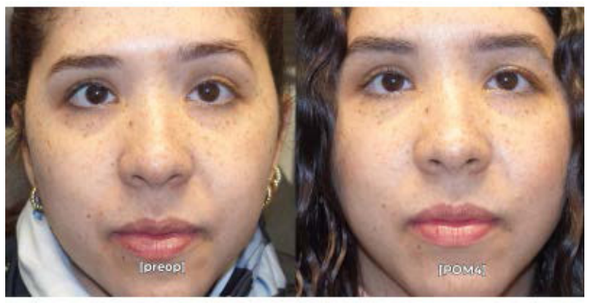

Figure 3. Representative pre- and post-operative month 3 photos of a woman who underwent bilateral endoscopic brow lifting with left > right asymmetric release, symmetric result at POW1, and residual asymmetry at POM3.

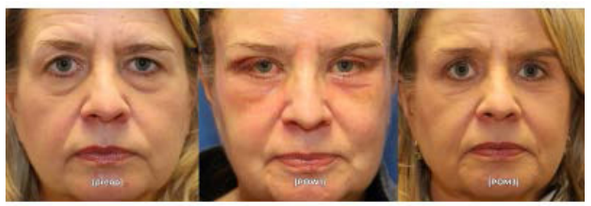

Figure 4. Representative pre- and post-operative month 3 photos of a woman who underwent bilateral endoscopic brow lifting with right > left asymmetric release, symmetric result at POW1, and residual asymmetry at POM3.

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8:09-8:14 am

Risk of Blindness in Temple Filler Injections: Exploring Vascular Anastomosis from the Deep Temporal Arteries to the Ophthalmic Artery

Nishita Sheth[1,2], Erik Hauck[3], Joseph Bibawy[3], Irene Lee[2], Christopher Dermarkarian[2], David Saadat[4], Julie Woodward[2]
[1]University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, North Carolina, United States, [2]Ophthalmology, Duke Eye Center, Durham, North Carolina, United States, [3]Neurosurgery, Duke University Medical Center, Durham, North Carolina, United States, [4]Beverly Hills Aesthetic Surgical Institute, Beverly Hills, California, United States

Introduction: Soft-tissue filler injections, particularly hyaluronic acid, has gained popularity for restoring volume in areas such as the temples.[1,2] Recently, one company received approval for the FDA indication to inject hyaluronic acid for temple revolumization, with another company seeking approval.[3] Although uncommon, this area poses risks, including vision loss from embolic occlusion.[1,2] Various guidelines have been proposed to mitigate risks, with injection into the supraperiosteal plane often considered safest.[4–7] This plane lies below the deep temporal fascia extending to the temporal bone.[5,8] However, the presence of deep temporal arteries (DTA) within this plane raises concerns for vascular occlusion.[4,6] This study investigates potential pathways from the DTA to the ophthalmic artery (OA) and proposes mechanisms of filler travel in this moderate-risk area.[2]

Methods: We conducted a retrospective analysis of carotid angiograms from patients with marked carotid artery stenosis or vascular malformations. Our proposed collaterals are considered to become more prominent and thus visible on neuroimaging in the presence of vascular blockages, despite being present in normal circumstances.[9] Select cases were identified and reviewed by the neurosurgery team until four were selected that displayed our proposed anastomosis.

Results: Four routes of anastomosis between the DTA and OA were identified. All pathways display a combination of anterograde and retrograde flow. Case 1 shows direct anastomosis of the DTA with the lacrimal artery which branches from the OA[10] (Figure 1). For cases 2-4, the DTA is shown originating from the internal maxillary artery (IMAX) following its anatomical course.[6] Retrograde flow from the DTA into the IMAX can then lead to anterograde flow into branches connecting to the IMAX including the superficial temporal artery (STA), infra-orbital artery, and middle meningeal artery (MMA).[11–13] We show these arteries can then form collaterals with the OA. Case 2 shows the frontal branch of STA anastomosis with the supraorbital artery which originates from the OA[10] (Figure 2). Case 3 shows infra-orbital artery anastomosis with the OA (Figure 3). Case 4 shows MMA anastomosis with the OA (Figure 4). The table summarizes the direction of flow with asterisks indicating the anastomosis. In the Figures, the black star represents the location of anastomosis, and the white circle represents the general globe location.

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	Route
1	**DTA** *-(anterograde)->* **Lacrimal Artery** -(retrograde)-> **OA**
2	**DTA** -(retrograde)-> **IMAX** -(anterograde)-> **STA** -(anterograde)-> **Frontal branch STA** *-(anterograde)->* **Supraorbital** -(retrograde)-> **OA**
3	**DTA** -(retrograde)-> **IMAX** -(anterograde)-> **Infra-orbital artery** *-(retrograde)->* **OA**
4	**DTA** -(retrograde)-> **IMAX** -(anterograde)-> **MMA** *-(retrograde)->* **OA**

Conclusions: Our study is the first to elucidate four potential routes for filler-induced OA occlusion originating from DTAs in the supraperiosteal plane.[4,6] These pathways involve retrograde flow, a mechanism previously suggested for filler-induced occlusion.[14,15] There are minimal reports of these collaterals present in the literature, particularly in the context of dermal filler.[9,12,16–18] Notably, the likelihood of these pathways being traversed may be low due to their length and amount of filler volume required; however, it is not impossible. Therefore, practitioners should maintain awareness of these anastomosis, combined with anatomical knowledge and technical expertise, to maintain safe injection practices during temple revolumization.

Figure 1

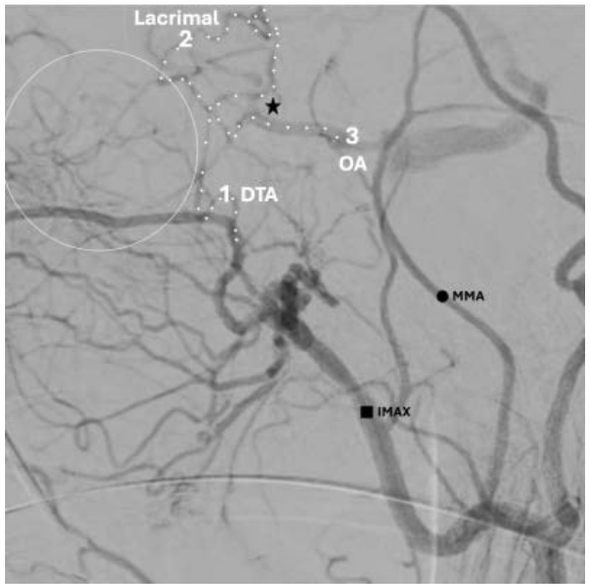


Figure 2

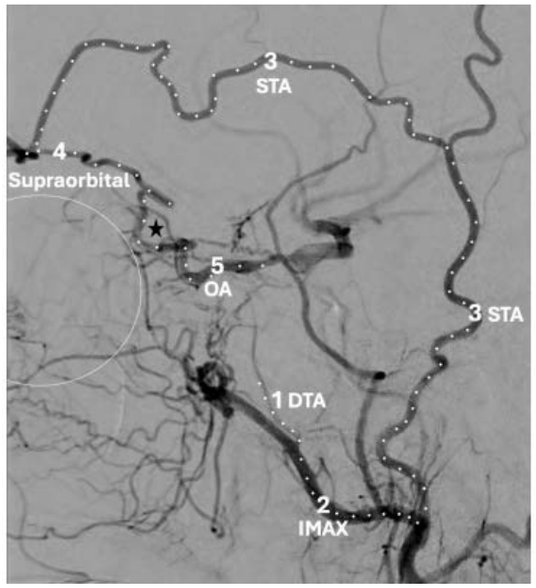


Figure 3

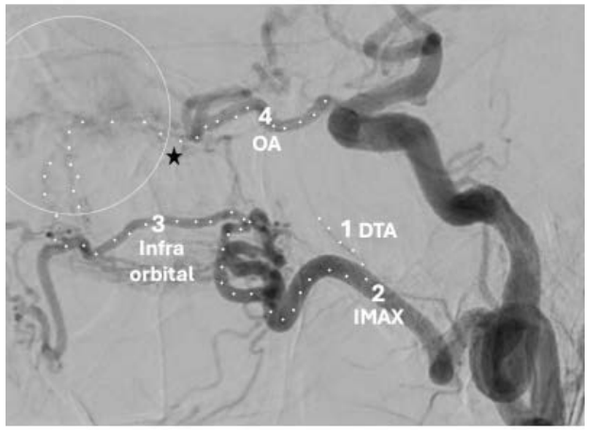
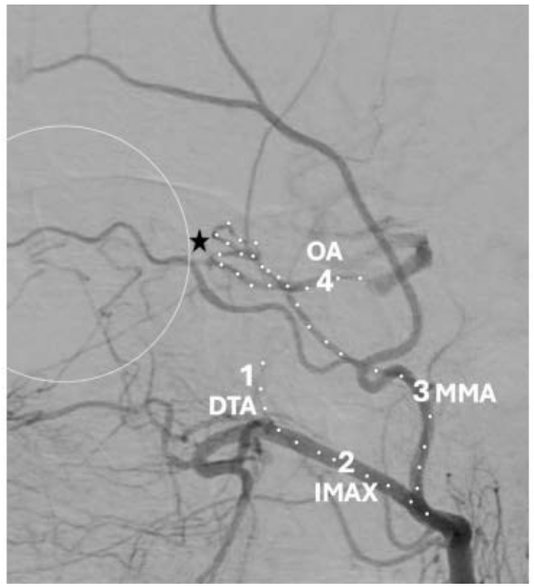


Figure 4



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8:14-8:19 am

Micropigmentation for Facial and Periocular Surgical Scar Camouflage

Karen Brown[1], Erica Miles[2], Makayla McCoskey[1], Tanuj Nakra[1,3]
[1]TOC Eye and Face, Austin, Texas, United States, [2]Erica Miles Beauty, Austin, Texas, United States, [3]Department of Ophthalmology, Dell Medical School, The University of Texas at Austin, Austin, Texas, United States

Introduction: Medical tattooing, or micropigmentation, has been used for camouflage for skin conditions such as vitiligo[1,2] and alopecia.[3-6] Micropigmentation can augment the results of reconstructive surgery, perhaps most notably with recreation of the nipple areolar complex after breast reconstruction.[7-14] Facial incisions that undergo routine healing can still be aesthetically prominent due to pigmentation changes even with topical and intralesional anti-inflammatory post-surgical intervention. The role of micropigmentation for optimization of scars has been described for scars resulting from trauma, as well as for scalp and body aesthetic surgery, such as post-abdominoplasty. Micropigmentation can provide a minimally invasive and effective option to camouflage healed postoperative scars and improve aesthetic outcomes. Here we present the first case series of medical grade micropigmentation for facial and periocular scars in the postsurgical setting.

Methods: Patients with well-healed (greater than 6 months postoperative) facial and periocular surgical scars with hypopigmentation or pigmentation change from surrounding skin were referred to a local permanent makeup artist with experience in micropigmentation for scar camouflage. Patients with hypertrophic or keloid scars were excluded. Patients with scars that had not undergone complete healing were also excluded. Patient also met the following criteria: no current sunburn or skin breakdown, no recent (within 4-6 weeks) retinol, laser or chemical skin treatments. Results were graded by survey of both patients and blinded observers reviewing pre- and post-treatment digital photography. Patients were surveyed regarding their perception of their surgical scar prior to and subsequent to treatment with micropigmentation. Patient demographic information and postoperative complications were also reviewed.

All patients underwent evaluation and treatment by a single permanent makeup artist certified in micropigmentation (EM). The skin was prepped with alcohol. A color sample appropriate to the patient's natural skin pigment is tested on the skin and adjustments are made as needed. A #5 Round Shader needle was used for the initial session to provide a base color matching adjacent skin pigment. Pointillism technique can be used to match freckling or irregular pigment. Aquaphor is applied to the area for one week. Touch up micropigmentation was performed approximately 6 weeks after the initial treatment as needed to adjust the color. Patients were advised that pigmentation will fade over the years, expedited by sun exposure or exfoliation, and that touch up micropigmentation may be necessary to maintain results.

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Results: A total of 22 patients underwent micropigmentation of hypopigmented scars of the periocular region or face. Surgical procedures leading to scarring included pretrichial brow lift (2 patients, Figure 1), lower facelift (16 patients) with preauricular (Figure 2), postauricular incisions, and temporal hairline incisions (Figure 3), Mohs micrographic surgery (3 patients), and CO2 laser (1 patient). One patient The Fitzpatrick skin type ranged from I-III. The number of treatment sessions ranged from 1 to 6, with an average of 2.1 sessions to achieve the desired result. Thicker scar and greater scar length correlated with the need for a greater number of treatment. Higher number of treatments was associated with Average length of follow-up was 3.3 months. All patients noted improvement in their perception of the treated scar(s) and high satisfaction with the appearance of their scar(s) after treatment. Patients noted improvement in quality of life, citing examples such as feeling comfortable styling hair up away from the face, when previously using hair to cover conspicuous scars. Blinded reviewers also noted improvement in scar appearance in all 22 cases. There was no incidence of infection, contact dermatitis or adverse reaction to the materials used.

Conclusions: Micropigmentation is a minimally invasive, safe and effective option for aesthetic improvement of appropriately selected patients with well-healed postoperative scars for facial and periorbital oculoplastic surgery. Successful treatment of the scar hypopigmentation can result in a more inconspicuous scar and an improved quality of life for the patient.

Figure 1

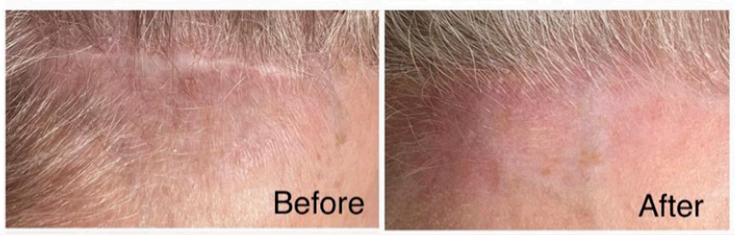

Figure 1. Pretrichial brow lift scar prior to micropigmentation (left) and 6 weeks after micropigmentation (right) for scar camouflage.

Figure 2

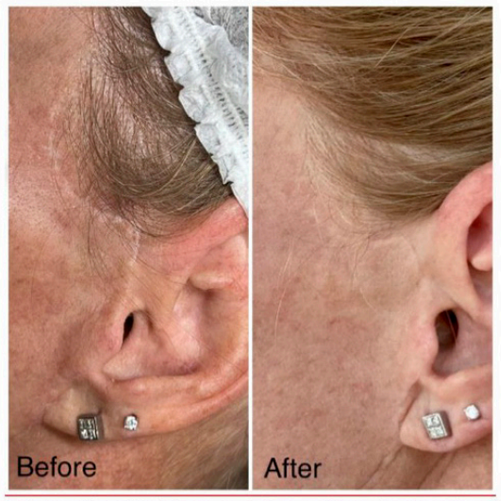

Figure 2. Preauricular scar from facelift surgery before and 6 weeks after micropigmentation for scar camouflage.

Figure 3

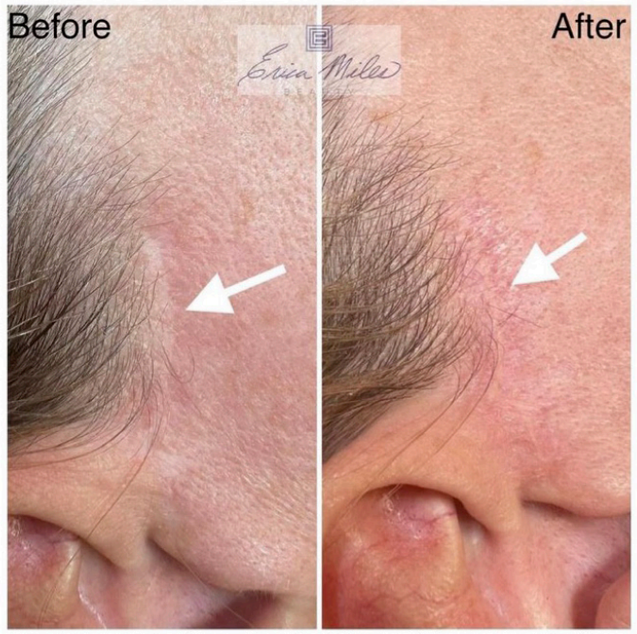

Figure 3. Temporal hairline scar from facelift surgery before and 6 weeks after micropigmentation for scar camouflage.

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8:19-8:24 am

Comparison of the Longevity of Micro-Fat Graft in Conjunction with Each of the Products of SVF, ADSC and Nano-Fat in Nude Mice Model

Farzad Pakdel[1,2], Saeed Heidari Keshel[3], Marjan Omidi[3], Faeze Salahshoor[4], Zohre Nozarian[5], Amireza Mafi[6], Abbas Mohamadi[6], Samad Mohamadnezhad[7]
[1]Farabi Hospital, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic Of, [2]Cranio-Maxilofacial Research center, Tehran University of Medical Sciences, Tehran, Iran, [3]Tehran, Iran, Islamic Republic Of, [4]Radiology, IKHC, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic Of, [5]Pathology, Farabi Hospital, Tehran, Iran, Islamic Republic Of, [6]Ophthalmology, farabi Hospital, Faculty of Medicine, Tehran, Iran, Islamic Republic Of, [7]Cancer Research Centre, Cancer Institute, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic Of

Introduction: Micro-fat graft has growing applications in aesthetic and reconstructive fields. One of main concerns has been uncertain longevity after being grafted. On strategy to tackle this issue is to add biologic enhancers including stromal vascular fraction (SVF), and adipose derived stem cells (ADSC) . In addition, recently it has been found that ultra-purified adipose tissue extract contain ADSCs and growth factors that can potentially support the grafted adipocytes. We made a head to head comparative study to investigate the durability and survival of injected micro-fat tissue in nude mice model in the conditions of fat composition with each of SVF, nano-fat and ADSC products.

Methods: In this study, 16 adult nude mice were included. They were divided in four groups. In all groups micro-fat was injected under scalp skin. Nano-fat, SVF and ADSC were processed, mixed and injected along with micro-fat in 3 different groups. The fourth control group received only micro-fat injection without add-on product. In the time intervals of 1, 3, 8 and 12 weeks, the volume and durability of fat tissue was checked by MRI. At the end of 12 weeks, the persistence of fat tissue assessed for histologic characteristic including inflammation, fibrosis and viability of adipose tissue.

Results: In the 12th week, the amount of adipose tissue permanence was significantly higher in the nano-fat group than in the other groups, and in the next order, it was the SVF group. In all the intervention groups, the volume of adipose tissue examined by MRI decreased significantly with the passage of time, but in the nano-fat group, the persistence of adipose tissue was higher (8.59mm2 in the nano-fat group, compared to 4.01 in the control group, p= 0.043).(Fig 1) Among all the intervention groups, the tissue weight combined with nano-fat was significantly higher (0.45g in the nano-fat group and 0.32g in the control group). (Table 1) Also, the volume of combination with SVF was in the next ranks. Adipose tissue necrosis and lipogranulomatosis have not been seen in any of the adipose tissue samples combined with nano-fat.
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Conclusions: Nano-fat compared to SVF and ADSC can improve micro-fat graft persistence and survival of adipocytes. Application of nano-fat may provide a potentially viable clinical approach for to enhance predictability and durability of adipose tissue graft for aesthetic and reconstructive purposes.

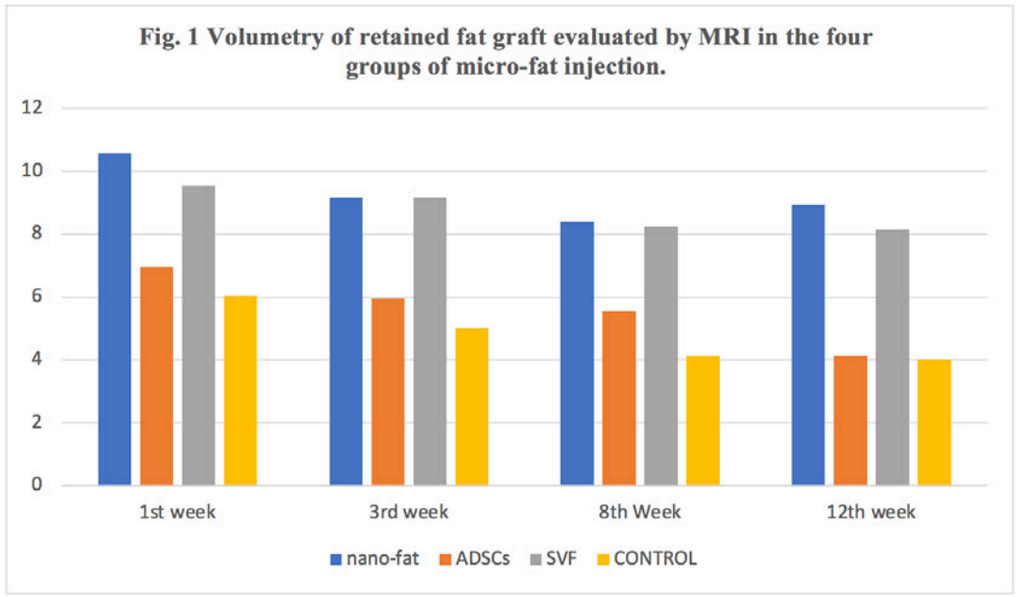

Table 1. Volume of fat tissue in the four groups in time intervals after micro-fat graft.

Sample volume(mm^2)	One week	3 week	8 week	12 week	P value
Nano-fat	10.58	9.16	8.41	8.95	*0.025*
ADSCs	6.96	5.96	5.56	4.13	*0.041*
SVF	9.54	9.16	8.25	8.14	*0.044*
Control	6.05	5.02	4.13	4.01	*0.034*

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8:24-8:29 am

Diagnosis and Treatment of Filler Orbital Syndrome

Jocelyne Kohn[1,2]
[1]Clínica Thea, Santiago, Chile, [2]Oculoplastics, Universidad de Valparaíso, Valparaíso, Chile

Introduction: With the upgrowing number of periocular hyaluronic acid filler (AH) procedures, complication rates has increased. The management usually includes hyaluronidase reversal, although when inadvertent injection inside the orbit might represent a true diagnostic and therapeutic challenge. High degree of suspicion is required and the use of high-resolution ultrasound (HRU) in the clinical setting is a valuable tool.

Methods: Case series of 8 patients presenting with retrobulbar pain, eyelid swelling, recurrent inflammatory nodules and evidence of AH within the orbit using HRU. Ultrasound guided intralesional hyaluronidase injection of 50 -150 units was performed from a transconjunctival approach with a 30G needle, while using a modified malleable valve to isolate the target. Then under direct visualization the HRU probe was used against the metallic valve to intensely massage the filler and achieve complete dissolution. Clinical and HRU imaging follow-up 2 to12 weeks after.

Results: Patients referred clinical onset after viral infection (n=2), second application of periocular filler (n=3) and bioestimulators (n=3). Symptoms typically worsen in the morning, specific foods, stress, traveling by plane and ocular and rino-sinusal allergies. In 7 cases patients recall the use of canula for injection. 5 had undergone at least 1 previous attempt of unsuccessful hyaluronidase injection (range 0-9) and only 3 patients had a palpable orbital mass. Other findings included: Lacrimal gland enlargement, dry eye, ptosis, eyelid retraction, conjunctival injection, tyndall and malar mount. HRU confirmed the nature and location of the filler in all cases, 5 inside the fat pads and 3 within the septum. 4 patients also had AH in intimate relation to septal transfixiating vessels. Edema and overall vascular congestion were also observed.

The application of hyaluronidase was successful in all cases, with significant reduction of the filler volume. 3 patients had residual AH at HRU follow-up but had complete resolution of the orbital symptoms. 2 patients where not aesthetically satisfied and required surgery for complete rehabilitation.

Upper eyelid puffiness, lacrimal gland enlargement and dry eye also improved significantly after treatment.

Conclusions: Accidental infraorbital injection of AH may be more common than described, most probably most cases are asymptomatic, and the otherwise mild, vague and chronic symptoms can be easily underestimated and not recognized. Trigger

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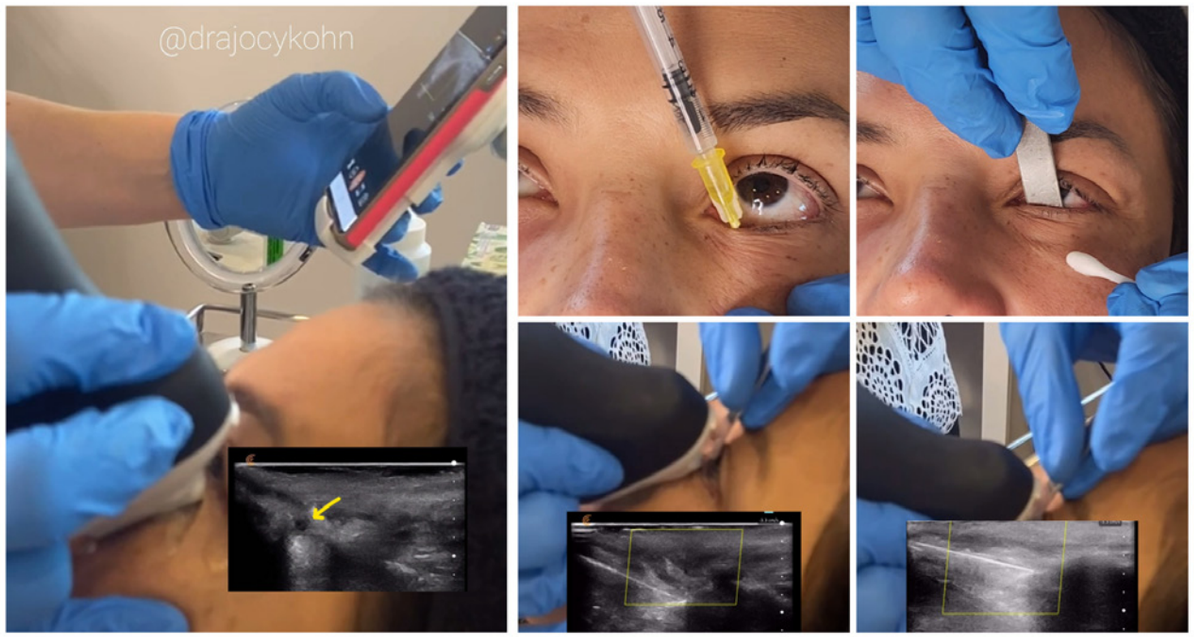
inflammatory events may make of the orbital fat a susceptible target for local immunological response in patients with autoimmune predisposition, making this a novel presentation of ASIA.

HRU is key in the diagnosis, especially when used by the oculoplastic surgeon to analyze the dynamics of the eyelid and identify the movement of the septum and define the intraorbital space.

Imaging confirmation of effective hyaluronidase injection is important, but even more is that it allows for proper manipulation and massage within the orbit. A two-hand manipulation that can easily be observed with HRU thanks to the help of this simple metallic instrument specially designed to pursue an optimal endpoint. Therefore, it is an efficient, safer, and reproducible technique.

Figure 1



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8:29-8:34 am

Customized Endoscopic Male Forehead/Eyebrow Lift

Mohsen Kashkouli, Christopher Compton, Jeremy Clark
Department of Ophthalmology and Visual Sciences, University of Louisville School of Medicine, Louisville, Louisville, Kentucky, United States

Introduction: While trans-blepharoplasty and direct eyebrow lift (DEL) are only changing the eyebrow position, forehead/eyebrow lift (FEL) procedures change both the eyebrow and forehead position. FEL techniques consist of conventional endoscopic; modified retrotrichial, pretrichial, and midforehead endoscopic; and open (pretrichial/trichophytic, transcoronal, temporal) technique. Higher hairline, thicker/heavier skin, and stronger eyebrow depressor muscles make the male FEL challenging. The aim is to demonstrate (Films and photos) senior author's 20-year experience with customized endoscopic FEL techniques in male subjects.

Methods: This is a chart review and surgical technique demonstration on consecutive male subjects who underwent customized endoscopic FEL techniques between 2007 and 2022. Subjects with prior trauma or surgery and facial nerve palsy were excluded. The customized technique was selected based upon the presence and severity of high hairline, thick/heavy forehead skin, forehead wrinkles, and subjects' perspective on the magnitude of the lift effect and skin incisions (Fig. 1). Central forehead and medial eyebrows were lifted by endoscopic release of the depressor muscles (Film) through either posterior hairline vertical skin incision (Fig.2-A), pretrichial skin excision (Fig.2-B), or mid-forehead skin excision (Fig.2-C). Lateral forehead and eyebrows were lifted by endoscopic release of the conjoint tendon and orbital retaining ligaments (Film) through either paramedian vertical skin incisions (Fig.3-A) or pretrichial skin excision (Fig.3-B). Lateral DEL (Fig.3-C) could also be performed to increase the lift effect. Temporal lift was performed by skin flap excision 1-3cm behind the temporal hair line (Fig.4) and endoscopic release of the lateral orbital rim periosteum and lateral canthal raphe (film).

Results: There were 107 male subjects with FEL procedures from whom 44.8% (48/107) had conventional endoscopic, 35.5% (38/107) open pretrichial, and 19.6% (21/107) customized endoscopic FEL procedure (Fig.5).

Conclusions: A customized endoscopic FEL technique is required in almost 20% of male subjects requesting a FEL procedure (Figure 1).

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Figure 1

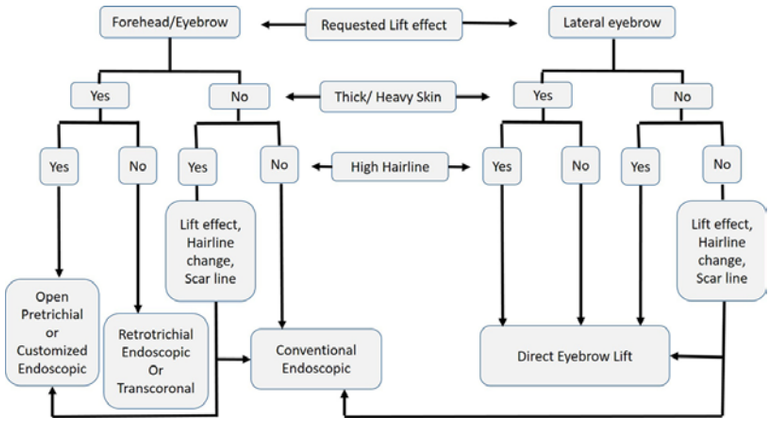


Figure 2

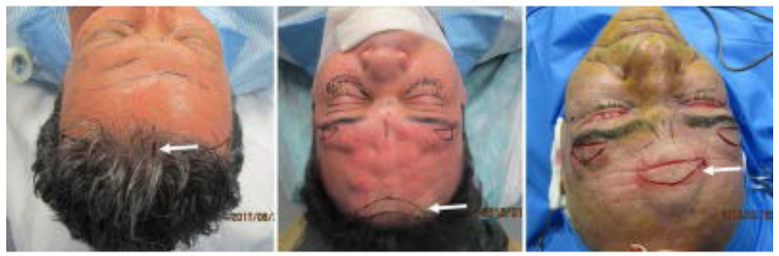
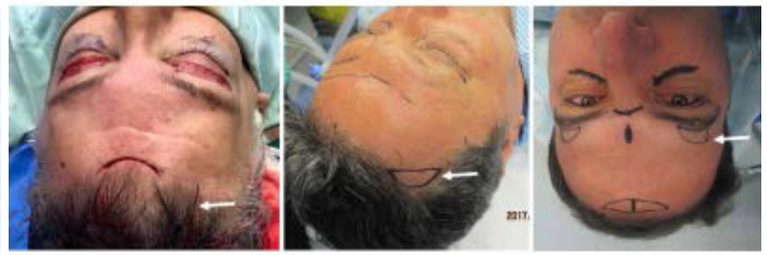


Figure 3



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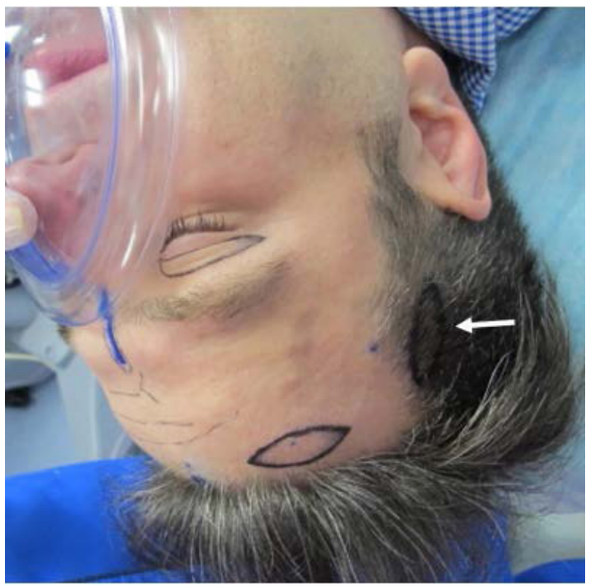

Figure 5

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8:47-8:53 am

Long-Term Effects of Orbital Lacrimal Gland Resection for Canalicular Obstruction and Functional Epiphora

Masashi Mimura[1,2], Yasushi Fujita[3], Yohei Sato[3]
[1]Ophthalmology, Hyogo Medical University, Nishinomiya, Japan, [2]Ophthalmology, Toho University Sakura Hospital, Sakura, Japan, [3]Ophthalmology, Oculofacial Clinic Osaka, Osaka, Japan

Introduction: The optimal treatment for proximal lacrimal apparatus obstruction, such as canalicular obstruction or functional epiphora, remains controversial. Palpebral lacrimal gland removal via the trans-conjunctival approach was reported for this pathophysiology in the 1960s to 1980s[1–3]; however, this treatment approach is not widely adopted due to the occurrence of complicating dry eye post-surgery, ranging from 2% to 14%, attributed to the destruction of lacrimal gland ductules. Therefore, we advocate for orbital lacrimal gland excision limited to the orbital lobe, via trans-cutaneous approach preserving lacrimal gland ductules, in these pathophysiologies and report its long-term effects.

Methods: We retrospectively studied seven subjects, comprising five cases of severe upper and lower canalicular obstruction, one case of combined lower lacrimal canal obstruction and functional epiphora due to Duane syndrome, and one case of functional epiphora due to gustolacrimal reflex (crocodile tear syndrome), who failed lacrimal intubation. Surgery was conducted under general anesthesia in all cases, with excision limited to the orbital lobe of the lacrimal gland via trans-crease approach. (Fig1) Surgical effects were evaluated using the Schirmer test and Munk scale before and after surgery. In cases of insufficient postoperative effects, excision of the palpebral lobe of the lacrimal gland was additionally performed.

Results: The mean age was 58.3 (SD: 19.5) years, with a male-to-female ratio of 5:2 and a right-to-left ratio of 3:4. The mean follow-up period was 35 months (range, 2-84 months), with only one case requiring additional excision of the lacrimal gland eyelid part due to recurrence one year postoperatively. The mean preoperative Schirmer value decreased by 50.4% from 25.0 (SD: 8.0) mm preoperatively to 12.4 (5.0) mm postoperatively. (Fig 2) The mean Munk scale improved from 4.6 (0.8) preoperatively to 0.6 (0.5) postoperatively. (Fig3) No cases of postoperative dry eye or other functional impairments were observed.

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Conclusions: Orbital lacrimal gland excision surgery may represent a useful approach in cases of epiphora where lacrimal duct therapy proves ineffective.

Figure 1

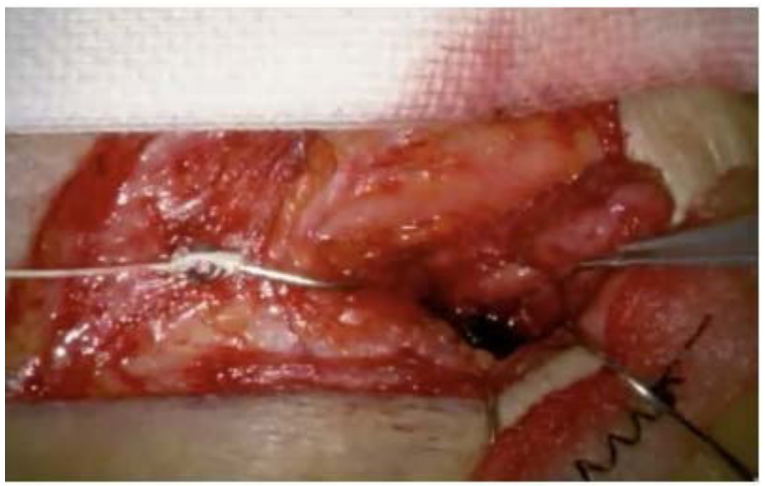

Figure 2

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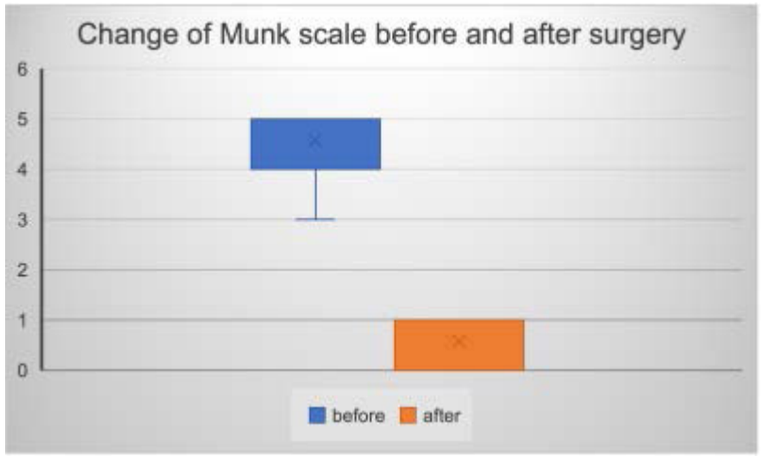

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8:53-8:59 am

Bilateral Corneal Neurotization using the Greater Auricular and Posterior Auricular Nerves

Sasha Hubschman[1], Paula Herbst[1], Kevin Heinze[1], Maria Cortina[1], Lee Alkureishi[2], Ann Tran[1]
[1]Department of Ophthalmology, University of Illinois Eye and Ear Infirmary, Chicago, Illinois, United States, [2]Division of Plastic, Reconstructive and Cosmetic Surgery, University of Illinois College of Medicine, Chicago, Illinois, United States

Introduction: Corneal neurotization (CN) is performed to restore sensation and integrity to neurotrophic corneas. The greater auricular nerve (GAN) has been described as a possible donor, either as a sensory source or as the graft itself.[1,2] Rarely has it been reported for bilateral CN.[3,4] There is no report of the posterior auricular nerve (PAN) being used as a donor source.

Methods: In this case report, the authors describe a patient with bilateral neurotrophic corneas due to trigeminal nerve injury successfully treated with an indirect bilateral CN procedure, performed simultaneously using the GAN and PAN as the donor nerves and an autologous sural nerve graft as the conduit.

Results: An 83-year-old man with a history of bilateral trigeminal nerve decompressions presented with bilateral neurotrophic corneas and corneal melt. The visual acuity was light-perception in the right eye and counting-fingers in the left eye. Cochet-Bonnet esthesiometry (CBE) revealed completely absent sensation of bilateral corneas. He had absent facial sensation bilaterally in trigeminal nerve (CN V) 1 and 2 distributions, and significantly decreased in the CN V3 distribution. Nerve conduction studies confirmed normal GAN and sural nerves function bilaterally.

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CN was performed in a joint procedure between ophthalmology and plastic surgery. Harvesting of the bilateral sural nerve grafts was performed ensuring a nerve segment of at least 30cm. To expose the GAN, a modified blair incision was utilized bilaterally. Once dissected free, each GAN was ligated at its most distal point and transected. The ligated distal end was then sutured into the underlying muscle to prevent subsequent neuroma formation. The right GAN was noted to be smaller than the left, therefore the right PAN was identified and transected in a similar fashion. Next, tunnels were developed between the inferior fornix of both lower eyelids and the neck at the level of the GAN in the suborbicularis and subcutaneous planes. The sural nerve grafts were passed through the tunnel and the perineurium were anastomosed to the GAN using 10-0 nylon suture and thrombin adhesive (Figure 1A). On the right side, anastomosis was also performed between the sural nerve graft and the PAN (Figure 1B). An inferior peritomy was then performed bilaterally and the grafts passed from the inferior fornix to the limbus in the subconjunctival plane. The nerve fascicles were then divided into three separate branches and secured into position at the limbus using fibrin tissue adhesive. The conjunctival peritomy was closed using polyglactin sutures and a bandage contact lens was placed. A permanent lateral tarsorrhaphy was performed bilaterally to provide additional ocular surface coverage. At five months follow up, the corneal surface was stable and sensation with CBE was 0.5cm bilaterally, however this was measured 1 hour after instillation of proparacaine.

Conclusions: The authors present a unique case of bilateral indirect CN in which the GAN and PAN were successfully used as the donor sensory sources. This case reports the ability to utilize two donor cutaneous nerves, in situations where a robust sensory nerve may not be identified.

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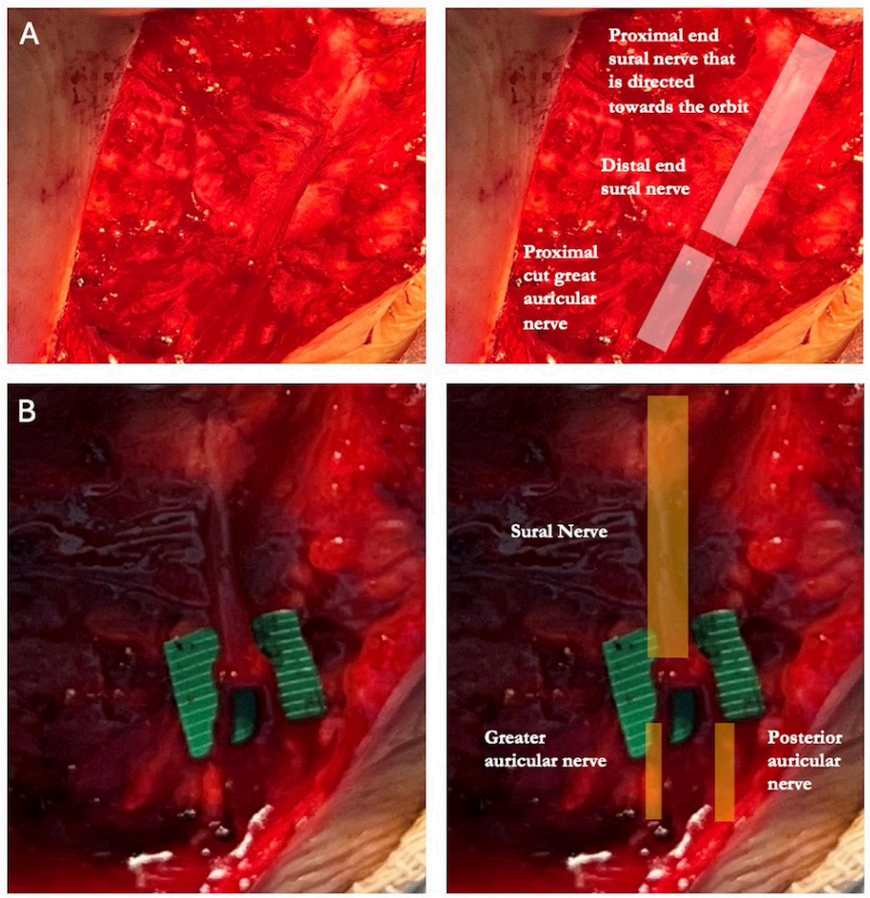

Figure 1: (A) Left neck dissection, sural nerve tunneled to anastomose with GAN. (B) Right neck dissection, sural nerve tunneled to anastomose with two cutaneous nerves (GAN and PAN).

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8:59-9:05 am

A Novel Technique for Removal of 'Hard-to-Find' Metallic Foreign Bodies in the Posterior Orbit

Vladimir Kratky[1,2], Farnaz Javadian[1]
[1]Ophthalmology, Queens University, Kingston, Ontario, Canada, [2]Ophthalmology, Charles University, Prague, Czech Republic

Introduction: Intra-orbital foreign bodies from penetrating injuries can be challenging to detect and remove in the operative setting. We report a case of a 59-year-old female who had presented with a double penetrating ocular injury from an electric weed trimmer and a retained 8 mm metallic foreign body in the posterior orbit. To expedite localization and removal, we employed the probe that can trace magnetic liquid, developed for breast cancer operations in general surgery. To our knowledge, this is the first case of an ophthalmology application using this technology to localize and remove a metallic intra-orbital foreign body.

Methods: Presentation of a single case study of a traumatic orbital injury and review of literature.

Results: A 59-year-old female presented to our emergency department with a left globe rupture, secondary to a broken metal blade from an electric weed trimmer. Imaging confirmed a double perforation of the globe, by an 8 mm metallic missile foreign body which came to rest in the posterior retrobulbar space. The globe was urgently repaired, but the vision remained poor at light perception and the patient continued experiencing pain in the eye. Both the cornea and retina services deemed the status of the globe beyond further surgical repair with no expected visual improvement. The patient preferred to proceed with enucleation and was referred to our oculoplastics service. In the operating room, the eye was successfully enucleated, and careful palpation of the orbital cavity was done to locate the foreign body. Unfortunately, this was difficult, as multiple small nodular lesions were removed but turned out to be fibrous tissue. The SentiMag© probe was then employed, and it immediately picked up a magnetic signal in the posterior superior orbit, leading to successful removal of the metal fragment. A standard orbital implant was then inserted, and the enucleation was completed in the usual fashion.

Conclusions: To our knowledge, this is the first case describing successful removal of an intra-orbital metallic foreign body, using the SentiMag© magnetic probe. It appears that this device, used primarily in breast cancer surgery, can also be helpful in orbital surgery for retained metallic objects and represents another useful tool available for the orbital surgeon.

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Figure 1

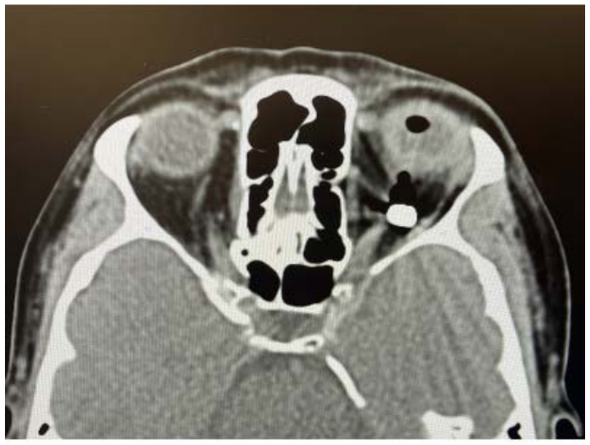

Figure 2

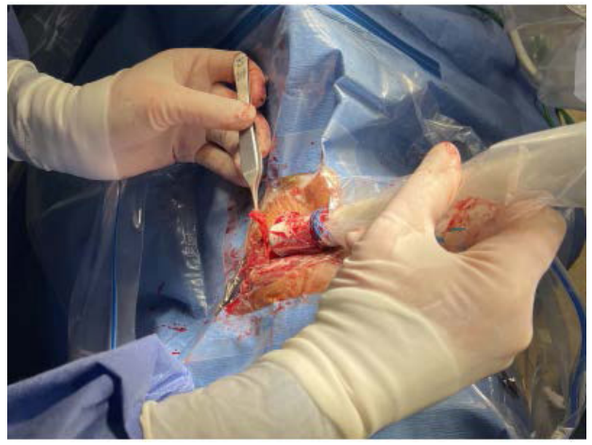

Figure 3

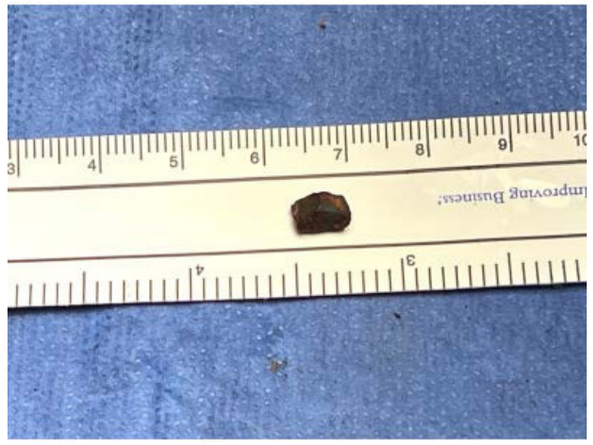

Figure 4

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9:05-9:11 am

Medial Canthal Eccrine Poroma with Invasion of the Nasal Cavity – Excision and Staged Reconstruction

Makayla McCoskey[1], Karen Brown[1], Monica Ray[1], Vikram Durairaj[1,2], Anish Abrol[1]
[1]TOC Eye and Face, Austin, Texas, United States, [2]Department of Ophthalmology, University of Texas at Austin, Dell Medical School, Austin, Texas, United States

Introduction: Eccrine poroma is a benign, cutaneous adnexal neoplasm arising from eccrine sweat ducts. The tumor generally presents as a gradually enlarging pigmented or erythematous nodule.[1] These are most often found on the extremities and rarely reported to occur on the face in the periocular region.[2] Due to their rarity, the literature regarding the management and ultimate prognosis is limited to their description in case reports.[2-4] Given the risk of local recurrence and malignant transformation if incompletely excised, these benign lesions require complete surgical excision.[2] Here we report the surgical management and reconstruction in the case of an eccrine poroma presenting on the medial lower eyelid and nasal sidewall, found to erode into the nasal cavity and infiltrate the nasolacrimal system.

Methods: Case report and review of the literature. The collection and evaluation of protected patient health information complies with the Declaration of Helsinki.

Results: A 74-year-old man with a 5-year history of a right medial canthal lesion presented for evaluation and treatment. Examination revealed a large, palpable nodule along the right nasal sidewall with inferior and superior satellite lesions, all of which demonstrated central ulceration (Figure 1). He was also found to have a nasocutaneous fistula. A primary incisional biopsy was taken and demonstrated adnexal neoplasm consistent with benign eccrine poroma. CT maxillofacial contrast enhanced imaging revealed a mass extending from the nasal sidewall through the lacrimal bone into the right ethmoid sinus and frontal sinus outflow tract. (Figure 2). Surgical total resection included dacryocystectomy with partial resection of the nasolacrimal duct and resulted in a full thickness defect into the nasal cavity, The remaining intranasal tumor was then fully resected endoscopically via ethmoidectomy and frontal sinus exploration. First stage reconstruction was then performed with a contralateral paramedian forehead flap for the external defect and an underlay acellular dermis graft to reconstruct the internal nasal lining (Figure 3). He was taken for second stage reconstruction four weeks later for division of the forehead flap and final wound repair (Figure 4). The patient remains free of local recurrence and pleased with the reconstructive outcome at six months post-operatively.

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Conclusions: This case highlights the importance of clinical suspicion, appropriate histopathologic diagnosis, and complete excision of eccrine poromas given the potential for aggressive local growth and invasion of surrounding vital structures. If diagnosed early, patients may be spared the morbidity related to complex resection and reconstruction.

Figure 1

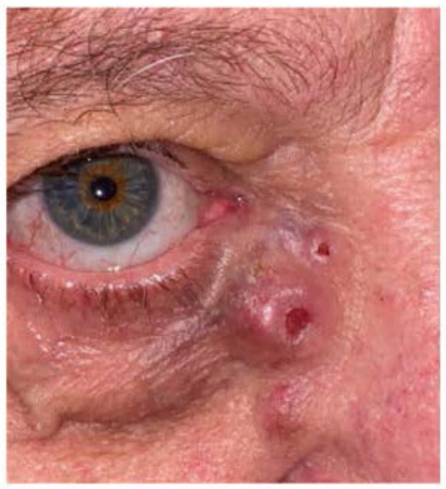

Figure 1: External photograph of the right medial canthal eccrine poroma with superficial ulceration and nasocutaneous fistula.

Figure 2

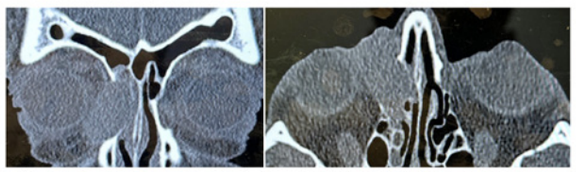

Figure 2: Computed tomography imaging (coronal, left; axial, right) revealing the extent of intranasal invasion.

Figure 3

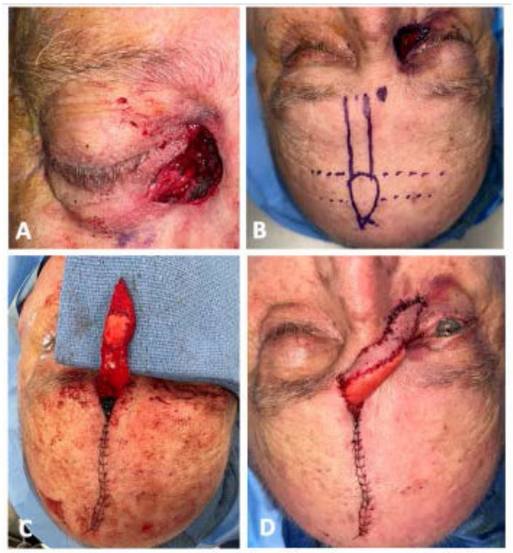

Figure 3: First stage surgical excision (A) and reconstruction (B-D).

Figure 4

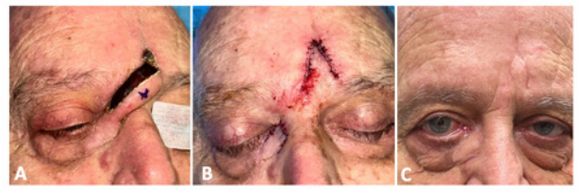

Figure 4: Second stage reconstruction (A-B) and post-operative outcome at four months (C).

References:

1. Calonje, J. Eduardo, et al. McKee's Pathology of the Skin, 2 Volume Set. Elsevier, 2019.
2. Mencía-Gutiérrez E, Navarro-Perea C, Gutiérrez-Díaz E, Cámara-Jurado M, Bengoa-González Á. Eyelid Eccrine Poroma: A Case Report and Review of Literature. Cureus. 2020 Jun 29;12(6):e8906. doi: 10.7759/cureus.8906.
3. McCoskey M, Neerukonda VK, Hatton MP, Wolkow N. Eccrine poroma of the eyelid. Orbit. 2021 Jul 14:1. doi: 10.1080/01676830.2021.1939732.
4. Kalamkar C, Radke N, Mukherjee A, Radke S. Rare case of large eccrine poroma of the eyelid. Med J Armed Forces India. 2021 Jul;77(3):371- 373. doi: 10.1016/j.mjafi.2020.07.012.

9:11-9:17 am

Multidisciplinary Management of Silent Sinus Syndrome

Marissa K. Shoji[1], Akshara Legala[2], Eman Al-Sharif[1,3], Skenda Jean-Charles[1], Catherine Liu[1], Don O. Kikkawa[1], Bobby S. Korn[1]
[1]Oculofacial Plastic and Orbital Surgery, Shiley Eye Institute, San Diego, California, United States, [2]Shiley Eye Institute, San Diego, California, United States, [3]Princess Nourah bint Abdulrahman University, Riyadh

Introduction: This retrospective study evaluates characteristics, treatment, and outcomes associated with silent sinus syndrome (SSS), a rare entity with both ophthalmologic and sinus findings, with emphasis on multidisciplinary sinus and orbital management.

Methods: This IRB-approved retrospective study reviewed patients diagnosed with SSS treated at a tertiary medical center from January 2004-April 2024. Inclusion criteria were imaging demonstrating maxillary sinus atelectasis and orbital floor resorption. Cases with identifiable orbital cause of ostiomeatal occlusion were excluded. Data collected included patient demographics, clinical history, globe position measurements, management, and outcomes. Statistical analysis was performed with Student's t-test and chi-squared testing.

Results: Thirty-five patients were included (mean age 44.7 years, 62.9% male, Table 1). Patients presented with enophthalmos (48.6%), hypoglobus (42.8%), and diplopia (11.4%). Imaging confirmed maxillary atelectasis with orbital floor resorption. Patients underwent observation (n=12), sinus surgery alone (n=10), simultaneous orbital reconstruction and sinus surgery (n=12), and staged sinus surgery followed by orbital reconstruction with implant (n=1). Sinus surgery commonly involved endoscopic maxillary antrostomy, with additional surgery including septoplasty, ethmoidectomy, and inferior turbinectomy. For patients undergoing orbital reconstruction, porous polyethylene barrier channel implant was most commonly used (n=5), often with multiple stacked sheets. 2 cases used porous polyethylene with titanium mesh, and 2 cases used both porous polyethylene with titanium mesh and barrier channel implants. Calvarial bone was used in one patient to reduce bacterial seeding from concurrent severe maxillary sinusitis. The implants were typically fixated to the orbital rim with 1-2 titanium screws. Subanalysis comparing observation, sinus surgery alone, and simultaneous sinus surgery with orbital implant placement groups demonstrated greater incidence of pre-operative hypoglobus and enophthalmos in the sinus+orbital implant surgery group (Table 2, p=0.007, p=0.0002, respectively). All simultaneous sinus+orbital implant patients had partial improvement or better, with more frequent clinical resolution of symptoms vs. the sinus surgery alone group. The sinus+orbital implant group also had significantly greater improvement in postoperative enophthalmos vs. the sinus surgery alone group (2.5±0.7 vs. 0.25±0.33 mm, respectively, p=0.005). One sinus+orbital implant group patient had postoperative self-resolving infraorbital hypoesthesia, and another required revision surgery and strabismus surgery due to hyperglobus. There were no cases of orbital implant infection, extrusion, vision loss, or recurrent sinusitis.

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Conclusions: SSS is a very rare entity characterized by spontaneous enophthalmos and inferior globe displacement due to idiopathic maxillary sinus atelectasis and resulting negative pressure. The optimal surgical technique and timing remain controversial with advocates for simultaneous combined sinus surgery and orbital reconstruction, staged repair with sinus surgery followed by orbital reconstruction months later, sinus surgery alone, or observation.[1] Most previously reported studies are small case series (average 9.8 total cases per study) and lack comparison between management strategies.[1,2] Our results suggest that multidisciplinary surgical treatment with simultaneous combined sinus and orbital surgery is a safe and effective option resulting in notable improvement in globe position in patients with SSS.

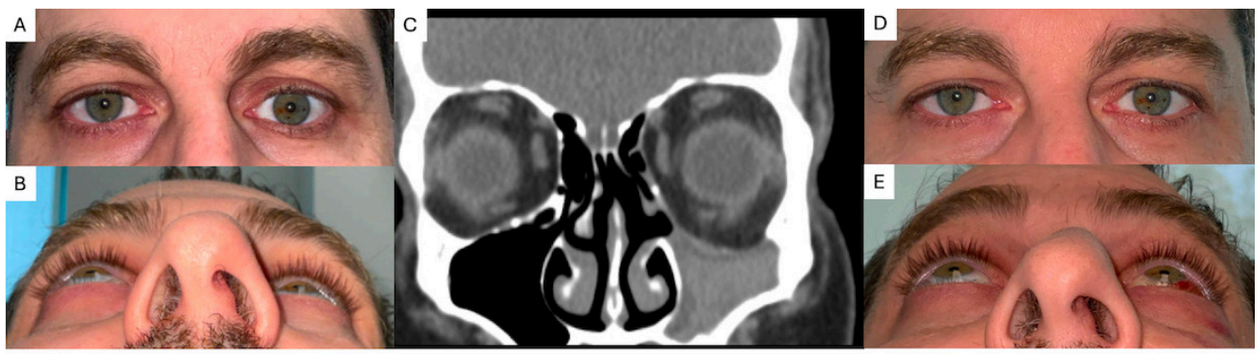

Figure 1. This patient presented with left enophthalmos and hypoglobus due to silent sinus syndrome (A,B). Computerized tomography imaging of the orbits demonstrated left maxillary atelectasis and orbital floor bowing with bony resorption (C). After multidisciplinary management with simultaneous combined left maxillary antrostomy and orbital porous polyethylene barrier channel implant placement, the patient experienced significant improvement with clinical resolution of his hypoglobus and enophthalmos (D,E).

Table 1. Characteristics of Patients with Silent Sinus Syndrome

Age (years)	44.7 +/- 15.6
Sex (male)	n = 22 (62.9%)
History of orbital trauma (yes)	n = 5 (14.2%)
History of prior sinus/orbital surgery (yes)	n = 3 (8.6%)
Clinical Features	
Duration of symptoms (months)	33.7 +/- 74.6
Affected side (right)	n = 20 (57.1%)
Diplopia (yes)	n = 4 (11.4%)
Enophthalmos (yes)	n = 17 (48.6%)
Degree of enophthalmos (mm)	2.7 +/- 1.42
Hypoglobus (yes)	n = 15 (42.8%)
Observation	n = 12 (34.3%)
Sinus surgery alone	n = 10 (28.6%)
Sinus + orbital implant surgery simultaneously	n = 12 (34.3%)
Sinus + orbital surgery staged	n = 1 (2.9%)
Follow-up duration (months)	16.5 +/- 37.6

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Table 2. Outcomes of Patients with Silent Sinus Syndrome

	Observation (n = 12)	Sinus surgery alone (n=10)	Simultaneous sinus + orbital surgery (n=12)	p-value
Age (years)	40.7 +/- 17.5	55.2 +/- 11.6	41.1 +/- 13.4	**p = 0.045**
Sex (male)	n = 8 (66.7%)	n = 5 (50%)	n = 9 (75%)	p = 0.47
History of orbital trauma (yes)	n = 1 (8.3%)	n = 0	n = 4 (33.3%)	NA
History of prior sinus/orbital surgery (yes)	n = 1 (8.3%)	n = 1 (10%)	n = 1 (8.3%)	p = 0.99
Clinical Features				
Duration of symptoms (months)	43.3 +/- 96.4	4**	19.23 +/- 27.2	NA
Affected side (right)	n = 6 (50%)	n = 8 (80%)	n = 6 (50%)	p = 0.27
Diplopia (yes)	n = 0	n = 0	n = 4 (33.3%)	NA
Enophthalmos (yes)	n = 3 (25%)	n = 3 (30%)	n = 10 (83.3%)	**p = 0.007**
Degree of enophthalmos (mm)	0*	1.5**	3.2 +/- 1.1	NA
Hypoglobus (yes)	n = 3 (25%)	n = 1 (10%)	n = 11 (91.7%)	**p = 0.0002**
Outcomes				
Postoperative enophthalmos	n = 0	n = 2 (20%)	n = 0	NA
Postoperative enophthalmos (mm)	0*	2.5 +/- 0.7	0.6 +/- 5	NA
Change in enophthalmos from baseline	0*	+0.5**	-3.0 +/- 0.5	NA
No improvement	n = 2 (16.6%)	n = 2 (20%)	n = 0	NA
Partial clinical improvement	n = 0	n = 4 (40%)	n = 6 (50%)	NA
Clinical resolution	n = 0	n = 4 (40%)	n = 6 (50%)	NA
NS	n = 10	n = 0	n = 0	NA
Further surgeries required	n =1 (8.3%)	n = 1 (10%)	n = 1 (8.3%)	p = 0.99
Duration of follow-up (months)	33.3 +/- 54.0	10.8 +/- 16.4	23.3 +/- 47.6	p = 0.61

* only specified for 1 patient, who had no enophthalmos

**data only available for 1 patient

Abbreviations: NS: not specified

References:

1. Rosso et al. *Acta Otorhinolaryngologica Italica,* 2022.
2. Freiser et al. *Int J Pediatr Otorhinolaryngol,* 2020.

9:31-9:55 am

The Unhappy Patient: Can I Avoid a Lawsuit and What Happens if I Can't?

Robert G. Fante, Ron W. Pelton, and Linda Harrison

(continued)

HENRY I. BAYLIS COSMETIC SURGERY AWARD LECTURE

Friday, October 18

Moderators: Chris R. Alabiad and Jacqueline R. Carrasco

10:34-10:54 am

Henry Baylis' Timeless Insights for Oculofacial Surgeons

Tanuj Nakra

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SASOPRS LUNCH SESSION (NON-CME)

Friday, October 18

Moderator: Jeffrey A. Nerad

12-1 pm

Six Stages of Practice

Panelists: John W. Shore, Liza M. Cohen, Michael J. Hawes, and Patrick M. Flaharty
Moderator: Jeffrey A. Nerad

(continued)

1:01-1:07 pm

Inflation-Adjusted Changes in Medicare Reimbursement for Commonly Performed Oculoplastics Procedures Over the Last Decade

Jonathan Siktberg[1], Howard Zhang[2], Sean Berkowitz[1], Xiangyu Ji[3], Qingxia Chen[3], Rachel Sobel[1]
[1]Department of Ophthalmology and Visual Sciences, Vanderbilt University Medical Center, Nashville, Tennessee, United States, [2]Vanderbilt University School of Medicine, Nashville, Tennessee, United States, [3]Department of Biostatistics, Vanderbilt University, Nashville, Tennessee, United States

Introduction: The purpose of this study is to examine the inflation-adjusted changes in Medicare reimbursement for the 15 most commonly performed oculoplastics procedures performed in clinic and in the operating room over the last decade.

Methods: The 2021 Medicare National Summary Data File was used to identify the 15 most commonly performed oculoplastics office procedures and operating room procedures in Medicare Part B beneficiaries by CPT code.[1] The reimbursements for each of these 30 CPT codes for each year of the last decade were then found using the Medicare Physician Fee Schedule Online Tool available on CMS.gov.[2] Adjustments for inflation were made using the Consumer Price Index (CPI) from the United States Bureau of Labor Statistics.[3] Descriptive statistics were computed to show the change in reimbursement amount over time. Spearmen correlation coefficient between the inflation-adjusted reimbursement amount and year of each procedure was used to evaluate the trend over time.

Results: The 15 most commonly performed oculoplastics procedures performed in 2021 in the clinic and in the operating room, respectively, are shown in Table 1. Figures 1-2 show the inflation-adjusted reimbursement levels for each CPT code from 2014-2023. As shown in Table 2, the average nominal change in payment amount was -3.5% (range: -63.6% to 12.5%) for Office CPT codes and -7.7% (range: -35.3% to 6.5%) for Facility CPT codes. The average inflation-adjusted change in payment amount was -24.6% (range: -71.5% to -12.1%) for Office codes and -27.8% (range: 16.8% to -49.4%) for Facility codes. Statistical analysis showed a statistically significant negative correlation (p-value < 0.05) between inflation-adjusted reimbursement level and time for 29 of 30 CPT codes tested (Table 3).

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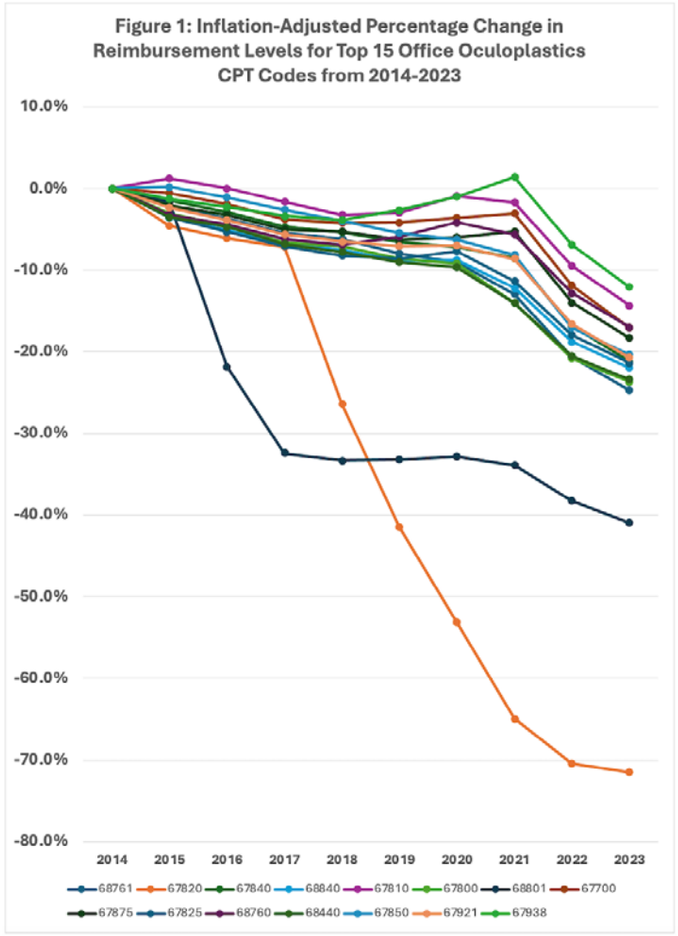
Conclusions: Medicare inflation-adjusted reimbursements for the most commonly performed oculoplastic procedures have significantly decreased over the last decade. Notably, when adjusted for inflation, the top 15 office and facility CPT code reimbursements have declined by an average of 24.6% and 27.8%, respectively, since 2014.

Table 1. CPT Codes and Procedure Description

CPT Code	Procedure
15823	Blepharoplasty, upper eyelid; with excessive skin weighting down lid
67900	Repair, brow ptosis
67904	Repair, blepharoptosis; levator resection/advancement, external
67903	Repair, blepharoptosis; levator resection/advancement, internal
67917	Repair, ectropion; extensive
67950	Canthoplasty
67924	Repair, entropion; extensive
68720	Dacryocystorhinostomy
67911	Correction, lid retraction
67400	Orbitotomy w/o bone flap; for exploration
68810	Probing, nasolacrimal duct
68815	Probing, nasolacrimal duct; w/ insertion of tube
67908	Repair, blepharoptosis; conjunctivo-tarso-muller's muscle-levator resection
67966	Excision/repair, eyelid; > 1/4 of lid margin
67961	Excision/repair, eyelid; up to 1/4 of lid margin
68761	Closure, lacrimal punctum; by plug
67820	Correction, trichiasis; epilation, by forceps
67840	Excision, lesion, eyelid (except chalazion)
68840	Balloon Catheter Dilation with Probing, lacrimal canaliculi
67810	Biopsy, eyelid
67800	Excision, chalazion; single
68801	Dilation, lacrimal punctum
67700	Blepharotomy, drainage, abscess, eyelid
67875	Temporary closure of eyelids by suture
67825	Correction, trichiasis; epilation, non-forceps
68760	Closure, lacrimal punctum; thermocauterization/ligation/laser
68440	Snip incision, lacrimal punctum
67850	Destruction, lesion, lid margin, 1 cm/less
67921	Repair, entropion; suture
67938	Removal, embedded foreign body, eyelid



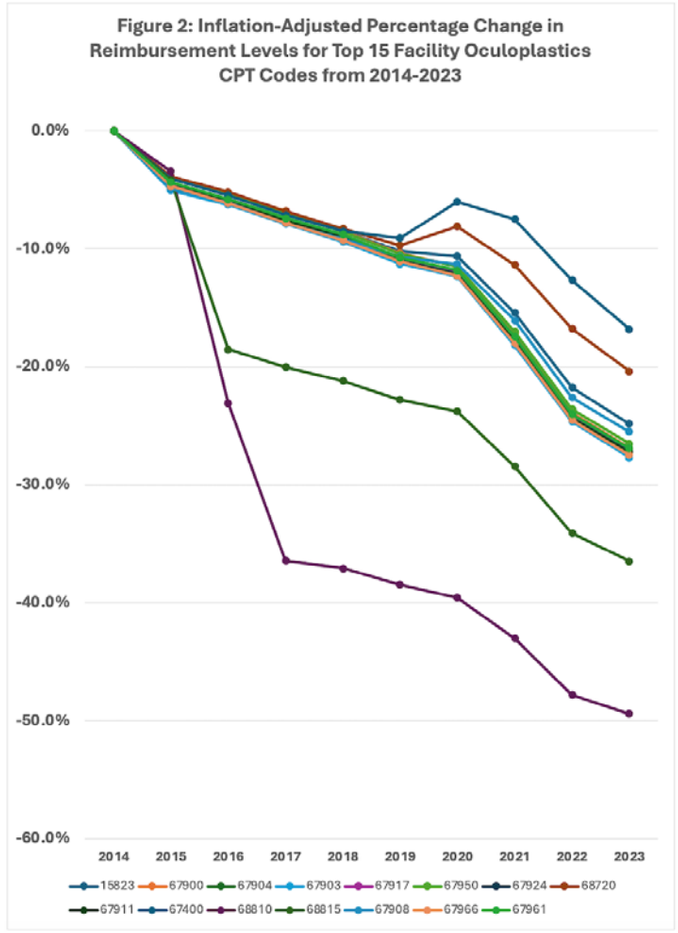


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Table 2. Nominal and inflation-adjusted reimbursement rates for common oculoplastic procedures from 2014 to 2023

		Nominal reimbursement ($)			*Inflation-adjusted Reimbursement (to 2023 US dollars)*		
Office	***CPT Codes***	**2014**	**2023**	**% Change**	**2014**	**2023**	**% Change**
	68761	152.96	147.41	-3.63	195.74	147.41	-24.69
	67820	53.02	19.32	-63.56	67.85	19.32	-71.52
	67840	282.28	284.65	0.84	361.23	284.65	-21.20
	68840	134.34	134.19	-0.11	171.91	134.19	-21.94
	67810	171.59	188.07	9.60	219.58	188.07	-14.35
	67800	132.90	129.79	-2.34	170.07	129.79	-23.68
	68801	128.25	96.92	-24.43	164.12	96.92	-40.95
	67700	272.25	289.06	6.17	348.39	289.06	-17.03
	67875	176.61	184.69	4.58	226.00	184.69	-18.28
	67825	135.41	136.23	0.61	173.28	136.23	-21.38
	68760	209.92	222.98	6.22	268.63	222.98	-16.99
	68440	107.11	105.05	-1.92	137.07	105.05	-23.36
	67850	216.37	220.61	1.96	276.88	220.61	-20.32
	67921	476.80	483.91	1.49	610.15	483.91	-20.69
	67938	246.46	277.20	12.47	315.39	277.20	-12.11
	Average			**-3.47**			**-24.57**
Facility	*15823*	576.39	554.40	-3.82	737.59	554.40	-24.84
	67900	538.42	503.90	-6.41	689.00	503.90	-26.87
	67904	636.57	593.03	-6.84	814.61	593.03	-27.20
	67903	516.57	478.15	-7.44	661.04	478.15	-27.67
	67917	486.83	454.77	-6.59	622.99	454.77	-27.00
	67950	490.41	461.21	-5.95	627.57	461.21	-26.51
	67924	487.55	454.43	-6.79	623.91	454.43	-27.16
	68720	798.13	813.29	1.90	1,021.35	813.29	-20.37
	67911	598.60	556.77	-6.99	766.02	556.77	-27.32
	67400	982.98	1,046.44	6.46	1,257.90	1,046.44	-16.81
	68810	197.38	127.76	-35.27	252.58	127.76	-49.42
	68815	272.61	221.62	-18.70	348.85	221.62	-36.47
	67908	452.44	431.38	-4.65	578.98	431.38	-25.49
	67966	701.41	650.97	-7.19	897.58	650.97	-27.47
	67961	483.25	452.06	-6.45	618.40	452.06	-26.90
	Average			**-7.65**			**-27.83**

Table 3

	Facility Inflation-adjusted			*Office Inflation-adjusted*	
Code	***Spearman coefficient***	***P-value***	***Code***	***Spearman coefficient***	***P-value***
15823	-1.00	<0.001	*68761*	-1.00	<0.001
67900	-1.00	<0.001	*67820*	-1.00	<0.001
67904	-1.00	<0.001	*67840*	-1.00	<0.001
67903	-1.00	<0.001	*68840*	-0.99	<0.001
67917	-1.00	<0.001	*67810*	-0.82	0.007
67950	-1.00	<0.001	*67800*	-1.00	<0.001
67924	-1.00	<0.001	*68801*	-0.95	<0.001
68720	-0.96	<0.001	*67700*	-0.72	0.01
67911	-1.00	<0.001	*67875*	-0.92	<0.001
67400	-0.87	0.003	*67825*	-0.96	<0.001
68810	-1.00	<0.001	*68760*	-0.73	0.021
68815	-1.00	<0.001	*68440*	-1.00	<0.001
67908	-1.00	<0.001	*67850*	-0.99	<0.001
67966	-1.00	<0.001	*67921*	-0.99	<0.001
67961	-1.00	<0.001	*67938*	-0.44	0.204

References:

1. Centers for Medicare & Medicaid Services. Part B National Summary Data File (Previously known as BESS). https://www.cms.gov/data-research/statistics-trends-and-reports/part-b-national-summary-data-file. Accessed September 27, 2023.
2. Centers for Medicare & Medicaid Services. Search the Physician Fee Schedule. https://www.cms.gov/medicare/physician-fee-schedule/search. Accessed October 1, 2023.
3. U.S. Bureau of Labor Statistics. Consumer Price Index. https://www.bls.gov/cpi/. Accessed 2024, Feb 21.

1:07-1:13 pm

Evaluating Oculoplastics Procedure Waste: A Quality Improvement Study

Sruti Rachapudi[1,2], Patrick Hunt[3,4], Lucy Mudie[5], Micheal Yen[5]
[1]The University of Texas Medical Branch School of Medicine, Galveston, Texas, United States, [2]Department of Ophthalmology, Illinois Eye and Ear Infirmary/ University of Illinois Chicago, Chicago, Illinois, United States, [3]Baylor College of Medicine, Houston, Texas, United States, [4]Department of Ophthalmology and Visual Sciences, Yale School of Medicine, New Haven, Connecticut, United States, [5]Department of Ophthalmology, Baylor College of Medicine, Houston, Texas, United States

Introduction: Ophthalmologists, with high clinic and surgical volumes, face the compelling opportunity to lead efforts to make eye care more sustainable. Currently, there is unexplored potential in oculoplastics for waste reduction. The purpose of this study is to characterize and quantify the environmental waste produced by oculoplastic procedures to develop interventions that will reduce the environmental impact and prioritize the ease of adaptation for staff.

Methods: Oculoplastics procedures performed in either office-based surgery suites or ambulatory surgery centers at two sites were observed by an independent observer. During Phase I, waste audits were conducted to quantify the number of used and unused but discarded disposable items. In Phase II, this data is used to adjust the standardized procedure setups and design other sustainable interventions.

Results: Phase I included 39 clinic procedures and 34 OR procedures across both sites. Most waste was from textiles (surgical gowns, drapes, gauze), plastics (hard and soft wrappings), and medications (drops). The most commonly performed procedures are botulinum toxin injections (18.4%), eyelid lesion excision (16.3%), and blepharoplasty (12.2%). The most commonly opened yet discarded surgical supplies were cotton tip applicators (12.8±6) and 4x4 gauze (9.5±7). Therefore, an intervention was introduced to reduce the cotton tip applicators from 20 to 8 and 4x4 gauze from 10 to 8 for the office-based procedure set-ups. Similarly, the cotton tip applicators were reduced from 20 to 10 and 4x4 gauze from 20 to 10 for operating room procedures. Of course, more supplies were opened during the procedures as needed. Early post-intervention data includes surgical supply reduction for 10 minor procedures and 1 operating room dacryocystorhinostomy, and shows promising results. These adjustments have shown a decrease in the number of discarded disposable items post-procedure (3.3±2.3) by 74%. Further analysis will be conducted as more data becomes available to assess the long-term effectiveness of this waste reduction strategy and its impact on overall sustainability efforts within the clinic and operating room environments.

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Conclusions: Due to the high procedural volume, ophthalmologists are in a unique position to lead sustainability efforts. We strongly recommend against pre-emptive over-opening of cotton tip applicators and gauze squares for minor procedures such as lash epilations, eyelid lesion excisions, and the reduction in the cotton tips for ptosis/ectropion/entropion repairs. Surgeons can open more supplies as needed. Other potential interventions include revising the use of topical anesthetic bottles during surgery (e.g. reuse between cases), minimal surface area of draping, and optimizing surgical supply packaging and instructions for use. However we recognize that such practices require central sterilization, society and state-level legislation, and stakeholder diligence.

1:13-1:19 pm

The Impacts of Reimbursement Rates on Oculoplastic Procedure Location Choice: A Discrete Choice Analysis

Tiffany Hu[1], Ethan Osias[2], Darren Filson[3], Daniel Rootman[4]
[1]UCI SOM, Cerritos, California, United States, [2]Ophthalmology, UCLA Stein Eye Institute, Los Angeles, California, United States, [3]Economics and Finance, Robert Day School of Economics and Finance, Claremont, California, United States, [4]Oculoplastics, UCLA Stein Eye Institute, Los Angeles, California, United States

Introduction: The majority of US oculoplastic procedures are performed in an operating room (OR).[1] However, migration of these procedures to a procedure room (PR) could generate significant cost savings.[2,3] This study evaluates factors driving surgery location choice for 9 oculoplastic procedures.

Methods: Phase 1: Oculoplastic surgeons were surveyed to determine key elements when deciding to perform surgery in OR/PR. Responses were collated into major domains.

Phase 2: Discrete choice analysis evaluated each factor's impact for ptosis. Participants were randomly assigned hypothetical ptosis procedure scenarios, choosing OR/PR. For all scenarios, OR reimbursement was $550, the other factors were varied systematically.

Phase 3: Eight additional oculoplastic procedures (Figure 1) were evaluated for variable reimbursement scenarios (PR = 1x, 1.5x, 2.0x, 2.5x of OR). For each procedure, national average CMS reimbursement 2021 was set as OR reimbursement. A new population of oculoplastic surgeons were randomly assigned hypothetical procedure scenarios, choosing OR/PR under varying PR reimbursements, holding sedation/comorbidities/logistics constant.

Results: Phase 1: Four domains were identified: comorbidities/sedation/logistics (2 levels each, with one preferable) and reimbursement (5 levels $550-$1650, each level increasing 50%).

Phase 2: 73 surgeons yielded 1022 observations. Increasing PR reimbursement increased probability of choosing PR, with diminishing effects above $1100 (Table 1). Serious comorbidities/sedation-requirements/logistical issues reduced probability of PR choice, while rural offices and annual number of surgeries increased probability. Ownership and years of experience were insignificant. If all risk factors are low, doubling reimbursement to $1100 increases likelihood of PR use by 35%. When risk factors are high, likelihood increases by 17% (Table 2).

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Phase 3: 114 surgeons yielded 1715 observations. Figure 1 provides the probability of selecting the PR for each procedure under the different reimbursement ratios. In all cases, likelihood of selecting PR increases with reimbursement with diminishing returns observed after 2.0x for 7/8 surgeries.

Utilizing 2021 CMS data, a cost estimate of each surgery was conducted. OR costs included: facility ($1,871.24), surgeon, and anesthesia ($152.15) paid out by Medicare, totaling $2,290.46-$2,653.20/procedure. For PR, CMS is responsible for surgeon fee only. The cost of materials/staffing hours are borne by the surgeon.

In 2021, 155,065 cumulative surgeries performed for 9 procedures (7.4% in PR), costing $381 million.[1] If 28% of cases transitioned to PR, cost saving of $53 million/year is realized with a 2x reimbursement raise.

Conclusions: The model shows reimbursement is a key factor in surgery followed by location choice, rural office setting, sedation, comorbidities, logistics, and surgeon's annual number of cases. For ptosis surgery with low-risk factors, doubling reimbursement increases PR use by 35%.Similar patterns were observed for 7 additional procedures. Relatively small increases in PR reimbursements impact physician behavior, to a point when 2x is offered. Increasing reimbursement can shift 28% of surgeries to PR, generating $53 million/year in cost savings.

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Table 1. Predicted Probability of Choosing the PR Associated with Different Values of the Independent Variables for Ptosis Surgery. The probability is evaluated at every observation and averaged. In the sample as a whole, there is a .40 probability of choosing the PR.

Variable	Probability (Std. Error)
Ptosis PR Reimbursement:	
$550	.19** (.026)
$825	.35** (.035)
$1,100	.45** (.034)
$1,375	.51** (.036)
$1,650	.52** (.037)
There are no serious comorbidities	.44** (.021)
There are serious comorbidities	.35** (.021)
Sedation is not needed	.49** (.022)
Sedation is needed	.31** (.020)
There are no logistical issues	.44** (.022)
There are logistical issues	.36** (.020)
The office is in an urban area	.37** (.016)
The office is in a rural area	.89** (.045)
The physician does not own the office	.41** (.022)
The physician owns the office	.38** (.021)

** indicates statistical significance at the 1% level

Table 2. Predicted Probability of Choosing the PR Associated with Different Values of the Independent Variables for Ptosis Surgery. The probability is evaluated at every observation and averaged under the restrictions indicated in the table: In (1), there are no comorbidities, no need for sedation, and no logistical issues, and in (2), there are serious comorbidities, a need for sedation, and logistical issues.

	(1): Low Risk	(2): High Risk
Variable	Probability (Std. Error)	Probability (Std. Error)
Ptosis PR Reimbursement:		
$550	.28** (.046)	.063** (.016)
$825	.51** (.054)	.15** (.031)
$1,100	.63** (.049)	.23** (.038)
$1,375	.68** (.047)	.27** (.042)
$1,650	.70** (.046)	.29** (.045)

** indicates statistical significance at the 1% level

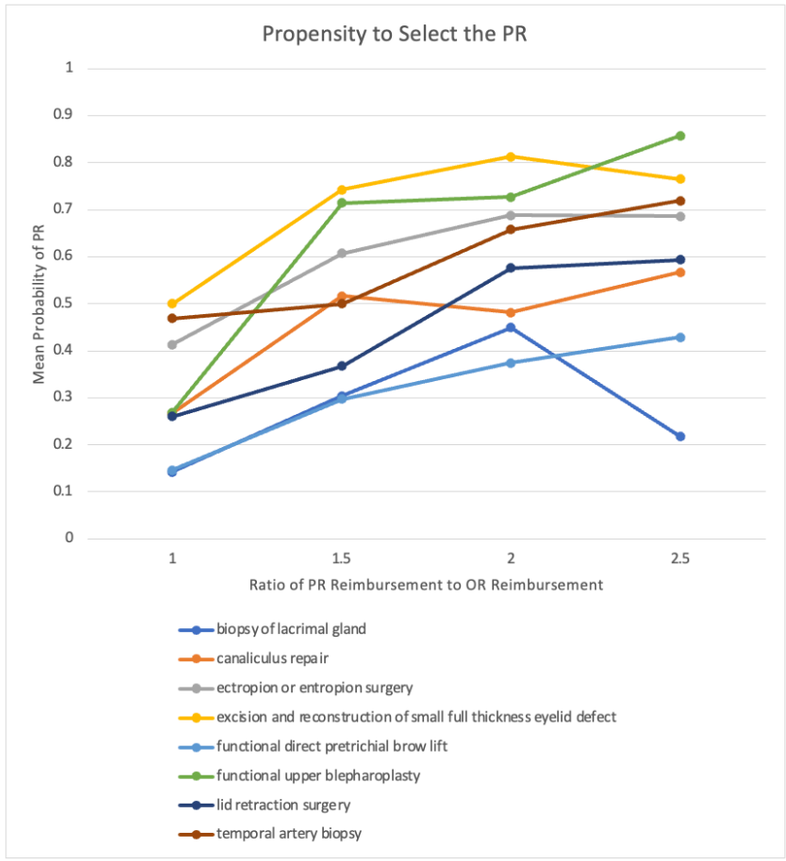

Figure 1. Provides the probability of selecting the PR for each procedure under the different reimbursement ratios. In all cases, the likelihood of selecting the PR is higher under 1.5 than under 1. Beyond that point there are diminishing returns, but the likelihood of selecting the PR is higher under 2.0 than under 1.5 in seven of the eight cases. The likelihood of selecting the PR is higher under 2.5 than under 2.0 in five of the eight cases, and all but one of the increases in the likelihood are quite small.

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1:19-1:25 pm

Ocular Trauma Predicts Poor Outcomes in Patients with a History of Intimate Partner Violence

Linus Amarikwa[1], Andrea Lora Kossler[2], Prithvi Mruthyunjaya[2], Ehsan Rahimy[2], Euna Koo[2], Karen Wai[2]
[1]Ophthalmology, University of Nebraska Medical Center, Omaha, Nebraska, United States, [2]Ophthalmology, Stanford, Palo Alto, California, United States

Introduction: Intimate partner violence is a significant cause of morbidity and mortality. There are several reports in the literature documenting risk factors for ocular trauma related to intimate partner violence [1-3]. However, no studies have looked at incidence and risk factors for multiple emergency room visits and mortality in a large database of patients in the United States. We aimed to characterize the risk factors for poor outcomes in patients with a history of ocular trauma related to intimate partner violence (IPV).

Methods: An electronic health records database, TriNetX (Cambridge, Ma, USA) was used to identify patients with a history of IPV, ocular trauma (including orbital fracture or eyelid contusion) and a history of an associated emergency room (ER) visit. A group with ocular trauma, an ER visit, and no ocular trauma was also identified. Propensity score matching (PSM) was done to control age, gender, race, and presence of chronic medical conditions. The primary study outcome was IPV-related risk of death within 3 years after the primary visit for management of ocular trauma. The secondary outcome was a multi-variable logistic regression to assess for risk factors.

Results: In total, 2,689 from the IPV group and 902,516 from the non-IPV group met inclusion criteria for the study. After PSM, 2,689 patients from each group were included in the primary outcome analysis. The mean age of patients was 41.5 ± 18.4 years. Patients with a history of IPV had significantly higher 3-year mortality rates of 8.1% and 5.7% in the IPV and no-IPV groups, respectively. This result was statistically significant (OR = 1.55, $p < 0.001$). When comparing patients with IPV and no ocular trauma with patients with IPV and ocular trauma, we found that patients with IPV and ocular trauma had a significantly higher risk (OR=1.63, $p<0.001$) of mortality. On logistic regression analysis, we found that non-Hispanic ethnicity (OR = 2.2, $p=0.003$), alcohol abuse (OR = 1.87, $p<0.001$), mental disorders (OR = 2.35, $p<0.001$) increase the odds of mortality. Interestingly, being married (OR = 0.535, $p=0.006$) and African American race (OR=0.343, $p<0.001$) were associated with decreased mortality. Though, African American race was associated (OR=2.3, $p<0.001$) with more ER visits (Figure 1).

Conclusions: We found that patients with IPV-related ocular trauma have significantly higher mortality rates than similar patients with ocular trauma due to other causes. Notable risk factors included substance use and mental disorders. IPV-related ocular trauma is a relatively uncommon finding that significantly increases patient-mortality and should concern providers. Ophthalmologists and other providers treating this patient population should take extra time to counsel patients on available resources.

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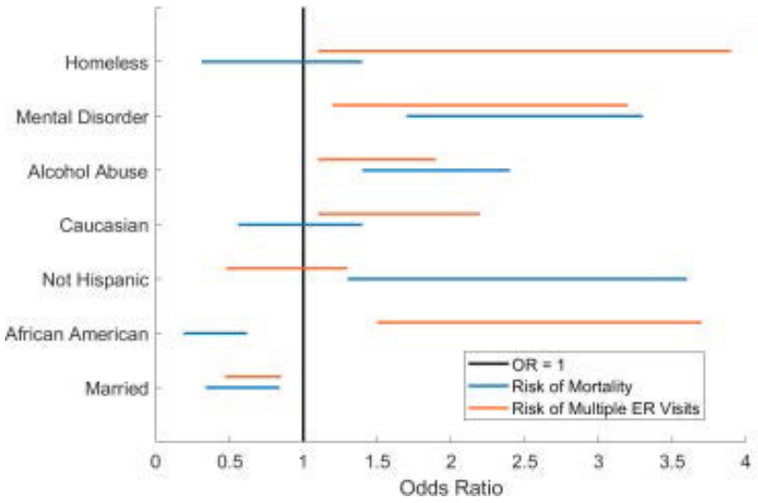
Figure 1



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1:25-1:31 pm

The Efficacy of a Midfacial Oxygen Scavenger Mask in Reducing Local Oxygen Concentrations and Oculofacial Surgical Field Fire Risk

Christopher Yang, Teresa Chen, Jeremiah Tao
Division of Oculofacial and Orbital Surgery, Gavin Herbert Eye Institute, University of California, Irvine, Irvine, California, United States

Introduction: This study aims to evaluate the efficacy of a midfacial oxygen scavenger mask in reducing local oxygen concentrations from nasal cannulated oxygen delivery compared to a standard open oculofacial surgical field.

Methods: This is a controlled experiment using a custom-made patented midfacial oxygen scavenger device, handheld oxygen detector and oxygen from a Datex Ohmeda Aisys Carestation anesthesia unit. Oxygen concentrations were measured at 18 facial landmarks (*Figure 1*) with nasal cannula flow of 2, 4, and 6 L/min of 100% FiO2 in both masked and unmasked conditions (*Figure 2*).

Results: The mean oxygen concentration in the oculofacial surgical field with the oxygen scavenger mask was 24.8% and 20.95% without ($P < 0.001$; two-tailed paired t-test). The unmasked condition was associated with suprathreshold oxygen concentration levels at 13 of 18 facial landmarks (*Table 1*). The masked condition significantly reduced local oxygen concentration at 16 of 18 facial landmarks (*Table 1*). The masked condition provided safe oxygen concentration levels at all three flow rates, and surgical field oxygen concentration directly correlated with oxygen flow rate in the unmasked condition (*Table 2*).

Conclusions: A midfacial oxygen scavenger mask reduced local oxygen concentrations from nasal cannula ventilation to below the 23% fire threshold in the entire oculofacial surgical field in this experiment. The device may be useful to intraoperative fire risk.

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Figure 1

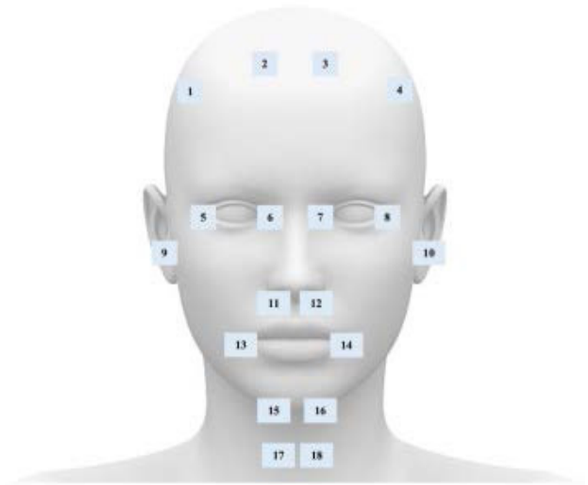

Figure 2

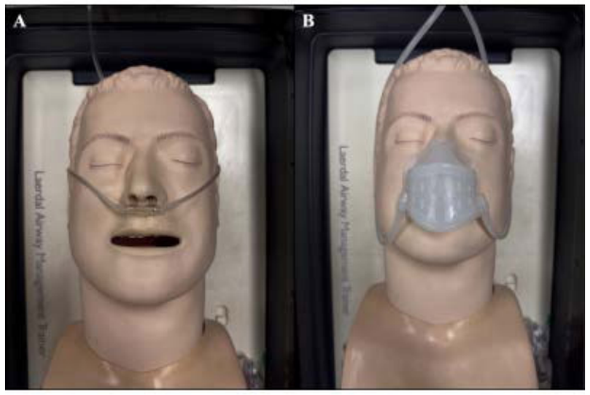

Table 1

Landmark	Average Unmasked Oxygen Concentration (%)	Average Masked Oxygen Concentration (%)	*P*-value
1	22.08	20.9	0.1799
2	22.44	20.9	*0.0071***
3	22.37	20.92	*0.0212**
4	21.96	20.9	0.2202
5	**23.49**	20.97	*0.0252**
6	**23.32**	20.9	*0.0168**
7	**23.36**	20.9	*0.0173**
8	**23.29**	21	*0.0477**
9	**23.44**	20.91	*0.0269**
10	**23.58**	20.91	*0.0361**
11	**25.94**	21.04	*0.0003****
12	**26.97**	21.08	*0.0025****
13	**26.12**	21.19	*0.0001****
14	**26.3**	21.22	*0.00003****
15	**24.89**	21.42	*0.0008****
16	**24.7**	21.36	*0.0019***
17	**23.02**	21.18	*0.0266**
18	22.84	21.21	*0.0252**

Table 2

Landmark	Flow Rate (L/min)	Average Unmasked Oxygen Concentration (%)	Average Masked Oxygen Concentration (%)	P value
1	2	20.9	20.9	N/A
	4	21.47	20.9	0.423
	6	**23.87**	20.9	0.312
2	2	22.47	20.9	0.041
	4	21.73	20.9	0.253
	6	**23.13**	20.9	0.194
3	2	22.37	20.9	0.096
	4	21.33	20.97	0.257
	6	**23.4**	20.9	0.189
4	2	20.9	20.9	N/A
	4	21.37	20.9	0.331
	6	**23.6**	20.9	0.363
5	2	21.17	20.9	0.423
	4	**23.2**	21.1	0.108
	6	**26.1**	20.9	0.103
6	2	**24.93**	20.9	0.139
	4	**23.83**	20.9	0.113
	6	21.2	20.9	0.423
7	2	21.23	20.9	0.423
	4	**23.97**	20.9	0.127
	6	**24.87**	20.9	0.147
8	2	21.1	20.9	0.423
	4	**23.17**	21.2	0.121
	6	**25.6**	20.9	0.19
9	2	20.9	20.9	N/A
	4	**24.1**	20.93	0.142
	6	**25.33**	20.9	0.142
10	2	20.9	20.9	N/A
	4	**24.07**	20.93	0.124
	6	**25.77**	20.9	0.184
11	2	**24.6**	20.9	0.197
	4	**26.73**	21.33	*0.050**
	6	**26.5**	20.9	*0.033**
12	2	**24.57**	20.9	0.202
	4	**26.8**	21.43	*0.049**
	6	**26.53**	20.9	*0.026**
13	2	**24.7**	20.9	0.107
	4	**27.5**	21.77	*0.033**
	6	**26.17**	20.9	0.063
14	2	**25.47**	20.9	0.089
	4	**27.1**	21.87	*0.032**
	6	**26.33**	20.9	*0.043**
15	2	**23.5**	20.9	0.112
	4	**25.7**	21.93	0.133
	6	**25.47**	21.43	0.078
16	2	**23.17**	20.9	0.115
	4	**25.67**	21.97	0.163
	6	**25.27**	21.2	0.103
17	2	22.6	21.5	0.16
	4	**24.53**	21.13	0.16
	6	21.93	20.9	0.423
18	2	22.33	21.2	0.083

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1:31-1:37 pm

The Current Landscape of ASOPRS Oculofacial Surgeons

Kamar Abdullahi[1], Alisha Kamboj[2], Ali Mokhtarzadeh[2], Andrew Harrison[2,3]
[1]Minneapolis, Minnesota, United States, [2]Department of Ophthalmology and Visual Neurosciences, University of Minnesota, Minneapolis, Minnesota, United States, [3]Department of Otolaryngology and Head and Neck Surgery, University of Minnesota, Minneapolis, Minnesota, United States

Introduction: A cross-sectional study was performed to explore the demographics, training, practice settings, and geographic distribution of ASOPRS oculofacial plastic surgeons in the United States.

Methods: The Oculofacial Society surgeon directory was used to identify active, ASOPRS oculofacial surgeons in the United States. Data on demographics, training, and practice type and location was compiled from publicly available sources (e.g. American Academy of Ophthalmology, Castle Connolly, LinkedIn, and U.S. News Health).

Results: Overall, 740 active ASOPRS oculofacial surgeons were identified. The majority of surgeons were male (73.5%) and had completed their education in United States allopathic medical schools (97.4%); approximately 2.0% and 0.5% of physicians completed their training at international medical schools and United States osteopathic medical schools, respectively. Approximately 7.9% of surgeons held other graduate degrees; a Doctor of Philosophy degree was held by 4.5% of surgeons, Master of Business Administration degree by 1.4%, and Master of Public Health degree by 1.2%. In addition to completion of ophthalmology residency, four individuals had also completed training in other residency programs, namely plastic surgery, pediatrics, and pathology. Along with completion of an ASOPRS fellowship, 79 individuals had completed training in other fellowship programs; among these individuals, the most common additional fellowships were neuro-ophthalmology (31.6%), ocular pathology (13.9%), cosmetic surgery (12.7%), and ocular oncology (12.7%). Practicing ASOPRS oculofacial surgeons were, on average, 22.5 years from completion of their fellowship training. Approximately 20.8% of surgeons were less than 10 years out from fellowship completion, nearly half of these surgeons were female (47.7%). The states with the greatest number of ASOPRS oculofacial surgeons were California (120 surgeons), Florida (57), Texas (55), New York (52), and Pennsylvania (38). Currently, there are five states with no surgeons listed in the Oculofacial Society surgeon directory: Montana, New Mexico, North Dakota, South Dakota, and Wyoming. Among practice styles, private practice was found to be the most common setting for oculofacial surgeons (73.4%); among those in private practice, 15.3% also had an academic appointment.

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Conclusions: While the majority of ASOPRS oculofacial plastic surgeons are male, nearly half of surgeons less than ten years from fellowship completion are female. A notable subset of oculofacial surgeons hold additional graduate degrees and have completed fellowship training in other disciplines, the most common of which is neuro-ophthalmology. The majority of surgeons practice in the private sector and there are inconsistencies in the geographic distribution of surgeons across the United States, which may contribute to disparities in access to care.

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1:37-1:43 pm

Emotional Intelligence, Burnout, and Professional Fulfillment among ASOPRS Attendings and Fellows

Hays Cape[1], Cody Blanchard[1], Lalita Gupta[1], Ryan Harpole[1], Zella Christensen[2], Calisse Burand[2], Peter Timoney[1]
[1]Department of Ophthalmology and Visual Sciences, University of Kentucky College of Medicine, Lexington, Kentucky, United States,
[2]Department of Statistics, University of Kentucky, Lexington, Kentucky, United States

Introduction: Emotional intelligence is the ability to recognize and manage the emotions of ourselves and others. The purpose of this study is to determine if a relationship exists between emotional intelligence (EI), burnout, and professional fulfillment levels among American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) attendings and fellows.

Methods: An online survey consisting of the Brief Emotional Intelligence Scale (BEIS-10) and the Professional Fulfillment Index (PFI) was sent to the emails of all ASOPRS members who agreed to survey distributions.[1-2] The PFI measured burnout symptoms experienced over the two weeks prior to survey completion. Incomplete surveys were excluded. Statistical analysis was performed with Pearson's correlation, t-tests, and ANOVA.

Results: A total of 72 participants, 56 attendings and 16 fellows, completed surveys. EI and the Professional Fulfillment subscale of the PFI had a significant positive correlation ($R = 0.31$, $p < 0.01$), while EI and the Work Exhaustion subscale of the PFI had a negative correlation which was not statistically significant ($R = -0.18$, $p = 0.14$). Years in practice, geographic location, and year in fellowship were not associated with differences in burnout or professional fulfillment. A private practice setting was associated with lower EI ($p < 0.01$) and decreased professional fulfillment ($p = 0.05$). According to preset cut scores for the PFI, only 36/72 respondents (50%) were professionally fulfilled with their role as an ASOPRS fellow or attending while 23/72 respondents (31.9%) were experiencing burnout at time of survey. Data from ASOPRS fellows and attendings was compared to a previously reported study looking at ophthalmology residents (Figures 1-3), and there were significant differences between the three groups in EI ($p < 0.01$), professional fulfillment ($p < 0.01$), and work exhaustion ($p < 0.01$).[3]

Conclusions: EI is associated with increased professional fulfillment in ASOPRS attendings and fellows. A significant portion of respondents were not fulfilled with their careers and were experiencing burnout at the time of survey.

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Figure 1

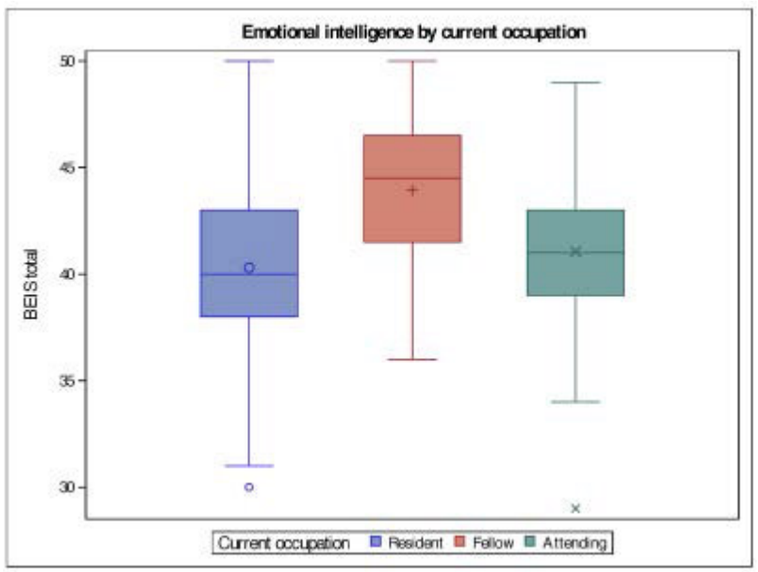


Figure 2

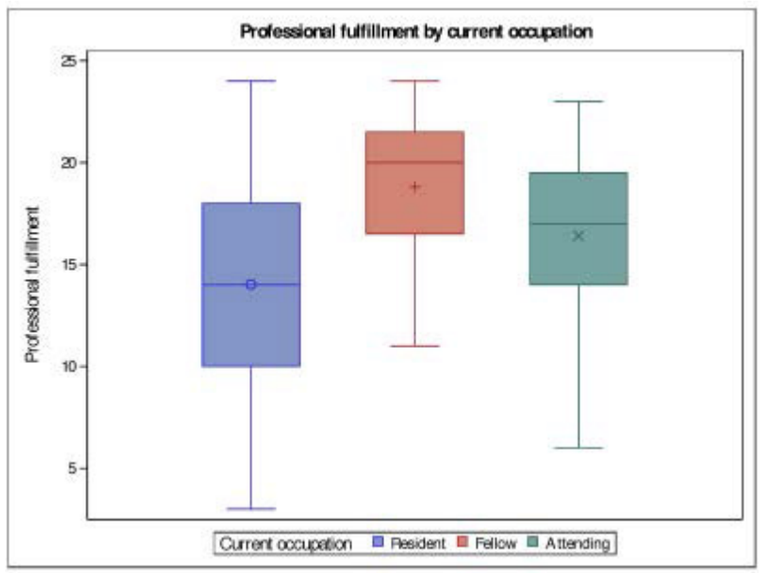
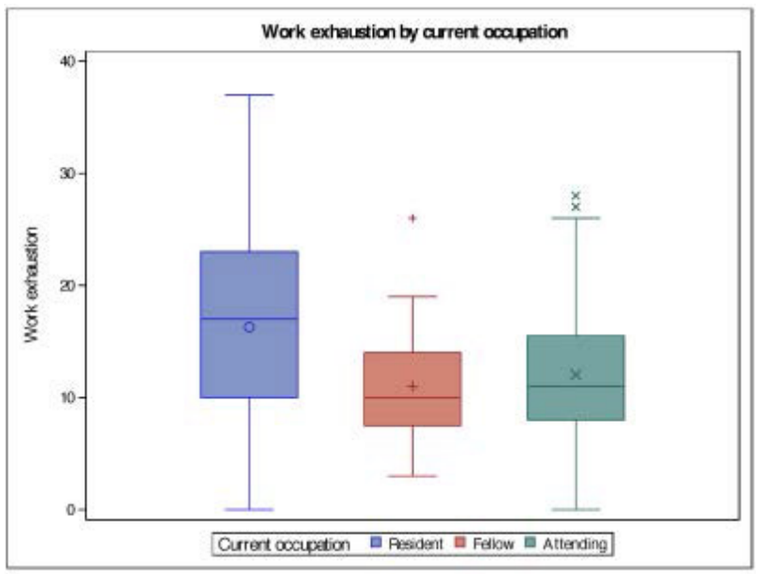


Figure 3



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1:56-2:02 pm

Dacryocystorhinostomy Outcomes for Congenital Nasolacrimal Duct Obstruction Associated with Craniofacial Abnormalities

Anab Mohamed[1], Grayson Ashby[2], Ashika Kuchhangi[3], Julius Oatts[4], Lilly Wagner[2]
[1]Mayo Clinic Alix School of Medicine, Rochester, Minnesota, United States, [2]Ophthalmology, Mayo Clinic, Rochester, Minnesota, United States, [3]University of California San Francisco, San Francisco, California, United States, [4]Ophthalmology, University of California San Francisco, San Francisco, California, United States

Introduction: The success rate of lacrimal probing for congenital nasolacrimal duct obstruction (CNLDO) has been found to be lower in children with concurrent craniofacial abnormalities.[1] Persistent symptoms are addressed with Dacryocystorhinostomy (DCR). There is little data on the effectiveness of DCR for patients in this group. This retrospective observational study compared the clinical characteristics and outcomes of DCR for CNLDO in children with and without concurrent craniofacial abnormalities.

Methods: Multi-center study of all patients

Results: DCR for treatment of CNLDO was completed on 70 eyes among 58 patients (12 bilateral cases). Craniofacial abnormalities were present in 27 of the 70 surgeries. Mean age at the time of surgery was 7.4 years and 61.5% were female. The patients in the craniofacial group were younger at time of surgery ((5.7 years±4.4 vs. 8.4 years±4.8, p=0.015) and were significantly more likely to have concurrent canalicular pathology (70% vs. 24.5%, p<0.01). Surgery was done in multidisciplinary collaboration between otorhinolaryngology and ophthalmology in 48.1% of craniofacial associated CNLDO compared to 6% of simple CNLDO (p<0.01). There was no significant difference in use of intraoperative navigation, surgical approach (endoscopic versus external) or additional procedures conducted under anesthesia. In the simple CNLDO group, 11.6% had no improvement of symptoms after surgery compared to 18.5% in the craniofacial cohort (p=0.42).

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Conclusions: CNLDO in patients with associated craniofacial abnormalities is more likely to present with coexisting canalicular pathology, and require multidisciplinary care compared to patients with simple CNLDO. Failure rate may be higher with craniofacial abnormalities, but larger case numbers are needed to confirm this trend. Further studies could examine whether specific DCR approaches (endoscopic versus external) produce better outcomes in CNLDO associated with craniofacial abnormalities.

References:

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2:02-2:08 pm

Frontalis suspension for Congenital Ptosis: Re-Operation Rate and Timing Based on Age at Time of Surgery

Llwyatt Hofer[1], Nick Nakasian[1], Jessica Crawford[1,2,3], Daniel Straka[1,2,3], Cameron Nabavi[1,2,3], Kenneth Cahill[1,2,3], Jill Foster[1,2,3]
[1]Plastic Surgery, Eye Center of Columbus, Columbus, Ohio, United States, [2]Department of Ophthalmology, Nationwide Children's Hospital, Columbus, Ohio, United States, [3]Department of Ophthalmology, The Ohio State University, Columbus, Ohio, United States

Introduction: Frontalis suspension (FS) surgery is the typical intervention for congenital ptosis with poor levator function. With time, this procedure may need to be repeated. When the family is informed about the potential need for additional surgery, the question arises as to how long the procedure will last. This paper looks to answer this question, and also investigate if age at the time of surgery is a variable that helps predict when another procedure may be required.

Methods: A retrospective chart review was performed for 72 pediatric patients who underwent FS from 2001-2023 while under 18 years of age. Exclusion criteria included paralytic ptosis, CFEOM, and surgery where the sling was removed for complications (infection, extrusion) rather than a natural suspension failure. Surgery timing, sling material, eyelid height and asymmetry, follow-up duration, revision rate (immediate need for repeat surgery), and rate for additional surgery later in life were assessed. Linear regression was used to compare time between FS vs age at surgery. Kaplan-Meier survival analysis was performed to estimate sling-survival rates at different time intervals.

Results: After exclusions, data for 104 FS (with each eye counted individually for bilateral surgeries) on 65 patients (78 eyes) were collected. A single-rhomboid technique was used in all but 2 surgeries, wherein a double-rhomboid technique was used. Mean (±SD) age at surgery was 5.1±4.9 years. Mean follow-up time was 5.3±5.1 years. Lid asymmetry improved from a mean of 2.1±1.3 mm pre-operatively to 0.8±0.7 mm post-operatively, with an average MRD1 improvement of 2.1±1.2 mm per surgery. Silicone slings were used in 100/104 (96.1%) surgeries.

At least one additional surgery was required after 26/104 surgeries (25.0%), for 21/65 patients (32.3%) [23/78 eyes (29.4%)]. In the 26 cases that required additional surgery, the average duration between surgeries was 7.0±4.8 years. There was no correlation between age and time between surgery [R-squared=0.0005, F(2,24)=0.01 (p=0.92)]. Three-year, five-year, and ten-year sling-survival estimates were 93.4% CI [88.4, 98.7], 84.5% CI [77.0,92.7], and 74.0% CI [64.2, 85.2] respectively.

There were no significant differences in sling-survival estimates, average change in MRD1, rate of revisional surgery, or need for additional surgery later in life when comparing age groups of 0-3 years and 3-18 years at time of surgery.
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Conclusions: Age at time of FS is not a variable that affects how long the procedure will last, re-operation rate, or other surgical outcomes. These data show that re-operation is required after 25% of FS, an average of 7 years after the previous surgery, which can guide physician ability to answer questions about timing and likelihood of repeat surgery for congenital ptosis patients with poor levator function.

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2:08-2:14 pm

Can A Crease Lead the Way? A Single Center Review on Simple Congenital Ptosis Intervention and the Role of Lid Crease Evaluation

Fabliha Mukit[1], Natalie Sullivan[2], Shawyon Rohani[3], Jillian Liu[1], Jacquelyn Laplant[4], Brian Fowler[1]
[1]Oculofacial Plastic and Reconstructive Surgery, The University of Tennessee Health Science Center - Hamilton Eye Institute, Memphis, Tennessee, United States, [2]Ophthalmology, University of Tennessee Health Science Center, College of Medicine, Memphis, Tennessee, United States, [3]Ophthalmology, University of Tennessee Health Science Center, College of Medicine, Memphis, Tennessee, United States, [4]Orbital and Oculofacial Plastic Surgery, Medical College of Wisconsin, Milwaukee, Wisconsin, United States

Introduction: Simple congenital ptosis (SCP) is the most common cause of childhood ptosis with an incidence of 0.18–1.41% in the general population[1] and an average age at diagnosis of 3.7 years (birth to 16.7 years).[2] While the spectrum of ptosis can range from mild to severe, it can cause lifelong visual, cosmetic, and mental health consequences to young patients without intervention.[3] A comprehensive literature review of articles published from 1989 – 2024 yielded 138 results, none of which have previously studied pre-operative lid crease (LC) evaluation as an additional measure of levator function (LF). LF measurements can be difficult and inconsistent in pediatric patients with congenital ptosis. To the best of the authors' knowledge, we report the first and largest single center, single surgeon retrospective study assessing the efficacy of levator resection in patients with poor levator function with a present lid crease.

Methods: With IRB approval, all SCP patients from 2017-2023 who had evaluation and management by a single surgeon at the university practice were reviewed. Patients were excluded if they had any previous eyelid surgeries, syndromic disorders or other diagnoses affecting the eyelid(s), no subsequent surgical intervention, no pre-operative photo, or were lost to follow-up postoperatively. An outside board-certified oculoplastic surgeon performed a blind review of patient images to determine a presence or absence of a lid crease. Statistical analysis was performed using SAS software and used Chi squared or Fischer's exact test. Significance was set $p < 0.05$.

Results: A total of 68 patients with 81 eyes were included in our study with a predominance of male (63.2%) and black (48.5%) patients. A LC was present in 79% (N=64) of patients. Of all patients, 37% (N=30) underwent a LR, 61.7% (N=50) underwent a frontalis sling, and 72.8% (N=59) had adequate treatment overall [Figure 1].

Success of LR in patients with a LC (N=51) was stratified by binary levator function (**poor** LF <4mm to 8mm *versus* **moderate** LF of >8mm to 15mm). Of the 38 SCP eyes with poor LF with a LC, 12 underwent a LR, of which only two needed repeat treatment, resulting in 83.3% (10/12) adequate treatment with LR only. Conversely, 26 of the 38 eyes with poor LF and presence of LC underwent a FS (68%), of which 9 needed repeat treatment resulting in adequate treatment 65.4% (17/26) of the time. Of the 13 SCP eyes with at least moderate LF and

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presence of a LC, 11 underwent a LR and 3 required a repeat LR, resulting in 72.73% (8/11) adequate treatment with LR only. All eyes with poor levator function (12/17, 71%) and absence of a LC underwent FS which resulted in 83.3% (10/12) adequate treatment. Overall, 70% of patients with a LC had adequate treatment.

Conclusions: LR offers good eyelid function and fewer ocular co-morbidities compared to FS. Our study demonstrates that the presence of a LC should be examined when evaluating SCP patients and that performing LR in SCP patients with a lid crease and poor levator function is a safe and similarly efficacious intervention to FS.

Figure 1

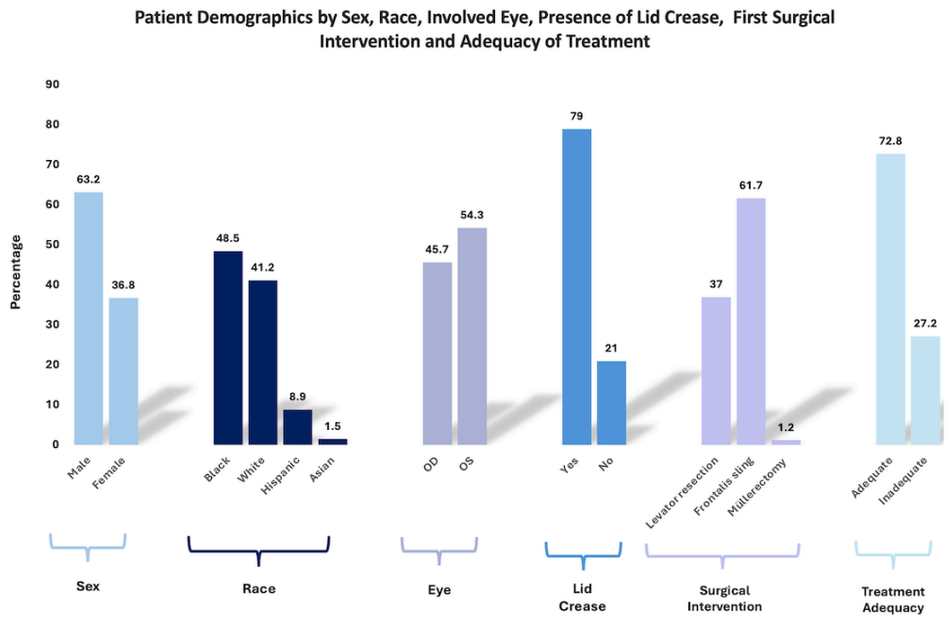
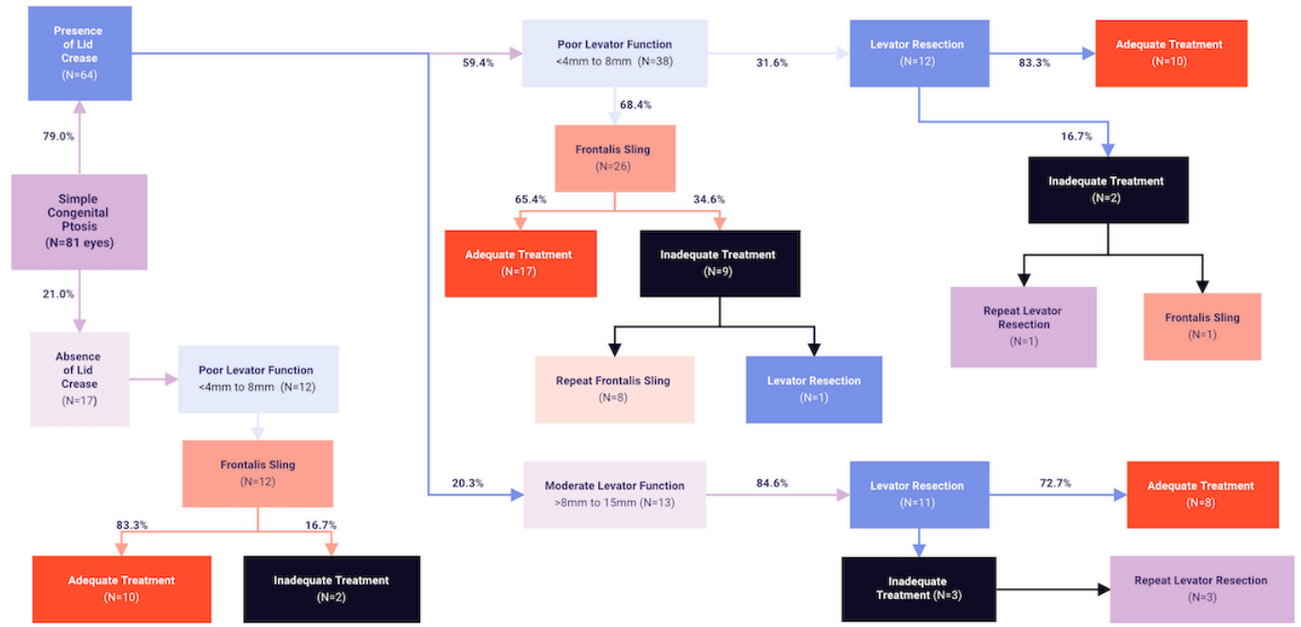


Figure 2



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2:14-2:20 pm

Severe Chalazion Development in Adolescents with Cystic Fibrosis on Elexacaftor/Tezacaftor/Ivacaftor

Malcolm Kates[1], Hector Gutierrez[2], John Paul Luckett[1,3], Matthew Vicinanzo[1,3]
[1]Department of Ophthalmology and Visual Sciences, University of Alabama at Birmingham, Birmingham, Alabama, United States,
[2]Division of Pediatric Pulmonary and Sleep Medicine, University of Alabama at Birmingham, Birmingham, Alabama, United States,
[3]Alabama Ophthalmology Associates, Birmingham, Alabama, United States

Introduction: We report a series of adolescent patients with cystic fibrosis (CF) who developed severe chalazia after starting elexacaftor/tezacaftor/ivacaftor (ETI) therapy, a new treatment regimen shown improve respiratory outcomes and quality of life in patient with CF.[1,2]

Methods: This study is a series of three adolescents (age 11-14) who developed severe chalazia after starting ETI necessitating aggressive intervention.

Results: All three patient develops robust bilateral eruption of lesions that were only minimally responsive to conservative treatment with heat, steroids, and antibiotics (both oral and topical). Two of the three patients required intervention either via incision and drainage or intralesional steroids.

Conclusions: Chalazion development has not been previously reported with ETI treatment in patients with CF. As the drug is still relatively new, the side effect profile is not well known though other cutaneous side effects including robust acneiform eruptions have been reported.[3,4] This potential association between ETI use and chalazia development is supported biologically by the presence of the anion channel modulated by ETI (cystic fibrosis transmembrane conductance regulator) in meibomian glands based on animal models.[5] The chalazia associated with use may be severe enough to warrant invasive treatment with intralesional steroids and/or incision and drainage. As such, providers should be aware of this association and patients should be warned of this possible adverse effect.

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Figure 1

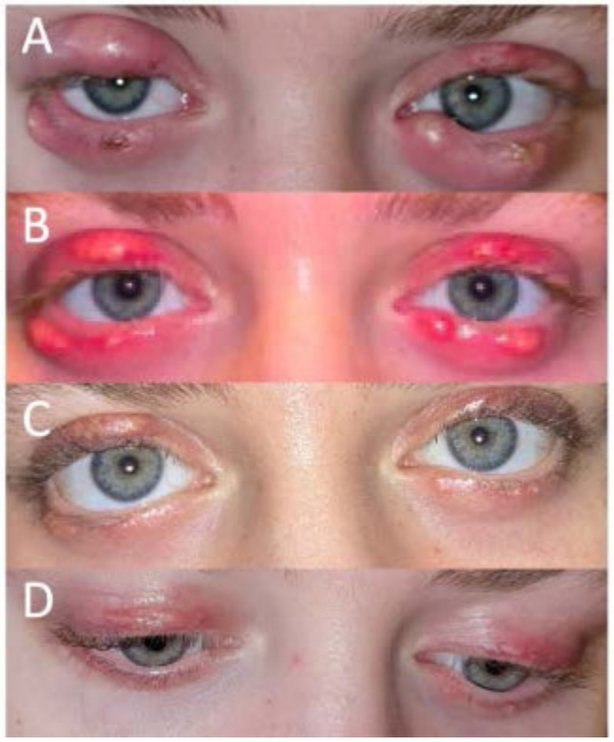

Figure 2

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2:20-2:26 pm

Medial Rectus Pyomyositis as a Complication of Orbital Cellulitis: A Case Report

Erica N. Woertz, Sudarshan Srivatsan, H. Joon Kim, Robert Kersten
Ophthalmology and Visual Sciences, University of Utah, Salt Lake City, Utah, United States

Introduction: Orbital cellulitis is a common complication of bacterial sinusitis and is characterized by post-septal inflammation with or without organized abscess. Here we present the first reported case of orbital cellulitis complicated by pyomyositis of the medial rectus muscle.

Methods: We reviewed the case of a 13-year-old female with complicated sinusitis and orbital cellulitis. We also performed literature review to compare our observations to those previously reported.

Results: The patient initially presented to a community hospital with fever, vomiting, headache, and right eyelid swelling. Orbital computed tomography (CT) imaging demonstrated pansinusitis, extensive pre-septal cellulitis involving the right eyelids and frontalis muscle, and subtle right orbital cellulitis. Chest X-ray was unremarkable. She was admitted for intravenous antibiotic treatment. Blood cultures were positive for group A *Streptococcus*. On hospital day 2 (HD2) her course was complicated by new hypoxemia, and chest CT angiography was concerning for septic emboli. She was transferred to a tertiary referral hospital for subspecialty care.

Initial ophthalmology evaluation on HD3 was significant for right periorbital swelling and erythema as well as marked limitation to adduction (-4) of the right eye. She had visual acuity 20/20 in both eyes, reactive pupils without afferent pupillary defect, normal intraocular pressure, and no optic disc edema. On HD4 magnetic resonance imaging (MRI) of the brain and orbits demonstrated a large rim-enhancing fluid collection (24 x 7 x 12 mm) concerning for abscess in the medial orbit that did not appear to be sub-periosteal. On HD5, surgical drainage of the orbit revealed copious pus in the medial extraconal space without entry into the subperiosteal space or medial rectus muscle belly. However, post-operatively the patient developed new limitation to supraduction (-2) of the right eye. Repeat MRI on HD8 (Figure 1) showed minimally reduced size (20 x 6 x 9 mm) of the medial orbital fluid collection. This indicated that the abscess was in fact intra-muscular, and the patient was scheduled for repeat surgical drainage. However, orbital ultrasound on HD9 suggested that the abscess was resolving, so no further surgical intervention was performed. Subsequent MRI showed progressively decreasing size of the fluid collection. At out-patient follow up, the patient had persistent mild limitation to adduction (-1.5) of the right eye.

Literature review suggests that bacterial pyomyositis of the extraocular muscles is extremely rare, with only 14 reported cases. All cases with positive cultures were due to *Staphylococcus aureus* and none were associated with sinogenic orbital cellulitis.
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Conclusions: This is the first reported case of extraocular muscle pyomyositis secondary to bacterial orbital cellulitis in a child. It is also the first reported case of extraocular muscle pyomyositis caused by *Streptococcus* species.

Figure 1

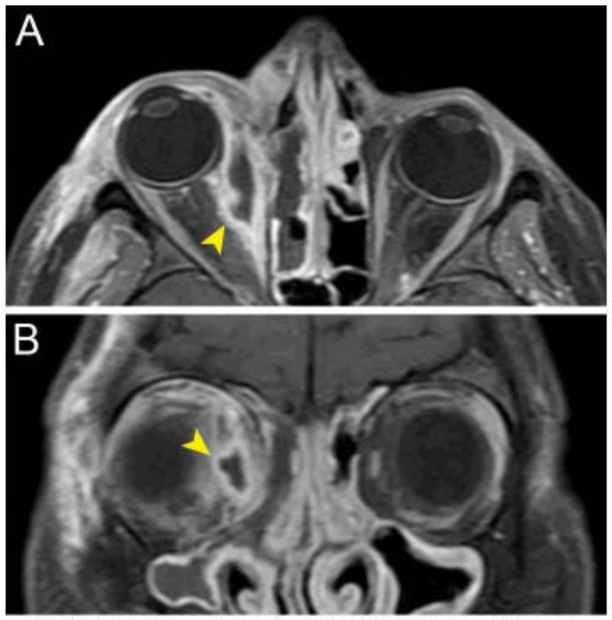

Figure 1: Magnetic resonance imaging of right medial rectus abscess (yellow arroheads) in the axial (A) and coronal (B) planes.

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FACELIFT PANEL

Moderator: Natalie A. Homer

Friday, October 18

3:10-4:10 pm

Facelift Panel

Panelists: David B. Samimi, Roger A. Dailey, Alan B. Brackup, and Tanuj Nakra

3:10–3:11 pm	Introduction by Moderator
3:11–3:24 pm	Modern Facelifting Goals & Principles David B. Samimi
3:24–3:37 pm	Facelift Incision and SMAS Plication Techniques Roger A. Dailey
3:37–3:50 pm	SMASectomy, the Deep Plane and Cutaneous Adjuncts Alan B. Brackup
3:50–4:03 pm	Neck Lifting Tanuj Nakra

4:31-4:35 pm

Subperiosteal Abscess of the Orbit: Long-Term Trends in Bacteriology and Clinical Outcomes and Current Management Recommendations

Nina Boal[1], Yasaman Ataei[1], Sang Hong[1], Timothy Wells[1], Gregory Griepentrog[1], Neda Esmaili[1], Smith Ann M. Chisholm[1], Gerald Harris[1]
[1]*Division of Oculofacial and Orbital Surgery, Department of Ophthalmology and Visual Sciences, Medical College of Wisconsin, Milwaukee, Wisconsin, United States*

Introduction: Orbital extension of bacterial sinusitis in the form of subperiosteal abscess (SPA) is a well-defined process with the potential for vision- and life-threatening complications.[1] An SPA represents the accumulation of purulent products in the potential space between the periorbita and the thin bony walls separating the sinuses and orbit. Organisms can extend through neurovascular foramina, congenital or osteitic bone dehiscence, or shared valveless venous channels.[1–3] The bacteria responsible for sinusitis-related SPA are therefore normal respiratory flora that have reached pathogenic proportions. With the widespread use of antibiotics, development of vaccines, emergence of antibiotic resistance, and improved laboratory techniques for microbial identification, organisms isolated in periocular infections have changed over time.[4,5]

Management of sinusitis-related SPA has also evolved. Surgical drainage was once standard treatment for virtually all CT-diagnosed cases.[1,3,6,7] Under this formerly surgically oriented approach, 37 cases treated from 1977 to 1992 were retrospectively analyzed.[8,9] Important age-related differences were noted—specifically a trend from simple aerobic pathogens causing antibiotic-responsive infections in children <9 years old, to more complex polymicrobial aerobic-anaerobic pathogens causing refractory infections in older children and adults. Guidelines were formulated for surgical decision-making that considered multiple factors, including patient age and abscess size (Figure 1). While there has been therapeutic success with this algorithm, it is important to be attentive to evolving pathogens. The present study analyzes the current organisms and clinical courses in pediatric sinusitis-related SPA, with comparison to prior time frames, and re-examination of the management protocol.

Methods: Comparative case series of pediatric patients with sinusitis-related SPA from 2012 to 2022. Outcomes, culture results, age-specific findings, and antibiotic duration were compared with those in 1977–1992[8,9], 1988–1998[10], 1999–2008[3], and 2002–2012[4] cohorts.

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Results: Ninety-one patients met inclusion criteria. Forty-nine patients (53.8 %) recovered with medical therapy alone; forty-two (46.2 %) underwent surgical drainage. There was increased representation in surgical cases of *Streptococcus anginosis* group (SAG) (52.4%) and anaerobes (26.2%) (Table 1). Anaerobes were isolated from two patients <9 years old, the youngest age 5; recovery in prior series was limited to patients ≥9 years old. Among 61 of 91 patients <9 years old, 41 (67.2%) were managed medically and 20 (32.8%) underwent surgery (Table 2). Comparable proportions were 67.5%/32.5%, 85%/15%, and 72%/28% in prior cohorts. Among nonsurgical patients <9 years old, mean duration of IV antibiotics was 4.02 ±1.2 days (Figure 2). Two patients required reoperation in the same admission, four patients had repeat admissions. In cases positive for aggressive pathogens, initial findings prompted timely drainage. All patients had favorable visual and systemic outcomes.

Conclusions: This study extends to 45 years an analysis of the bacteriology and clinical course of SPA at a single center with comparatively stable patient demographics and environmental factors, using a relatively uniform treatment algorithm. Despite increased representation of SAG and anaerobes, a multifactor protocol with minor modifications remains an effective strategy. We recommend that frontal sinusitis be considered a risk factor, but not a stand-alone surgical indication, and that SPA recurrence be added to the criteria for surgical drainage (Figure 3).

Figure 1

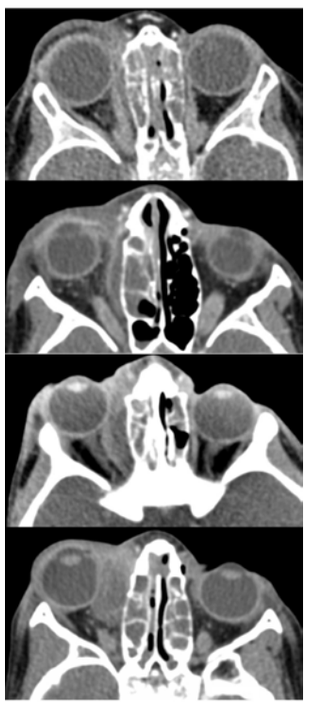

Figure 1. Axial CT images of representative medial SPAs with

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Figure 2

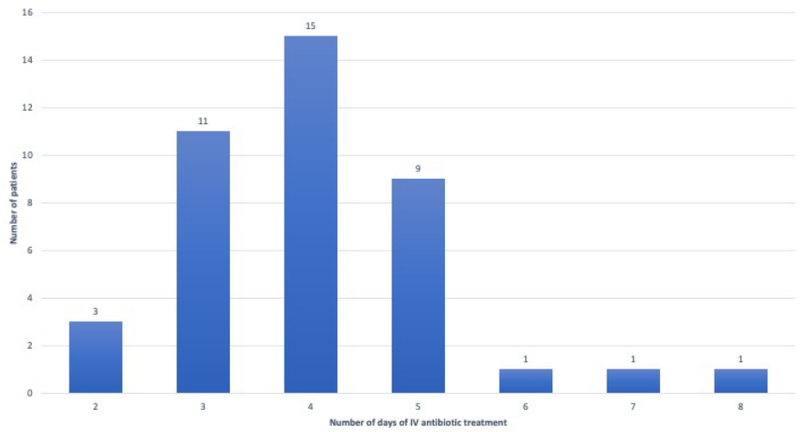

Figure 2. Duration of IV antibiotic therapy in patients <9 years of age managed without surgery. Distribution of inpatient IV antibiotic treatment (in days) in 41 patients <9 years of age with SPA treated medically: range, 2–8 days; mean, 4.02 days; standard deviation, 1.23 days; median 4 days.

Figure 3

Figure 3. Recommended Criteria for Urgent Surgical Drainage of Sinusitis-related SPA

1. Optic nerve compromise (relative afferent pupillary defect)*
2. Large SPA
3. Extensive superior or inferior SPA
4. Intracranial extension
5. Age ≥9 years
6. Other evidence of anaerobic infection (gas within SPA, dental origin, chronic sinusitis)
7. Recurrence of a medically managed SPA

*Emergency drainage (as soon as possible)

Recommended Criteria for Surgical Default of Medically Managed Sinusitis-related SPA

1. Development of an afferent defect at any time
2. Fever not abated within 36 hours*
3. Clinical deterioration despite 48 hours*
4. No clinical improvement despite 72 hours*

*Of appropriate intravenous antibiotics

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Table 1: Subperiosteal Culture Results 2012-2022

	Culture	
Patient/Sex/Age	**Aerobic**	**Anaerobic**
1/M/6 mo	*Haemophilus influenzae* (β-lactamase –) *Staphylococcus* coag -	-
2/M/11 mo	*Streptococcus anginosis (milleri)* gp*	-
3/M/1 y	*Streptococcus anginosis (milleri)* gp	-
4/M/1 y	*Haemophilus influenzae* (β-lactamase –) *Moraxella species*	-
5/F/1 y	Methicillin-resistant *staphylococcus aureus* (MRSA)* *β-streptococcus pyogenes* (gp A)*	-
6/F/1 y	*Staphylococcus* coag – *Rothia mucilaginosa*	-
7/M/3 y	*Haemophilus influenzae* (β-lactamase –)	-
8/M/5 y	*β-streptococcus pyogenes* (gp A)	-
9/M/5 y	-	-
10/M/5 y	*Streptococcus anginosis (milleri)* gp	*Parvimonas micra*
11/F/5 y	*Streptococcus intermedius*	-
12/M/5 y	*Streptococcus anginosis (milleri)* gp	-
13/F/6 y	*Streptococcus pneumoniae*	-
14/M/7 y	*Streptococcus anginosis (milleri)* gp, *Staphylococcus* coag –	-
15/F/7 y	*Streptococcus anginosis (milleri)* gp* Mixed oropharyngeal flora*	-
16/F/8 y	*Streptococcus anginosis (milleri)* gp* Mixed oropharyngeal flora*	-
17/F/8 y	Methicillin-resistant *staphylococcus aureus* (MRSA)	-
18/M/8 y	-	-
19/M/8 y	*Streptococcus anginosis (milleri)* gp *Staphylococcus aureus* (MSSA) Mixed oropharyngeal flora	*Parvimonas micra* *Peptostreptococcus species*
20/M/8 y	*Streptococcus pneumoniae*	-
21/F/9 y	*Streptococcus anginosis* (milleri) gp	*Parvimonas micra* *Prevotella (Bacteroides) intermedia* (β-lactamase+)
22/M/10 y	*β-Streptococcus pyogenes* (gp A) Mixed oropharyngeal flora*	-
23/F/10 y	*Streptococcus anginosis (milleri)* gp	-
24/M/10 y	*Staphylococcus* coag –	*Eikenella corrodens* (β-lactamase –) *Peptostreptococcus species*
25/F/10 y	*Streptococcus pneumoniae* *Staphylococcus* coag –	-
26/M/10 y	*Haemophilus influenzae* (β-lactamase –)	-
27/M/11 y	*Streptococcus anginosis (milleri)* gp	-
28/M/11 y	*Staphylococcus* coag –	-
29/F/11 y	*Streptococcus anginosis (milleri)* gp* Mixed oropharyngeal flora*	*Eikenella corrodens* (β-lactamase –)
30/M/11 y	*Streptococcus anginosis (milleri)* gp	*Fusobacterium necrophorum* (β-lactamase +) *Parvimonas micra*
31/F/11 y	*Streptococcus anginosis (milleri)* gp Mixed oropharyngeal flora*	-
32/M/11 y	*Streptococcus anginosis (milleri)* gp, *Staphylococcus* coag –	-
33/M/12 y	*Staphylococcus aureus* (MSSA)	-
34/M/12 y	*Streptococcus anginosis (milleri)* gp	-
35/M/12 y	*Haemophilus influenzae* (β-lactamase +)	-
36/F/12 y	*Streptococcus anginosis* (milleri) gp *Staphylococcus* coag –	*Propionibacterium acnes* (cutibacterium)
37/M/13 y	*Streptococcus anginosis* (milleri) gp	-
38/M/13 y	*Streptococcus anginosis (milleri)* gp	*Fusobacterium necrophorum* (β-lactamase +)
39/M/14 y	*Neisseria species* (not gonorrhoeae or meningitidis) *Staphylococcus* coag – *Streptococcus anginosis (milleri)* gp	*Prevotella (Bacteroides) intermedia* (β-lactamase +)
40/M/14 y	*Streptococcus anginosis (milleri)* gp *Staphylococcus aureus* (MSSA)	*Fusobacterium nucleatum* (β-lactamase–)
41/M/14 y	Mixed oropharyngeal flora*	-
42/M/17 y	*Streptococcus anginosis* (milleri) gp	*Prevotella (Bacteroides) intermedia* (β-lactamase–) *Eikenella corrodens* (β-lactamase –) Mixed oropharyngeal flora

- = no organisms isolated
*Retrieved from sinus only
M = Male; F = Female

Table 2: Findings and Outcomes in Surgical Patients < 9 years old (2012-2022)

Patient/Sex/Age	Visual Function	CT Findings	Surgery	Visual Outcome
1/M/6 mo	*, no APD	Small medial SPA§	Medical management (4 d IV ab / 7 d PO ab)	F&F
	*, no APD	Small medial SPA§ (Recurrent 4 wk later)	Medical management (5 d IV ab / 17 d PO ab)	F&F
	*, no APD	Small-medium medial SPA§ (Recurrent 7 wk later)	Urgent drainage∞	F&F
2/M/11 mo	*, no APD	Small medial SPA§	Default drainage (failed to defervesce at 36 h) (FESS only)	F&F
3/M/1 y	*, no APD	Large superior, medial, inferior SPA§; large temporal fossa abscess	Urgent drainage∞	F&F
4/M/1 y	*, no APD	Small superomedial SPA§ (5 mo after "preseptal cellulitis", 10 d PO ab)	Medical management (4 d IV ab / 17 d PO ab)	F&F
	*, no APD	Medium superomedial SPA§ (Recurrent 6 wk later)	Urgent drainage∞	F&F
5/F/1 y	*, no APD	Small medial SPA§	Urgent drainage (FESS only)	F&F
6/F/1 y	*, no APD	Large superior, medial, inferior SPA§	Emergency drainageψ	F&F
7/M/3 y	*, no APD	Large medial SPA§	Emergency drainageψ	*
8/M/5 y	≥20/40, no APD	Large medial SPA§; posterior globe distortion	Emergency drainageψ	20/20
9/M/5 y	≥20/40, no APD	Large medial, inferior SPA§; large nasal wall abscess	Emergency drainageψ	20/20
10/M/5 y	≥20/40, no APD	Medium medial SPA§	Default drainage (failed to defervesce at 36 h)	20/25
11/F/5 y	≥20/40, no APD	Large medial SPA§	Emergency drainageψ	20/20
12/M/5 y	≥20/40, no APD	Large superior SPA¶	Emergency drainageψ	20/20
13/F/6 y	≥20/40, no APD	Large superior SPA¶; epidural abscess	Emergency drainageψ	20/25
14/M/7 y	≥20/40, no APD	Medium medial SPA¶	Urgent drainage∞	20/20
15/F/7 y	≥20/40, no APD	Small medial SPA§	Urgent drainage (FESS only)	20/20
16/F/8 y	≥20/40, no APD	Large superior, medial SPA¶	Urgent drainage∞	20/20
17/F/8 y	≥20/40, no APD	Medium medial SPA¶	Default drainage (no improvement at 72 h)	20/20
18/M/8 y	≥20/40, no APD	Large medial SPA¶	Urgent drainage∞	20/20
19/M/8 y	≥20/40, no APD	Large medial, superior SPA¶	Urgent drainage∞; repeat drainage 2 days later for deterioration	20/25
20/M/8 y	≥20/40, no APD	Medium superior SPA¶	Urgent drainage∞	20/30

Visual Function = in affected eye; APD = afferent pupillary defect; CT = computed tomography; Visual Outcome = at hospital discharge; F = female; M = male; mo = months; y = years; wk = weeks; d = days; h = hours; ab = antibiotics; IV = intravenous; PO = by mouth; F&F = fixation and following; SPA = subperiosteal abscess; FESS = functional endoscopic sinus surgery (performed by Otolaryngology)
* Indeterminate because of poor cooperation
§ With ipsilateral ethmoid/maxillary sinusitis.
¶ With ipsilateral ethmoid/maxillary/frontal sinusitis.
ψ SPA and sinus drainage as soon as possible after initial presentation.
∞ SPA and sinus drainage within 24 hours of initial presentation.

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Comparison of Kinetic, Automated, Tangent Screen and Novel Disposable Perimetry for the Evaluation of Dermatochalasis and Blepharoptosis

Nicole P. Rebollo[1], Catherine J. Hwang[1], Julian D. Perry[1]
[1]*Oculofacial Plastic and Reconstructive Surgery, Cleveland Clinic Cole Eye Institute, Cleveland, Ohio, United States*

Introduction: To compare a novel disposable ptosis visual field device to conventional perimetry devices for the evaluation of dermatochalasis and/or blepharoptosis.

Methods: Forty patients from a single academic center participated in this prospective, observational study. Patients with dermatochalasis (skin resting on the eyelashes) and/or blepharoptosis (Marginal Reflex Distance 1 (MRD1) < 2mm) were included. Each subject underwent untaped and taped perimetry using 4 visual field devices in random order: Goldmann (GVF), automated Humphrey (HVF), tangent screen (TS) and the novel device (NVF). One eye was randomly selected and McNemar's tests and paired t-tests were used to establish comparisons between devices.

Results: The mean difference between untaped and taped central perimetry (in degrees) in the GVF, NVF, HVF and TS was 26.5 ± 14.0, 12.4 ± 8.5, 9.6 ± 6.5 and 9.6 ± 5.8 degrees (Table 1). The novel device detected a mean 2.9° greater difference than both the HVF (p=0.083) and the TS (p=0.062) (Table 2). The GVF, NVF, HVF and TS detected a >12° difference in 90%, 50%, 39%, and 32.5% of patients, respectively. The GVF detected a mean 14.1° greater difference than the novel device (p<0.001). There was no statistical difference in the ability of the NVF to detect a >12° difference compared to HVF or TS. The GVF, NVF, HVF and TS detected a 30% or greater loss of superior visual field with upper eyelid in resting position in 98%, 73%, 55% and 50% of patients, respectively. There was a statistically significant difference in the ability of GVF detect a 30% or greater superior visual field loss when compared to the NVF (p=0.002). There were no differences in the ability of the NVF to detect a 30% or greater superior field loss when compared to the HVF or TS.

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Table 1. Recorded visual field degree values at the 90 degree meridian for each of the visual field tests

Visual field test	n	Degrees in the 90° meridian
Goldmann visual field (GVF)		
Goldmann Taped, mean ± sd	40	46.3 ± 9.4
Goldmann Untaped, mean ± sd	40	18.6 ± 9.9
Goldmann Taped - Untaped, mean ± sd	40	26.5 ± 14.0
Goldmann difference ≥ 12, n (%)	40	36 (90.0)
Goldmann ≥ 30% superior field occlusion, n (%)	40	39 (97.5)
Tangent screen (TS)		
Tangent Taped, mean ± sd	40	34.5 ± 9.9
Tangent Untaped, mean ± sd	40	25.0 ± 9.5
Tangent Taped - Untaped, mean ± sd	40	9.6 ± 5.8
Tangent difference ≥ 12, n (%)	40	13 (32.5)
Tangent ≥ 30% superior field occlusion, n (%)	40	20 (50.0)
Automated Humphrey visual field (HVF)		
HVF Taped, mean ± sd	38*	28.4 ± 6.3
HVF Untaped, mean ± sd	38*	18.8 ± 7.7
HVF Taped - Untaped, mean ± sd	38*	9.6 ± 6.5
HVF difference ≥ 12, n (%)	38*	15 (39.5)
HVF ≥ 30% superior field occlusion, n (%)	40	21 (55.3)
Novel visual field device (NVF)		
Novel Taped, mean ± sd	40	25.3 ± 9.4
Novel Untaped, mean ± sd	40	12.9 ± 8.6
Novel Taped - Untaped, mean ± sd	40	12.4 ± 8.5
Novel difference ≥ 12, n (%)	40	20 (50.0)
Novel ≥ 30% superior field occlusion, n (%)	40	29 (72.5)

sd = standard deviation. *Two patients did not have HVF measurements recorded due to inability to complete the study (one patient endorsed claustrophobia, one patient had significant tearing when the upper lids were taped during the HVF test)

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Table 2. Comparisons between novel visual field device (NVF) and other visual field tests.

Compared tests	Mean Difference [95% CI]	p-value
Novel vs Goldmann	-14.1 [-18.3 , -9.9]	**<0.001** [2,3]
Novel vs HVF	2.9 [-0.4 , 6.2]	0.083[1]
Novel vs Tangent	2.9 [-0.1 , 5.9]	0.062

CI= confidence interval.

P-values are from Paired t-tests. Mean differences were further compared with repeated measures ANOVA (*p<0.001*).

[1] Significantly different from Novel - Goldman
[2] Significantly different from Novel - HVF
[3] Significantly different from Novel - Tangent
Post-hoc pairwise comparisons were done using Bonferroni adjustment.

Conclusions: The novel visual field device is as reliable as the commonly used Humphrey visual field and tangent screen for the evaluation of visual obstruction due to blepharoptosis and dermatochalasis. The Goldmann visual field is more sensitive than the other three devices. The novel disposable visual field device uses ambient light, weighs less than an ounce, and is relatively flat which may translate into a potential implementation in virtual visual field testing.

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Figure 1

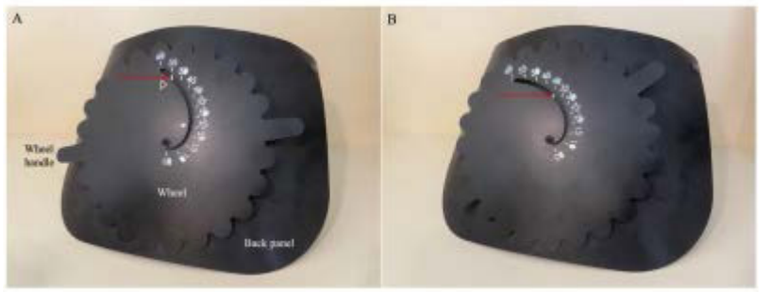
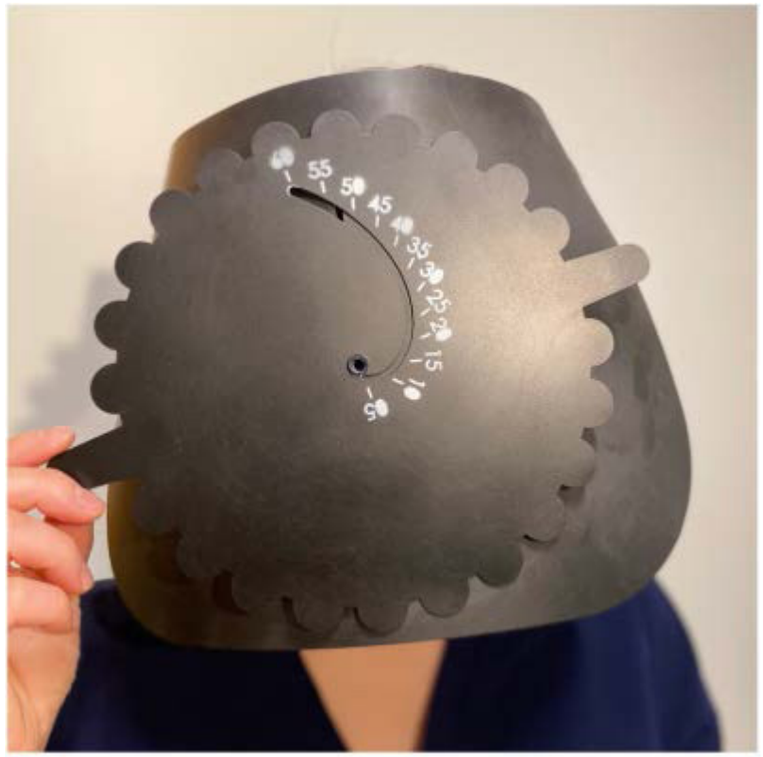


Figure 2



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1 Curvilinear Incision Design for Improved Wound Healing in Endoscopic Brow Lift Surgery

Makayla McCoskey[1], Karen Brown[1], Tanuj Nakra[1,2]
[1]TOC Eye and Face, Austin, Texas, United States, [2]Department of Ophthalmology, University of Texas at Austin, Dell Medical School, Austin, Texas, United States

Introduction: The traditional paramedian incision for endoscopic brow lifting is straight and linear, perpendicular to the hairline or customized to the direction of the intended vector of lift. "Lazy-S" and "zigzag" incision designs have been shown to have superior distribution of tension upon closure compared to linear incisions in biomechanical studies, which can result in decreased scar width.[1] Additionally, in hair-bearing skin, such as the scalp, an irregular incision causes less visible separation of the hair, resulting in decreased visibility of the scar during and after wound healing.[1] Microscopic studies of cellular wound healing also suggest improved cell migration and gap-bridging times in wavy compared to linear incisions.[2] In this study, a single surgeon's experience in using a curvilinear incision design for endoscopic brow lift surgery is reviewed.

Methods: This is a retrospective study of a single surgeon's endoscopic brow/forehead lift incision technique and post-operative outcomes. The electronic medical record was queried to identify all cases of cosmetic endoscopic brow/forehead lifting by CPT code. The collection and evaluation of protected patient health information complies with the Declaration of Helsinki.

Results: We identified 481 cases of endoscopic brow lift procedures performed between 2017 and 2024 by a single surgeon with bilateral paramedian curvilinear incisions and bilateral temporal ellipse incisions. The incisions were designed posterior to the hairline, with the location of each incision customized to the intended vector of lift. Each paramedian incision was made with a #15 blade in a sine-wave, curvilinear fashion extending approximately 2.5 centimeters (Figure 1A-B). The incision was made in multiple passes, first through skin only, then through deeper scalp tissue, and finally through periosteum, to ensure smooth transit of the blade without creation of jagged edges. The remainder of the procedure was performed with standard technique. The incisions were closed with staples (Figure 1C), which were removed at the post-operative week one visit.

Prior to 2017, 124 endoscopic brow-lift procedures performed by the same surgeon were identified. These cases were performed with straight, linear paramedian incisions, and were compared to the later cohort with regard to patient satisfaction and incisional complications.

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In the curvilinear incision cohort, excellent wound healing was generally observed at the time of staple removal one week after surgery and at post-operative month one (Figure 2). Complications observed included incision-site alopecia, tenderness, palpable irregularity, and suture granuloma formation. These complications were found to be decreased in the curvilinear incision cohort compared to the linear incision. Overall subjective patient satisfaction with incisional wound healing was high and found to be improved in the curvilinear group compared to those with linear incisions.

Conclusions: Curvilinear incision design for the post-hairline paramedian incisions in endoscopic brow lift surgery may improve both early and long-term wound healing and improve patient satisfaction.

Figure 1

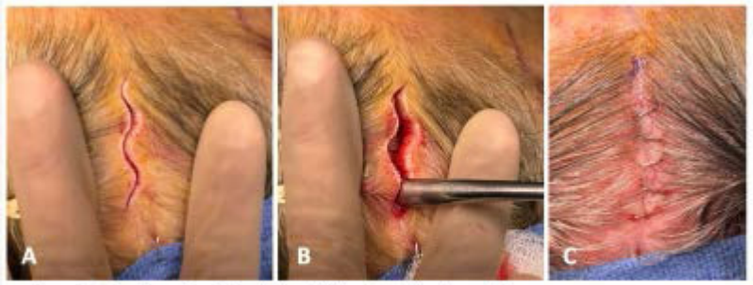

Figure 1: Curvilinear incision design (A,B) and staple closure (C).

Figure 2

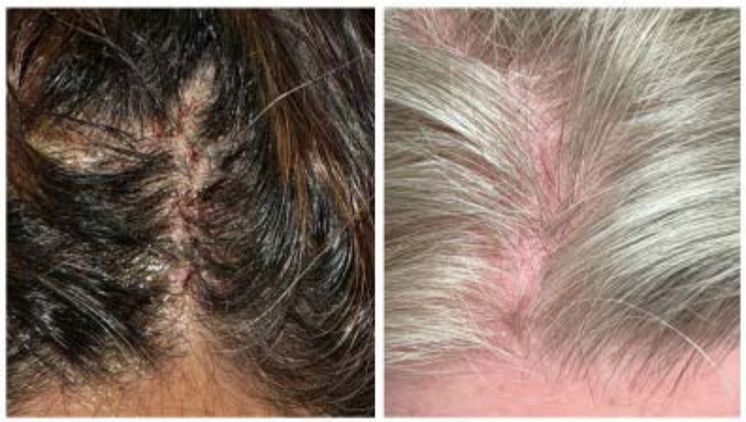

Figure 2: Early incisional healing at post-operative week one (left) and month one (right).

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2 Diplopia after Transposition Lower Blepharoplasty

Tanuj Nakra[1], Jane Edmund[2]
[1]Department of Ophthalmology, Dell Medical School, The University of Texas at Austin, TOC Eye and Face, Austin, Texas, United States,
[2]Department of Ophthalmology, Dell Medical School, The University of Texas at Austin, Austin, Texas, United States

Introduction: Transposition lower blepharoplasty has transformed the aesthetic management of the periorbital region. While the surgery is generally a safe and well-tolerated procedure, complications can occur. Reported complications of transposition lower blepharoplasty include extended swelling, infection, and contour irregularity/asymmetry. Rarely with any blepharoplasty, vision related complications can occur, including diplopia. This study aims to review the frequency, severity and nature of diplopia after transposition lower blepharoplasty.

Methods: This is a retrospective review of all transposition lower blepharoplasty surgeries performed by a single surgeon in private practice over a 14 year period. The EMR was queried for all cases of 15821, and further culled to include only cases of transposition lower blepharoplasty as opposed to subtractive lower blepharoplasty. These cases were reviewed to identify the extent, the nature, and timeline of diplopia. Cases referred to a strabsimus specialist were reviewed further.

Results: A total of 906 patients were identified who underwent transposition lower blepharoplasty by a single-surgeon in this practice. A total of 45 patients experienced transient diplopia that resolved within 2 weeks of surgery. 4 patients had extended diplopia with a torsional component and underwent orbital anti-inflammatory injections; of these, 2 patients resolved with injections and motility exercises within 6 weeks of surgery. 2 patients had long-term diplopia, and required strabismus surgery by a strabisumus surgery specialist within 6 months of surgery.

Conclusions: Transposition lower blepharoplasty is a safe and effective surgery with a remarkably low rate of diplopia. In this study, we found that diplopia occurred in 5% of cases. The vast majority of these resolved with conservative measures. 0.2% of patients experienced long-term diplopia that required strabismus surgery.

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3 Effect of Subcutaneous Injection of Tranexamic Acid on Ecchymosis and Edema after Oculofacial Surgery: A Prospective, Randomized, Split-Face, Double-Blind Study

Teresa Chen[1], Dylann Fujimoto[1], Eduardo Feijó[2], Jose Rios[2], Marisa Rassi[2], Rafael Leão[2], Roberto Limongi[2], Jeremiah Tao[1]

[1]Division of Oculofacial Plastic and Orbital Surgery, Gavin Herbert Eye Institute, University of California, Irvine, Irvine, California, United States, [2]Department of Oculoplastic Surgery, Universidade Federal de Goiás, Goiânia, Brazil

Introduction: This study aims to assess the effects of subcutaneous tranexamic acid (TXA) on periocular ecchymosis and edema in oculofacial plastic surgeries.

Methods: This is a prospective, randomized, double-blind, split-face study. The sides of the face were randomized to local anesthetic (bupivacaine with epinephrine) mixed with TXA or sodium chloride (placebo). Photographs were taken immediately post-operatively and on post-operative day (POD) 1 and 7. Photographs were graded by two masked investigators using the Surgeon Periorbital Rating of Edema and Ecchymosis (SPREE) criteria. Patients selected the side that they subjectively determined to have less periocular ecchymosis and edema. As a secondary outcome, patients rated pain on each side of their face using the Wong-Baker FACES pain scale. Adverse events were recorded.

Results: Twenty-four patients undergoing bilateral, symmetric oculofacial surgery were included in the study. There was a statistically significant difference in postoperative periocular ecchymosis on POD7 (with TXA 0.91 ± 0.73 versus placebo 1.61 ± 1.03; p = 0.020) and in periocular edema on POD1 (with TXA 1.30 ± 0.76 versus placebo 2.00 ± 0.85; p = 0.028). All patients selected the side of the face receiving TXA as having less periocular ecchymosis and edema. There was no statistically significant difference in subjective pain level between the sides of the face for all patients. There were no intraoperative or postoperative complications or adverse events.

Conclusions: Subcutaneous TXA was safe and reduced periocular ecchymosis and edema compared to contralateral placebo injections in this series of patients undergoing bilateral oculofacial plastic surgeries.

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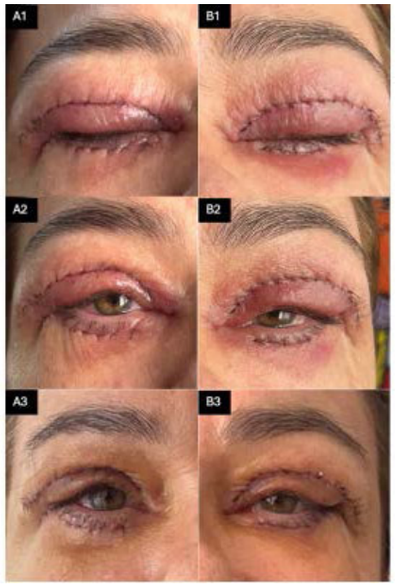
Figure 1

Figure 2

Figure 3



Age	58.0 ± 9.7
Sex	
Female	22 (92%)
Male	2 (8%)
Type of oculofacial plastic procedure	
Bilateral upper lid blepharoplasty (BULB) + CO2 laser	6 (25%)
Lower lid blepharoplasty (BLLB) + CO2 laser	3 (13%)
BULB + BLLB + midface lift	11 (46%)
BULB + BLLB + midface lift + CO2 laser	1 (4%)
BULB + brow lift + CO2 laser	2 (8%)
BULB + brow lift + conjunctivomullerectomy + CO2 laser	1 (4%)
History of anticoagulation use	
No	24 (100%)
Yes	0 (0%)
Smoking status	
No	24 (100%)
Yes	0 (0%)
Preoperative blood pressure (BP)	
Systolic BP	138 ± 13
Diastolic BP	73 ± 10
Mean arterial BP	95 ± 9
Side with tranexamic acid (TXA)	
Right	13 (54%)
Left	11 (46%)

Table 1. Baseline patient characteristics

	Side with TXA	Side without TXA	P value
Periocular ecchymosis (SPREE 0-3)			
Immediately post-op	1.13 ± 0.74	1.67 ± 1.01	0.13
POD1	1.25 ± 0.74	1.63 ± 0.82	0.35
POD7	0.91 ± 0.73	1.61 ± 1.03	**0.020**
Periocular edema (SPREE 0-4)			
Immediately post-op	1.33 ± 0.76	1.71 ± 0.86	0.21
POD1	1.30 ± 0.76	2.00 ± 0.85	**0.028**
POD7	0.83 ± 0.65	1.39 ± 0.89	0.14
Patient subjective pain score (Wong-Baker FACES Pain rating scale 0-10)			
Immediately post-op	0.54 ± 0.93	0.54 ± 0.98	0.84
POD1	0.29 ± 0.46	0.29 ± 0.46	1
POD7	0.18 ± 0.39	0.18 ± 0.39	1
Patient subjective better side	24 (100%)	0 (0%)	

TXA = tranexamic acid
POD = postoperative day
SPREE = Surgeon Periorbital Rating of Edema and Ecchymosis

Table 2. Comparison of postoperative data of the side with and without tranexamic acid (TXA)

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4 Evaluating Hyaluronidase Amounts Required to Dissolve Twenty-Two Hyaluronic Acid Fillers using a Single Dose

Rasika Sudharshan[1], Shreya Gupta[1], Alena Shen[1], Julie Woodward[2], Wendy Lee[3], Femida Kherani[4,5], Jill Foster[6], Sandy Zhang-Nunes[7]
[1]USC Roski Eye Institute, Los Angeles, California, United States, [2]Oculoplastic and Reconstructive Surgery, Duke University Eye Center, Durham, North Carolina, United States, [3]Bascom Palmer Eye Institute, University of Miami, Miami, Florida, United States, [4]Southern Alberta Eye Center, Department of Surgery, Cumming School of Medicine, University of Calgary, Calgary, Canada, [5]Department of Ophthalmology & Visual Sciences, University of British Columbia, Vancouver, Canada, [6]Department of Ophthalmology, Ohio State University, Columbus, Ohio, United States, [7]USC Roski Eye Institute, Los Angeles, California, United States

Introduction: Hyaluronic acid fillers are often preferred due to their ability to be dissolved with hyaluronidase.[1] As the use of hyaluronic acid (HA) fillers continues to increase for clinical and aesthetic purposes, associated complications continue to rise as well. Excess hyaluronidase is often used to dissolve filler, which has its own set of adverse effects including overcorrection, delayed healing, and tissue damage.[1] In prior studies, we evaluated in-vivo and in-vitro protocols evaluating filler characteristics through dissolution experiments.[2-4] This study analyzes 22 commercially available fillers to delineate the lowest single dose of recombinant human hyaluronidase (RHH) required to fully dissolve each filler within 6 hours across 3 trials.

Methods: 0.2 mL aliquots of 22 hyaluronidase fillers were placed on slides. A single dose of RHH was administered to the center of the aliquot, to a maximum of 140 units. RHH amounts were as follows: 0, 2.5, 5, 10, 20, 40, 60, 80, 100, 120, or 140 units of RHH. Filler aliquots were not mixed until the 6 hour time point to resemble an in-vivo process of an undisturbed aliquot after RHH injection. To record progress of dissolution, bird's eye and lateral photographs were taken of each filler slide at the following time points: pre-hyaluronidase injection, post-injection, 15 minutes, 30 minutes, 1 hour, 2 hour, 3 hour, and 6 hours (Figure 1). Heights were analyzed from lateral photos to identify rate of dissolution for each filler after RHH administration. After 6 hours, each aliquot was stirred to confirm the full dissolution of the initial aliquot and was video recorded. This process was repeated three times per filler until the minimal dose of RHH was identified that was consistently able to dissolve each aliquot.

Results: Juvéderm Volbella, Juvéderm Vollure, Juvéderm Skinvive, Restylane-L, Restylane Lyft, and Restylane Silk were identified as the least resistant fillers, requiring ≤ 20 units to dissolve. RHA 2, RHA 3, RHA 4, Belotero Volume, Juvéderm Ultra XC, Juvéderm Volux, Restylane Kysse, and Revanesse Versa were classified as most resistant, requiring ≥ 120 units to dissolve. Figure 2 shows the comprehensive data of

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the lowest number of units of RHH required for dissolution for each of the 22 fillers. Figure 3 shows the rate of each filler's dissolution over the 6 hours.

Conclusions: This study paired with previous studies helps to elucidate dissolution characteristics of 22 HA fillers using a single dose from 2.5 units/0.2mL to 140 units/0.2mL unstirred until 6 hours to confirm dissolution. When paired with existing literature, this study can further inform physicians on dissolving HA filler.[2-6]

Figure 1

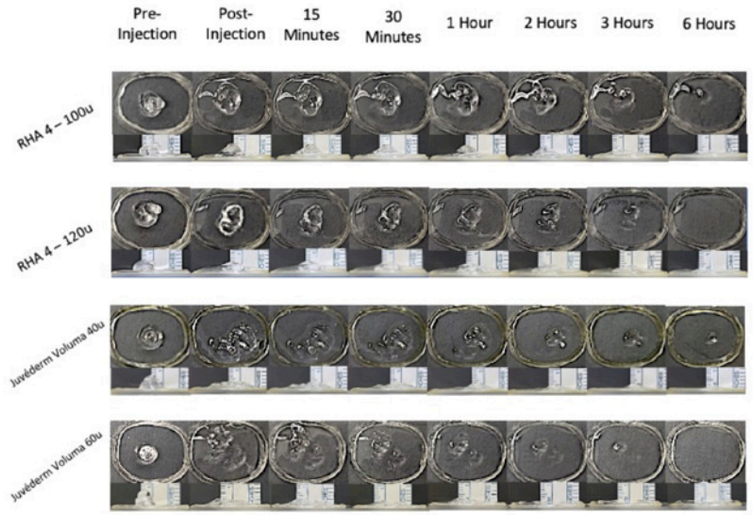


Figure 2

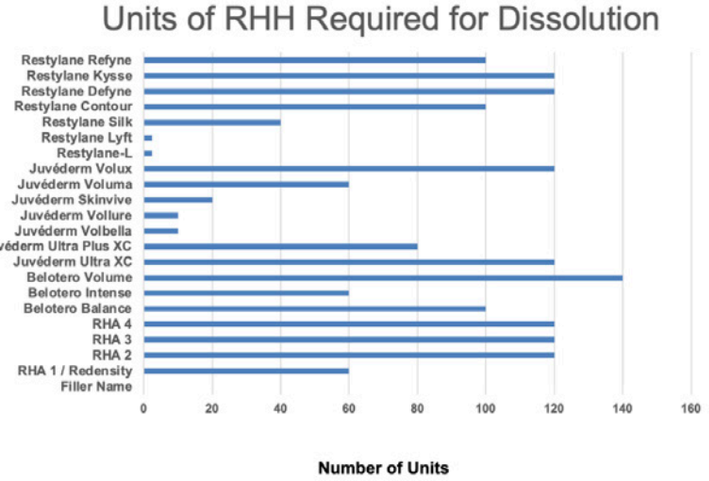
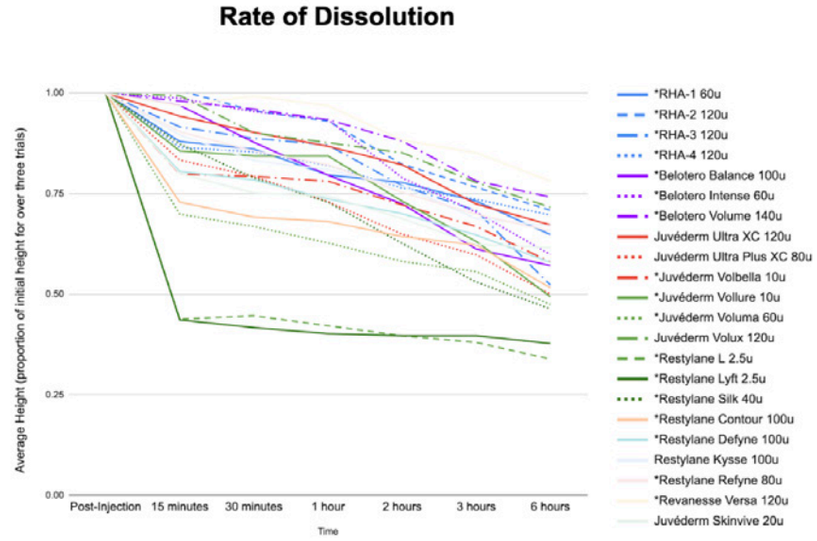


Figure 3



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5 Orbital Infarction Syndrome Following Hyaluronic Acid Lip Filler Injection

Fitz Gerald Diala, Louise Mawn
Department of Ophthalmology, Vanderbilt University Medical Center, Nashville, Tennessee, United States

Introduction: Previous reports have detailed blindness associated with aesthetic, hyaluronic acid filler injections to the glabella, nasal region, nasolabial fold, and forehead;[1-3] we report a case of orbital infarction syndrome with blindness following hyaluronic acid lip injections.

Methods: Case report with review of the literature reporting blindness following aesthetic hyaluronic acid facial injections.

Results: 31-year-old female presents with painful, acute onset vision loss in the left eye associated with complete ptosis and ophthalmoplegia. Patient received aesthetic lip filler injection 2 days prior to presentation. The day following the injection, she noted blurred vision on awakening and presented to the local emergency room; while under observation, the visual change progressed to No Light Perception vision. The patient was transferred to our facility. On presentation, there was proptosis, complete ptosis, ophthalmoplegia, relative afferent pupillary defect, elevated intraocular pressure, hemorrhagic chemosis, and sloughing edematous cornea without view to the fundus. B scan demonstrated thickening of the sclera without evidence of vitreitis. Concerned for retrograde propagation of hyaluronic acid filler material, a stroke alert was called. Computed tomography angiogram head and neck was without evidence of medium to large vessel occlusion. Findings were concerning for ophthalmic artery occlusion, a rare complication of filler injections. The patient received anterior chamber paracentesis, lateral canthotomy/cantholysis, periorbital and orbital injections of hyaluronidase, intravenous Solumedrol, Verapamil, and aspirin. While she was hospitalized for 5 days, she was also covered for infection with broad spectrum antibiotics. There was improvement in ptosis and extraocular motility prior to discharge. There was no improvement in visual acuity.

Conclusions: While fillers are generally well tolerated, rare ophthalmic complications, which can be devastating, are also increasing in incidence given the sheer volume of injections.[2,4-5] In this case, the patient received her lip augmentation at a beauty boutique shop. Previous studies with periocular injection of hyaluronidase report mixed outcome at best, leading to conclusion of no significant benefit.[6] In a pre-clinical model, enzyme was not able to meaningfully enter the optic nerve to digest hyaluronic acid clot.[7] Given this finding, the limited visual improvement with hyaluronidase likely stemmed from inability to deliver the enzyme intravascularly. The rapid recovery of eyelid and extraocular muscle function may have been secondary to the greater resiliency of these structures. Recovery

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of vision, and even late recovery of vision, has been reported in a series of patients in which direct cannulation and delivery of enzyme was performed.[8] Prompt multidisciplinary clinical intervention may allow for restoration of function after filler complications.

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6 A 20-Year Survey of Atypical Mycobacterial Infections in an Academic Oculofacial Practice

Eman Al-Sharif[1,2], Marissa K. Shoji[1], Catherine Y. Liu[1], Don O. Kikkawa[1,3], Bobby S Korn[1,3]
[1]Division of Oculofacial Plastic and Reconstructive Surgery, Viterbi Family Department of Ophthalmology, UC San Diego Shiley Eye Institute, San Diego, California, United States, [2]Surgery Department, College of Medicine, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia, [3]Division of Plastic and Reconstructive Surgery, Department of Surgery, UC San Diego School of Medicine, San Diego, California, United States

Introduction: This study reports five rare cases of atypical mycobacterial infection after eyelid surgery.

Methods: All cases of upper eyelid ptosis and blepharoplasty were reviewed for a 20-year period (January 2004 to December 2023). Only cases with confirmed microbiological diagnosis of atypical mycobacterium were included.

Results: Five cases were identified, and they are as following:

Case 1: A 68-year-old woman, one-month post-bilateral upper eyelid blepharoplasty, presented with multiple bilateral erythematous nodules along the wounds. Suspected to be a suture granuloma, it was managed with local debridement and steroid injection, yet persistent nodules emerged, leading to further debridement. Cultures revealed Mycobacterium Chelonae, possibly contracted from exposure to soil dust post-surgery. She was successfully treated with clarithromycin for 4 months without recurrence.

Case 2: A 74-year-old woman developed non-tender left upper eyelid swelling a month after Mullerectomy (single suture technique) for ptosis repair. It was initially managed conservatively as a suture granuloma, however persistent symptoms prompted an incision and biopsy, revealing Mycobacterium Chelonae upon culture growth. Successful treatment involved long-term oral clarithromycin antibiotic.

Case 3: A 58-year-old woman developed multiple non-tender erythematous nodules along her bilateral upper eyelid blepharoplasty wounds three weeks post-surgery. Biopsy and cultures confirmed Mycobacterium Chelonae infection. Treatment began with oral clarithromycin and Tobramycin ointment which demonstrated sensitivity, but due to systemic side effects and inadequate response, intralesional tobramycin injections were administered. After receiving 5 injections to the right eye and 3 injections to the left eye (0.1 to 0.2 ml per administration of 40 mg/ml tobramycin), the nodules resolved. She was switched to omadacycline by infectious disease specialist, and no recurrence occurred at 6 months follow-up (Figure 1).

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Case 4: A 77-year-old woman developed a tender, red nodule on her left upper eyelid two months post-upper lid blepharoplasty. Cultures revealed unspecified atypical mycobacteria. She received an extended course of oral clarithromycin and had no recurrence during follow-up.

Case 5: A 44-year-old woman developed a progressively enlarging nodule on the right upper lid 6 weeks after uncomplicated upper lid blepharoplasty. Biopsy of the nodule revealed Mycobacterium fortuitum. The patient was started on extended course of oral clarithromycin and had resolution with no recurrence.

Conclusions: Atypical mycobacterial infections following eyelid surgery are exceedingly rare, with an incidence of less than 1% in our institute over 20-year period. They typically manifest as non-tender erythematous granulomas or nodules along the incision site about 3-6 weeks post-surgery. The primary causative agents are mycobacterium chelonae and fortuitum, which are widely distributed in natural water, tap water, and soil. They generally have low pathogenicity but do infect immunocompetent individuals. Diagnosis can be challenging and often involves acid-fast stain, PCR, and culture that should be kept up to 8 weeks. Treatment is typically difficult and conventionally involves long-term systemic clarithromycin or doxycycline, but we have demonstrated successful management with intralesional tobramycin, a novel approach. Differential diagnosis should consider abscesses and suture granulomas. Despite its rarity, surgeons should maintain a high index of suspicion for persistent nodules especially in this cosmetic patient subset, aiming for optimal outcomes.

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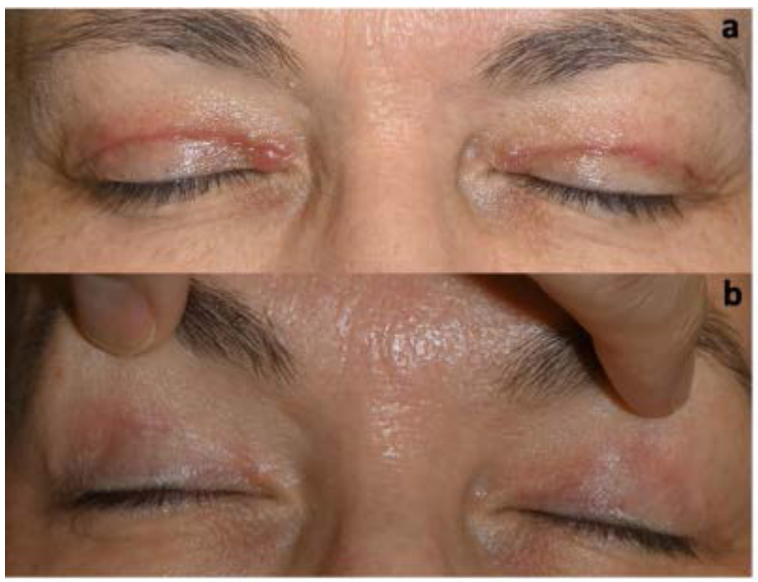
Figure 1



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7 Association of Upper Eyelid Blepharoplasty (UEB) versus Muller's Muscle-Conjunctival Resection (MMCR) with Dry Eye Syndrome (DES)

Sheharbano Jafry[1], Linus Amarikwa[2], Andrea Lora Kossler[1], Prithvi Mruthyunjaya[1], Ehsan Rahimy[1], Euna Koo[1], Karen Wai[1]
[1]Ophthalmology, Stanford, Palo Alto, California, United States, [2]Ophthalmology, University of Nebraska, Omaha, Nebraska, United States

Introduction: Dry Eye Syndrome (DES) poses a significant ocular health concern globally, leading to complications such as chronic eye inflammation and vision impairment. This study investigates the incidence and risk factors associated with DES or dry eye symptoms following Upper-Eyelid Blepharoplasty (UEB) and Muller's Muscle-Conjunctival Resection (MMCR). Considering these surgeries' proximity to the Meibomian gland and potential impact on tear production, we hypothesized that patients undergoing UEB or MMCR face an increased risk of developing DES or dry eye symptoms post-operation.

Methods: Utilizing the TriNetX database spanning 2004 to 2024, records of 28,465 patients undergoing UEB and 4,542 patients undergoing MMCR were examined after application of exclusion criteria. Exclusion criteria included pre-existing DES, dry eye symptoms, specified eye disorders, eye injuries, or eye area radiotherapy. Analysis encompassed linear regression to identify demographic and medical risk factors associated with post-surgical DES. Propensity score matching (PSM) facilitated outcome comparisons between UEB and MMCR.

Results: Post-UEB, 7.237% (n = 1,963) of patients developed DES (Figure 1). Significant risk factors included female gender (OR = 1.189; P = 0.001), Asian ethnicity (OR = 1.707; P < 0.0001), glaucoma, and lacrimal gland disorders (Figure 2). Among MMCR patients, 9.438% (n = 419) experienced post-surgical DES (Figure 1). Notably, female gender emerged as a significant risk factor (OR = 1.572; P = 0), alongside medical conditions such as glaucoma and lacrimal gland disorders (Figure 3). Comparative analysis post-PSM revealed a notably lower risk of post-surgical DES in UEB compared to MMCR (OR = 0.86; 95% CI: 0.74-0.999) (Figure 4).

Conclusions: Both UEB and MMCR surgeries present inherent risks for postoperative DES, with female gender and specific medical conditions significantly influencing DES incidence. Notably, MMCR poses a heightened risk compared to UEB. These insights underscore the necessity for comprehensive preoperative assessments and targeted patient counseling to mitigate DES risk in eyelid surgeries.

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Figure 1

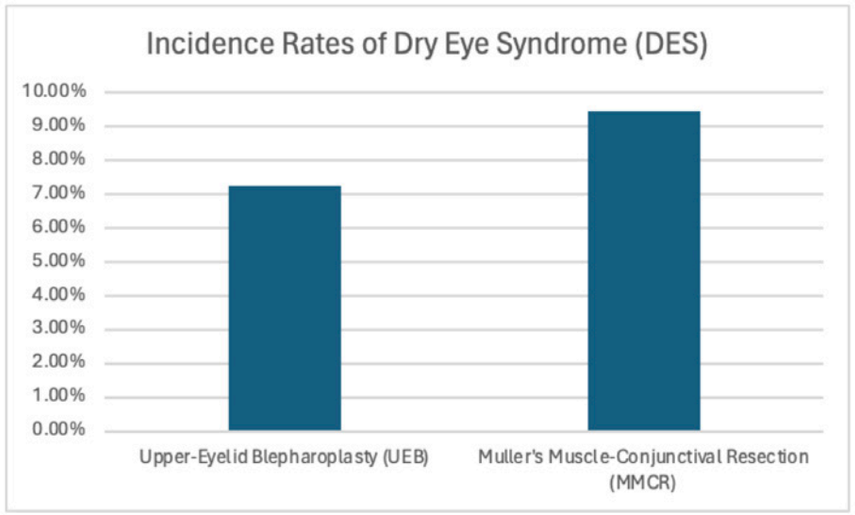

Figure 1: Incidence Rates of DES Post-UEB and Post-MCCR

Figure 2

	Odds Ratio	95% CI	P-value
Female	1.189	(1.074, 1.317)	0.001
Asian	1.707	(1.388, 2.099)	<0.00001
Glaucoma	2.963	(2.617, 3.354)	<0.00001
Lacrimal Gland Disorders	5.373	(4.619, 6.249)	<0.00001

Figure 2: Risk Factors Associated with UEB

Figure 3

	Odds Ratio	95% CI	P-value
Female	1.572	(1.252, 1.972)	0
Glaucoma	3.361	(2.649, 4.263)	<0.00001
Lacrimal Gland Disorders	7.354	(4.118, 13.132)	<0.00001

Figure 3: Risk Factors Associated with MMCR

Figure 4

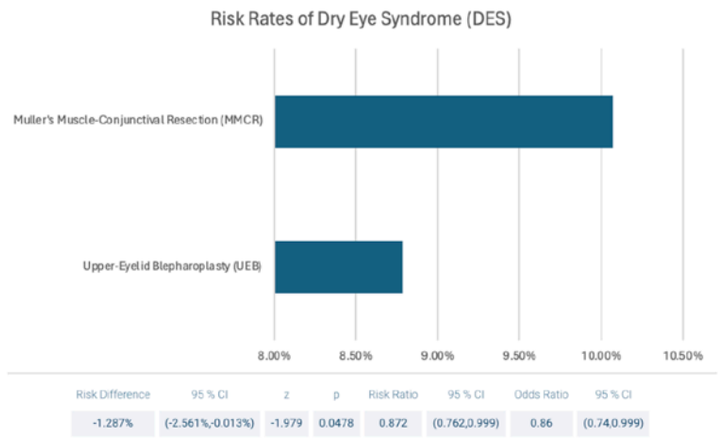

Figure 4: Post-PSM Risk Difference and Risk and Odds Ratios Comparing the Postoperative DES Risk of UEB to MMCR

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8 Can You Feel It: Assessment of Corneal Sensation in Facial Nerve Paralysis

Angela Oh[1], Abdulrahman Almalouhi[2], Daniel Rootman[1]

[1]Orbital and Ophthalmic Plastic Surgery, UCLA Stein Eye Institute, Los Angeles, California, United States, [2]Orbital and Ophthalmic Plastic Surgery, UCLA David Geffen School of Medicine, Los Angeles, California, United States

Introduction: Patients with facial nerve paralysis may exhibit reduced corneal sensation, raising the risk of vision-threatening corneal conditions like exposure keratopathy and neurotrophic keratitis. Testing for corneal sensation in these patients is important for targeting interventions. In this study, we assess the rate of reduced corneal sensation in patients with facial nerve paralysis and assess any differences in visual acuity and treatment between those with normal and abnormal corneal sensation.

Methods: We performed a retrospective case series examining patients with facial nerve paralysis from a single academic institution from 2016 – 2024. We measured corneal sensitivity using a Cochet Bonnet esthesiometer and divided patients into two groups: normal and decreased sensation. Etiology of the palsy, rate of synkinesis, visual acuity, and treatments were compared between groups.

Results: 31 patients with facial nerve paralysis (39% females, aged 60.1 ± 19.8 years) had a completed examination of corneal sensation. Two had bilateral involvement, one from a pontine hemorrhage and another from Bell's palsy. 35% (11/31) had decreased corneal sensation ipsilaterally. Among those with normal sensation, causes were central lesions (30%) including acoustic schwannomas, peripheral lesions (25%) including parotid gland tumors, and idiopathic Bell's palsy (45%). All patients with abnormal corneal sensation had an underlying diagnosis of a central (64%) or peripheral (36%) etiology. Of the 9 with idiopathic Bell's palsy, all had intact corneal sensation. Conversely, approximately half of patients with facial nerve palsy from central and peripheral causes exhibited reduced corneal sensation, at rates of 54% and 44% respectively. 10% developed synkinesis; two patients with normal sensation and one with reduced sensation.

Mean visual acuity on the ipsilateral side of facial nerve palsy was lower in patients with reduced sensation (logMAR 0.8) compared to normal corneal sensation (logMAR 0.3, p=0.009). One patient had a prior pars plana vitrectomy from retinal vasculitis ipsilateral to the facial palsy and was excluded from visual acuity analysis. Most patients (74%) had a history of facial or neurosurgery before the onset of facial nerve palsy with no difference in rates between groups (64% in patients with normal vs 80% in those with reduced sensation, p>0.05). Subsequent surgery was performed in 52% with no difference between groups. Upper lid weight placement (0.8–1.6 grams) was completed in 45% and botulinum toxin in 10%. Three of 20 patients with normal sensation showed no evidence of keratopathy – two were following upper lid weight placement. Only one patient with normal corneal sensation had an epithelial defect and corneal scar.

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In contrast, all but one with decreased corneal sensation had some level of keratopathy. In the group with decreased sensation, two patients had corneal haze and another showed evidence of limbal stem cell deficiency.

Conclusions: Overall, reduced corneal sensation was prevalent in facial paralysis cases from central or peripheral lesions. Patients with reduced sensation presented following surgery and had worse vision compared to those with normal sensation. These results emphasize the importance of testing for corneal sensation in patients with facial nerve palsies and the impact of corneal sensitivity on visual outcomes.

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9 Clinical Characteristics and Treatment Outcomes of Morbihan Disease of the Eyelids: A Single-Center Retrospective Study

Ho-Seok Sa
Ophthalmology, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, Republic of

Introduction: To evaluate the clinical characteristics and treatment outcomes of Morbihan disease of the eyelids, a rare condition characterized by chronic erythematous edema of the face, including the eyelids.

Methods: We retrospectively analyzed clinical records of consecutive patients clinically diagnosed with Morbihan disease based on chronic edema of eyelids and face from March 2011 to December 2023. We assessed clinical presentation, involvement pattern, histopathologic findings, and treatment outcomes. Patients received nonsurgical treatments categorized into four groups: no treatment, oral steroid, intralesional steroid injection, and a combination of oral and intralesional steroid injection. Intralesional steroid injection patients were further divided into low-dose (<20mg) and high-dose (≥20mg) subgroups. Nonsurgical treatment outcomes were classified as complete response (CR), partial response (PR), or no response.

Results: The study included 67 patients (mean age: 54.3 ± 11.9 years), with 44 (65.7%) being male. Among 57 patients who underwent nonsurgical treatments, significant differences in treatment response were observed between oral steroids (n=13), intralesional steroid injections (n=16), and the combination group (n=28) ($p < 0.001$). Intralesional steroid injection (50.0%) and combination (89.3%) groups showed better responses (CR or PR) compared to the oral steroid group (46.2%) ($p<0.05$ for each comparison). The high-dose (≥20mg) injection group demonstrated a marginally better response than the low-dose (<20mg) group ($p= 0.06$). During follow-up, 23 out of 57 patients (40.3%) underwent debulking surgery with blepharoplasty, and 21 out of 23 (91.3%) achieved persistent satisfactory outcomes. Common histopathologic findings included lymphocytic infiltration, dermal edema, and lymphangiectasia.

Conclusions: Intralesional steroid injections showed superior efficacy compared to oral steroids for managing Morbihan disease of the eyelids, especially at an injection dose greater than 20mg. Additionally, less than half of the patients required eyelid surgery for debulking, which effectively provided persistent control of eyelid edema.

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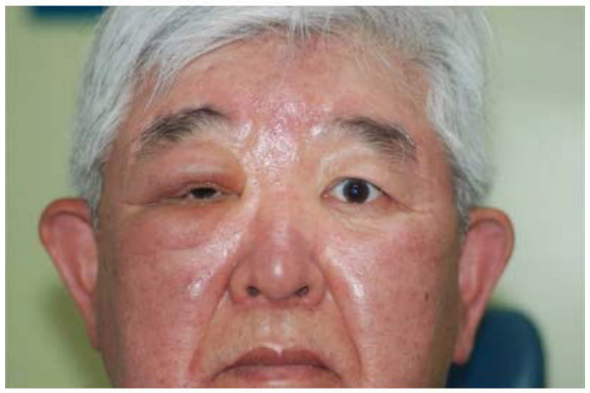
Figure 1



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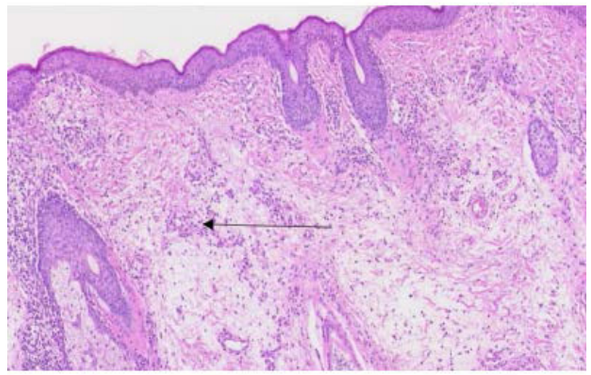
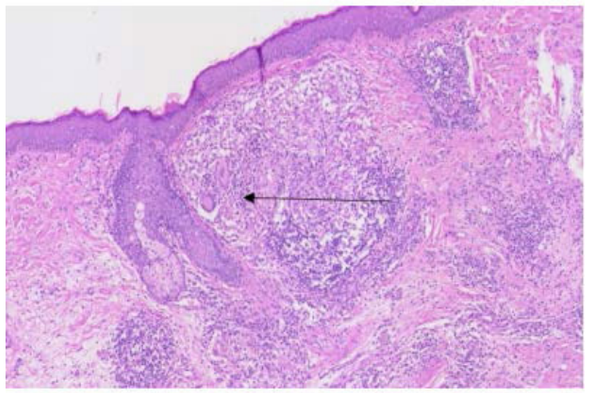


Figure 3



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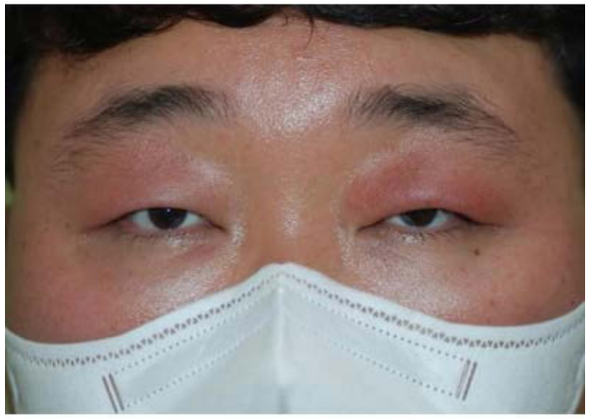

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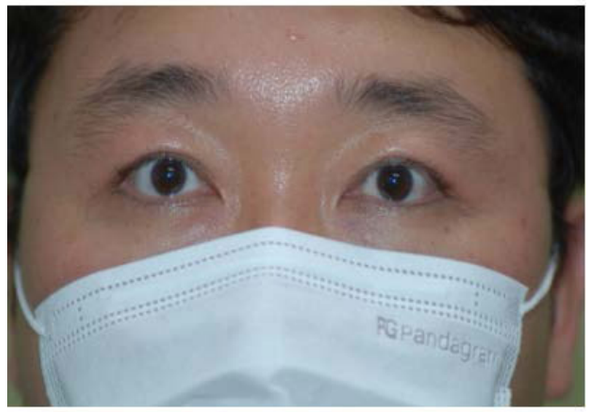

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10 Ectropion and Entropion Occurrence and Recurrence Incidence following Unilateral and Bilateral Surgery

Abdulrahman Almalouhi[1,2], Ashley Shirriff[3], Nathan Pirakitikulr[3], Daniel Rootman[4]

[1]David Geffen School of Medicine, the University of California, Los Angeles, USA., Los Angeles, California, United States, [2]Fielding School of Public Health, University of California at Los Angeles, Los Angeles, California, United States, [3]Los Angeles, California, United States, [4]Department of Ophthalmology, Orbital and Ophthalmic Plastic Surgery Division, University of California, Los Angeles., Los Angeles, California, United States

Introduction: Clinically, there can be a question when an individual presents with unilateral entropion or ectropion as to whether the opposite side is at risk of a similar occurrence. This study investigates the incidence of opposite eyelid malposition after unilateral involutional entropion or ectropion.

Methods: In this cross-sectional cohort study, all patients undergoing entropion or ectropion surgery at a single institution over a 10-year period were queried. Cases were reviewed and included if they underwent entropion or ectropion surgery for involutional pathology. Each was followed forward after surgery and occurrences of ipsilateral recurrence or contralateral occurrence of malposition was noted. Data regarding the type of malposition, surgical approach, associated surgeries, and demographics were extracted. The incidence of consecutive malposition and the number needed to treat for preventing occurrence were calculated.

Results: Three hundred and sixteen cases were identified, 60 records were subsequently excluded for cicatricial pathology. The mean follow-up time was 9 months (SD=7.5, SEM 95% CI ±3.5 months). Out of 256 remaining records, 102 underwent unilateral surgery and 154 bilateral. Of the 102 unilateral cases, 50 were entropion and 52 were ectropion. Consecutive contralateral entropion was noted in 6% of cases. No patient developed consecutive contralateral ectropion. Recurrent entropion was noted in 4.0% of cases. In patients who underwent unilateral ectropion repair, 5.6% developed recurrent ectropion in the same eye.

Out of the 154 bilateral cases, 52 were entropion and 102 ectropion. In patients who underwent bilateral entropion surgery, 5.8% developed unilateral entropion recurrence in one eye. In cases treated for bilateral ectropion, no recurrences were noted. Utilizing a bilateral failure rate of 5.8%, the number needed to treat (NNT) in order to prevent a contralateral occurrence after unilateral surgery was 35.

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Conclusions: This study finds a low occurrence rate of contralateral entropion or ectropion following unilateral surgery, with only 6% of patients developing contralateral entropion. The Number Needed to Treat (NNT) of 35 suggests that numerous bilateral surgeries would be required to prevent a single contralateral occurrence, indicating that routine prophylactic bilateral surgery may not be a resource-efficient strategy.

11 Evaluation of Sarcopenia as an Etiology for Blepharoptosis Using Muscle Signal Intensity on Orbital Magnetic Resonance Imaging

Kendall Hughes[1], Jonathan Nguyen[1], Andres Rodriguez[2], Kamand Khalaj[2], Alice Chuang[1], Roy Riascos-Castaneda[2], Ying Chen[1], Timothy McCulley[1]

[1]Ruiz Department of Ophthalmology and Visual Science, University of Texas at Houston, Houston, Texas, United States, [2]Department of Radiology, University of Texas at Houston, Houston, Texas, United States

Introduction: Recent studies have shown that involutional blepharoptosis (ptosis) may be in part due to an underlying levator palpebrae superioris (LPS) abnormality rather than dehiscence of the LPS aponeurosis;[1] our study seeks to compare the presence of sarcopenia of extraocular muscles with increasing age on magnetic resonance imaging (MRI).

Methods: This is a retrospective chart review. Orbital MRIs of adult patients between November 2014 – November 2023 were reviewed. All orbits with pathology were excluded. The average intensity was obtained for medial (MR), lateral (LR), superior (SR) and inferior (IR) rectus muscles and the intraconal orbital fat on coronal, non-fat saturated T1 images. The ratio of muscle to fat intensity were calculated to account for differences in MRI protocols. A generalized linear model was performed to compare the intensity of among the muscles and among the ratio of muscle to fat within an eye after adjusting for the age effect. A regression analysis was conducted to evaluate the relationship between each muscle signal intensity and age.

Results: A total of 30 orbits were included into the analysis. The average intensity of MR was 474.4±277.2, LR 472.7±334.5, SR 472.5±279.3, and IR 480.5±276.7 units. The average intensity of all muscles was 475.0±282.5 units. There were no differences in signal intensity among four extraocular muscles (P = 0.9842). The intensity of MR (10.33±3.09, p=0.002), LR (11.94±3.79, p=0.004), SR (10.51±3.10, p=0.002) and IR (10.30±3.08, P=0.002) significantly increased with age per year. The ratios of LR and IR muscle to fat intensity also statistically significantly increased with age (LR/Fat: 0.0025±0.0009 per year, p= 0.008, IR/Fat: 0.0021±0.0009 per year, p= 0.025). Additionally, the ratio of average of all muscles to fat intensity exhibited a significant increase with age (0.0020±0.0006 per year, p=0.003).

Conclusions: There is a positive association between age and signal intensity of extraocular muscles on MRI, indicative of sarcopenia. There is no difference in signal intensity between muscles, indicating that sarcopenia develops at a similar rate in all four recti muscles. As non-surgical treatment of sarcopenia emerges, alternate management options for blepharoptosis and other age-related ocular motility abnormalities may be applicable.

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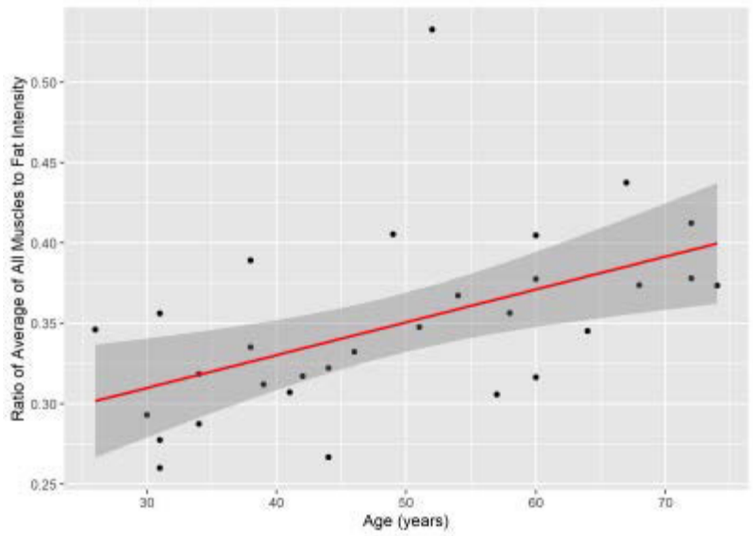
Figure 1



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12 Evidence Based Measures to Expedite Healing After Eyelid Surgery

Alomi Parikh[1,2], Benjamin Carvalho[3], David Samimi[1,2]
[1]Eyesthetica, Los Angeles, California, United States, [2]USC Roski Eye Institute, Los Angeles, California, United States, [3]Keck School of Medicine of USC, Los Angeles, California, United States

Introduction: The authors aim to evaluate and summarize evidence-based recommendations regarding peri-operative techniques shown to reduce edema and ecchymosis following eyelid surgery.

Methods: A literature review was conducted on April 7, 2024 using the PubMed database with the following MeSH search terms: (ptosis OR blepharoplasty OR entropion OR ectropion OR eyelid) AND (perioperative period OR edema OR ecchymosis OR cold temperature OR hot temperature OR arnica OR ice OR tranexamic acid). Titles and abstracts were reviewed for relevance. Articles not related to eyelid surgery, peri-operative management, not including human subjects, or not published in English were excluded. Articles were graded using Oxford Centre of Evidence-Based Medicine levels.[1] Included articles were categorized by intervention and level of evidence before summarizing.

Results: Fifteen hundred seventy articles were produced, of which 22 met inclusion criteria. An additional 3 recently published articles were encountered which had not been assigned MeSH terms, however were included based on reasonable expectation for MeSH inclusion, for a total of 25 reviewed articles which are summarized in Figures 1-4. These articles consisted mainly of randomized controlled trials (18 studies). There was one prospective comparative study, three retrospective reviews, and one literature review. Most studies focused on upper blepharoplasty, with some including ptosis repair or endoscopic brow lift. A wide range of interventions including methods of hemostasis, cooling, local anesthesia injection techniques, and compression dressings were studied. For many of these interventions, only single studies were identified in the literature. Interventions that showed clear benefit in high level of evidence studies include: local anesthetic tranexamic acid reducing ecchymosis after external levator advancement; fibrin glue reducing ecchymosis in patients who take anticoagulants (stopped 1 week prior to surgery); less bleeding and swelling with ropivacaine than prilocaine; less post operative pain but no difference in edema or ecchymosis with pre-operative cooling; greater reduction in severity of bruising with post operative intense pulsed light therapy; less edema and ecchymosis with magnesium sulfate dressings; less eyelid edema with oral dexamethasone; less ecchymosis with melilotus extract.[2-9] Interventions that showed no clear benefit include: tranexamic acid in local anesthetic for eyelid surgeries other than external levator advancement such as upper blepharoplasty; compression dressings (wet gauze followed by dry gauze followed by an eye pad and tape) showed no significant benefit for post operative edema or ecchymosis.[2,10-12] Studies on arnica were mixed; one showed a benefit in healing time while two with higher levels of

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evidence showed no significant difference.[13-15] Studies on injecting local anesthesia with blunt cannulas and small needles compared to traditional needles also showed mixed results for pain, ecchymosis, and edema.[16-18]

Conclusions: The literature on peri-operative management in eyelid surgery contains several randomized controlled trials with a good level of evidence; however few articles have been published on each intervention. Published data suggest that oral steroids, post-operative intense pulsed light therapy, magnesium sulfate dressings, and tranexamic acid or fibrin glue in select cases can be beneficial, while compression dressings and arnica may not. More studies are needed to determine which peri-operative interventions best reduce post-operative ecchymosis and edema.

Figure 1

Citation	Type of study	Level of Evidence	Category of peri-operative management	Type of Surgery	Intervention	N	Outcome Measure	Follow up	Result
HEMOSTATIC AGENTS									
Tranexamic acid									
Sagiv et al (2018)[10]	Randomized controlled trial	2	Tranexamic Acid	Upper blepharcplasty	Subcutaneous Tranexamic Acid vs. 0.9% Normal Saline (placebo), each mixed 1:1 with 2% lidocaine (for a final concentration of TXA of 50 mg/mL)	34 patients (68 eyes)	Total surgical time, cumulative time of cautery use, blood loss, surgeon's assessment of bleeding, pain level reported by the patient, periocular ecchymosis during the post op week 1, time til patient's return to normal daily activity	Post op Day 1, Post op Day 7	No significant difference between TXA vs. control for intraoperative or postoperative bleeding, length of surgery, or use of electrical cautery. Non-statistically significant trend toward smaller periocular ecchymoses at POD 7 in the TXA-treated group compared to control
Paramo et al (2024)[2]	Randomized controlled trial	2	Tranexamic Acid	Upper and/or lower blepharcplasty, levator advancement, or conjunctivomuller rectomy	Tranexamic Acid (0.5 mL of 100mg/mL TXA combined with 2.5mL of 1:1 2% lidocaine with epinephrine and 0.5% bupivacaine with epinephrine) vs. control without TXA (1:1 2% lidocaine with epinephrine and 0.5% bupivacaine with epinephrine) randomized to right or left eye of the same patient	130 patients (260 eyes)	Periocular ecchymosis at post op Day 0 and post op Week 1 scored on a 5 point scale by two blinded graders. Patients' subjective grading of bruising at post op Week 1. Surgeon rating of intraoperative and post-cperative bleeding	Post op Day 0, Post op Week 1	Significantly reduced ecchymosis with TXA compared to control on post op Day 0 and post op Week 1. Patients who reported subjective bruising at post op Week 1 indicated more ecchymosis on the control side. On subgroup analysis, external levator advancement was the only surgery type with statistically significant improvement between TXA and control. Other surgery types trended towards reduced ecchymosis with TXA, but were not statistically significant. No significant difference in intraoperative or postoperative bleeding between TXA and control
Arnica									
Kotlus et al (2010)[13]	Randomized controlled trial	2	Arnica montana	Unilateral upper eyelid blepharcplasty with subsequent contralateral eyelid at least 1 month later	Arnica montana pills (100 and 1000-fold serial dilution) on the day of surgery and for 3 days post operatively vs. placebo pills	30 patients (57 eyes)	Post cp ecchymosis by area of ecchymosis and rank-order of patient photographs (from least ecchymotic to most ecchymotic) by a blinded observer for post op day 3 and post op day 7 sets	Post op Day 3, Post op Day 7	No significant difference between arnica and control for area or rank order of ecchymosis after upper eyelid blepharoplasty
van Exsel et al (2016)[14]	Randomized controlled trial	2	Arnica montana	Upper eyelid blepharcplasty	Arnica montana 10% oirtment vs placebo ointment	116 patients (232 eyes)	Appearance of the periorbital areas graded by a blinded medical and non-medical panel. Ecchymosis, erythema and swelling (assessed by light photography), pain and patient satisfaction	Post op Day 3, Post op Day 7, Post op Week 6	No significant difference between topical arnica and placebo with reduction of postoperative ecchymosis, erythema, swelling, or pain of the eyelics, nor difference in patient satisfaction with postoperative recovery or outcome
Kang et al (2017)[15]	Retrospective review	4	Arnica montana and Rhododendron tomentosum	Blepharoplasty, browpexy, rhinoplasty	Arnica montana and Rhododendron tomentosum (contained in hydrogel pads) applied continuously for 48 hours after surgery and then 3 hours a day on post op days 3-6 vs control (patients undergoing equivalent procedures without Arnica or Rhododendron tomentosum)	27 patients	Surgeon ratings of patients' observed healing compared to expected (based on control photos of patients not using Arnica/Rhodocendron tomentosum)	Post op Day 1-2, Post op Day 3-5, Post op Day 6-8, "Overall"	Significantly more patients using arnica had accelerated healing compared to having no appreciable difference from the expected healing at Post op day 3-5, 6-8, and overall
Fibrin glue									
Lee et al (2023)[3]	Retrospective review	4	Fibrin glue	Ptosis repair	Intraoperative use of fibrin glue	115 patients (228 eyes)	Degree of ecchymosis and MRD1 at 1 week and 1 month after surgery	Post op Week 1, Post op Month 1	Significantly lower rate of severe ecchymosis 1 week after surgery and persistent ecchymosis 1 month after surgery when fibrin glue was used compared to no fibrin glue, in the subset of patients who were on antithrombotic agents (which were stopped 1 week before surgery). No significant difference for patients who did not take antithrombotic agents. No significant difference in MRD1 with versus without fibrin glue.
Khat leaves									
Landau Prat et al (2022)[16]	Prospective comparative study	2	Frozen khat leaves	Upper blepharcplasty and/or Muller's muscle conjunctival resection	48 hours of a cold dressing with frozen khat leaves to one eyelid vs frozen peas to the other	24 patients	Degree of ecchymosis and edema rated on a 5 point scale post operatively by blinded observers	Post op Day 1, Post op Day 3, Post op Day 7	Khat was associated with lower postoperative ecchymosis at each time point but this was not statistically significant.

Figure 2

Citation	Type of study	Level of Evidence	Category of peri-operative management	Type of Surgery	Intervention	N	Outcome Measure	Follow up	Result
COMPRESSION									
Schuh et al (2024)[11]	Randomized controlled trial	2	Compression Dressing or Shield	External levator advancement with or without blepharoplasty	Compression dressing (moist gauze compress followed by dry gauze compress followed by eye pad fixed with an adhesive patch) applied for 24 hours post operatively vs. clear shield randomized to right or left eye for patients undergoing bilateral surgery and randomly assigned for patients undergoing unilateral surgery	24 patients (40 eyes)	Patient-reported pain in the first 24 hours postoperatively using a visual analogue scale. Patient evaluations of the aesthetic result at post op Day 1, post op Day 7, and post op Day 56 using the Global Aesthetic Improvement Scale. Corneal staining. Edema and ecchymosis rated on a 4 point scale, scar redness and bulging rated on a 4 point scale, and aesthetic result using the Global Aesthetic Improvement Scale at post op Day 1, 7, and 56 rated by the blinded author	Post op Day 1, Post op Day 8, Post op Day 57	No significant difference between compression dressing vs. shield groups for ecchymosis, edema, scar formation, aesthetic outcome, or pain. 1 case of corneal erosion in compression dressing group on post op day 1
Schuh et al (2024)[12]	Randomized controlled trial	2	Compression Dressing	Upper blepharoplasty	Compression dressing (moist gauze compress followed by dry gauze compress followed by eye pad fixed with an adhesive patch) applied for 24 hours post operatively vs. no compression Dressing (control) randomized to left or right eye of the same patient	20 patients (40 eyes)	Edema and ecchymosis rated on a 4 point scale by a blinded observer on post op Day 1, post op Day 7, and post op Day 56. Redness and bulging of the scar rated by a blinded observer on post op Day 7 and post op Day 56. Aesthetic outcome (global aesthetic improvement score) rated by the patient and a blinded observer on post op Day 1, post op Day 7, and post op Day 56. Postoperative pain scored by the patients using a visual analogue scale on post op Day 1. On post op Day 1 patients stated which side felt more comfortable	Post op Day 1, Post op Day 7, Post op Day 56	No significant difference between compression dressing vs. no compression dressing in measurements of edema, ecchymosis, ocular surface irritation, aesthetic result, or scarring. 55% of patients reported no compression dressing as more comfortable; 20% reported the compression dressing was more comfortable, and 25% reported equal comfort with and without the compression dressing
Anderson et al (2007)[20]	Commentary	5	Compression Dressing	All (2000+ myectomies, 15,000+ overall orbit and eyelid surgeries)	Patching	15000 surgical cases	Not described	Not described	Authors note better cosmetic appearance at the first post-operative visit, less ecchymosis, edema, pain, and less long-term complications like fibrosis and scarring; no cases of vision loss
COOLING									
Huang et al (2015)[5]	Randomized controlled trial	2	Pre-operative cooling, buffering lidocaine	Upper blepharoplasty	Cooling one eyelid with ice for 2 minutes before injecting lidocaine with epinephrine with balanced salt solution vs. injecting lidocaine with epinephrine with sodium bicarbonate to the fellow eyelid	60 patients (120 eyes)	Injection pain rated after the operation by the Wong-Baker FACES scale, post operative pain; bleeding, bruising, swelling rated on a 0-4 point scale; scar appearance at 6 months	2-4 hours post operatively, Post op Day 1, Post op Day 2, Post op Day 7	No significant difference in injection pain between cooling and buffered lidocaine; significantly less post-operative pain at 2-4 hours and 24 hours post operatively with pre-operative cooling compared to buffered lidocaine
Pool et al (2015)[6]	Randomized controlled trial	2	Ice	Bilateral upper blepharoplasty	Ice pack applied to one eyelid for 30 minutes immediately after the operation and for 15-20 minutes three times on the first day of surgery vs control (uncooled fellow eyelid in the same patient)	38 patients (76 eyes)	Postoperative pain rated on a visual analogue scale by the patient at post op hour 1 and post op day 1. Postoperative edema, erythema, and hematoma scored by patient using a 4 point scale at post op hour 1, post op day 1, post op week 1, and post op month 2. Degree of bruising at post op week 1 graded on a 4 point scale by a blinded observer	Post op Hour 1, Post op Day 1, Post op Week 1, Post op Month 2	Significantly lower pain in cooled eyelids on post op day 1; absolute pain scores were low (median 0 and 0.5 on a scale of 10). No significant difference in edema, erythema, or hematoma between cooled vs. uncooled eyelids at any time point.

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Figure 3

Citation	Type of study	Level of Evidence	Category of peri-operative management	Type of Surgery	Intervention	N	Outcome Measure	Follow up	Result
LOCAL ANESTHESIA									
Garcia et al (2020)[16]	Randomized controlled trial	2	Needle used for local anesthesia	Upper blepharoplasty	Injecting local anesthesia with an 18G blunt-tipped microcannula (one eyelid) vs a 26G sharp needle (fellow eyelid of the same patient) during upper blepharoplasty	68 patients (136 eyes)	Pain on injection and post-operative ecchymosis rated on a 10 point scale by blinded observers	Transoperative, immediately post operative, 24-48 hours post operative, 1 week post operative, 1 month post operative	No significant difference between injection methods for pain or ecchymosis; there was lower pain with the micro-cannula than the needle but this was not statistically significant
Ensat et al (2016)[4]	Randomized controlled trial	2	Type of local anesthetic	Upper blepharoplasty	Prilocaine with 1:100,000 epinephrine (one eyelid) vs Ropivacaine with 1:100,000 epinephrine (fellow eyelid of same patient) during upper blepharoplasty	31 patients (62 eyes)	Intraoperative bleeding and post-operative edema rated on a 5 point scale by the surgeon (blinded to the anesthetic used)	2h after surgery, Post-op Day 1, Post-op Day 5-7	Significantly lower bleeding tendency with ropivacaine (1.71) compared to prilocaine (3.39). Significantly less post-operative swelling at all follow up time points with ropivacaine compared to prilocaine
Dell'Avanzato et al (2024)[17]	Randomized controlled trial	2	Needle used for local anesthesia	Upper blepharoplasty	Injecting local anesthesia with a Nanosoft needle (one eyelid) vs a 30 gauge needle (fellow eyelid of the same patient) during upper blepharoplasty	20 patients (40 eyes)	Patient discomfort during the procedure using a visual analogue scale, presence of post-operative edema and ecchymosis	10 weeks	Significantly less perceived pain and significantly lower rate of post operative ecchymosis and edema with the Nanosoft technology needle compared to the traditional 30 gauge needle
Yu et al (2017)[18]	Randomized controlled trial	2	Needle	Upper blepharoplasty	Injecting local anesthesia (2% lidocaine) with a sharp vs blunt 27G needle	44 patients (88 eyes)	Injection pain rated by patients on a visual analogue scale and bruise/hematoma identified from photos by 2 blinded observers	Intra-operative only	Significantly reduced pain scores and rates of bruise/hematoma formation (noted immediately after anesthesia injection) with blunt needle compared to sharp needle
Vrcek et al (2017)[21]	Commentary	5	Injection technique for local anesthesia	Upper blepharoplasty	Injecting local anesthesia (50 mL of 2% lidocaine with epinephrine combined 1:1 with 0.5% bupivacaine, 1 mL of hyaluronidase, and 5 mL of sodium bicarbonate) with a 30-gauge needle on a 3 mL syringe with the bevel positioned upward and injecting into the subcutaneous plane through one central entry site	4000 blepharoplasties	Not described	Not described	Authors note decreased post-operative ecchymosis with this injection technique
SURGICAL TECHNIQUE									
Pool et al (2015)[22]	Randomized controlled trial	2	Suturing technique	Upper blepharoplasty	Subcuticular suture within the confines of the incision (internal intradermal suturing) in one eyelid vs subcuticular suture starting and ending with a pass through skin (external intradermal suturing) in the fellow eyelid	32 patients (64 eyes)	Presence of focal inflammation and suture abscesses 1 week and 6 weeks after surgery assessed by an observer; patient comparison of edema and erythem at the medial wound margins of their upper eyelids	Post op Week 1, Post op Week 6	Significantly less medial wound inflammation at post op week 1 for internal compared to external intradermal sutures; no significant difference in focal inflammation or suture abscess formation laterally
Chen et al (2023)[23]	Randomized controlled trial	2	Carbon dioxide laser	Transconjunctival lower blepharoplasty	Carbon dioxide laser vs. monopolar electrosurgery	78 patients (156 eyes)	Total operation time, patient subjective intraoperative heat sensation and pain (scored 0 to 10), and blood pressure. Postoperative ecchymosis scored on a 4 point scale by 6 plastic surgeons and 1 nurse. Patient satisfaction score rated 0-100 at 2 months post op	Post op Day 7 and Post Op Month 2	Significantly lower incidence of chemosis with carbon dioxide laser than monopolar electrosurgery. No significant difference in operation time, intraoperative pain, intraoperative blood pressure, ecchymosis, or patient satisfaction.

Figure 4

Citation	Type of study	Level of Evidence	Category of peri-operative management	Type of Surgery	Intervention	N	Outcome Measure	Follow up	Result
OTHER									
Zhang-Nunes et al (2023)[24]	Retrospective review	4	Demographic and physiological factors	Upper blepharoplasty, external levator advancement with or without lid crease formation	None	217 patients	Clinically significant postoperative eyelid edema graded on a 3 point scale	Post op Week 1, Post op Month 1, Post op Month 3-6	Significantly higher odds of developing clinically significant eyelid edema in patients of Asian race. No significant difference in development of clinically significant eyelid edema based on BMI, medical comorbidities, medication use, or age. Patients who developed clinically significant eyelid edema were significantly more likely to require reoperation
Malik et al (2021)[25]	Literature review	1	-	All	Suture material and removal; antibiotic use; hemostasis methods; cooling	47 articles	-	-	Pre-operative antisepsis is enough to reduce the risk of post-op infection; there is limited evidence for compression dressings or anti-inflammatory medications post-operatively; further evidence is needed
Linkov et al (2016)[7]	Randomized controlled trial	2	Intense pulsed light therapy	All (most prevalent: blepharoplasty, with endoscopic brow lift or ptosis repair)	Intense pulsed light therapy to one eyelid on post operative day 1 to 2, 5 to 7, and 10 to 12 versus sham light therapy to the fellow eyelid of the same patient	28 patients (56)	Patient and physician ratings of ecchymosis, edema, and erythema at each follow up visit	Post op Day 1-2, Post op Day 5-7, Post op Day 10-12	Significantly greater reduction in severity of bruising (per patients and physicians) and color of bruising (per patients) at post-operative day 10-12 compared to post-operative day 1-2 when intensed pulsed light therapy was used compared to sham. No significant difference in final patient or physician reported scores for bruising at post operative day 10-12 when comparing scores for intensed pulsed light therapy versus sham
Schendel et al (1996)[26]	Randomized controlled trial	2	Human corticotropin-releasing factor	Upper and/or lower blepharoplasty	Pre-operative IV human corticotropin in doses of 2, 4, and 8 ug/kg	32 patients (64 eyes)	Periorbital edema measured with a 3-dimensional laser scanner	3-6 hours post operatively, Post op Day 2, Post op Day 3, Post op Day 5	No significant difference in post-operative edema between the dosage groups of human corticotropin-releasing factor
Zou et al (2023)[8]	Randomized controlled trial	2	Magnesium sulfate dressing	Bilateral upper and/or lower blepharoplasty	50% Magnesium sulfate solution-soaked dressing vs ice pack (control) each applied for 2 days post-operatively for 30 minutes, twice a day (randomized to left or right eye)	58 patients (116 eyes)	Edema and ecchymosis were scored from photographs by 2 blinded senior authors. Blinded patients also provided side preference for irritation and appearance	Post op Day 1, Post op Day 5	Significantly reduced edema, incidence of periorbital ecchymosis, and bruising area on post op Day 5 with MgSO4 dressing compared to cooling. Most patients reported preference for MgSO4 dressing compared to cooling on both post op Day 1 and post op Day 5
Xu et al (2008)[9]	Randomized controlled trial	2	Melitotus extract and steroid	Simultaneous augmentation rhinoplasty and double-eyelid blepharoplasty	Melitotus oral tablet for 1 week vs Dexamethasone taper for 1 week vs control (no treatment)	46 patients (92 eyes)	Paranasal and eyelid ecchymosis, eyelid edema, paranasal edema scored by two blinded observers	Post op Day 1, Post op Day 4, Post op Day 7	Significantly reduced upper eyelid edema on post op Day 1 and post op Day 4 in dexamethasone treatment compared to control group. Significantly reduced lower eyelid edema on post op Day 1 in dexamethasone treatment compared to control group. No significant difference in eyelid edema for melilotus extract compared to control group. Significantly reduced upper and lower eyelid ecchymosis on post op Day 7 with melilotus extract compared to the other groups

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13 Acute Dacryocystitis: Factors Impacting Clinical Outcomes in Adult Patients

Kenneth Peng, Ava Niknahad, Mannat Kaur, Dorothy Wang, Ramy Elsafy, Emily Li
Wilmer Eye Institute, Johns Hopkins University School of Medicine, Baltimore, United States

Introduction: Acute dacryocystitis (AD) management in adults conventionally consists of initial systemic antibiotic therapy to treat active infection and subsequent dacryocystorhinostomy (DCR) to address underlying nasolacrimal duct obstruction (NLDO).[1,2] Clinical outcomes of patients who do not undergo DCR remain unknown, and factors impacting outcomes in surgical and nonsurgical AD patients are not clearly defined in current literature.[3,4] The present study aimed to assess the impact of demographic, clinical, and management factors on outcomes in adults with AD.

Methods: A retrospective cohort study was conducted at a tertiary care center from January 1, 2003, to December 31, 2023, using a medical record search of billing codes for AD. Exclusion criteria were age younger than 18 years, DCR history before AD presentation, and surgical intervention other than DCR for NLDO. Data extracted included demographic features, concurrent infection at presentation, and histories of sinusitis, diabetes mellitus, facial trauma, and radiation. Surgical management data included intervention type, timing of surgery, stent placement, and duration of stent intubation when applicable. Primary outcomes assessed were AD recurrence and epiphora at final follow-up. Statistical analyses were conducted using Fisher's exact tests, general linear model, and logistic regression tests, with a p-value of 0.05 indicating statistical significance.

Results: Of the 328 patients (mean age 57.8 +/- 19.0 years) who met criteria, 88 (26.8%) were in the surgical cohort and 240 (73.2%) were nonsurgical (mean age 62.4 +/- 18.1 versus 56.1 +/- 19.1 years, $p = 0.011$) (Table 1). Sinusitis was present in 71 patients (21.65%), while less than 5% of patients had a history of facial trauma, diabetes, or radiation. Older patients ($p = 0.010$) and those with epiphora at presentation ($p < 0.001$) were significantly more likely to undergo DCR. Of the surgical patients, 17 (17.17%) underwent endoscopic DCR and 82 (82.83%) underwent external DCR. The median time to surgery was 55 days (interquartile range 28 to 125 days) after presentation. Surgical and nonsurgical patients had similar rates of AD recurrence (5.68% versus 10.00%) and epiphora (20.24% versus 18.66%) at final-follow up ($p = 0.276$ and 0.860, respectively). Concurrent orbital cellulitis was significantly associated with AD recurrence (13.79% versus 2.68%, $p = 0.015$). No factors assessed were predictive of epiphora at final follow-up. Time to surgery, stent placement, and duration of stent intubation were not associated with AD recurrence or epiphora at follow-up in the surgical cohort.

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Conclusions: The rate of recurrent AD in adults may be approximately twice as high in patients who do not undergo DCR compared to those who do, and long-term epiphora appears to occur in one-fifth of cases in both cohorts. Concurrent orbital cellulitis may increase the risk of recurrent AD. Further research is warranted to investigate the impact of surgical approach and timing on outcomes.

Table 1. Demographic and presentation characteristics

	Total (N=328)	Surgical (N=88)	Nonsurgical (N=240)	*P*-Value
Race				0.673
White	203 (61.89%)	62 (70.45%)	141 (58.75%)	
Black or African American	67 (20.43%)	14 (15.91%)	53 (22.08%)	
Asian	22 (6.71%)	4 (4.55%)	18 (7.50%)	
American Indian	1 (0.30%)	0	1 (0.42%)	
Native Hawaiian	1 (0.30%)	0	1 (0.42%)	
Not mentioned	5 (1.52%)	1 (1.14%)	4 (1.67%)	
Other	29 (8.84%)	7 (7.95%)	22 (9.17%)	
Sex				0.888
Female	241 (73.48%)	24 (27.27%)	177 (73.75%)	
Male	87 (26.52%)	64 (72.73%)	63 (26.25%)	
Age at presentation (years)	57.79 +/- 19.03	62.35 +/- 18.07	56.13 +/- 19.14	0.011*
Coinfection at presentation				
Sinusitis	71 (21.65%)	25 (28.41%)	46 (19.17%)	0.095
Dental infection	3 (0.91%)	1 (1.14%)	2 (0.83%)	1.000
Orbital cellulitis	12 (3.66%)	6 (6.82%)	6 (2.50%)	0.092
History of				
Diabetes mellitus	58 (17.68%)	13 (14.77%)	45 (18.75%)	0.514
Facial trauma	12 (3.66%)	3 (3.41%)	9 (3.75%)	1.000
Facial radiation	3 (0.91%)	2 (2.27%)	1 (0.42%)	0.176
Epiphora at presentation	157 (47.87%)	65 (73.86%)	92 (38.33%)	< 0.001*

P-values were calculated using Fishers exact tests for nominal outcomes and general linear models for continuous outcomes between patients with DCR and patients without surgical intervention. **p*-value <0.05

Table 2. Surgical management of patients who underwent dacryocystorhinostomy

	N = 99
Dacryocystorhinostomy type	
Endoscopic (%)	17 (17.17)
External (%)	82 (82.83)
Median time to surgery, days (IQR)	55.0 (28.0-125.0)
Stent intubation (%)	92 (92.93)
Median stent duration, days (IQR)	90.5 (54.0-114.0)

IQR: interquartile range

Table 3. Clinical outcomes

	Total (N=218; 328)	Surgical (N=84; 88)	Nonsurgical (N=134; 240)	*P*-Value
Epiphora at final follow-up	42 (19.27%)	17 (20.24%)	25 (18.66%)	0.860
AD recurrence	29 (8.84%)	5 (5.68%)	24 (10.00%)	0.276

AD: acute dacryocystitis; The first N is number of available data for epiphora at final follow-up, and the second N is number of available data for AD recurrence. *P*-values were calculated using Fishers exact tests for nominal outcomes between patients with and without surgical intervention. The percentages are calculated based on information available at follow-up. **p*-value <0.05

Table 4. Potential clinical predictors of epiphora at final follow-up

	No epiphora (N=176)	Epiphora (N=42)	*P*-Value
Median time to follow-up, days (IQR)	60.5 (14.0-183.0)	82.5 (23.0-266.0)	0.318
History of			
Diabetes mellitus	38 (21.59%)	7 (16.67%)	0.553
Facial trauma	5 (2.84%)	2 (4.76%)	0.622
Facial radiation	2 (1.14%)	0 (0%)	1.000
Coinfection at presentation			
Sinusitis	40 (22.73%)	9 (21.43%)	1.000
Dental infection	3 (1.70%)	0 (0%)	1.000
Orbital cellulitis	8 (4.55%)	1 (2.38%)	1.000
Surgical rate	67 (38.07%)	17 (40.48%)	0.860
Dacryocystorhinostomy type			0.754
Endoscopic	14 (19.44%)	3 (14.29%)	
External	58 (80.56%)	18 (85.71%)	
Median time to surgery, days (IQR)	53.0 (28.5-116.0)	62.0 (32.0-130.0)	0.633
Stent intubation	67 (93.06%)	19 (90.48%)	0.654
Median duration of stent, days (IQR)	89.0 (22.0-114.0)	96.0 (54.0-117.0)	0.336

IQR: interquartile range; *p*-values were calculated using Fishers exact tests for nominal outcomes and general linear models for continuous outcomes between patients with and without epiphora at final follow-up. **p*-value <0.05

Table 5. Potential clinical predictors of recurrent acute dacryocystitis

	No Recurrence (N = 299)	Recurrence (N = 29)	*P*-Value
Median time to follow-up, days (IQR)	45 (14-175)	178 (56-392)	0.148
History of			
Diabetes mellitus	54 (18.06%)	4 (13.79%)	0.799
Facial trauma	11 (3.68%)	1 (3.45%)	1.000
Facial radiation	3 (1.00%)	0 (0%)	1.000
Coinfection at presentation			
Sinusitis	63 (21.07%)	8 (27.59%)	0.478
Dental infection	2 (0.67%)	1 (3.45%)	0.243
Orbital cellulitis	8 (2.68%)	4 (13.79%)	0.015*
Surgical rate**	83 (27.76%)	5 (17.24%)	0.130
Dacryocystorhinostomy type			1.000
Endoscopic	14 (16.87%)	3 (18.75%)	
External	69 (83.13%)	13 (81.25%)	
Median time to surgery, days (IQR)	49 (28-117)	86.5 (54-170.5)	0.126
Stent intubation	77 (92.77%)	15 (93.75%)	1.000
Median duration of stent, days (IQR)	88 (44-113)	94 (65-122)	0.246

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14 Evaluation of Lacrimal Passage Disorders Induced by S-1 and Potential Preventative Interventions

Masahiro Fujimoto[1,2], Tomoyuki Kashima[1], Yuji Yamana[1], Ryo Kikuchi[1], Yuki Kamiya[1]
[1]Ophthalmology, Oculofacial Clinic Group, Tokyo, Japan, [2]Ophthalmology, Kyoto University Hospital, Kyoto City, Japan

Introduction: S-1, an anticancer medication, has been associated with lacrimal system disorders, potentially becoming refractory if diagnosis and treatment are delayed. This study aims to assess the pathological changes in the lacrimal passages following S-1 administration and to explore the mechanisms responsible for these changes and possible preventive strategies.

Methods: We used sixteen male New Zealand White rabbits weighing approximately 2.5 kg. Ten rabbits, forming the S-1 group, underwent punctal closure on the left side and received 3 mg/kg/day of S-1 for one month. The control group consisted of six healthy rabbits. We conducted a pathological evaluation of the lacrimal passages and performed fractal analysis on the vascular cavities within the nasolacrimal duct mucosa to assess vascular complexity and heterogeneity.

Results: The S-1 group showed much higher rates of severe epithelial exfoliation than the control group ($P = 0.000172$). They also had more complex and varied vascular structures, suggesting possible vascular dilation or disruption ($P = 0.031$ and $P < 0.05$). Severe exfoliation was more common near closed puncta ($P = 0.024$). While sub-epithelial disorders were similar on both sides, the treated side displayed greater capillary heterogeneity ($P = 0.0030$), with no difference in deep vessel heterogeneity ($P = 0.35$).

Conclusions: The primary mechanism underlying S-1 induced lacrimal passage disorder appears to be vascular damage. Maintaining tear flow may protect the mucosal membrane. Interventions such as ocular instillation, periodic lacrimal syringing, or silicon intubation could potentially prevent lacrimal passage disorders associated with S-1 treatment.

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Figure 1

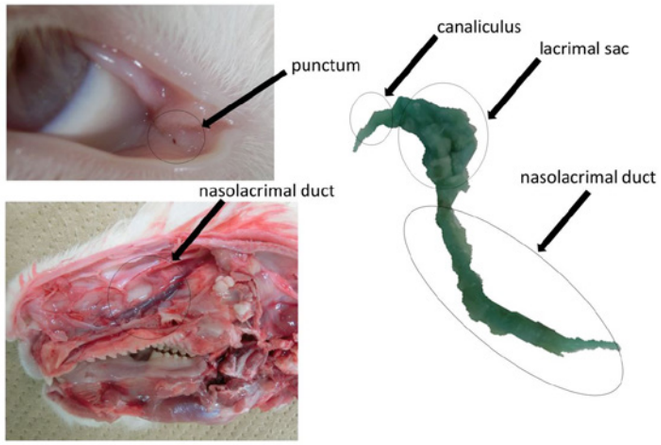

Figure 1. Harvest of the lacrimal drainage system. **a** Representative image showing the punctum in a rabbit eye. **b** Anatomical location of the lacrimal passage within the rabbit skull. **c** Image of a dissected lacrimal drainage system.

Figure 2

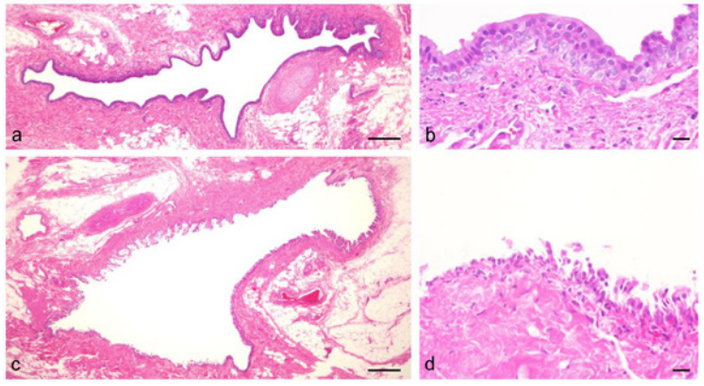

Figure 2. Light micrographs of cross-sections through the lacrimal sac. **a** Low-magnification light micrograph of a lacrimal sac from the control group. Epithelial exfoliation was not found. **b** Higher magnification of (a). The lining of the pseudostratified columnar epithelium is intact. **c** Low-magnification light micrograph of a lacrimal sac from the S-1 group. Epithelial exfoliation is observed in 50-75% of the whole circumference. **d** Higher magnification of (c). Basal cells remain, but the more superficial epithelium has been exfoliated. Bars: 100 µm for a,c; 20 µm for b,d

Figure 3

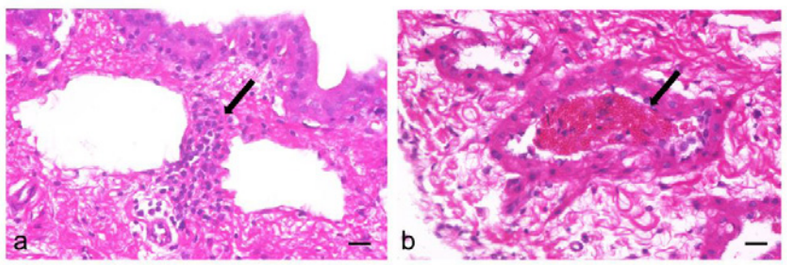

Figure 3. Histological appearance of the submucosa of the lacrimal passage in S-1-treated rabbits. **a** Mononuclear cells infiltrating (arrow) into the interstitium. **b** Fibrin thrombosis (arrow) is observed in the vascular cavity. Bars: 20 µm

Figure 4

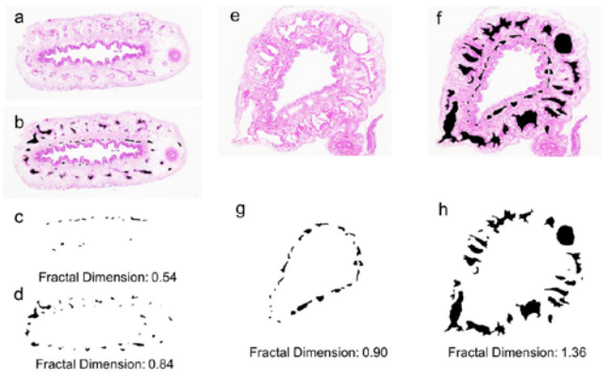

Figure 4. Evaluation of the vascular cavity in the nasolacrimal duct. a-d Control group. a The nasolacrimal duct in the control group. b Coloring of the vascular cavity in (a). c A superficial capillary of the submucosa is displayed. The fractal dimension is 0.54. d The deep submucosal vessels are displayed. The fractal dimension is 0.84. e-h: S-1 group. e Nasolacrimal duct in the S-1 group. f Coloring of the vascular cavity in (e). g A superficial capillary in the submucosa. The fractal dimension is 0.90. h Deep submucosal vessels. The fractal dimension is 1.36.

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15 A Challenging Case of Recurrent Unilateral Alternating Orbital Inflammation Associated with VEXAS Syndrome

Buse Guneri Beser[1], Almila Sarigul Sezenoz[1,2], Sarinee Juntipwong[1], Mehriban Alizada[1], Aslan Aykut[1,3], Victor Elner[1], Hakan Demirci[1]
[1]Department of Ophthalmology and Visual Sciences, University of Michigan, Ann Arbor, Michigan, United States, [2]Department of Ophthalmology and Visual Sciences, Baskent University, Ankara, Other, [3]Department of Ophthalmology and Visual Sciences, Marmara University, Istanbul, Other

Introduction: VEXAS syndrome is a rare disorder marked by systemic inflammation and blood disorders, caused by somatic mutations in the ubiquitin-activating enzyme 1(UBA1) gene of hematopoietic stem cells.[1] UBA1 is an X-linked gene that produces the E1 activating enzyme, essential for protein degradation and cellular equilibrium. In VEXAS syndrome, mutations decrease E1 enzyme levels, leading to increased inflammatory cytokines like IFN-γ, IL-8, and IP-10, which cause inflammation across multiple organs.[2] Around 45% of VEXAS patients encounter eye problems including periorbital edema, episcleritis, scleritis, uveitis, conjunctivitis, blepharitis, orbital myositis, orbital cellulitis, dacryoadenitis, and diplopia.[3]

Methods: A retrospective case report

Results: A 63-year-old man with a history of glaucoma in both eyes was presented with sudden onset of right periorbital edema, proptosis, ophthalmoplegia, and conjunctival chemosis(Fig1A-B). His vision was 20/25 OD and 20/20 OS. Pupillary reactions were normal, and there was no sign of intraocular inflammation. Maxillofacial computed tomography(CT) demonstrated asymmetric stranding in the right retro-orbital fat with associated right globe proptosis(Fig1C); but no discrete collection or paranasal sinus opacification. He was admitted with a concern of right orbital cellulitis and intravenous vancomycin and ampicillin/sulbactam were started. Four days after the admission, the eyelid edema regressed. However, his periorbital edema progressed overnight after transitioning to oral antibiotics, and intravenous antibiotics were restarted. His symptoms improved in one week. One month later, he developed a new pain and swelling of the left temple that progressed to the left periorbital area. Maxillofacial CT showed left preseptal cellulitis extending onto the left premaxillary space. Due to a history of recent orbital cellulitis, he was placed on intravenous linezolid/ceftriaxone/metronidazole and later changed to linezolid/cefepime/metronidazole due to lack of improvement and concern for progression to left orbital cellulitis. He developed left significant proptosis, ophthalmoplegia and, chemosis(Fig2A-B). Maxillofacial CT showed new thickening and inflammatory change surrounding the left superior rectus(Fig2C). Given the unresponsiveness to broad-spectrum antibiotic treatment, he underwent a left orbital and temporal artery biopsy(TAB) which showed dacryoadenitis with scarring and mild

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subacute inflammation in the left superior orbit. There was no evidence of temporal arteritis, no fungi and, mycobacteria on special stains and IgG4 staining was not consistent with IgG4-related disease. Six weeks after the left orbital surgery, right orbital inflammation recurred(Fig3A) with acute inflammatory changes of the right orbit involving the right lateral rectus muscle on CT(Fig3B). He underwent right orbital and TAB which showed idiopathic sclerosing orbital inflammation. Intravenous methylprednisolone was started and he responded well. He had an extensive inflammatory workup which was non-contributory. During the two-year follow-up, he developed a multi-organ inflammatory disorder(Fig4). DNA analysis from bone marrow revealed a mutation in the ubiquitin-activating enzyme 1(UBA1) gene, confirming the diagnosis of VEXAS syndrome. His symptoms are currently under control with 10 mg of prednisone and ruxolitinib(JAK inhibitor).

Conclusions: VEXAS syndrome should be considered in the differential diagnosis of recurrent orbital inflammatory syndromes, particularly in older patients who have multiorgan inflammation and/or hematological disorders. Prednisone 20-40mg/day is the most effective treatment for VEXAS-related inflammation flares while low-dose prednisone and JAK inhibitors prevent recurrences.[4]

Figure 1

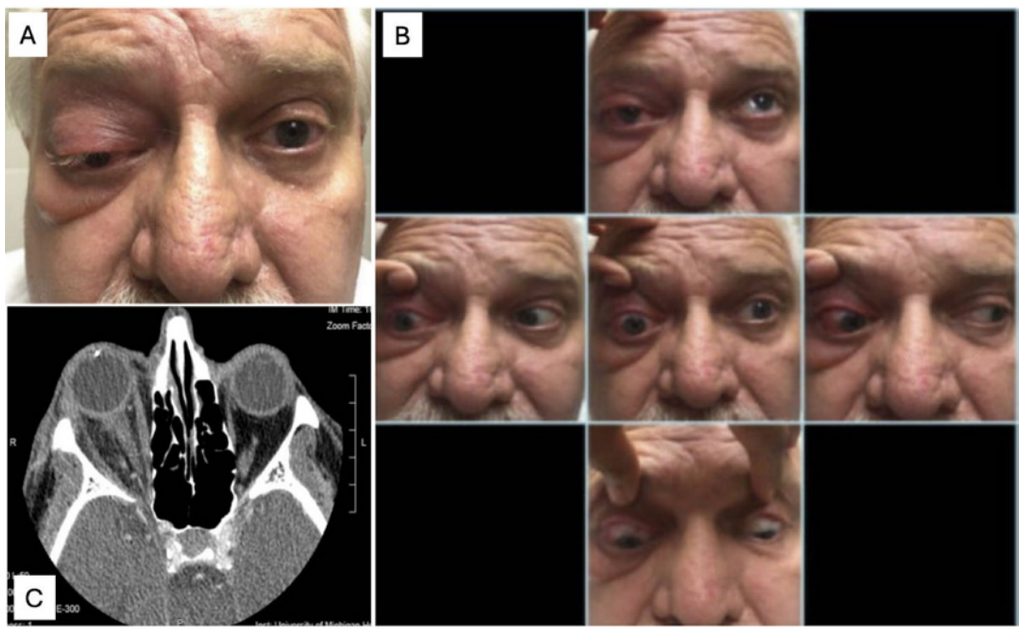

Figure 2

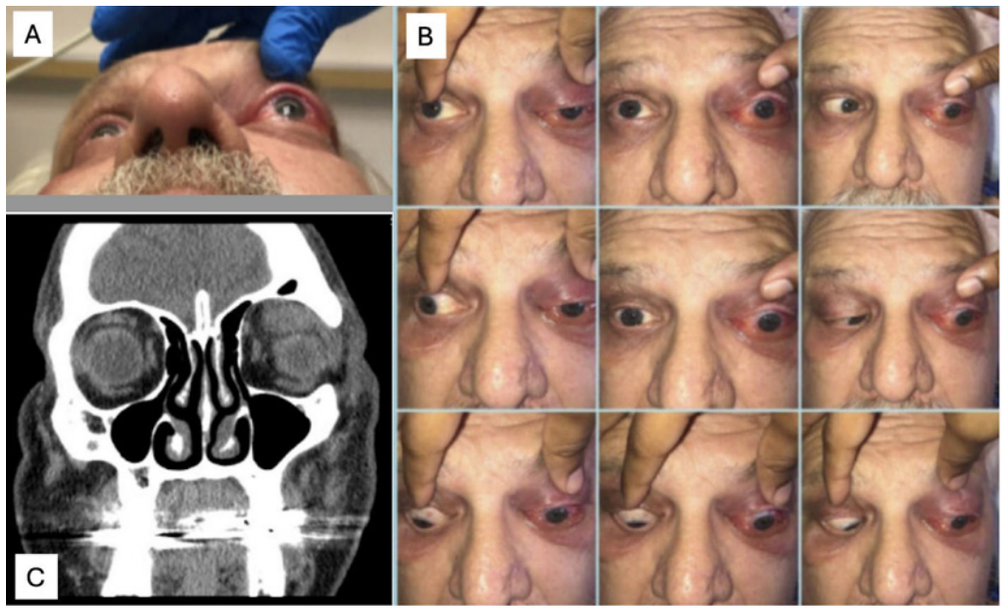

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Figure 3

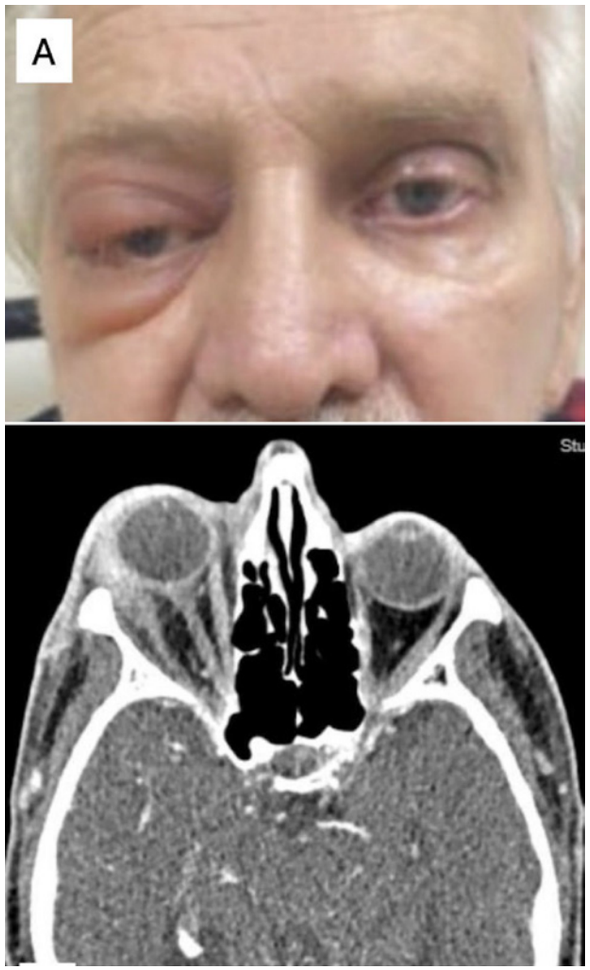

Table 1

Table 1. Systemic manifestations of VEXAS syndrome in a case of 76-year-old man

Organ system	Symptoms
Ocular	Dcaryoadenitis and subacute inflammation Sclerosing inflammatory orbital pseudotumor with recurrent periorbital swelling (flares whenever prednisone dose < 20 mg)
Skin	Skin biopsy concerning for polyarteritis nodosa vasculitis with tender pruritic nodular rashes (flares whenever prednisone dose < 15 mg)
Hematological	A right subclavian deep vein thrombosis Macrocytic anemia and thrombocytopenia with intermittent leukopenia, bone marrow biopsy showed vacuoles
Respiratory	Waxing and waning dry cough, computerized tomography changes concerning for interstitial lung disease
Musculoskeletal	Inflammatory arthritis including podagra
Other	Intermittent low-grade fever

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16 Chronic Anophthalmic Socket Pain Successfully Treated Using a Radial Forearm Free Flap

Remigio Flor[1], Bryan Allen[1], Jonathan Buttram[1], Jason Lewis[2], Paul Wistermayer[3], Ean Saberski[4], Eva Chou[1,5]
[1]Ophthalmology, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [2]Ophthalmology, Madigan Army Medical Center, Joint Base Lewis-McChord, Washington, United States, [3]Otolaryngology, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [4]Plastic Surgery, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [5]Surgery, Uniformed Services University of the Health Sciences, Bethesda, Maryland, United States

Introduction: Anophthalmic socket pain is a challenging condition following enucleation. Socket revision may be necessary if medical therapy is unsuccessful. Traditional techniques include split- or full thickness skin grafts, rotation flaps, mucosal grafts, or the use of alloplastic materials. We present a case of orbital reconstruction via radial forearm free flap following failure of previous procedures, providing a predictable vascular pedicle for reliable single-stage orbital reconstruction.

Methods: This is a case-report of a 58-year-old male who suffered from left anophthalmic socket syndrome characterized by chronic pain, discharge, and progressive socket contracture. The patient had a history of left eye trauma and subsequent enucleation with hydroxyapatite implantation 30 years ago. His subsequent course has been complicated by a cracked implant following pegging necessitating explantation with replacement of volume by dermis fat graft, followed by dermis fat graft involution, infections, and socket contracture. Despite extensive medical therapy, he suffered intractable pain from the left anophthalmic socket. A multidisciplinary team addressed this challenge, using a vascularized flap with a sized radial forearm flap to revise the anophthalmic socket.

Results: A multidisciplinary team that included Oculofacial Plastic Surgery, Head and Neck Surgery, and Plastic Surgery evaluated the patient to offer a variety of revisional surgical options. Various local and free flap options that would fit the tissue quality, contour, and volume needed for socket revision were considered. These included a temporoparietal fascia flap and free flaps from the medial calf, anterolateral thigh, and radial forearm. The radial forearm free flap was selected as it allows for a long pedicle length, an epithelialized component, and options of either a fascia or dermal extension.

The free flap was harvested using microsurgical techniques. Within the socket, significant scar tissue was encountered and lysed. A previously-placed spherical implant was removed. A 2x1cm lateral orbital bony window was created to allow for the insetting of the vascularized flap. Meanwhile, a modified Blair incision was used to isolate facial and neck vasculature as recipient vessels. A tunnel created between left neck and orbit via a subplatysmal/sub-SMAS flap with simultaneous preservation and protection of the facial nerve. The left facial artery and left external jugular vein were used for vascular anastomosis.

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All branches of the facial nerve stimulated appropriately at end of case. The donor site was primarily closed without pressure but subsequently required a skin graft following wound dehiscence. The patient completed a weeklong inpatient stay for flap monitoring and was seen in the outpatient setting and noted to be healing well with improved volume and resolved pain.

Conclusions: The radial forearm free flap is a viable option for the revisional surgery in a patient with chronic anophthalmic socket pain. This case report demonstrates the successful use of the vascularized flap in achieving volume and vascular restoration, minimizing chronic inflammation, and achieving resolution of chronic pain.

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17 A Rare Zoonotic Orbital Infection

Montana Osler, Cameron Yang, Sruti Akella
Department of Ophthalmology and Visual Sciences, The Ohio State University Wexner Medical Center, Columbus, Ohio, United States

Introduction: *Rhodococcus hoagii* (formerly *R. equi*) is an aerobic actinomycete that primarily causes lung infections via inhalation of soil spores in severely immunosuppressed patients (historically HIV patients). Though rare, infection with this microorganism carries a high fatality rate with bacteremia seen in more than 50% of cases. The authors present the first reported case of traumatic inoculation with *R. hoagii* resulting from proximity to household dogs, causing an isolated eyelid abscess without bacteremia in an immunocompromised patient.

Methods: Case report.

Results: A 30 year-old male with history of Grade IV medulloblastoma status-post resection and adjuvant chemoradiation with subsequent development of treatment-related acute myeloid leukemia (AML) presented to the hospital after a syncopal episode. He was noted to have a right traumatic sub-brow hematoma without other ocular findings and was admitted to the hospital for workup of generalized weakness. In the subsequent week, he developed fevers and underwent a broad infectious work-up. Computed tomography (CT) of the orbits demonstrated an abscess at the site of his previous hematoma with associated cellulitis. His orbital abscess (Figure 1) was drained and sent for culture, which showed infection with R. hoagii. Additional magnetic resonance imaging (MRI) of the brain showed numerous ring-enhancing lesions (Figure 2), suspected to have directly disseminated from the orbital abscess. All blood cultures were negative for any microorganism. He was started on empiric treatment for systemic Rhodococcus infection, with the presumed source being his two domesticated dogs. After completion of antibiotic therapy, repeat MRI noted near-resolution of lesions. At most recent follow-up, patient is doing well and anticipating a bone marrow transplant for treatment of his AML.

Conclusions: Zoonotic organisms present an emerging threat to immunocompromised patients. Multispecialty collaboration for diagnosis and management is essential for caring for these complex patients. In particular, it is important to recognize that these atypical infections may behave unusually, as in this case where an infection in the periocular area directly extended into the CNS without bacteremia.

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Figure 1

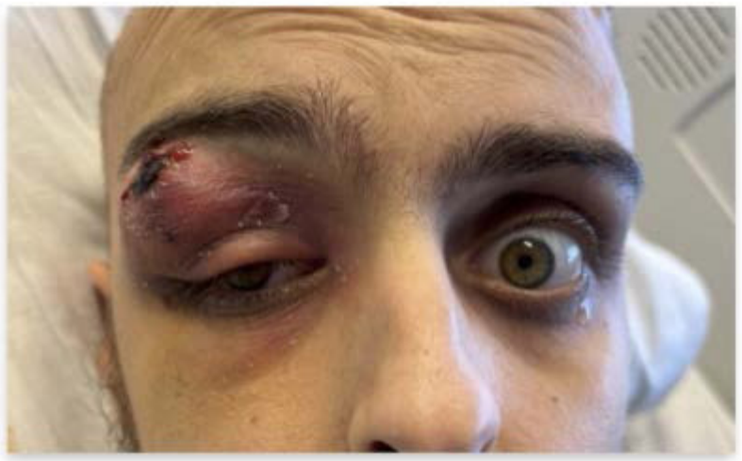

Figure 1. External photo of patient's sub-brow abscess and associated cellulitis.

Figure 2

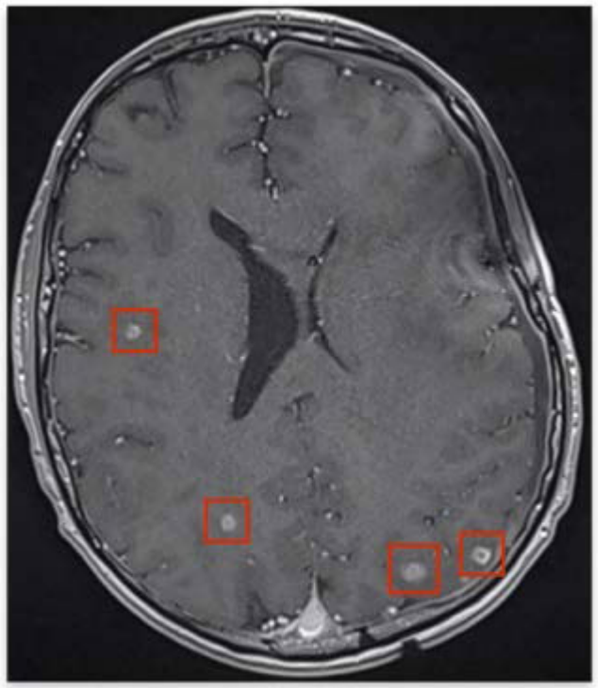

Figure 2. MRI Brain, axial T1 weighted VIBE sequence demonstrating several ring-enhancing lesions.

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18 Bifrontal Craniotomy for Optic Nerve Decompression in the Setting of Severe Polyostotic Fibrous Dysplasia and a Vascular Malformation

Caroline Brereton, M.D.[1], Xiaojun Zhang, M.D.[1], Nicholas Scoville, M.D.[1], Daniel Prevedello, M.D.[2], Raymond Cho, M.D., F.A.C.S.[3]
[1]Department of Ophthalmology and Visual Sciences, Columbus, Ohio, United States, [2]Department of Neurological Surgery, Columbus, Ohio, United States, [3]Department of Ophthalmology and Visual Sciences, Columbus, Ohio, United States

Introduction: The authors present an unusual case of compressive optic neuropathy requiring a bifrontal craniotomy approach for optic nerve decompression in the setting of severe polyostotic fibrous dysplasia and a large venous varix discovered on imaging.

Methods: Case report and literature review

Results: A 32-year-old female with a history of McCune-Albright Syndrome presented with several weeks of right eye vision loss due to compressive optic neuropathy secondary to severe polyostotic fibrous dysplasia. Visual acuity of the right eye was J10 and color vision with Ishihara test plates was 4/12. External examination was significant for frontal bossing and hypertelorism. Pupils were equal, round, and reactive to light bilaterally. Dilated fundus examination revealed mild disc pallor of the right eye. Computed tomography (CT) of the head without contrast demonstrated extensive fibrous dysplasia of the calvarium, skull base, and facial bones with narrowing of the bilateral optic canals and skull base foramina (Figure 1). A CT angiogram of the brain and neck revealed a large venous ectasia within the right frontal calvarium coursing into the region of the ethmoid air cells and sphenoid sinuses, traversing the clivus, and converging with the left internal jugular vein near the left jugular foramen (Figure 2). For further evaluation of the abnormal vasculature, a directional coronary atherectomy was performed and confirmed the presence of a large venous varix. Given the severity of disease and vascular malformation found on imaging, the less invasive endoscopic endonasal approach was felt to be high risk. Neurosurgery proceeded with a traditional bifrontal craniotomy, drilling a corridor to the optic nerve for decompression. A post-operative CT head appeared stable. Two weeks following the surgery, the patient's right eye visual acuity improved to J1+ and color vision with Ishihara test plates was 12/12. Her vision remains stable and improved since initial presentation at 1 month follow up, and she continues conservative management with denosumab injections for treatment of fibrous dysplasia.

Conclusions: For many years, a craniotomy was considered the standard approach to perform optic nerve decompression. The endoscopic endonasal technique was developed and is now considered the preferable, less invasive option; however, this approach is not available in the setting of severe polyostotic fibrous dysplasia and vascular malformations.

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Figure 1

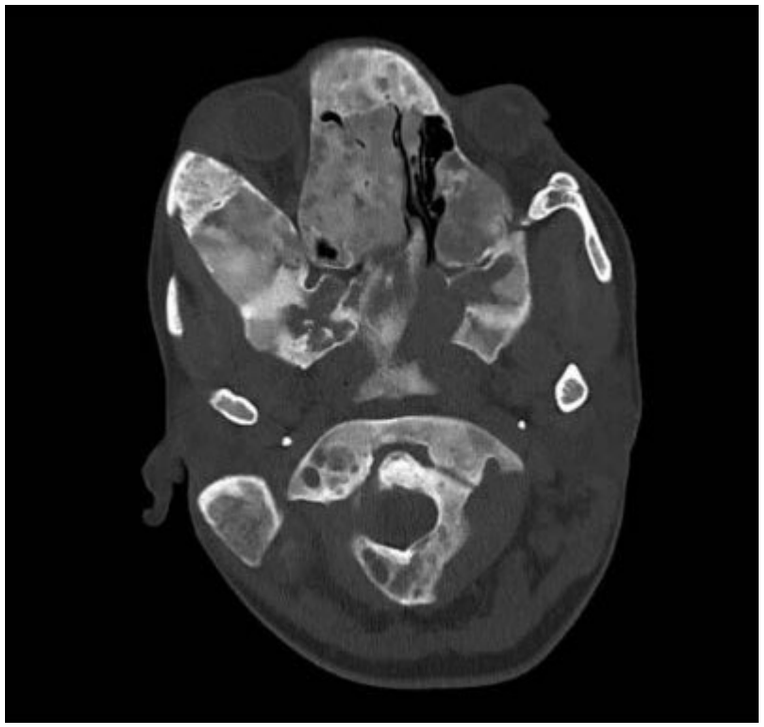
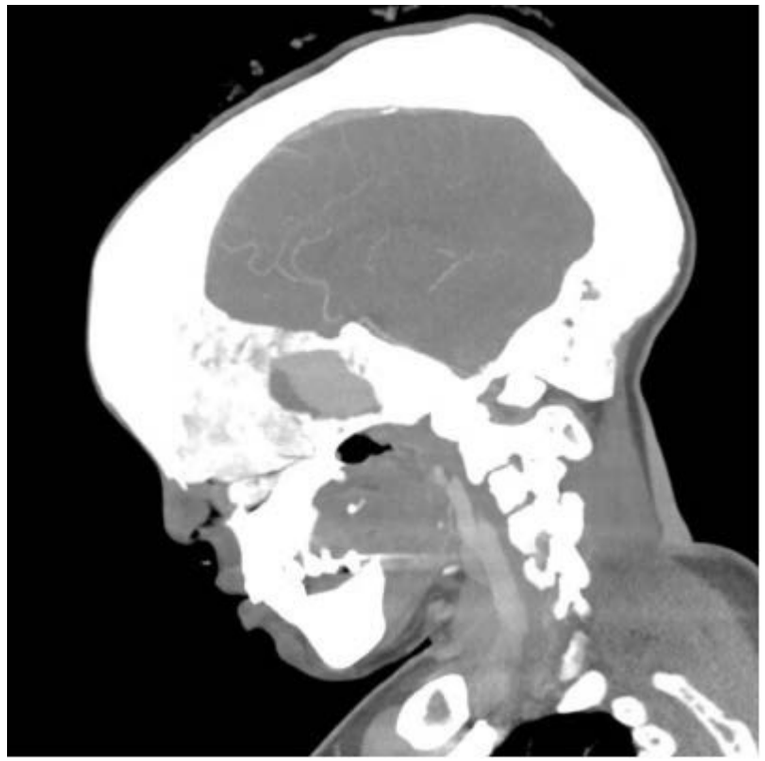


Figure 2



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19 Change in Thyroid Autoantibody Levels with Teprotumumab Infusions in Thyroid Eye Disease Patients

Marissa Shoji[1], Eman Al-Sharif[1,2], Catherine Liu[1], Bobby Korn[1], Don Kikkawa[1]
[1]Oculofacial Plastic and Orbital Surgery, Shiley Eye Institute, San Diego, California, United States, [2]Princess Nourah bint Abdulrahman University, Riyadh

Introduction: This study investigates changes in thyroid stimulating immunoglobulin (TSI) and thyroid receptor antibody (TRAB) in thyroid eye disease (TED) patients receiving teprotumumab.

Methods: Retrospective study assessing TED patients who received at least 4 infusions of teprotumumab from July 2023 – April 2024. Inclusion criteria were at least two measurements of TSI or TRAB, including one measurement at baseline no more than 3 months before starting teprotumumab. All other measurements were collected immediately prior to teprotumumab infusion or within 3 months after final teprotumumab infusion. Charts were reviewed for patient demographics, including age, gender, smoking history, clinical measures including exophthalmolmetry and clinical activity score (CAS) before, during, and after infusions. Laboratory values including thyroid stimulating immunoglobulin (TSI) and thyroid receptor antibody (TRAB) were assessed. These tests were performed with the same assay among all patients (normal TSI <0.54 IU/L, normal TRAB <1.75 IU/L). Statistical analysis was performed with SPSS.

Results: Ten patients met inclusion criteria, with a mean age of 55.1 +/- 14.4 years with the majority female (80%). The average baseline CAS was 3.5 +/- 1.2, and the average baseline exophthalmos was 22.5 +/- 3.3 mm. Patients received an average of 6.5 +/- 1.4 infusions (range 5 to 8) at the time of data collection. The average change in proptosis was -3.4 mm +/- 2.4 mm with average reduction in CAS of -1.7 +/- 1.0 at last documented follow-up. Nine patients had TSI measured, the majority (n=8, 88%) of whom experienced a net decrease in TSI from their baseline level during teprotumumab (-1.2 +/- 2.6 IU/L). Nine patients had TRAB measurements, 5 of whom demonstrated a net decrease from their baseline level (-1.7 +/- 3.2 IU/L). In evaluating the overall data, there was a negative correlation with TSI with number of teprotumumab infusions and TRAB with number of teprotumumab infusions, with trend towards statistical significance for the correlation between TRAB and dose of teprotumumab ($p=0.16$, Figure 1). There was a significant positive correlation between the change in TSI and the change in TRAB ($R=0.9$, $p<0.001$).

Conclusions: TSI and TRAB are thyroid autoantibodies that may have significant roles as diagnostic and prognostic markers for Graves' disease.[1] Additionally, both autoantibodies have been demonstrated to correlate with TED disease activity, including CAS, and severity.[1,2] However, few studies have assessed changes in these values with TED treatment; only one study has reported changes in

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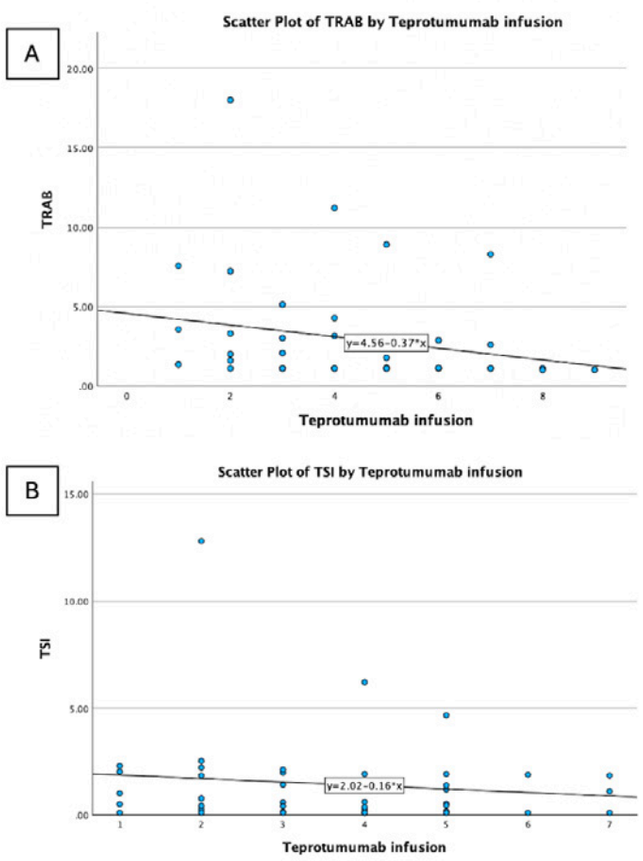
TRAB after steroids and cyclosporine.[1] Teprotumumab, a monoclonal human antibody targeting insulin-like growth factor-1 receptor, has been demonstrated to improve proptosis and CAS associated with TED; however, its effects on inflammatory biomarkers remain unknown. Our study demonstrates that patients undergoing treatment with teprotumumab had net and sequential reduction of thyroid autoantibodies with infusions of the medication, suggesting that teprotumumab may have additional anti-inflammatory effects beyond its primary mechanism of action on the IGF-1R pathway and a potential role for these biomarkers in monitoring TED disease and treatment response.

Figure 1



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20 Changes in the Incidence of Orbital Decompression Surgeries after the Introduction of Teprotumumab

Abdulrahman Almalouhi[1,2], Robert Goldberg[3], Daniel Rootman[3]
[1]David Geffen School of Medicine, the University of California, Los Angeles, Los Angeles, California, United States, [2]Department of Ophthalmology, University of California, Los Angeles, Orbital and Ophthalmic Plastic Surgery Division, Los Angeles, California, United States, [3]Los Angeles, California, United States

Introduction: The introduction of Teprotumumab, approved by the FDA in January 2020 for treating Thyroid Eye Disease (TED)[1], altered the landscape of management for proptosis in TED[2]. Given the significant effect on proptosis reduction with teprotumumab, many clinicians may have shifted management strategies from surgical to medical[3,4]. This study aims to examine the changes in the incidence of surgical decompression as medical management entered the marketplace.

Methods: In this cross-sectional database study, the electronic health record (EHR)-based, ENACT network database was queried for the years 2015 to 2024 inclusive. This database amalgamates claim-based data from 52 sites across the United States. Cases of decompression were identified by associating the diagnosis of thyrotoxicosis, identified via ICD-10 Diagnosis codes E05.00-.09, with CPT codes for decompression (67400, 67405, 67412, 67413, 67414, 67420, 67430, 67440, 67445, 67450). Patient counts were rounded to the nearest multiple of five, allowing a margin of error of ± 10 patients. Sites reporting "10 or fewer" patients in a specific year had their counts adjusted to 10 to maintain confidentiality and data integrity. An interrupted time series (ITS) analysis was utilized to assess the impact of teprotumumab's introduction in 2020 on the incidence of surgical decompression using R studio.

Results: Thirty sites were excluded due to incomplete or insufficient data. The remaining 22 sites were assessed. Pre-2020, the annual number of surgical decompressions was stable with a mean of 461 (SD = 18.7). There was a decline to 250 procedures in 2020 (Figure1). The trend for 2021 to 2023 was for a slightly increasing surgical numbers, however the number of surgeries remained significantly reduced compared to pre-teprotumumab years, with an average of 281.67 (SD = 17.2) procedures annually. The interrupted time series analysis demonstrated a strong fit (R^2 0.97, $p < 0.001$). To understand the potential confounding decrease in elective surgeries due to the COVID-19 pandemic, a secondary ITS analysis was conducted using 2021 as the intervention year. This analysis also demonstrated a significant association (R^2 0.515, $p = 0.0294$).

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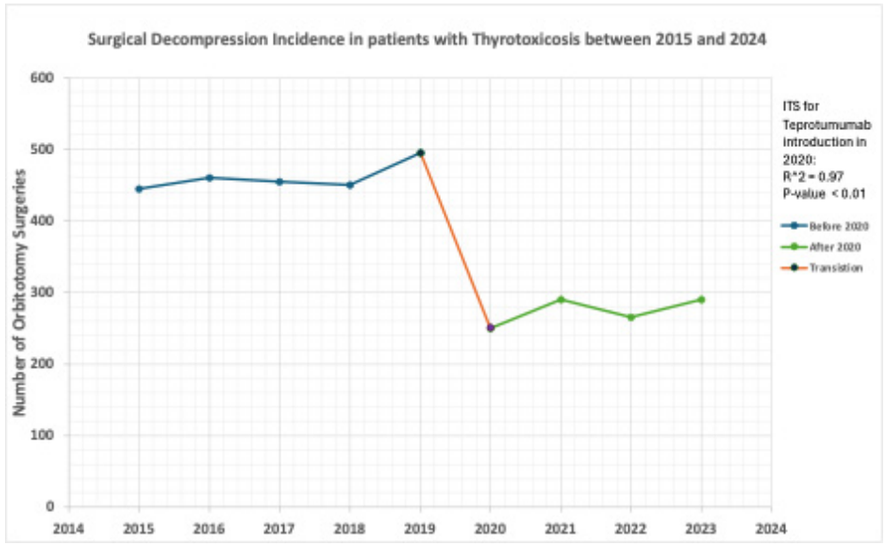
Conclusions: The observed data indicates that the rate of orbital decompression surgery decreased significantly in 2020, and despite some increase in this number over the ensuing 3 years, the number of surgeries remined approximately 25% reduced from the years preceding 2020. The results support the notion that teprotumumab may be associated with changes in the management of Thyroid Eye Disease.

Figure 1



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21 Characteristics and Outcomes of Orbital Gunshot Wounds at a Level I Trauma Center

Kendall Hughes[1], Jennifer Dunnigan[1], Samuel Ruiz[2], Jose Barrera[2], Timothy McCulley[1], David Wainwright[2], Ying Chen[1]
[1]Ruiz Department of Ophthalmology and Visual Science, University of Texas at Houston, Houston, Texas, United States, [2]Department of Plastic and Reconstructive Surgery, University of Texas at Houston, Houston, Texas, United States

Introduction: The purpose of our study is to characterize gunshot wounds (GSW) to the orbit at a Level I Trauma Center and to evaluate the utility of the Birmingham Eye Trauma Terminology system (BETT) in categorizing injuries.

Methods: A retrospective chart review of patients sustaining GSWs to the orbit at a large level 1 trauma center from January 2009 to December 2020 was performed. Patients with GSWs to the eye, orbit, and surrounding tissues were included. Epidemiological data, injury characteristics, visual acuity (VA), and surgical intervention during the initial hospital course were collated. Injuries were categorized based on the Birmingham Eye Trauma Terminology system (BETT)[1]. The data was analyzed using descriptive statistics.

Results: Two-hundred and seventy-one orbits in 221 patients were identified. Average age of presentation was 33.4 years. One-hundred eighty-eight (85%) were male and 160 (59%) had self-inflicted injuries. There were 71 orbits (26.2%) with open-globe injuries. Sixty-nine eyes (25.5%) underwent eye surgery including globe repair (13.3%), enucleation (10.3%), and evisceration (4%) during hospitalization. Two globes (0.7%) were initially attempted to be repaired but were ultimately deemed unsalvageable and went on to be enucleated or eviscerated. Two patients (0.9%) underwent bilateral primary evisceration/enucleation. Of the patients undergoing surgery, 78.2% had a VA of count fingers or worse, whereas only 20.2% of patients who did not undergo eye surgery had a VA of count fingers or worse. Eyelid injury occurred in 84 (38%) patients, with thirty-six patients (13.3%) requiring simple repair of eyelid lacerations, while 48 patients (21.7%) eyelids required more complex surgical repair. All patients (100%) sustained injury to the orbital bones with the orbital floor being the most commonly affected wall (160 patients, 59.0%). Only 74 (27%) of patients underwent surgery to repair orbital fractures during hospitalization. Orbital gunshot injuries classified into BETTS presented with 63 contusions (22.9%), 11 lamellar lacerations (4.43%), 37 perforations (13.3%), 16 intraocular foreign bodies (IOFB) (5.90%), 17 penetrations (6.64%), 1 rupture (0.37%), and 126 globes with no injury (46.5%). Of the patients with contusions and lamellar lacerations, 2 (2.7%) underwent surgery while 63 (88.7%) of the perforating, IOFB, and penetrating injuries had surgery.

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Conclusions: GSWs to the orbit can be devastating, often severely impacting vision and requiring surgical management of the injuries. Based on our data, a substantial portion of orbital GSWs had globe damage. All 271 orbits were able to be classified into BETTS and outcomes were categorized based on surgical intervention. This study can provide valuable information for patient management of GSWs and emphasize the need for identification and early social intervention for individuals experiencing suicidal ideation, given the high rate of self-inflicted injuries.

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22 Characterization of Visual Impairment, Periocular, and Ophthalmic Findings in Face Transplant Candidates

Caroline Yu[1], Kerri McInnis-Smith[1], Samir Mardini[2], Hatem Amer[3], Elizabeth Bradley[1]
[1]Department of Ophthalmology, Mayo Clinic, Rochester, Minnesota, United States, [2]Division of Plastic Surgery, Department of Surgery, Mayo Clinic, Rochester, Minnesota, United States, [3]Division of Nephrology and Hypertension, Mayo Clinic, Rochester, Minnesota, United States

Introduction: Periorbital injuries are common in face transplant recipients, and over half of the face transplants performed to date have included periorbital components[1]. However, visual impairment can be a barrier to face transplantation candidacy, with some transplant team members considering bilateral blindness an absolute contraindication[2]. Our study aims to describe the rates of visual impairment and characterize the ophthalmic injury patterns in facial transplant candidates.

Methods: A retrospective study of all face transplant candidates seen at Mayo Clinic between 2015 and 2023 was performed. Charts were reviewed for patient demographics, mechanism and date of injury, pre-operative ophthalmic exam information including best corrected visual acuity (BCVA), ocular alignment, and external, slit lamp, and dilated fundus exams. Visual impairment was categorized per the World Health Organization (WHO) guidelines into moderate (BCVA of 20/70 to 20/160), severe (20/200 to 20/400), and profound (20/500 to 20/1000) and complete vision loss was defined as no light perception. When available, testing results were reviewed, including visual field, optic coherence tomography (OCT), fluorescein angiography (FA), ocular ultrasonography, and fundus photos. Nasolacrimal status was assessed from clinical notes and computed tomography (CT) facial scans. Exophthalmometry was estimated from radiographic images by drawing a horizontal line between the lateral orbital rims on an axial plane that bisects the lens and then drawing a perpendicular line forward to the posterior surface of the cornea.

Results: 9 patients were evaluated for consideration of face transplants, 8 of whom had preoperative eye exams. The average age was 36.6 years old (range 29 to 54), and 7 patients were male. The mechanisms of injury included ballistic trauma (n=4), electrical burn (n=2), blast injury (n=1), neurofibromatosis (n=1), and congenital defect (n=1).

Visual impairment was common and severe, and included bilateral complete vision loss (n=2), bilateral profound vision loss (n=1), and unilateral anophthalmos (n=3). Only one patient had intact bilateral visual acuity. Severe vision loss was most commonly due to chorioretinal scarring (n=4), optic atrophy (n=2), and corneal opacification (n=2). Ophthalmic testing was available for 5 patients, and included OCT (n=4), fundus photos (n=2), visual field (n=1), B-scan ultrasonography (n=1), and FA (n=1) (see Figure 1).

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Tearing was present in nearly all patients (n=8), with 5 patients having obstruction at the level of the lacrimal sac or nasolacrimal duct, and 3 patients with obstruction at the level of the canaliculi (see figure 2). In terms of orbital volume, 2 patients had unilateral enophthalmos and 3 patients had bilateral enophthalmos.

Conclusions: Face transplant candidates have a high rate of visual impairment and exhibit a range of ophthalmic injury patterns. Evaluation of face transplant candidates should include a thorough baseline ophthalmic exam, and regular ophthalmic follow-up is critical to preserve residual visual function.

Figure 1

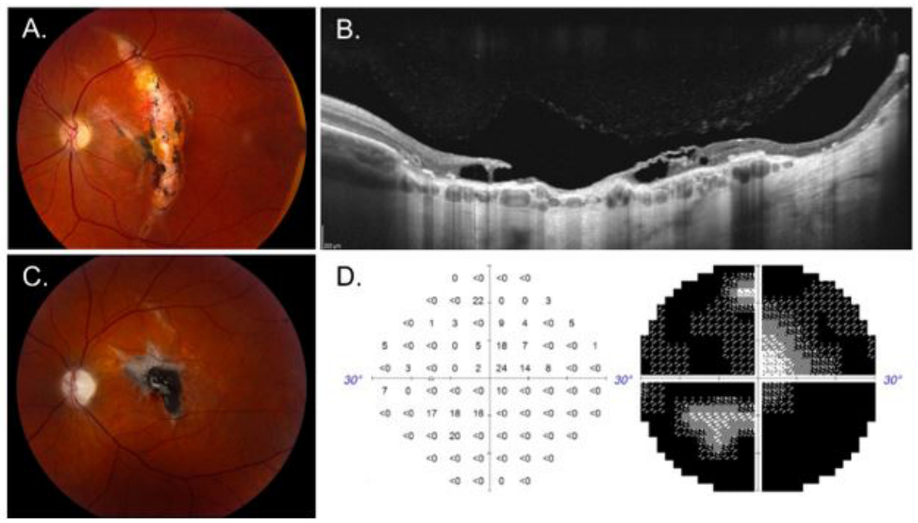

Figure 1. Ophthalmic injuries in face transplant candidates. (A) Left eye fundus photo shows a curvilinear choroidal rupture with foveal involvement and retinal pigment hypertrophy. (B) Optical coherence tomography (OCT) from the same patient shows severe chorioretinal atrophy with choroidal remodeling. (C) Left eye fundus photo from another patient shows optic nerve pallor and a dense foveal involving chorioretinal hyperpigmented scar. (D) Humphrey visual field (HVF) 24-2 shows diffuse depression.

Figure 2

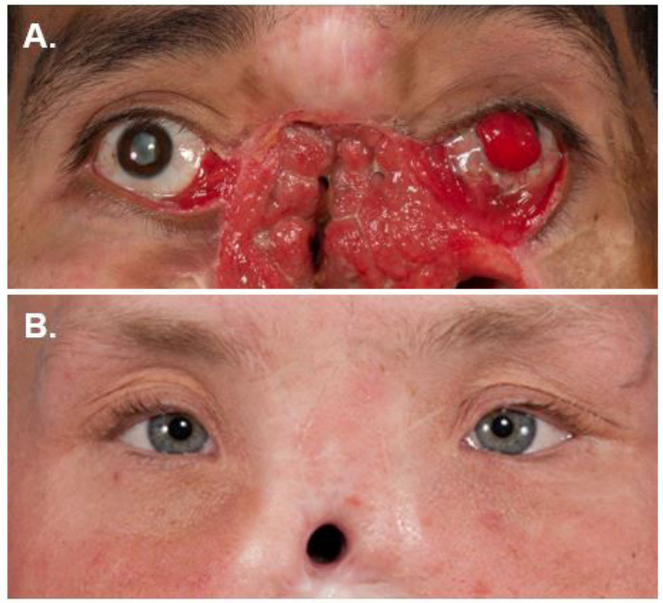

Figure 2. External photographs showing eyelid, anterior segment, and nasolacrimal abnormalities in two face transplant candidates. (A) Patient with bilateral lower lid retraction, loss of bilateral medial canthi and canaliculi, and severe bilateral anterior segment abnormalities. (B) Patient with telecanthus, normal anterior segment exam, intact canaliculi, and loss of the inferior lacrimal sac and ducts bilaterally.

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23 Clinicoradiologic Differences between Orbital Schwannoma and Cavernous Venous Malformation

Ho-Seok Sa
Ophthalmology, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, Republic of

Introduction: To compare the clinical and radiological characteristics, and surgical outcomes of orbital schwannoma and cavernous venous malformation (CVM).

Methods: We retrospectively compared 13 and 26 patients with biopsy-proven orbital schwannoma and CVM, respectively, analyzing clinical features, magnetic resonance imaging (MRI) and computed tomography (CT) features (including dynamic contrast enhancement [DCE] imaging, apparent diffusion coefficient [ADC] values, and CT densities), surgery type, and outcomes.

Results: In schwannoma (mean age, 45±16.7 years; 53.8% females) and CVM (mean age, 50.2±8.6 years; 61.5% females) groups, gradual proptosis was the most common symptom (53.8% and 46.2%; mean measurements of 3.0±1.97 mm and 2.5±1.64 mm, respectively), commonly intraconal (61.5 and 53.8%; mean sizes of 21.0±7 mm and 20±5 mm, respectively). On MRI, schwannomas were significantly more heterogeneous than CVM (p=0.044). Tail and target signs were seen in 46.2% of schwannomas s (p<0.001), and linear T2 hypointensity was present in 57.7% of CVM (p=0.008). DCE-MRI revealed wide early enhancement for schwannomas and nodular early enhancement for CVMs (p<0.001). Schwannomas displayed higher ADC value without statistical significance (1.64±0.56 x 10-3 mm2/s vs. 1.26±0.21 x 10-3 mm2/s; p=0.078), but significantly lower median CT density (40 HU vs. 56 HU; p=0.001) than CVM. Majority underwent en bloc surgical excision without capsule violation (schwannoma, 76.9%; CVM, 100%). Three schwannoma and two CVM patients required bony marginotomy. Three schwannoma patients underwent subtotal resection without recurrence during a 4.3±3.4-year follow-up.

Conclusions: MRI aids in pre-operatively diagnosing orbital schwannoma and CVM. Schwannomas exhibit heterogeneous T2WI appearance, wide early-phase enhancement, and tail/target signs. Conversely, CVMs display homogenous T2WI signal, linear T2 hypointensity, and nodular earlyphase enhancement. Additionally, schwannomas showed lower density on CT. Although complete removal without bony marginotomy is effective, physicians should not risk vision loss for total excision in anatomically-challenging cases, as recurrence risk after subtotal resection is rare.

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Figure 1

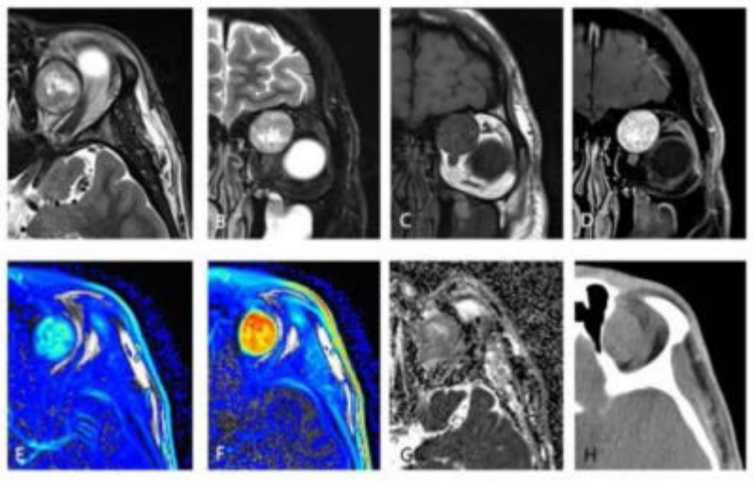
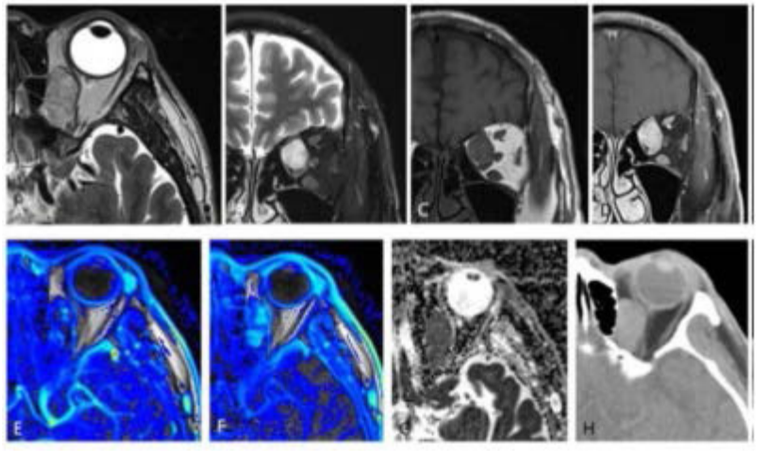


Figure 2



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24 Effects of Teprotumumab and Role of HLA Markers in Patients with Thyroid Eye Disease

Remigio Flor[1], Thanh-Duc Hoang[2], Jason Lewis[3], Sebastian De La Torre[4], Sorana Raiciulescu[5], Mohamed Shakir[2], Eva Chou[1,6]
[1]Ophthalmology, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [2]Endocrinology, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [3]Ophthalmology, Madigan Army Medical Center, Joint Base Lewis-McChord, Washington, United States, [4]Internal Medicine, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [5]Preventive Medicine and Biostatistics, Uniformed Services University of the Health Sciences, Bethesda, Maryland, United States, [6]Surgery, Uniformed Services University of the Health Sciences, Bethesda, Maryland, United States

Introduction: Teprotumumab is an effective, non-surgical treatment for thyroid eye disease (TED), with studies showing improvement in proptosis and diplopia in cohorts of patients with tightly controlled characteristics. The purpose of this study is to assess potential genetic features that may indicate treatment response in patients who underwent teprotumumab treatment for TED.

Methods: This is a single-center, retrospective, non-comparative study of all patients treated with teprotumumab since 2020. This study aims to further evaluate the effects of teprotumumab on a broader population of patients with both acute and chronic thyroid eye disease. Participants were 18-76 years-old at the time of treatment with the diagnosis of active thyroid eye disease and all subjects were treated with teprotumumab. The primary outcome was the change in proptosis before and after teprotumumab treatment. Secondary outcomes include change in optical coherence tomography, diplopia, intraocular pressure, automated visual field measurements, clinical activity score, and thyroid laboratory tests. Change in all outcomes were analyzed using a Wilcoxon Signed-Rank test. Human leukocyte antigens (HLA) markers were also analyzed for response to teprotumumab.

Results: Twenty-six patients were included in the final analysis. The duration of TED ranged from 3-480 months [average 52.8 months], with 85% (n=22) having TED >1 year. Biochemical and ophthalmic studies were completed before and after teprotumumab treatment. There was a significant decrease in TSI and TRAb levels ($p<0.0001$) and significant increases in HbA1c ($p=0.0021$), fasting glucose ($p=0.004$), and total T3 ($p=0.0047$). There was no significant change in the mean TSH and free T4 levels.

There was also significant reduction in proptosis ($p<0.0001$), CAS ($p=0.0002$), retinal nerve fiber layer (RNFL) thickness ($p<0.0001$), ganglion cell (GCA) thickness ($p<0.0001$), and intraocular pressure ($p<0.05$). No significant changes were seen in lid retraction or visual field mean deviation. HLA haplotypes were distinct between responders and non-responders, with HLA-DRB3*02:02:01G, HLA-DRB4*neg, and HLA-DQB1*02:01:01G demonstrating better response to teprotumumab and HLA-A*23:01:01G strongly correlating to non-response.

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Conclusions: This study shows that teprotumumab treatment significantly reduced TSI, TRAb levels, proptosis, CAS, RNFL and GCA thickness, and IOP in patients with both acute and chronic TED. The effect of teprotumumab on commonly measured parameters extends past the acute phase of TED and autoimmune thyroid disease and HLA may predict responders vs. non-responders.

Table 1: Clinical characteristics of study participants.

Clinical characteristics	Average ± stdev
Age (years)	47.6 ± 13.1
Gender	73% female, 27% male
Ethnicity	54% Black, 27% White, 15% Asian, 4% Hispanics
BMI (kg/m²)	29.5 ± 6.0
Duration of Graves' disease (months)	3 – 480
Duration of TED (months)	37.3 ± 17.7 (range 3-144)

Table 2: Biochemical results before and after teprotumumab therapy.

Biochemical Marker (Reference Range)	Before therapy Median (IQR)	After therapy Median (IQR)	P-value+
TSH (0.27-4.2 mIU/L)	2.31 (4.09-1.27)	1.44 (2.55-0.65)	0.160
Free T4 (0.8-1.8 ng/dL)	1.34 (1.68-1.22)	1.48 (1.72-1.16)	0.477
Total T3 (60-180 ng/dL)	98.1 (118.2-85.6)	110.7 (126.0-94.5)	0.005
TSI (0- 0.54 IU/L)	1.90 (8.01-0.43)	0.69 (2.79-0.19)	<0.0001*
TPO Ab	11 (78.5-8.0)	10 (39-0)	<0.0001*
HbA1c (<6.5%)	5.5 (5.9-5.3)	5.8 (6.3-5.5)	0.002*
Fasting glucose (<100 mg/dL)	91 (100-78)	97 (122-84)	0.004*

BMI = body mass index, IQR = interquartile range (difference between the 75th and 25th percentiles of the data), TSH = thyrotropin or thyroid stimulating hormone, TSI = thyroid stimulating immunoglobulin, TRAb = thyrotropin receptor antibody
+Statistical analysis was completed using 2-tailed, paired samples t-test with a statistically significant p-value of <0.05.
* Statistically significant result with a p-value of <0.05.

Table 3: Summary of ophthalmic measurements in responders (≥2mm reduction in proptosis, n=21) versus minimal responder or non-responders (<2mm reduction in proptosis, n=5).

Ophthalmic Variable (N=18)	Mean Before Treatment (SD)	Mean After Treatment (SD)	t	P-value+
Exophthalmometry (mm), OD	22.4 (2.55)	19.97 (2.80)	8.29	0.000*
Exophthalmometry (mm), OS	23.0 (4.55)	20.23 (3.06)	4.86	0.000*
IOP (mmHg), OD	15.72 (4.21)	13.67 (3.80)	1.93	0.071
IOP (mmHg), OS	16.17 (4.26)	13.28 (4.18)	2.53	0.022*
Clinical Activity Score (CAS)	3.72 (1.67)	1.22 (1.40)	5.62	0.000*
MRD1 (mm), Right	4.11 (1.71)	3.86 (1.91)	0.66	0.519
MRD1 (mm), Left	4.19 (1.56)	4.02 (1.58)	0.48	0.638
PF (mm), Right	10.42 (2.016)	9.22 (3.12)	1.55	0.139
PF (mm), Left	10.28 (2.14)	9.89 (1.68)	0.69	0.502
HVF MD (dB), OD	-1.22 (1.60)	-0.77 (1.27)	-0.93	0.369
HVF MD (dB), OS	-1.15 (1.93)	-0.71 (1.78)	-0.82	0.426
HVF PSD (dB), OD	2.07 (0.81)	2.03 (0.76)	0.15	0.881
HVF PSD (dB), OS	1.89 (0.60)	1.99 (1.09)	-0.47	0.643
RNFL OCT (µm), OD	94.82 (12.58)	87.59 (13.84)	5.32	0.000*
RNFL OCT (µm), OS	95.94 (14.31)	88.94 (12.66)	7.03	0.000*

OD = Right eye, OS = Left eye, IOP = intraocular pressure, MRD1 = margin-to-reflex distance 1, PF = palpebral fissure, HVF = Humphrey visual field, MD = mean deviation, PSD = pattern standard deviation, RNFL = retinal nerve fiber layer, OCT = optical coherence tomography
+Statistical analysis was completed using 2-tailed, paired samples t-test with a statistically significant p-value of <0.05.
* Statistically significant result with a p-value of <0.05.

Table 4: Summary of HLA results in responders (≥2mm reduction in proptosis, n=21) versus minimal responder or non-responders (<2mm reduction in proptosis, n=5).

HLA haplotypes in responders (≥2mm reduction in proptosis, n=21)	HLA-DRB3*02:02:01G (n=11, 55%) HLA-DRB4*neg (n=17, 85%) HLA-DQB1*02:01:01G (n=8, 40%) HLA-DQB1*03:01:01G (n=7, 35%)
HLA haplotypes in non-responders (<2mm reduction in proptosis, n=5)	HLA-A*23:01:01G (n=3, 75%)

Foot note: Table reflects only the percentage > 20 for both responders and non-responders

Table 5: Side effects of teprotumumab reported by our patients during the treatment.

Adverse effects	Percentage of Patients (n)
Muscle cramps	42% (n=11)
Hyperglycemia	19% (n=5)
Muffled hearing	11.5% (n=3)
Tinnitus	11.5% (n=3)
Diarrhea, non-bloody	11.5% (n=3)
Fatigue	4% (n=1)
Paresthesia	4% (n=1)
Headache	4% (n=1)
Nausea	4% (n=1)
Hair loss	4% (n=1)
Dizziness	4% (n=1)
Shingle zoster	4% (n=1)
Encephalopathy	4% (n=1)

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25 Genetic Susceptibility to TED: A Selective Genomic Association Study Using the NIH All of Us Database

Catherine Y. Liu, Tonya C Lee, Jimmy Chen, Leo Meller, Eman Al Sharif, Marissa Shoji, Sally Baxter, Bobby S. Korn, Don O. Kikkawa
Ophthalmology, UC San Diego, La Jolla, California, United States

Introduction: Using whole genome sequencing from the NIH *All of Us* Research database, a case-control study was performed to determine genomic differences in patients with thyroid disorders with and without associated diagnoses of thyroid eye disease (TED).

Methods: We evaluated upstream regulators of IGF1-R and downstream factors for genetic polymorphisms in the IGF1-R pathway that differed between patients with TED-related diagnoses and a control dataset of patients with thyroid disorder diagnosis and without TED-related diagnoses. Deidentified patient data and genome sequencing was obtained from the NIH All of Us (AoU) database, a nationwide data repository with over 676,000 participants that emphasizes enrollment of historically underrepresented groups.[1] Case and control cohorts were matched in a 1:4 ratio by race, gender, ethnicity, and age. Genomic data was extracted and analyzed with covariates included to control for confounding effects. Significant variants were defined as those with a mean allele frequency (MAF) > 0.01 and adjusted empiric p-value of <0.54 IU/L, normal TRAB <1.75 IU/L). Statistical analysis was performed with SPSS.

Results: 817 patients with TED-related diagnoses and 3268 patients with thyroid disorders without TED-related diagnoses were included in the analysis. The total cohort consisted of 1056 males and 2940 females, of whom 2690 identified as white, 682 black, 64 Asian, and 649 other. A number of polymorphisms in the IGF1-R gene and directly interacting factors were found to be statistically significant between the two cohorts. Significant polymorphisms had odds ratios ranging from 0.6 to 2.0 comparing the occurrence of the dominant allele in the TED cohort to the non-TED cohort. Multiple significant polymorphisms were found in individual genes known to interact with IGF1-R.

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Conclusions: Reliable biomarkers for TED have yet to be identified despite significant advancements in the treatments available for TED,[2] as factors underlying its genetic predisposition remain poorly understood. Accumulating evidence in the literature has implicated the Insulin-like Growth Factor 1 Receptor (IGF1-R) pathway as a novel target of TED.[3,4] In this study, we evaluated the IGF1-R pathway for potential susceptibility genes by comparing polymorphisms seen in cohorts with thyroid disorders with and without TED-associated diagnoses. While prior studies investigated genes specific to the thyroid gland (i.e., TSHR, thyroglobulin) or genes common to immune regulation,[5-7] this study targeted a pathway known to play a mechanistic role in TED.[8,9] Identification of a biomarker for disease susceptibility could be important for early detection and targeted treatment of TED. Future studies will help elucidate the potential role of the polymorphisms identified in this study as biomarkers of TED.

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26 A Cost Analysis of Enucleation and Evisceration Surgeries for Treatment of Blind, Painful Eyes

Darren Chen, Amee Azad, Lisa Y. Lin, Michael K. Yoon
Ophthalmic Plastic Surgery Service, Department of Ophthalmology, Massachusetts Eye and Ear, Harvard Medical School, Boston, Massachusetts, United States

Introduction: The removal of blind, painful eyes is the definitive treatment for patients with intractable pain, and enucleation and evisceration are the procedures of choice. The delivery costs of these surgeries are increasing yearly in the face of rising inflation and simultaneous cuts in Medicare reimbursement. The purpose of this study is to assess the surgical costs of enucleations and eviscerations and their relation to current reimbursement rates using time-driven activity-based costing (TDABC). We hypothesize that current reimbursements rates are inadequate in covering the cost of enucleation and eviscerations.

Methods: This is a retrospective study using the Research Patient Data Registry (RPDR) to identify patients undergoing enucleation and evisceration surgeries with attachment of muscles (CPT 65105 and 65093) for a diagnosis of blind, painful eye, from January 1, 2019 – Dec 31, 2023 at a single, tertiary level, teaching hospital. Patients who underwent eye removal for other reasons such as ocular malignancy or those who had concurrent procedures like globe exploration were excluded. A time-driven activity-based cost analysis for day of surgery was performed, omitting anesthesia given its separate reimbursement. Operative reports, perioperative times, and supply costs were extracted from the electronic medical record (Epic Systems). Mean differences in times and surgical costs were compared using unpaired t-tests (GraphPad Prism). Financial estimates for overhead costs were based on previously published time-driven activity-based cost analyses.[1–3] Reimbursement data was taken from Center for Medicare Services (CMS) location adjusted rates,[4] and physician salary data from published Medical Group Management Association (MGMA) data.[5]

Results: In the five-year study span, 110 patients underwent enucleation and 52 underwent evisceration for a primary indication of blind, painful eye by 10 different surgeons. The mean pre-operative, surgical, total operating room (OR), and post-operative times are shown in Table 1. The average OR time and surgical time for enucleation was approximately 9 minutes longer compared to evisceration ($p<0.01$, figure 1). Both surgeries on average resulted in a negative margin with enucleations costing on average $373 more than eviscerations (Table 2). Supply costs, OR overhead, and surgeon time cost were significantly greater in enucleations than eviscerations ($p<0.05$, figure 2). The breakeven total OR time for enucleation and evisceration surgery was approximately 86.3 mins and 83.1 mins respectively. From the sample, approximately 79% of enucleation and 60% of evisceration surgeries resulted in a net negative margin. OR overhead costs constituted 84% and 85% of total cost in enucleation and evisceration whereas surgeon cost constituted only 5.7% and 5.6%.

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Conclusions: On average, the cost of enucleation and evisceration surgeries exceeded the reimbursement amount set by CMS. Compared to enucleation, evisceration was more time and cost effective by only a modest margin. This study suggests that current reimbursement rates are not adequately in line with delivery costs of these surgeries.

Figure 1

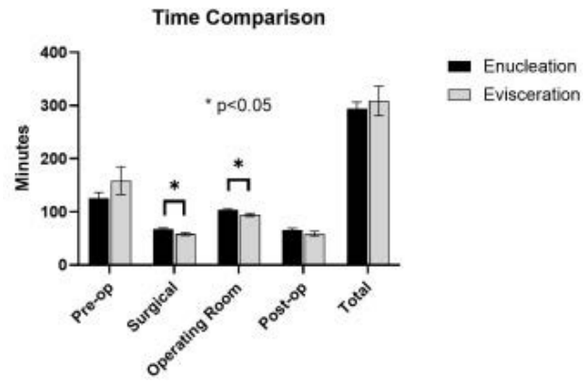

Figure 2

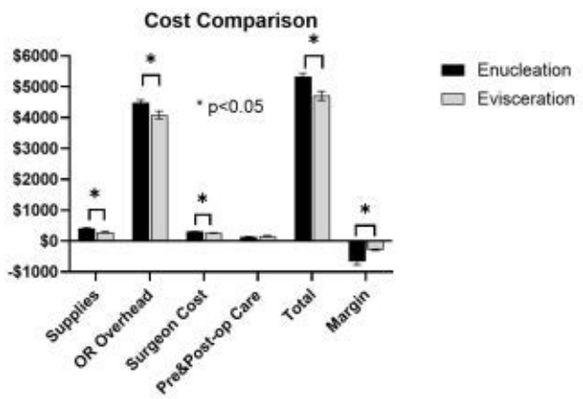

Table 1

Table 1: Perioperative time comparisons for enucleation and evisceration surgery

		Pre-operative (mins)	Surgical (mins)	Operating Room (mins)	Post-operative (mins)	Total (mins)
Enucleation	mean	125.57	67.78	103.60	65.36	291.63
	sd	112.00	19.40	21.64	38.95	113.47
	n	103	110	110	109	102
Evisceration	mean	158.57	58.04	94.35	58.46	308.65
	sd	177.34	17.82	21.41	34.19	189.03
	n	46	52	52	52	46
	p-value	0.17	**<0.01**	**0.01**	0.27	0.58

Table 2

Table 2: Cost comparisons between enucleation and evisceration surgery

		Supplies	OR Overhead	Surgeon Cost	Pre & Post-Op Care	Grand Total	Total CMS reimbursement	Margin
Enucleation	mean	$402.18	$4,083.30	$306.37	$139.64	$5,333.21	$4,668.23	$(664.98)
	sd	$377.98	$936.38	$87.69	$84.94	$1,129.06	-	$1,129.06
	n	110	110	110	103	103	-	103
Evisceration	mean	$285.38	$4,083.30	$262.33	$157.81	$4,708.98	$4,417.49	$(291.49)
	sd	$151.63	$926.81	$80.55	$132.88	$985.86	-	$985.86
	n	52	52	52	46	46	-	46
	p-value	**0.03**	**0.01**	**<0.01**	0.32	**<0.01**	-	**0.02**

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27 Assessment of Differential Diagnoses for Oculoplastics Cases produced by ChatGPT, Gemini, and CoPilot

Jeffrey C Peterson[1], Kevin Heinze[1], Thomas Oetting[2], Sean Rodriguez[2], Pete Setabutr[1], Ann Q Tran[1]

[1]Department of Ophthalmology, University of Illinois Chicago, Chicago, Illinois, United States, [2]Department of Ophthalmology, University of Iowa, Iowa City, Iowa, United States

Introduction: To evaluate the ability for large language models (LLMs) to generate differential diagnoses for oculoplastics cases.

Methods: Text from 20 oculoplastics cases from EyeRounds.org[1] was input into the LLMs OpenAI ChatGPT 3.5[2], Google Gemini[3], and Microsoft CoPilot[4], with a prompt requesting a differential diagnosis to be generated in order of most likely to least likely (Table 1). Cases included eyelid lesions (n=3), orbital (n=12), eyelid (n=4), and lacrimal pathology (n=1). Outputs were compared to the differential diagnosis found in the original EyeRounds case generated by an ophthalmologist. Accuracy of the output was assessed by calculating percentage of cases in which the top diagnosis of the LLM differential matched the case diagnosis and in which the case diagnosis was included anywhere in the LLM differential. Match percent, or how well the LLMs could find any diagnoses included in the EyeRounds differential, was calculated as number of diagnoses matching between the EyeRounds differential and the LLM output (i.e. number of matching diagnoses) over the number of diagnoses in the EyeRounds differential. Match parsimony, or how many diagnoses output by the LLM were found in the EyeRounds differential, was calculated as number of matching diagnoses over the number of diagnoses in the LLM differential.

Results: All 20 cases were successfully analyzed (Table 2). The number of differential diagnoses listed by EyeRounds per case was on average 9.4 ± 3.6, compared to the output of LLMs CoPilot (10.7 ± 3.3), Gemini (6.5 ± 1.5), and ChatGPT (6.0 ± 1.5, $p = <0.000001$). While ChatGPT and Gemini produced seemingly random number of diagnoses, CoPilot produced exactly 10 or 20 differential diagnoses for most cases. The LLM where the top diagnosis most consistently matched EyeRounds was CoPilot (60 ± 50%) followed by Gemini (30 ± 47%) and ChatGPT 3.5 (26 ± 45%) ($p = 0.048$). The LLM where the correct diagnosis was most often listed in the differential was CoPilot (85 ± 37%), followed by Gemini (80 ± 41%) and ChatGPT (70 ± 47%) ($p = 0.50$). The match percent was highest for CoPilot (41 ± 23%), followed by Gemini (33 ± 23%) and ChatGPT (31 ± 23%) ($p = 0.35$). Match parsimony was highest for ChatGPT (43 ± 30%) followed by Gemini (42 ± 27%) and CoPilot (36 ± 24%) ($p = 0.68$). The case that had the most accurate LLM outputs was idiopathic orbital inflammation (Table 3). The case that had the least accurate LLM outputs was floppy eyelid syndrome, case b (Table 4). Output errors sometimes included duplicate or invented diagnoses, a differential of hundreds of diagnoses, or a diagnosis in Japanese.

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Conclusions: CoPilot had the highest percentage of matching top diagnoses and inclusion of top diagnosis in the differential. However, CoPilot consistently produced the largest differential, which increased the number of matching diagnoses overall, as evidenced by the lowest match parsimony. LLMs can generate differential diagnoses which typically include the correct diagnosis for oculoplastics cases but can still fail to identify the correct diagnosis or all expected differential diagnoses.

Adenoid cystic carcinoma of the lacrimal gland
Basal cell carcinoma of the eyelid - morpheaform subtype
Bilateral nasal lacrimal duct obstruction
Capillary hemangioma
Carotid-cavernous fistula
Cavernous hemangioma
Chalazion
Chronic progressive external ophthalmoplegia
Congenital ptosis
Dermoid cyst
Enophthalmos secondary to metastatic breast cancer
Eosinophilic granulomatosis with polyangiitis
Fibrous dysplasia
Floppy eyelid syndrome, case a
Floppy eyelid syndrome, case b
Granulomatosis with polyangiitis
Idiopathic orbital inflammation
Idiopathic orbital myositis
Orbital lymphoma
Trochleitis

Table 1. List of EyeRounds cases entered into three large language models.

	ChatGPT 3.5	Gemini	CoPilot	EyeRounds	*p*
Number of diagnoses in differential	6.0 ± 1.5	6.5 ± 1.5	10.7 ± 3.3	9.4 ± 3.6	1.1e-7
Case diagnosis matches top diagnosis	26 ± 45%	30 ± 47%	60 ± 50%		0.048
Case diagnosis included in differential diagnosis	70 ± 47%	80 ± 41%	85 ± 37%		0.50
Match percent*	31 ± 23%	33 ± 23%	41 ± 23%		0.35
Match parsimony**	43 ± 30%	42 ± 27%	36 ± 24%		0.68

$$*Match\ percent = \frac{\#\ any\ matching\ diagnoses}{\#\ of\ diagnoses\ in\ EyeRounds\ case} \qquad **Match\ parsimony = \frac{\#\ any\ matching\ diagnoses}{\#\ of\ diagnoses\ in\ LLM\ output}$$

Table 2. Overall comparisons of differential diagnoses generated from three different language models compared to differentials derived from an ophthalmologist written in EyeRounds.

Case: Idiopathic Orbital Inflammation

EyeRounds	ChatGPT	Gemini	Co-pilot
1. Idiopathic orbital inflammation 2. Orbital inflammation secondary to an underlying disease 3. Thyroid eye disease 4. Orbital cellulitis 5. Malignancy (e.g., infiltrative lymphoma, metastasis, lacrimal gland tumors) 6. Orbital hemorrhage	1. Idiopathic Orbital Inflammatory Syndrome (Orbital pseudotumor) 2. Thyroid Eye Disease (Graves' Ophthalmopathy) 3. Lymphoma (Orbital lymphoma) 4. IgG4-Related Disease 5. Metastatic Carcinoma (Orbital metastasis) 6. Neurofibromatosis Type 1 (Orbital plexiform neurofibroma) 7. Orbital Varix	1. Idiopathic Orbital Inflammatory Syndrome (IOIS) 2. Graves' Ophthalmopathy 3. Allergic Orbital Inflammation 4. Lymphoma (orbital) 5. Sarcoidosis (orbital) 6. Dacryoadenitis (non-infectious) 7. Myositis (isolated extraocular muscle involvement)	1. Orbital Pseudotumor 2. Preseptal Cellulitis 3. Thyroid Eye Disease 4. Lacrimal Gland Tumor 5. Superior Rectus Muscle Enlargement 6. Levator Palpebrae Superioris Muscle Enlargement 7. Orbital Lymphoma 8. Orbital Metastasis 9. Orbital Hemangioma 10. Orbital Dermoid Cyst

Table 3. Example differential diagnosis generated from an example EyeRounds case description from three different language learning models with best accuracy. The order in the LLM outputs represents from most likely to least likely differential diagnosis.

Case: Floppy lid syndrome, case b

EyeRounds	ChatGPT	Gemini	Co-pilot
1. Floppy Eyelid Syndrome 2. Chronic conjunctivitis 3. Vernal conjunctivitis 4. Giant papillary conjunctivitis 5. Superior limbic keratoconjunctivitis 6. Toxic conjunctivitis 7. Canaliculitis 8. Involutional ectropion 9. Nasolacrimal duct obstruction 10. Sebaceous cell carcinoma	1. Congenital ptosis 2. Horner syndrome 3. Myasthenia gravis 4. Chronic progressive external ophthalmoplegia 5. Oculopharyngeal muscular dystrophy 6. Third nerve palsy 7. Aponeurotic ptosis 8. Malignancy (such as eyelid carcinoma)	1. Senile Ptosis 2. Myogenic Ptosis (possible) 3. Horner Syndrome (unilateral - less likely due to age and unilateral presentation) 4. Aponeurotic Ptosis (less likely due to minimal OS ptosis) 5. Neurogenic Ptosis (less likely due to age and normal extraocular motility) 6. Congenital Ptosis (unilateral presentation - less likely)	1. Involutional Ptosis 2. Aponeurotic Ptosis 3. Myasthenia Gravis 4. Horner's Syndrome 5. Third Nerve Palsy 6. Chronic Progressive External Ophthalmoplegia 7. Blepharochalasis Syndrome 8. Congenital Ptosis

Table 4. Example differential diagnosis generated from an example EyeRounds case description from three different language learning models with worst accuracy. The order in the LLM outputs represents from most likely to least likely differential diagnosis.

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28 The NYEE-Orbis Oculoplastic Surgery Curriculum: A Novel Online Interactive Course for Under-Resourced Settings Globally

Harsha Reddy[1], Jason Jo[2], Ha Min Kim Chang[3], Jackson Scharf[4], David Hunter Cherwek[5], Daniel Neely[6], Shailesh Gaurav[5]
[1]Ophthalmology, New York Eye and Ear/Mount Sinai, New York, United States, [2]Icahn Mount Sinai School of Medicine, New York, New York, United States, [3]Ophthalmology, New York Eye and Ear/Mount Sinai, New York, New York, United States, [4]New York, New York, United States, [5]Orbis, International, New York, New York, United States, [6]Ophthalmology, Indiana University, Indianapolis, Indiana, United States

Introduction: Online learning is an important component of surgical education in under-resourced settings globally where access to oculoplastic surgeons and teachers is limited or absent. Two novel courses - "Basics of Oculoplastic Surgery" and "Intermediate Oculoplastic Surgery" - were created by one of the authors (HSR) on Orbis International's Cybersight online learning platform and made available free of charge. The course format is a stepwise introduction to anatomy, clinical concepts, and surgical management including videos, photographs, and illustrations. The courses are interactive, with learners tested on material shortly after introduction and after full instruction, to aid in knowledge acquisition.

Methods: This retrospective study evaluated the global reach of these novel online courses. Demographic data on the course users were collected and analyzed. Data provided by the enrollees, as well as their performance during the course, were used to better understand the population that is enrolling, completing, and receiving the most benefit from the course.

Results: Since its launch, the "Basics of Oculoplastic Surgery" course has received 2545 enrollments in 150 countries while the "Intermediate Oculoplastic Surgery" course has received 1083 enrollments in 126 countries. While most applicants were from training programs or teaching eye hospitals, enrollees from a variety of other settings such as military hospitals, private eye care centers, and consulting agency were also represented. The top three countries with the highest use for the "Basics" course were India (15.5%), Vietnam (11.7%), and Nigeria (4.4%), and for the "Intermediate" course, Vietnam (13.9%), India (10.9%), and the United States (4.4%). A majority of applicants for the "Basics" course were practicing ophthalmologists (47.9%), residents (17.0%), optometrists (9.9%), nurses (7.6%), and medical students (4.6%). The "Intermediate" course recruited 55.1% ophthalmologists, 15.3% residents, 7.1% optometrists, 5.3% nurses, and 4.7% medical students. To date, many enrollees were in the process of completion of the courses, with 17.6% completion of the "Basics" course and 9.8% completion of the "Intermediate" course.

Conclusions: The interactive online courses had wide participation across countries worldwide. The large number of practicing ophthalmologists who enrolled in the course suggests an interest in post-graduate education in oculoplastic surgery. In addition, there

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was a diversity of non-MD medical providers taking the course. Subsequent studies will investigate the effectiveness of the curriculum in knowledge acquisition by assessing the pre-, intra- and post- performance metrics embedded in the courses. Online education can be combined with live instruction in 'blended learning' models for training programs and surgical missions.

Table 1

Table 1: Demographics and Course Progress of Survey Respondents

		Basics of Oculoplastics Surgery (% of whole)		Intermediate Oculoplastics (% of whole)
Total		2545 (100%)		1083 (100%)
Job Title	Ophthalmologist	1220 (47.9%)	Ophthalmologist	597 (55.1%)
	Resident	432 (17.0%)	Resident	166 (15.3%)
	Optometrist	251 (9.9%)	Optometrist	77 (7.1%)
	Nurse	194 (7.6%)	Nurse	57 (5.3%)
	Medical Student	118 (4.6%)	Medical Student	51 (4.7%)
Country	India	394 (15.5%)	Vietnam	151 (13.9%)
	Vietnam	297 (11.7%)	India	118 (10.9%)
	Nigeria	112 (4.4%)	United States	48 (4.4%)
	Pakistan	108 (4.2%)	Pakistan	47 (4.3%)
	Ethiopia	84 (3.3%)	Nigeria	43 (4.0%)
	United States	79 (3.1%)	United Kingdom	40 (3.7%)
	United Kingdom	75 (2.9%)	Ethiopia	31 (2.9%)
	Egypt	53 (2.1%)	Egypt	29 (2.7%)
	South Africa	50 (2.0%)	Turkey	27 (2.5%)
	Turkey	49 (1.9%)	Kenya	18 (1.7%)
	Zambia	46 (1.8%)	South Africa	18 (1.7%)
	Kenya	43 (1.7%)	Mongolia	17 (1.6%)
	Mongolia	42 (1.7%)	Romania	16 (1.5%)
	Bangladesh	36 (1.4%)	Iraq	15 (1.4%)
	Mexico	34 (1.3%)	Mexico	14 (1.3%)
	Malaysia	33 (1.3%)	Malaysia	13 (1.2%)
	Ghana	31 (1.2%)	Somalia	13 (1.2%)
	Rwanda	31 (1.2%)	Spain	13 (1.2%)
	Others (132 Countries) *(Total # of Countries = 150)*	948 (37.2%)	Others (108 Countries) *(Total # of Countries = 126)*	412 (38.0%)
Course Certificate Attained	No	2097 (82.4%)	No	977 (90.2%)
	Yes	448 (17.6%)	Yes	106 (9.8%)
Status of Course	In Progress	1354 (53.2%)	In Progress	639 (59.0%)
	Not Started	742 (29.2%)	Not Started	336 (31.0%)
	Complete	448 (17.6%)	Complete	106 (9.8%)
	Not Complete	1 (0.04%)	Not Complete	2 (0.01%)

Figure 1

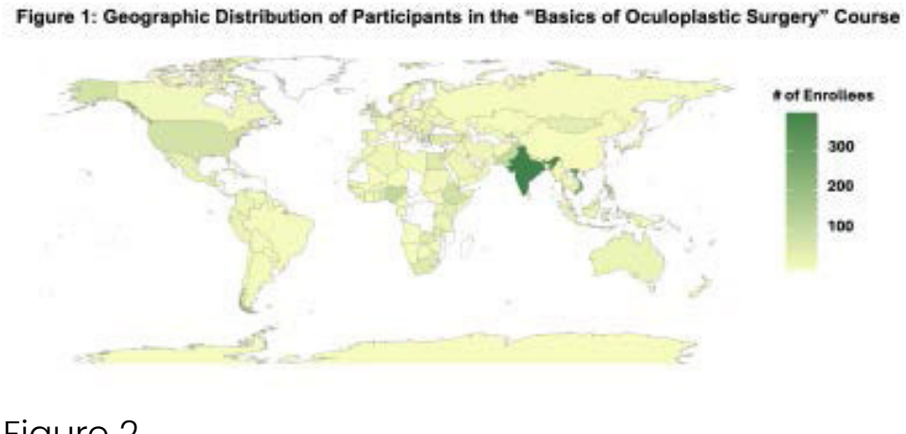

Figure 2

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29 Usage of Large Language Models (LLMs) in Plastic and Reconstructive Surgery Literature

Pelin Celiker[1], Diane Wang[2], Ivy Kaznoski[3], Parker Tumlin[4], Aaron Fay[5], John Nguyen[2,4]

[1]Ophthalmology & Visual Sciences, University of California Davis, Sacramento, California, United States, [2]Ophthalmology & Visual Sciences, West Virginia University, Morgantown, West Virginia, United States, [3]Medical Education, West Virginia University, Morgantown, West Virginia, United States, [4]Otolaryngology, Head and Neck Surgery, West Virginia University, Morgantown, West Virginia, United States, [5]Harvard Medical School, Fitchburg, Massachusetts, United States

Introduction: Artificial intelligence (AI) and large language models (LLM) has garnered considerable attention in medicine. Recent studies suggested that there may be a significant increase in the use LLM in the writing of scientific articles. The goal of this study is to determine the presence of text generated by LLM in plastic and reconstructive surgery journals before and after the launch of the Open AI generative pre-trained transformer (ChatGPT).

Methods: We evaluated articles from the November 2021 (pre-AI) and November 2023 (post-AI) issues of Plastic and Reconstructive Surgery (PRS), Plastic and Reconstructive Surgery Global Open (PRS-GO), and Ophthalmic Plastic and Reconstructive Surgery (OPRS). “Letter to Editor” and “Viewpoint” type articles were excluded. Articles were categorized by year of publication, country of origin, article type (investigation, review, case report or series, meta-analysis, or surgical technique). GPTzero was utilized to calculate the probability of AI origin for each article. Six other metrics were included: readability, SAT vocabulary, simplicity, perplexity, burstiness, and sentence length were evaluated. Pre-AI and Post-AI metrics were compared using the Mann-Whitney U test, Chi-square test, and logistic regression.

Results: A total of 120 articles from 2021 and 102 articles from 2023 were analyzed. One (0.83%) article from 2021 and 6 (6.86%) articles from 2023 were classified as AI generated. The average percentage of suspected LLM use was 11.2% ± 9.4% in the 2021 articles and 11.1% ± 17.0% in the 2023 articles (p=0.002). Seven of 120 (5.8%) articles from 2021 had a >30% probability of being AI-generated, while 10/102 (9.8%) articles from 2023 had a >30% probability of being AI-generated (p=0.04). Mean sentence length was significantly greater for the 2023 articles (22.6 words) than the 2021 articles (20.8 words) (p=0.001). No statistically significant findings were observed for the 5 other metrics. Regression analysis revealed that there was no association between country of origin and article type and probability of AI usage.

Conclusions: The pilot study implies an increased probability of AI usage in plastic and reconstructive surgery articles following the release of ChatGPT and raise potential questions on ethical, creativity and originality.

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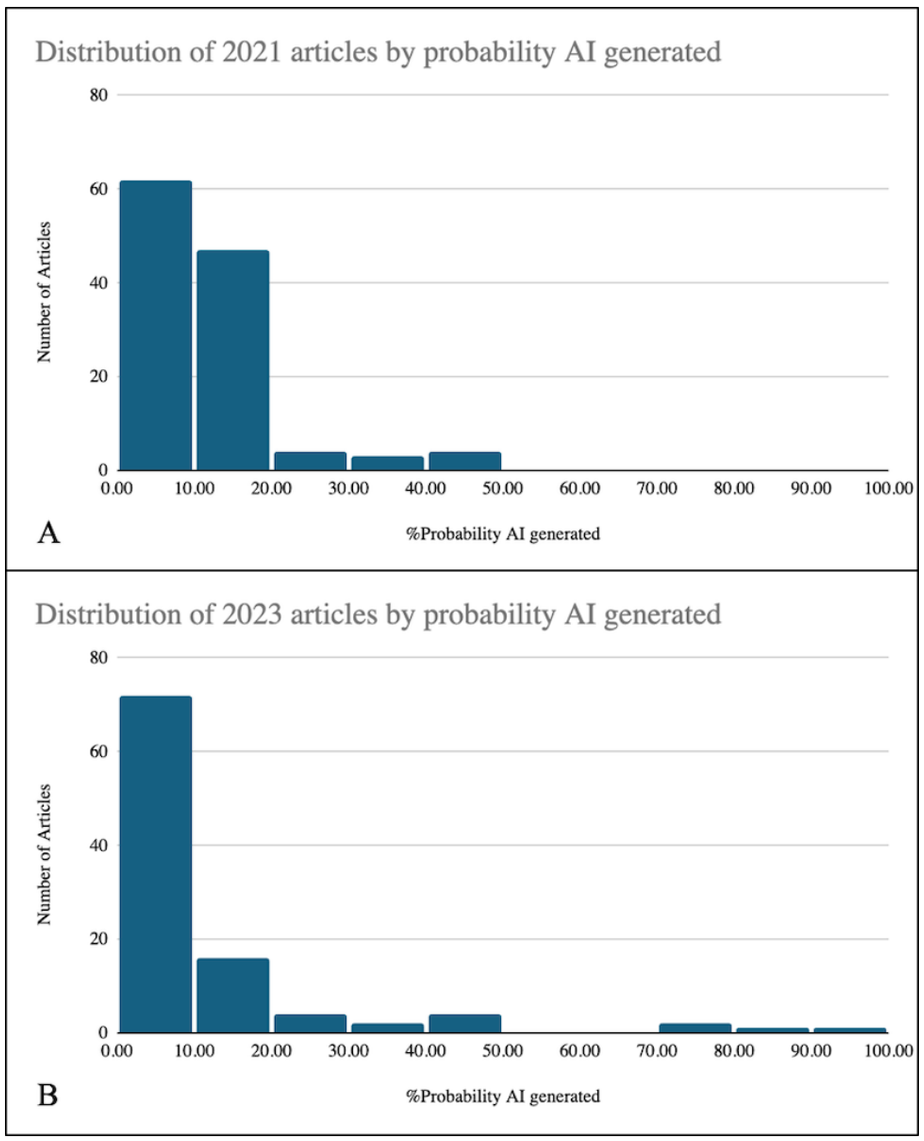
Figure 1



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1 The "Gliding Brow Lift:" An Objective Analysis of Outcomes for the Treatment of Brow Ptosis

Helena Lam[1], Jonathan Buttram[2], Joseph Jeffrey[3], David Holck[1]

[1]Eyeplastx, San Antonio, Texas, United States, [2]Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [3]Brooke Army Medical Center, San Antonio, Texas, United States

Introduction: There are currently limited studies on the surgical outcomes of the relatively novel "gliding brow lift," a technique of small incision subcutaneous dissection and hemostatic netting, first reported by Viterbo et al in 2019.[1] In this study, we examine the efficacy and safety of the approach in a cohort in the United States.

Methods: Charts of adults who underwent primary brow ptosis repair with gliding brow technique between October 2022-October 2024 with a single surgeon with at least six months of follow up data were retrospectively reviewed. Through minimal pretrichial incisions, careful subcutaneous tunneling and dissection was carried to release the skin from the underlying muscles and fascia past the orbital retaining ligaments across the forehead. Temporary sutured four-point fixation of each brow was placed followed by vertical running-locking hemostatic nets over the entire forehead without skin removal or other fixation devices. Preoperative and postoperative photographs of the primary front position were analyzed. Bilateral vertical distance measurements from the horizontal pupil plane (medial canthus, mid-pupil, and lateral canthus) were measured using a digital program analysis, Image J,[2] with calipers set to the average corneal diameter of 11.8 mm.[3] Postoperative complications were reviewed.

Results: A total of 60 brows of 30 patients met criteria for review. All patients were female, had an average age of 71 (60-83), underwent brow ptosis repair involving the entire forehead, and had concomitant upper lid blepharoplasty or ptosis repair. The average increase in brow height at the medial canthus was 5.2 ± 3.1 mm ($p<0.01$), at the mid-pupil 6.3 ± 3.0 mm ($p<0.01$), and at the lateral canthus 7.1 ± 3.0 mm ($p<0.01$) at 10.5 ± 3.7 weeks. Lasting lift was compared with most recent visit (8.4 ± 2.5 months) which showed a decrease in brow height of 0.4 ± 2.3 mm ($p=0.10$) at the medial canthus, 0.4 mm ± 2.0 mm at the mid-pupil ($p=0.07$), and 0.4 mm ± 1.9 mm ($p=0.04$). Complications included subjective brow asymmetry in five patients (13.33%) with one case requiring reoperation for correction, one case of frontalis weakness, and one case of skin necrosis. There were no cases of postoperative hematoma, seroma, lasting paresthesia, infection, alopecia, relapse, or exacerbation of preexisting ptosis.

Conclusions: The gliding brow technique successfully elevates along the entire brow while maintaining hemostasis and adequate fixation with relative safety. It uniquely offers the ability to contour the brow via temporary cutaneous fixation however significant prudence is required to avoid postoperative brow asymmetry.

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2 The Anatomy of Lower Eyelid Fat Pad Vasculature as Found in Lower Eyelid Blepharoplasties

Irene Lee[1], Nishita Sheth[2], Evan Black[3], Christopher Dermarkarian[2], Julie Woodward[2]
[1]Ophthalmology, Duke Eye Center, Durham, North Carolina, United States, [2]Chapel Hill, North Carolina, United States, [3]Southfield, Michigan, United States

Introduction: The difference in vasculature among the lower eyelid fat pads seen during lower eyelid blepharoplasty surgery has not been fully described. Better characterization of such vasculature may be helpful intraoperatively to prevent excessive bleeding and orbital hemorrhage. We hypothesize that during lower eyelid blepharoplasty, vasculature is more commonly encountered within the nasal fat pads compared to that of the central and lateral fat pads.

Methods: A retrospective review of all surgical cases of patients who underwent cosmetic bilateral lower eyelid blepharoplasties (BLLB) at a tertiary care facility from September 2023 to April 2024 was performed. Patients were included only if there was formal documentation in the operative note of the vasculature observed within the lower nasal, central, and lateral fat pads. Patients were excluded if they had a history of a prior BLLB. All BLLB were performed via a trans-conjunctival method with incisions made with carbon dioxide laser; lower fat pads were removed by incising 3 separate palpebral conjunctival pockets corresponding to the nasal, central, and lateral fat pads. If fat pad vasculature was present, it was graded on a scale of “mild,” “moderate,” or “large” based on the description of the vasculature in the operative note. If no vasculature was observed, “minimal” vasculature was noted documented. Of note, the grading system only applied to the deep vessels observed within the fat pads, not the superficial vessels that are commonly found on the sheath encapsulating the fat pads. All grading was were performed by two oculoplastics surgeons. Figure 1 demonstrates examples of the grading system. The various grades of vasculature were quantified and compared.

Results: 194 lower eyelids of 97 patients were included in the study. The presence of vasculature (“mild”, “moderate,” and “large”) was identified in 147 nasal fat pads, 10 central fat pads, and 25 lateral fat pads. The absence of vasculature (“minimal”) was documented in 47 nasal, 184 central, and 169 lateral fat pads. 76% of nasal fat pads encountered during BLLB contained vasculature, while only 5% of the central and 13% lateral fat pads had vasculature (Figure 2). 82% of large vasculature, 86% of moderate vasculature, and 67% of mild vasculature were all found in the nasal fat pads. 86% of minimal vasculature was found in the central and lateral fat pads (Figure 3).

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Conclusions: During BLLB, deep vasculature found within the fat pads was more commonly encountered in the nasal fat pads, as compared to that of central and lateral fat pads. Extra caution should be taken when excising or transposing the nasal fat pad to prevent excessive bleeding that can lead to orbital hemorrhage. In cases of visible vasculature, the authors recommend preemptive cautery (bipolar or other) to reduce the chance of hemorrhage. Our study is the first, to our knowledge, of characterizing the vasculature found within the lower eyelid nasal, central, and lateral fat pads.

Figure 1

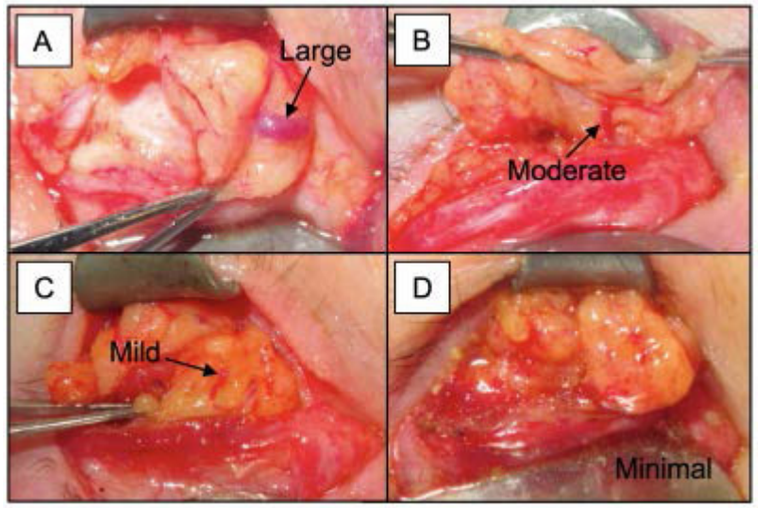


Figure 2

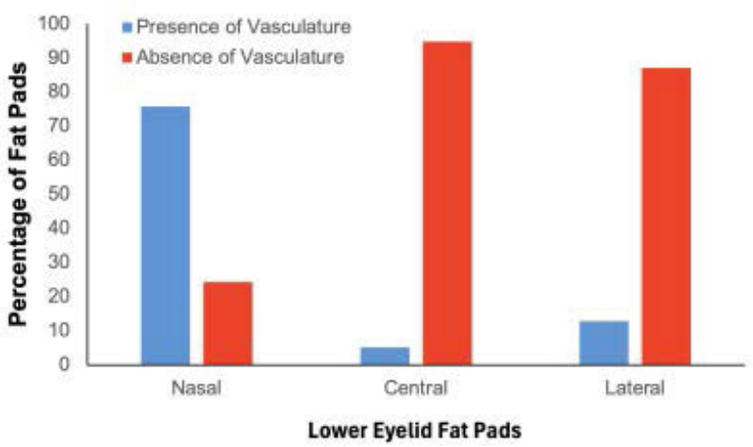
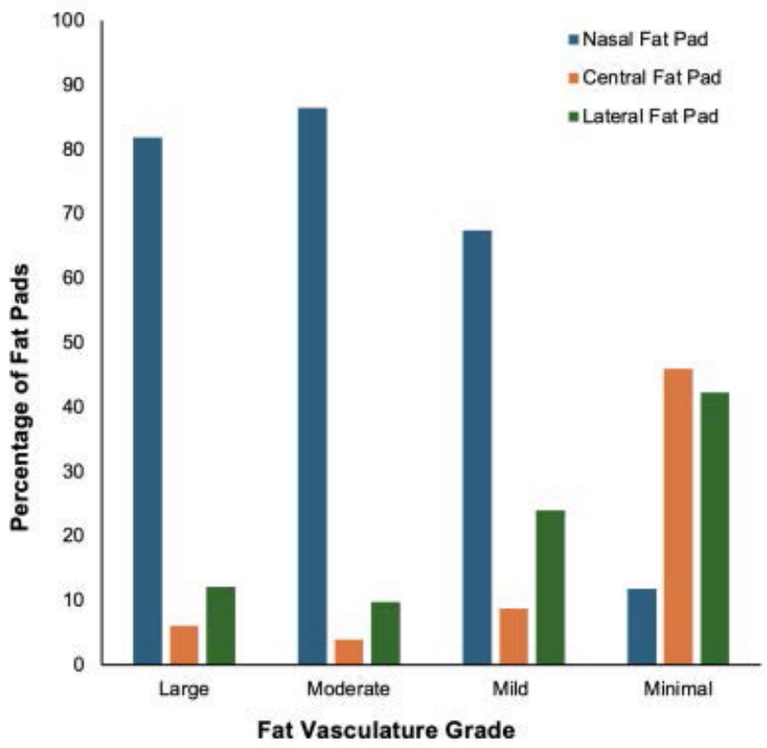


Figure 3



4 Flow-through Hypochlorous Acid 0.033% Wound Care for Periorbital Necrotizing Fasciitis

Katherine Lucarelli, Connie Sears, Maria Paula Quintero Mutis, Robert Goldberg, Daniel Rootman
Division of Orbital and Ophthalmic Plastic Surgery, Doheny and Stein Eye Institutes, University of California, Los Angeles, Los Angeles, California, United States

Introduction: Necrotizing fasciitis (NF) often requires debridement of necrotic tissue, which can lead to common sequalae such as lagophthalmos, ocular exposure, and disfigurement. Hypochlorous acid 0.01% (HOCl) wound care has shown potential to augment treatment of extra-facial NF. The authors present three patients with periorbital NF who received wound care with HOCl 0.033% (Vashe Wound Solution) via a flow-through instillation system fashioned from flexible intravenous tubing to supplement debridement and systemic antibiotics.

Methods: Case series and literature review

Results: Case 1: A 57-year-old man with diabetes mellitus, diabetic retinopathy, and chronic kidney disease presented with two days of severe right periorbital pain, swelling, and discharge without any inciting event. Vision was 20/100 right and 20/70 left (baseline). Computed tomography (CT) demonstrated subcutaneous emphysema and extensive orbital inflammation. Intravenous vancomycin and piperacillin/tazobactam were initiated. The patient underwent limited subcutaneous debridement of the right upper and lower eyelid (Figure 1A). Group A Beta Streptococcus was isolated. Post debridement, flow-through hypochlorous acid solution was administered to the eyelid q2h for 48 hours and then applied via wet to dry dressings for one week. At three months, the upper lid showed moderate scarring with recovering orbicularis function and 0.5 mm lagophthalmos (Figure 1B).

Case 2: An 83-year-old woman with hypertension and diabetes mellitus presented with severe left upper eyelid pain and swelling three days after a fall. Visual acuities were 20/30 right and 20/25 left. Orbital CT showed severe left preseptal soft tissue inflammation without obvious emphysema. After worsening on intravenous vancomycin and ceftriaxone, she underwent limited subcutaneous debridement of the left upper eyelid. Cultures grew group A Beta Streptococcus and coagulase negative staph. Flow-through hypochlorous acid solution was administered every four hours for 48 hours followed by wet to dry HOCl dressings (Figure 1C). At two months, there was left upper eyelid ptosis with a dense scar and no lagophthalmos (Figure 1D).

Case 3: A 40-year-old female with no significant past medical history presented with three days of left periorbital pain, swelling, and decreased vision after a lower eyelid stye. Vision was 20/20 right and 20/400 left with a relative afferent pupillary defect. Intravenous vancomycin, clindamycin and pipercillin/tazobactam were initiated. CT displayed an extensive fluid collection and mass effect on

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the globe. Debridement revealed necrotic orbicularis and a large phlegmon in the orbit. Cultures identified methicillin resistant staph aureus. Wound care with flow through hypochlorous acid was applied for 48 hours followed by wet to dry hypochlorous acid dressings for four days was implemented (Figure 1D). Vision improved to 20/25. At one month, there was early scar formation with ptosis and 1 mm lagophthalmos (Figure 1E).

Conclusions: Hypochlorous acid wound care may serve as a helpful wound care adjunct in the management of periocular necrotizing fasciitis. A flow through system can be fashioned in a simple and inexpensive technique, and it can also be used for wet to dry dressings. All three patients showed significant improvement without the need for additional debridement with the use of 0.003% HOCl wound care.

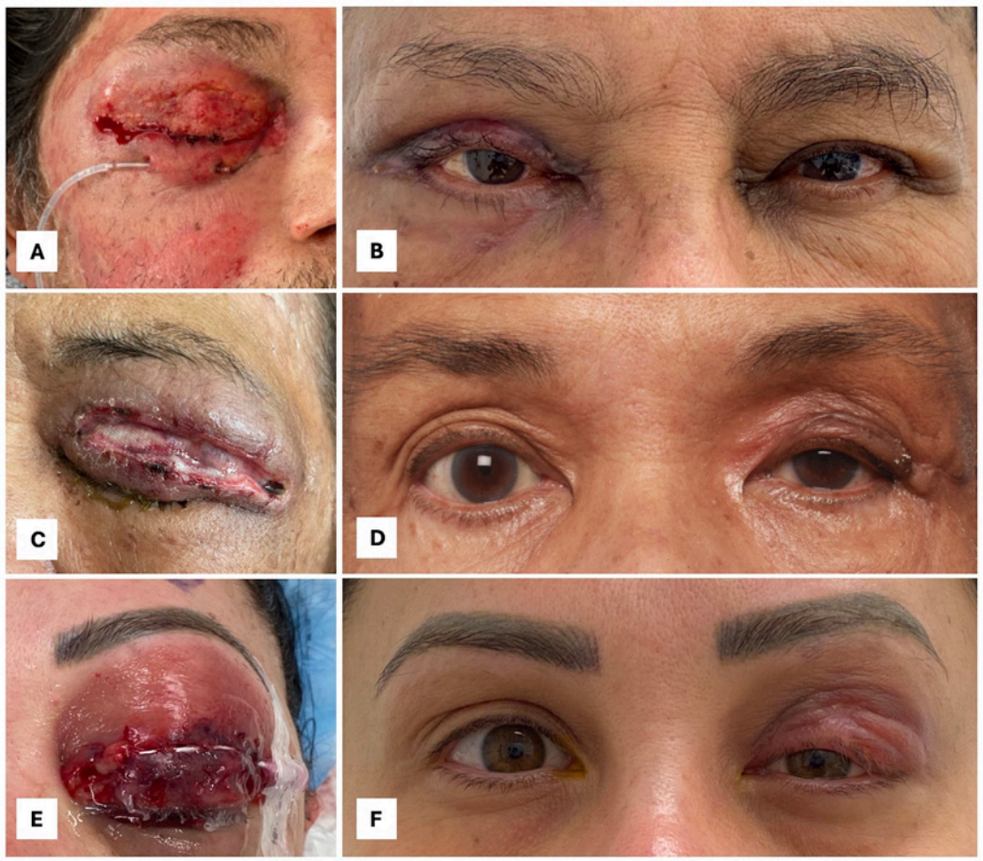

Figure 1: A. Flow-through hypochlorous acid 0.033% solution administered to the eyelid via fenestrated IV flush tubing following limited subcutaneous debridement (Patient 1). B. Moderate scarring and lateral retraction at post operative month 3 (Patient 1). C. Granulation tissue developing after wet to dry wound care with 0.033% hypochlorous acid (Patient 2). D. Ptosis with scar at post operative month 2 (Patient 2). E. Post debridement wound care with flow-through hypochlorous acid 0.033% (Patient 3) F. Ptosis and early scar formation at post operative month 1 (Patient 3).

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5 Impact of Orbitomalar Vector on Lower Eyelid Malposition Following Reconstruction of Lower Eyelid and Midface Mohs Defects

Nicole Sanchez Figueroa[1], Caroline Yu[2], Christeebella Akpala[3], Lilly Wagner[2]

[1]Division of Plastic Surgery, Department of Surgery, Mayo Clinic, Rochester, Minnesota, United States, [2]Department of Ophthalmology, Mayo Clinic, Rochester, Minnesota, United States, [3]Alix School of Medicine, Rochester, Minnesota, United States

Introduction: Ectropion and retraction are potential complications following Mohs reconstruction of the lower eyelids and adjacent subunits, and can lead to compromise of the ocular surface and significant quality of life detraction. Despite advancements in surgical techniques, post-reconstructive ectropion remains a challenge, and understanding risk factors can aid in prevention and management. Negative orbital vector is one factor that has been associated with the development of involutional eyelid retraction and ectropion but has not been studied in the context of Mohs reconstruction.[1] This study aimed to evaluate the effect of the orbital vector on the development of postoperative ectropion development in patients undergoing Mohs surgery and reconstruction of the lower eyelid and cheek.

Methods: This was a retrospective case-control study of patients who underwent Mohs surgery excision and reconstruction for facial skin cancer at a single institution between 2010 and 2022 with at least 1-year follow-up. Data were collected from electronic medical records, including patient and surgical variables, and external photographs were reviewed to determine pre-operative anatomical characteristics and outcomes. The reviewer of pre-operative photographs was blinded to the post-operative ectropion status. Descriptive statistics were used to summarize demographic and clinical characteristics. Categorical variables were compared with Chi-square test, and multivariate logistic regression analysis was conducted to identify predictors of ectropion development. Odds ratios (OR) and 95% confidence intervals (CI) were calculated, with p-values < 0.05 considered statistically significant.

Results: A total of 198 patients were identified. Negative or neutral orbital vector was associated with ectropion development ($p = 0.017$). Logistic regression analysis further demonstrated that patients with a positive orbitomalar vector were less likely to develop ectropion (OR = 0.248, 95% CI: 0.095–0.649, $p = 0.004$), while a larger total defect area greater than 3cm was associated with increased odds of ectropion (OR = 2.68, 95% CI: 1.286–5.851, $p = 0.008$). The use of local flaps in the reconstructive technique as opposed to primary closure or skin graft was significantly associated with higher odds of ectropion (OR = 2.964, 95% CI: 1.276–7.605, $p = 0.016$). Additionally, defect area (>3 cm) was significantly associated with increased odds of both ectropion and eyelid retraction (OR = 4.859, $p = 0.045$).

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Conclusions: Our findings emphasize the significance of orbitomalar vector as a pre-disposing anatomical risk factor for ectropion after Mohs defect reconstruction. As one would expect, larger defect size and subsequent need for larger local flaps were also found to be associated with post-reconstructive ectropion. Clinicians can use this knowledge to refine surgical planning and patient education. Further research investigating the interplay between defect size and surgical approach is warranted to clarify strategies to avoid post-reconstructive lower eyelid malposition.

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6 Investigating if Blepharospasm Disability Index Score Predicts Same-Day Botulinum Neurotoxin Dosage for Benign Essential Blepharospasm and Hemifacial Spasm

Ashley Shirriff, Robert Goldberg, Daniel Rootman
Ophthalmology, UCLA, Los Angeles, California, United States

Introduction: Botulinum neurotoxin (BTX) is a known therapeutic standard for both benign essential blepharospasm (BEB) and hemifacial spasm (HFS) and has been shown to improve patient-reported quality of life.[1,2] The Blepharospasm Disability Index (BSDI) is a self-rating assessment of functional status and has been shown to reliably characterize BEB symptomatology.[3,4] However, it remains unclear if there is an association between BSDI score and the dose of BTX administered for BEB or HFS.

Methods: In this cross-sectional cohort study, patients with a confirmed diagnosis of BEB or HFS managed at a tertiary oculoplastic center from January 2022 to January 2024 were reviewed. Patients were administered the BSDI instrument prior to BTX treatment. The BSDI comprises an assessment of six daily activities (reading, driving a vehicle, watching television, shopping, doing everyday activities, and getting about on foot) graded on a 5-point Likert scale related to severity of impairment (0 = no impairment, 1=mild impairment, 2=moderate impairment, 3=severe impairment, or 4 = activity not possible due to disease). The total BSDI score and number of same-day BTX units administered were collected. Linear regression analysis was used with alpha set at 0.05.

Results: Sixty patients (44 with BEB, 16 with HFS) were included with a mean age of 67.0±11.6 years. Subjects demonstrated a Caucasian female predominance (58% and 65%, respectively). The activity most impaired in the BEB cohort was watching television, while the activity most impaired in the HFS cohort was reading. For the BEB patient cohort, mean BSDI score was 8.4±5.7 and was found to be significantly correlated to number of same-day BTX units given (R^2=0.16, p=0.006). For the HFS patient cohort, mean BSDI score was 4.9±6.6, and BSDI was not found to have a significant association with number of same-day BTX units given (R^2=0.05, p=0.414). Dose-response curve shown in Figure 1 demonstrating the relationship between BTX dosage and BSDI score for both groups.

Conclusions: We found a significant positive association with BSDI and number of BTX units administered for BEB patients. These data suggest that patient self-assessment of disease severity is associated with dose escalation. In HFS, there does not appear to be a close association between dose and disease severity.

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7 Mathematical Model to Sizing the Semicircular Flap in Lower Eyelid Reconstruction

Preston Choi[1], Frank Mei[1], Liane Dallalzadeh[2], Phillip Tenzel[2]
[1]Department of Ophthalmology, University of Texas Southwestern Medical Center, Dallas, Texas, United States, [2]Division of Oculoplastic and Orbital Surgery, Department of Ophthalmology, University of Texas Southwestern Medical Center, Dallas, Texas, United States

Introduction: This study examines a mathematic model for sizing a semicircular flap for lower eyelid reconstruction.

Methods: Theoretical: The circumference of a semicircle is pi * (diameter)/2. (Figure 1, blue). As the rotational flap is advanced, the circumference straightens to approximate the semicircle's diameter (Figure 1, red). The excess tissue generated (Figure 1, green) should match the size of the initial eyelid defect; this should also be the difference between the semicircle's circumference and the diameter. Therefore, the following equations can be derived from Figure 1:

defect size = pi * (diameter)/2 - (diameter)

or, when simplified:

semicircle diameter = (defect size)/(pi/2-1) = 1.75 * (defect size)

Empirical: The theoretical formula was tested by creating semicircular flaps of varying diameters on 6 fresh cadavers. A full thickness vertical incision was made in the lower eyelid. The cut ends were pulled under gentle tension to simulate the defect repairable by direct closure—this tissue was excised to eliminate all laxity (Figure 2A). Semicircular flaps of different dizes (diameter =12-42mm) were dissected as previously described.[1,2] The cut ends of the previous eyelid incision were then crossed under gentle tension. The overlapping tissue was measured to give the size of defect repairable (Figure 2B).

Retrospective case series: This study included a retrospective case series of patients with lower eyelid defects repaired with a semicircular flap. Inclusion criteria included ≥ 18 years of age, eyelid defect repaired using a semicircular flap (either alone or in combination with other methods), and documented measurements of defect and semicircular diameter size. Records without documentation of defect or semicircular size were excluded.

Results: Theoretical: Table 1 lists the expected diameter of semicircle needed for various defect sizes using the model, and this is graphically shown in Figure 3.

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Empirical (Cadaveric model): The measured overlap (defect size) was plotted against the semicircle diameter in Figure 3. This closely follows the theoretical model ($p=1.24*10^{-6}$, $r^2=0.998$) across the given range of measurements (diameters 12-42mm).

Case series: Five patients from a single surgeon (PT) were included in this study. The mean defect size was 12.4mm (10mm-15mm), and the mean semicircular diameter was 21.5mm (16mm-27mm). One patient had transient lower lid entropion postoperatively, which resolved within one month; otherwise, there were no complications, and all patients reported excellent satisfaction with cosmetic and functional outcomes at least 3 months postoperatively.

Conclusions: The semicircular flap has been used for decades for repairing eyelid defects. However, there is no standardized protocol to size the semicircular flap. Here we report a mathematical model to size a semicircular flap that successfully predicts the semicircular flap size per defect in both cadaver and patient lower eyelid reconstruction.

Figure 1

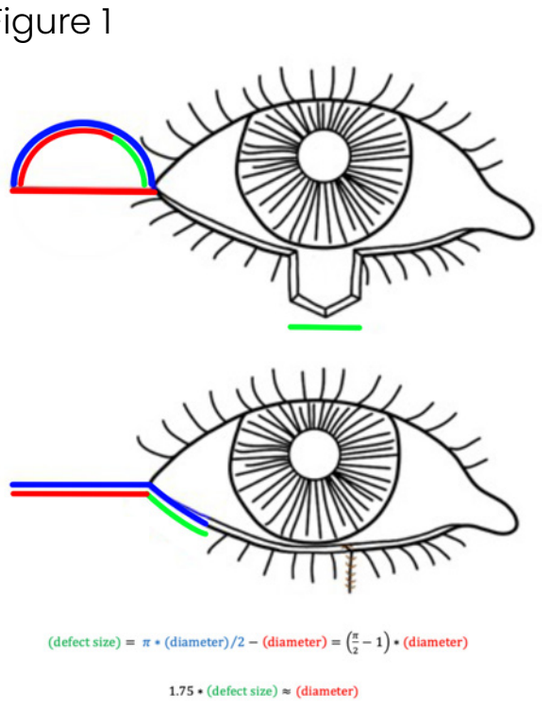


Figure 2

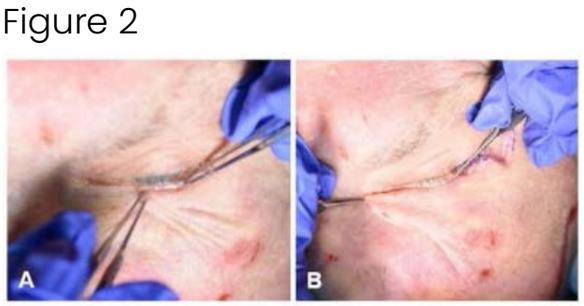
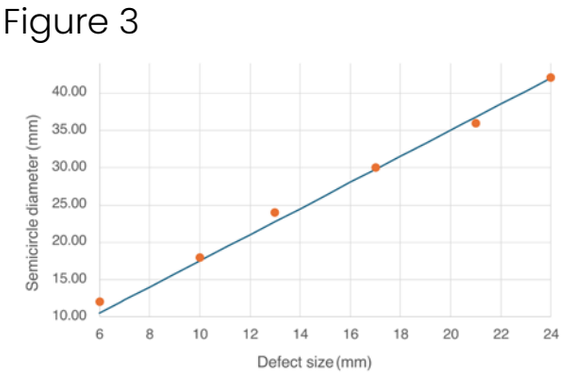


Figure 3



Blue: graph of theoretical relationship between defect size (x-axis, mm) and semicircle diameter (y-axis, mm)

Orange: measured overlap/defect size in cadaver specimens by semicircle diameter

Figure 4

Defect size (mm)	Diameter of semicircle (mm)
6	10.51
7	12.26
8	14.02
9	15.77
10	17.52
11	19.27
12	21.02
13	22.78
14	24.53
15	26.28
16	28.03
17	29.78
18	31.53
19	33.29
20	35.04
21	36.79
22	38.54
23	40.29
24	42.05

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8 Meibum Microbiome in Chalazion: Is there a Rationale for Antibiotics Use?

Vidhi Anklesaria[1], Arunasri Kotakonda[2], Javed Ali Mohammad[2], Swati Singh[2]
[1]L V Prasad Eye Institute, Hyderabad, India, [2]Hyderabad, India

Introduction: The current study evaluated the meibum microbiome of eyelids having chalazion and compared it with contralateral uninvolved eyelids.

Methods: Chalazion contents and expressed meibum swabs from the lid margins of seven patients with chalazia (mean age, 29 ± 12 years) were sequenced using Next Generation (NGS) 16S rDNA V3-V4 variable region sequencing. The contralateral eye served as control. The contents were also plated using conventional culture techniques.

Results: There was more alpha and beta diversity in the uninvolved eyelid compared to the eyelid with chalazia. Meibum microbiome profiling revealed differences between the affected and uninvolved sides. The predominant phyla were proteobacteria and actinobacteria, and *Acinetobacter*, *Moraxella*, and *Paracoccus* were the predominant genera. Principal coordinate analysis revealed overlap between the two groups, and significant differences were noted in the less abundant bacteria but not in abundant genera. None of the culture media (for aerobic, anaerobic bacteria and fungus) showed any growth. None of the patients had blepharitis; the mean Schirmer I value was 24.6±4.9mm.

Conclusions: Meibum microbiome is altered in eyelids affected with chalazion compared to the uninvolved side, though the prevalence of the abundant genera was similar in the two. The chalazion is likely a non-infectious pathology, and the use of topical antibiotic ointment should be reconsidered.

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9 Reviving the Fornix: A Morphometric Analysis of Three-Dimensional Printed Fornices from Cadaveric Molds

Ashley Shirriff[1], Jacob Pearl[2], Doug Daniels[3], Maria Quintero[1], Daniel Rootman[1]

[1]Ophthalmology, UCLA, Los Angeles, California, United States, [2]Bioengineering, UCLA, Los Angeles, California, United States, [3]Library, UCLA, Los Angeles, California, United States

Introduction: Obliteration of the fornix may result from various cicatricial ocular surface diseases, compromising ocular surface health and motility. Typical surgical correction of fornix contracture can involve lysis of the scarred tissue followed by reconstruction with a tissue substitute such as oral mucosa, amniotic membrane, or autologous conjunctiva.[1] In attempt to prevent re-adhesion of the conjunctiva, various strategies may be employed, to include symblepharon rings, silicone implants, placement of a custom conformer, anchoring sutures or topical mitomycin C.[1–3] Despite these measures, failure due to recurrence of adhesions remains an ongoing dilemma. Furthermore, the anatomical nuance of the fornix makes it difficult to accurately characterize. The aim of this study was to construct and characterize three-dimensional (3D) printed fornix models with the eventual goal of developing a biocompatible temporary barrier implant that replicates the natural anatomic structure of the fornix and ultimately maintains adequate fornix depth during healing to be later removed.

Methods: This proof-of-concept study involved taking alginate impressions of the inferior fornix from cadaveric specimens. Each impression was scanned using the Artec Space Spider 3D Scanner (Artec 3D, Luxembourg City, Luxembourg) with a 3D point accuracy of up to 0.05 mm. All scans were then 3D printed to create the final molds. They were evaluated for shape. The primary outcomes measured included width, depth at midline, inferior edge length (defined as length of the inferior curvature) and anterior projection (Figure 1). Curves normalized for width against depth were constructed using ImageJ (NIH, Bethesda, MD, USA) to facilitate comparison and demonstrate idealized fornix implant curvature. Descriptive statistics are presented.

Results: Twenty-one inferior fornices were molded, measured and reconstituted. The average measurements were (mean ± SD) width: 25.0 ± 2.9mm, depth: 5.1 ± 1.2mm, inferior edge length: 29.9 ± 3.2mm, and anterior projection: 4.0 ± 0.8mm (Figure 2). Following normalization, the variations in width among the different products revealed relative consistency with respect to the original depth (Figure 3).

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Conclusions: This study demonstrates that 3D-printed fornices may be developed from impression molds with an overall low dispersion of data. The key features of an idealized inferior fornix include: width of 25mm, a depth of 5mm with an anterior projection of 4mm. The curvature is roughly parabolic. Materials development will constitute the next stages of production.

Figure 1

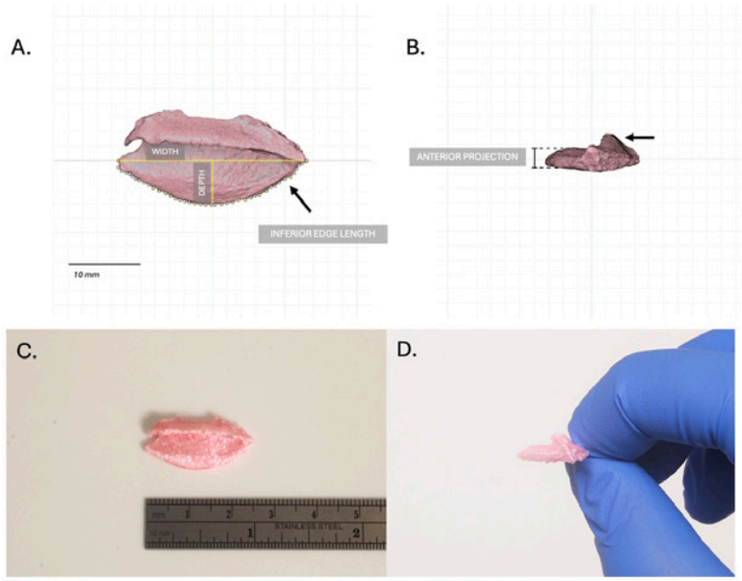


Figure 1. Scan (A, B) and 3D-printed final product (C, D) of a left fornix including how measurements were assessed. Arrow in B indicates extraneous spillover of alginate material during time of impression.

Figure 2

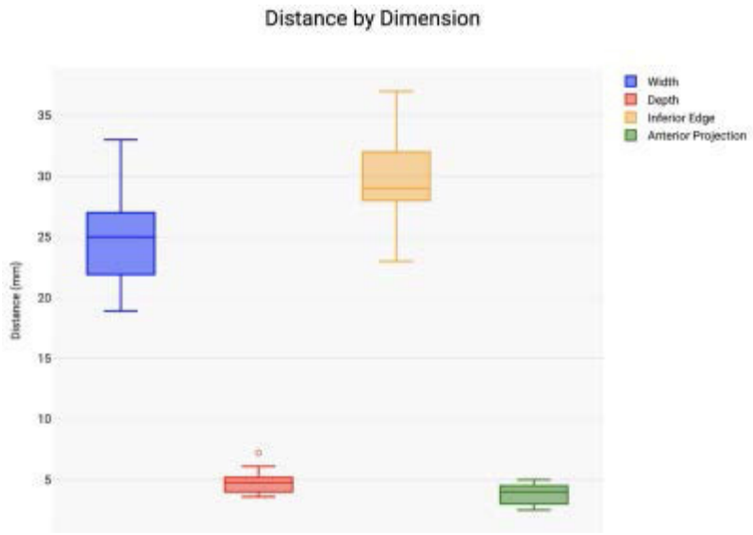
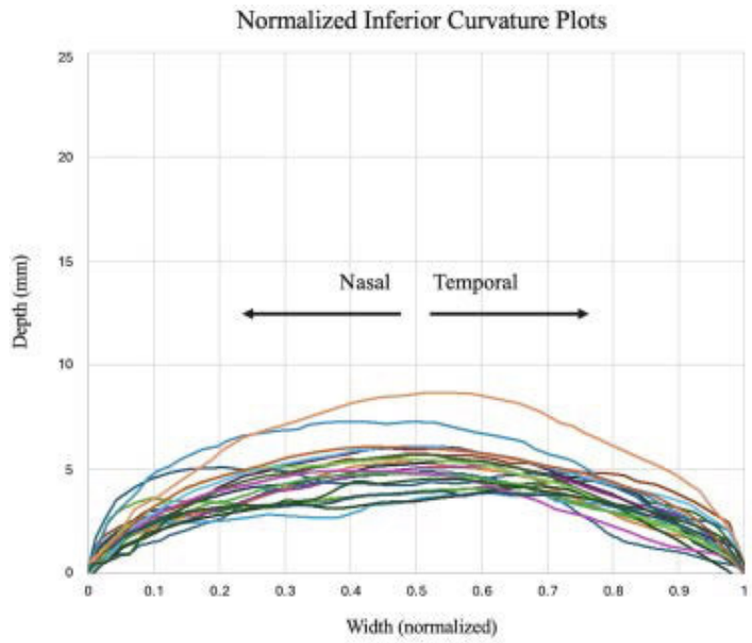


Figure 3



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10 Pythium Antigen Immunotherapy - A Revolutionary Globe-Sparing Treatment for Refractory Orbital Pythiosis

Mostafa Khattab[1,2], Liz Kutteh[3], Karen Bowlware[4], Donna Tyungu[4], Annah Baykal[1,2], Adam Bleeker[1,2], Thai Do[1,2]
[1]Ophthalmology, Dean McGee Eye Institute, Oklahoma City, Oklahoma, United States, [2]Ophthalmology, University of Oklahoma Health and Science Center, Oklahoma City, Oklahoma, United States, [3]Pediatric, University of Oklahoma Health and Science Center, Oklahoma City, Oklahoma, United States, [4]Pediatric Infectious Disease, University of Oklahoma Health and Science Center, Oklahoma City, Oklahoma, United States

Introduction: Pythium insidiosum, a zoonotic pathogen with fungal-like features, induces necrotizing infections in humans, resulting in substantial morbidity and mortality. Historically, orbital pythiosis resulted in severe necrotic disease requiring exenteration of the globe and infected orbital tissue. This disease poses a significant threat due to severe complications and a lack of standardized treatment. Recent advances in immunotherapy may offer globe-sparing therapy.

Methods: This is a case report of the successful treatment of orbital pythiosis with pythium antigen immunotherapy, which preserved vision and the globe.

Results: A previously healthy four-year-old girl presented with sudden-onset right lower eyelid edema and erythema (Figure 1A). Despite outpatient antibiotic treatment, she failed to respond and was admitted for orbital cellulitis with intravenous antibiotics (Figure 1B). Orbit MRI showed a T1 hyperintense mass in the right inferior orbit extending to the periorbital soft tissues and cheek. Following non-response to treatment, an orbital biopsy revealed a mixed inflammatory infiltrate with eosinophilic micro-abscesses and scattered large histiocytes, initially suggestive of Langerhans cell histiocytosis (Figure 3). A subsequent review identified fungal elements, raising suspicion for fungal orbital cellulitis (Figure 4).

Triple antifungal therapy (amphotericin B/voriconazole/micafungin) and triple antibiotic therapy (vancomycin/ceftriaxone/metronidazole) were administered over three weeks. Polymerase chain reaction testing confirmed *Pythium insidiosum* as the causative agent. Compassionate use approval for pythium antigen immunotherapy was obtained from the FDA. The patient underwent 16 weeks of this experimental treatment, resulting in complete resolution of orbital disease with vision and globe preservation (Figure 1C). At the 3-month follow-up, there were no signs of recurrence (Figure 1D).

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Conclusions: Pythium antigen immunotherapy represents an effective and potentially globe-saving approach to treating this rare and refractory orbital infection.

Figure 1

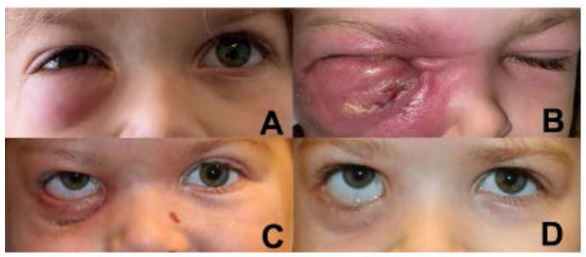


Figure 2

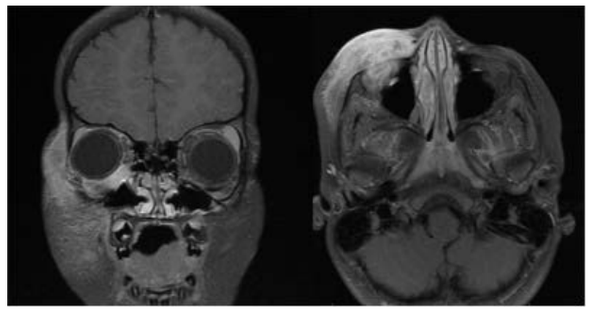


Figure 3

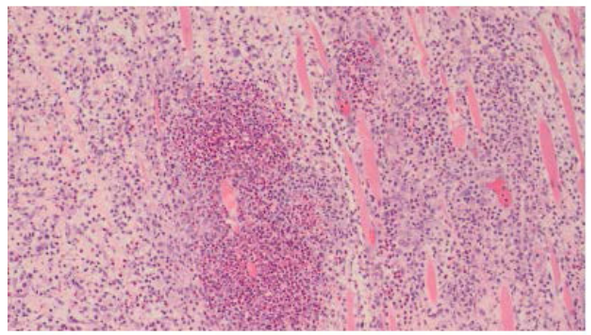
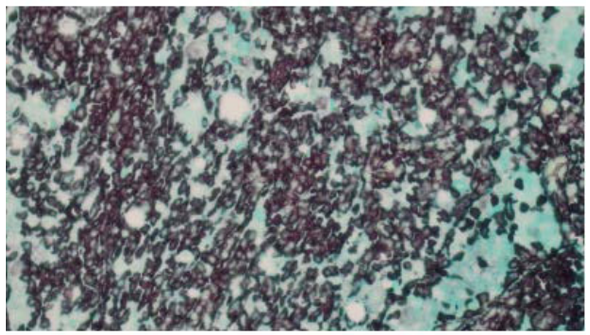


Figure 4



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11 Adjuvant I-125 Plaque Brachytherapy For the Management of Conjunctival Malignancies

Hakan Demirci[1], Almila Sarigul Sezenoz[1], Aslan Aykut[1], James Hayman[2], Choonik Lee[2], Charlie Matrosic[2]
[1]Kellogg Eye Center, University of Michigan, Ann Arbor, Michigan, United States, [2]Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan, United States

Introduction: The management of conjunctival malignancies with scleral invasion or diffuse conjunctival involvement is always challenging. It might require extensive surgical interventions including enucleation or exenteration. Plaque radiotherapy provides localized radiation therapy for conjunctival and scleral surfaces by sparing posterior segment or periocular complications of radiotherapy. In this study, we evaluated the efficacy and safety of conjunctival I-125 plaque brachytherapy for conjunctival malignancies.

Methods: Medical records of 30 cases with conjunctival malignancies treated with plaque therapy following excisional biopsy and cryotherapy at a single institution from October 2011 to February 2024 were retrospectively reviewed. Diagnosis, indication for treatment, follow-up time, local recurrence, metastasis, treatment side effects, and final treatment outcomes were evaluated.

Results: Of 30 cases, 19 cases had conjunctival melanoma, 9 had conjunctival squamous cell carcinoma, and 2 had sebaceous carcinoma. The reason for treatment was positive scleral and diffuse conjunctival margins in 25 cases and local recurrence over the diffuse conjunctival surface in 5 cases following the excisional biopsy and cryotherapy. The median age was 64.5 years(18-92 years). COMS plaque was used in 16 cases, 3-D printed conformer plaque in 14 cases. After a median follow-up of 28 months, local recurrence rates were 21% in conjunctival melanoma, 22% in squamous cell carcinoma, and 50% in sebaceous carcinoma. All local recurrence was within the first post-treatment year in squamous cell carcinoma and the third post-treatment year in conjunctival melanoma. The metastasis rate was 21% in conjunctival melanoma patients, and no metastasis was observed in squamous cell and sebaceous carcinoma. Globe salvage was obtained in 68% of cases. The most common side effect was limbal stem cell deficiency(30%). followed by cataracts(7%), rubeosis iridis(3%), and scleral melting(3%).

Conclusions: I-125 plaque radiotherapy seems to be an effective therapy for diffuse conjunctival involvement or scleral invasion in conjunctival melanoma and squamous cell carcinoma. However, patients should be followed closely for treatment side effects and recurrences.

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12 Assessing the Effect of Insurance Coverage on Healthcare Access for Patients with Periorbital Tumors and Malignancies

Shaili Davuluru, Rasika Sudharshan, Sandy Zhang-Nunes
USC Roski Eye Institute, Los Angeles, California, United States

Introduction: Access to specialists is important for diagnosing eyelid malignancies in a timely fashion. The goal of this study was to identify if there were differences in access to periorbital cancer care amongst various insurance plans, represented by time to receiving diagnosis, appropriate specialty care, and treatment.

Methods: Patients aged 18-75 years old with symptomatic tumors and malignancies of the periorbital and eyelid region were identified after retrospective chart review on all patients with ophthalmology specialty clinic appointments at a safety-net and private hospital over a 6-month period. Exclusion criteria included patients lost to follow-up and/or those who did not receive therapeutic measures for their cancer. Primary and secondary insurance types (e.g. Medi-Cal, Medicare, HMO, PPO, EPO, self-pay, none) were recorded. Time from onset of symptoms to diagnosis (TTD), time from initial visit to seeing an appropriate specialist (TTS), and time from diagnosis to receiving treatment (TTT) were also quantified.

Results: Twenty-eight patients were eligible for analysis (n=28). The mean TTD was 515 ± 728 days, mean TTS was 167.7 ± 226 days, and mean TTT was 210.1 ± 442 days. Patients with Medicare had statistically significant differences in TTD (mean TTD = 157.0 days, p=0.01) and TTS (mean TTS = 28.3 p=0.003) compared to patients without Medicare (mean TTD = 261.3 days, mean TTS = 94.4 days). A statistically significant difference was also identified in TTD (p=0.03) and TTS (p=0.01) between patients with Medicare and Medi-Cal specifically. These differences across insurance plans are depicted in Figure 1. There was a nearly statistically significant difference in mean TTD between patients at safety-net and private hospitals with notable differences in mean TTS and TTT (Figure 2).

Conclusions: Medicare coverage is associated with shorter time to cancer diagnosis and to seeing an oculoplastic surgeon or ocular oncologist, possibly implying higher levels of access compared to other insurance plans. Patients at the safety-net hospital tend to have longer wait times in diagnosis and treatment than at the private hospital. Additional research may reveal modifying factors contributing to these delays in access to care.

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Figure 1

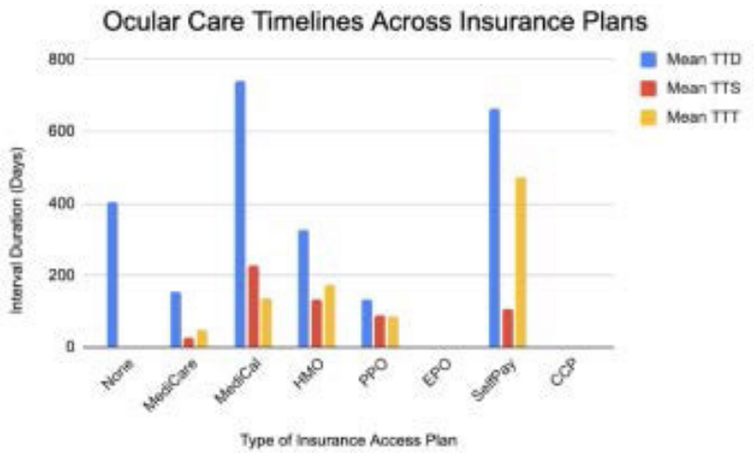

Figure 2

Summary of Diagnostic, Specialist, and Therapeutic Timelines by Hospital Type

	Mean ± SD (days)		
	Composite	Private	Safety Net
Time to Diagnosis	515 ± 728	288 ± 193	720 ± 945
Time to Specialist	167.7 ± 226	114 ± 198	219 ± 263
Time to Treatment	210.1 ± 442	126 ± 200	287 ± 583

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13 Hypochlorous Acid in the Management of Periorbital Necrotizing Fasciitis

Susan Luo, Nina Boal, Salma Dawoud, Sang Hun Hong
Ophthalmology and Visual Sciences, Medical College of Wisconsin, Milwaukee, Wisconsin, United States

Introduction: Periorbital necrotizing fasciitis (NF) is a rare, potentially life-threatening infection.[1,2] Early recognition and diagnosis is critical, as treatment relies on early surgical debridement.

Hypochlorous acid (HOCl) is a non-toxic, naturally occuring, microbicidal compound created within neutrophils as part of the innate immune system's response to infection.[3,4] HOCl has activity against biofilms and is thought to inactivate superantigens and exotoxins released by pathogens in NF.[4-6] Dilute formulations of HOCl have demonstrated unique safety on the periocular skin and corneal surface, exemplified by HOCl ophthalmic sprays used to treat blepharitis.[7-8] These properties make HOCl a safe and effective adjunct in treating periorbital NF, where exotoxins cause extensive tissue destruction often requiring multiple debridements approximating and involving critical ocular and orbital structures. Few case reports describe HOCl use in NF in general.[3,9] The authors present two cases of periorbital NF treated safely and effectively with HOCl (0.024%) with applications in intraoperative and postoperative wound irrigation and care.

Methods: Retrospective case series

Results: Both patients presented with progressive periorbital edema and erythema despite appropriate IV antibiotics. Each patient required two surgical debridements with drain placements. Intraoperative findings and pathology were consistent with NF. Postoperatively, wounds were cleansed with HOCl drain flushes and dressed with soft, non-woven sodium carboxymethylcellulose fibers integrated with ionic silver (Figure 1). Hyperbaric oxygen therapy was initiated. After drain removal, systemic antibiotic therapy was continued and daily dressing changes with HOCl spray were maintained. Patients experienced excellent visual, functional, and cosmetic recovery.

Case 1 (Figures 2-3): 57-year-old female with a history of alcoholic cirrhosis presented with extensive right periorbital edema and counting fingers visual acuity. She improved after initial debridement before developing chemosis and motility restriction on postoperative day 5. MRI showed intra-orbital edema and optic nerve tenting. Repeat debridement revealed extensive necrotic tissue with subcutaneous abscess pockets. Cultures grew *Streptococcus pyogenes*. Wounds were flushed and dressed with HOCl as described above until drain removal on postoperative day 3.

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Case 2 (Figures 4-5): 19-year-old male with a history of preceding upper respiratory tract infection presented with a right upper eyelid abscess tracking into the superotemporal orbit. Imaging showed optic nerve traction. Extensive ischemic superficial fat, muscle, and skin with "dishwater-fluid" drainage was concerning for NF. HOCl was irrigated intraoperatively and flushed postoperatively daily through a drain. Cultures grew *Fusobacterium necrophorum, Peptostreptococcus anaerobius, Cutibacterium acnes*, and an unidentified gram-positive cocci. The patient was discharged on Augmentin and wound care with improvement.

Two weeks later, there was recurrent eyelid swelling and orbital abscess likely due to insufficient length of antibiotic therapy. He required repeat debridement, irrigation, drain placement, and HOCl flushes until drain removal on postoperative day 4. Repeat cultures grew *Staphylococcus epidermidis*. The infection fully resolved on 3 weeks of antibiotics.

Conclusions: Hypochlorous acid 0.024% is a safe and effective adjunct to traditional therapies in the treatment of periorbital NF. Irrigation with HOCl at time of surgical debridement, postoperative HOCl drain flushes, and continued dressing changes with HOCl should be considered.

Figure 1

Wound Care Instructions

1. Cleanse wound with hypochlorous acid 0.024% solution by spraying topically on the wound bed and directly on a gauze dressing that is then placed on top of the wound, allowing the solution to penetrate the wound for approximately 3-5 minutes. Do not rinse.
2. Gently wipe wound bed and surrounding skin with gauze.
3. Apply a barrier film swab to peri-wound skin.
4. Apply soft, non-woven sodium carboxymethylcellulose fibers integrated with ionic silver and lightly pack into the open wound area.
5. Cover with abdominal pad.
6. Secure with soft cloth surgical tape.
7. Assess wound and change dressing daily.

Figure 1. Post-operative wound care instructions.

Figure 2

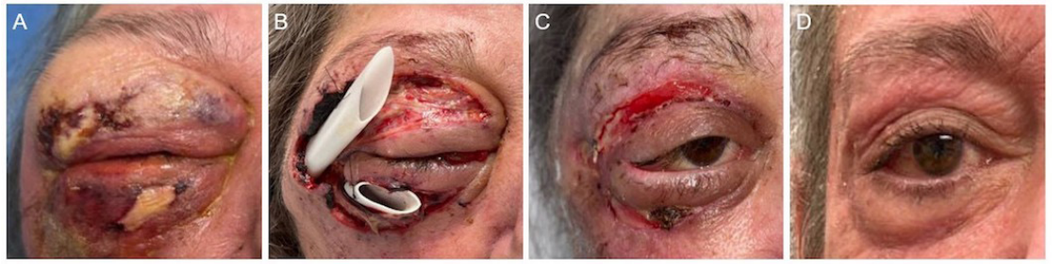

Figure 2. External appearance of case 1 right eye on **(A)** presentation, **(B)** postoperatively with Penrose drains in place, **(C)** day of hospital discharge, and **(D)** outpatient follow-up.

Figure 3

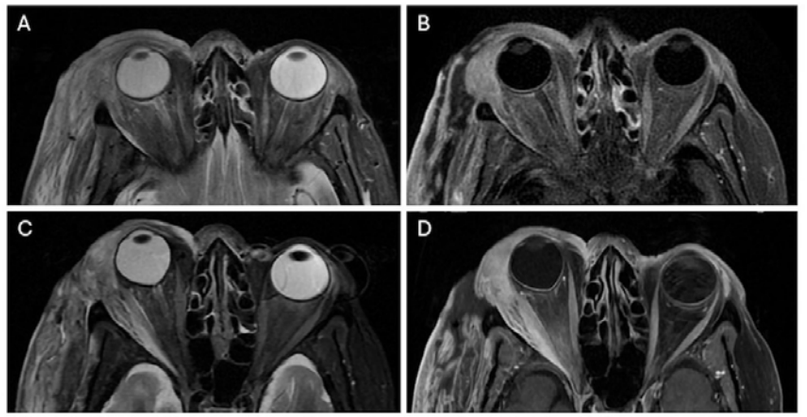

Figure 3. Case 1 MRI findings on initial presentation on **(A)** axial STIR and **(B)** axial T1 post-contrast fat suppressed sequence with enhancement in multiple superficial and deep fascial planes in the right orbital and temporal soft tissue. Repeat MRI four days later showing increased right intra-orbital enhancement and new tenting of the globe on **(C)** axial STIR and **(D)** axial T1 fat suppressed post-contrast images.

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Figure 4

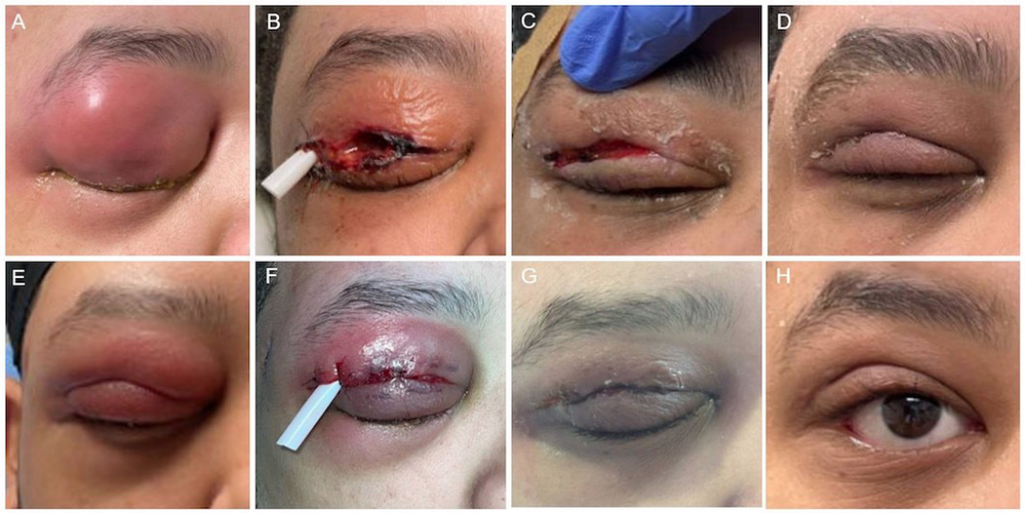

Figure 4. External appearance of case 2 right eye on **(A)** initial presentation, **(B)** postoperatively, **(C)** on day of hospital discharge, **(D)** on outpatient follow-up, **(E)** second hospital presentation, **(F)** postoperatively, **(G)** on day of hospital discharge, and **(E)** on outpatient follow-up.

Figure 5

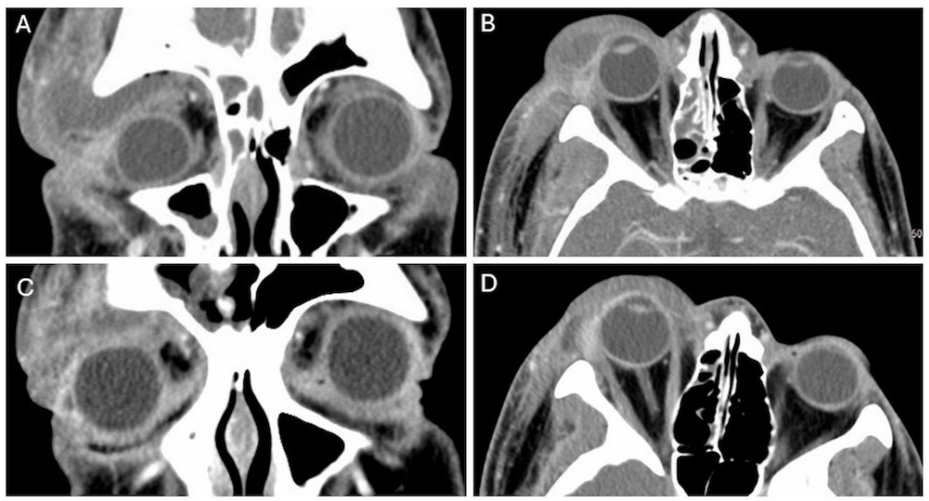

Figure 5. Case 2 CT on presentation in **(A)** coronal and **(B)** axial views showing right pre-septal abscess with extension into the superior orbit and temporalis involving multiple fascial layers. **(C, D)** Recurrence three weeks later showed an increase in size of a rim-enhancing fluid collection along the superior right orbit and flattening of the superior globe on coronal and axial views.

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14 Inflammatory Markers as Predictors of Orbital Infection Severity

Alison Gibbons[1], Elliot Cherkas[2], Mannat Kaur[3], Shazia Dharssi[3], Radwa Elsharawi[2], Davin Ashraf[2], Emily Li[3]
[1]Wilmer Eye Institute, Johns Hopkins University School of Medicine, Baltimore, United States, [2]Ophthalmology, Oregon Health and Science University School of Medicine, Portland, United States, [3]Wilmer Eye Institute, Johns Hopkins University School of Medicine, Baltimore, United States

Introduction: Inflammatory markers correlate with immune response and may differentiate orbital cellulitis (OC) from alternate conditions such as non-infectious orbital inflammation and preseptal cellulitis.[1,2] It is unknown whether inflammatory marker levels predict OC severity, including the extent of infection or the need for surgical intervention. We assessed the utility of inflammatory marker values at presentation in defining severe orbital infection.

Methods: A retrospective chart review was conducted at two tertiary care centers using a medical record search of OC billing codes from 1/1/2000 to 1/1/2023. Manual chart review categorized patients into two cohorts—OC without complication and OC with complication [subperiosteal abscess (SPA), orbital abscess (OA), or cavernous sinus thrombosis (CST)]. Values at presentation of the following markers were recorded: absolute neutrophil count (ANC), white blood cell (WBC), platelet count, C-reactive protein (CRP), and neutrophil-to-lymphocyte ratio (NLR). Logistic regression, controlled for immunosuppression, compared laboratory values at presentation (1) between infection types, (2) by management type (surgical versus non-surgical), and (3) by presenting vision. An α of 0.05 indicated significance.

Results: A total of 784 patients—413 with uncomplicated OC (52.7%) and 371 with complicated OC [273 SPA (34.8%), 85 OA (10.8%), and 13 CST (1.7%)]—met criteria. The sample was majority male (58.3%) and white (65.9%), with a mean age of 31.6 ± 26.4 years. Mean values for inflammatory markers are provided in Table 1. Neutrophil, WBC, and platelet levels were higher in patients with complicated OC ($p < 0.001$, $p < 0.001$, $p = 0.003$, respectively). Presenting levels of ANC, WBC, CRP, and NLR were higher in patients who underwent surgery ($p < 0.001$, $p = 0.027$, $p < 0.001$, $p = 0.003$, respectively). Lower NLR predicted better visual acuity at presentation ($p = 0.035$). Neutrophil, CRP, and NLR levels were positively correlated with length of hospitalization ($p < 0.001$, $p < 0.001$, $p < 0.001$, respectively).

Conclusions: Levels of ANC, NLR, WBC, and platelets at presentation may help define orbital infection severity and aid in management.

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Table 1. Inflammatory marker levels by infection type.

	Total* *N* = 784	OC *N* = 413 (52.7%)	Complicated OC *N* = 371 (47.3%)	*P*-Value
WBC (x10^3/µL)	12.6 ± 5.8	11.6 ± 6.1	13.7 ± 5.3	**<0.001**
CRP (mg/L)	21.1 ± 40.8	18.4 ± 37.9	23.3 ± 43.0	0.339
Neutrophils (x10^3/µL)	9.3 ± 6.8	7.8 ± 4.4	11.0 ± 8.5	**<0.001**
Platelet count (x10^3/µL)	294.4 ± 104.1	275.5 ± 104.1	314.4 ± 100.6	**0.003**
NLR	6.3 ± 7.4	6.1 ± 8.3	6.7 ± 6.2	0.422

*Values represent mean ± SD; SD = standard deviation; IQR = interquartile range; WBC = white blood cell count; CRP = C-reactive protein; NLR = neutrophil to lymphocyte ratio; Normal ranges: WBC (4.5-11.0x10^3/µL), CRP (< 3 mg/Lx10^3/µL), Neutrophils (2.5-6x10^3/µL), Platelet (150-400x10^3/µL), NLR (1-2).

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15 Influence of Insurance Coverage on Access to and Coordination of Healthcare in Thyroid Eye Disease Patients

Shaili Davuluru, Rasika Sudharshan, Sandy Zhang-Nunes
USC Roski Eye Institute, Los Angeles, California, United States

Introduction: The diagnosis and treatment of thyroid eye disease (TED) can vary in timeliness which can significantly impact a patient's vision and quality of life. We sought to determine whether different insurance access plans affect the time to diagnosis, specialists, and various levels of treatments for TED patients.

Methods: Patients over 18 years old with TED were identified at a public, safety-net and private hospitals through chart review of a 3 month period in 2022. Exclusion criteria included those with unclear or incomplete TED diagnostic/therapeutic timelines. Primary and secondary insurance types (e.g., Medi-Cal, Medicare, HMO, PPO, EPO, self-pay, none) were recorded. Time from onset of symptoms to diagnosis (TTD), time from initial visit to appropriate specialist (TTS), time from diagnosis to receiving any initial TED treatment (TTT), and time to receiving teprotumumab treatment specifically (TTP) were also quantified. The TED clinical activity scores (CAS) were documented at diagnosis and most recent ophthalmology visit to represent disease severity.

Results: Twenty patients were available for analysis (n=20) with chart review at both institutions. The mean TTD is 248.5 ± 243 days, mean TTS is 185.5 ± 512 days, mean TTT is 221.2 ± 540 days, and mean TTP is 270.7 ± 186 days. There were notable differences in TTD, TTS, and TTD between the private and safety-net hospital (Figure 1). Patients with Medicare had statistically significant differences in TTP (mean TTP = 51.5 days p=0.003) compared to those without Medicare (mean TTP = 248.7 days). A statistically significant difference in TTP persisted between Medicare and individual insurance types, such as MediCal (mean TTP = 256 days p=0.001) and PPO (mean TTP = 342.3 days p=0.029), and was nearly significant in comparison to HMO (mean TTP = 202.7 days p=0.14) depicted in Figure 2. There were no statistically significant differences in TTD, TTS, and TTT between insurance types.

Conclusions: Medicare coverage is associated with shorter time to receiving teprotumumab treatments for TED than other insurances including Medi-Cal, HMO, and PPO plans. This suggests more efficient access to treatment for Medicare patients especially in the setting of severe disease, given teprotumumab is often reserved for more clinically active TED. While this can be due to insurance authorization barriers alone, further research may elucidate other modifying sociodemographic factors for delays in access to TED treatment and coordination of care between specialists.

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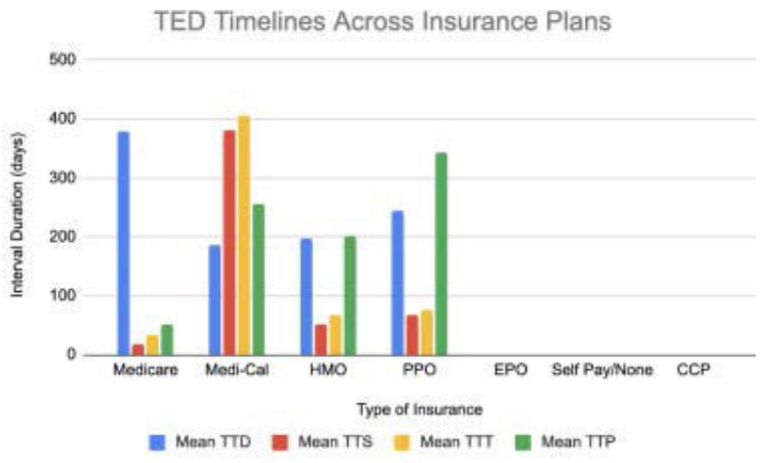
Figure 1

Summary of TED Diagnostic, Specialist, and Treatment Timelines by Hospital

	Mean ± SD (days)		
	Composite	Private	Safety-Net
Time to Diagnosis	248.5 ± 243	259.1 ± 282	190.8 ± 147
Time to Specialist	185.5 ± 512	52.8 ± 104	501.6 ±950
Time to Treatment	221.2 ± 540	53.9 ± 66	525.7 ± 897
Time to Teprotumumab	270.7 ± 186	255.5 ± 210	236 ± 65

Figure 2



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16 Iodine Contrast Should Be Avoided in Patients with or At Risk for Thyroid Eye Disease

Jane Spadaro[1,2], Brittany Simmons[3], Alon Kahana[1,2]

[1]Kahana Oculoplastic and Orbital Surgery, Livonia, Michigan, United States, [2]Ophthalmology, Beaumont Eye Institute, William Beaumont Hospital, Royal Oak, Michigan, United States, [3]Ophthalmology, W. K. Kellogg Eye Center, University of Michigan Medical School, Ann Arbor, Michigan, United States

Introduction: Iodinated contrast media (ICM) is known to trigger thyroid dysfunction and thyrotoxicosis in both euthyroid and susceptible individuals.[1–3] The sequelae for patients with thyroid eye disease (TED) are poorly documented.

Methods: This is a retrospective case series describing the clinical outcomes of patients with thyroid eye disease who have been exposed to iodinated contrast media.

Results: Table 1 (Figure 1) demonstrates the temporal relationship between exposure to iodinated contrast media and exacerbation of thyroid orbitopathy. Figure 2 depicts Case 2 prior to ICM exposure (A) and within 8-12 weeks post exposure (B).

Conclusions: The induction and exacerbation of thyroid orbitopathy following iodinated contrast media (ICM) exposure is frequently overlooked as a sequelae of thyroid dysfunction. The precise mechanism whereby susceptible patients experience an exacerbation of TED following ICM remains unclear at this time. Dysfunction of the sodium-iodine symporter (NIS) and presence of thyroid peroxidase (TPO) autoantibodies have been implicated in iodine-induced thyrotoxicosis.[2,4] Interestingly, both the sodium-iodine symporter (NIS) and TPO are expressed in orbital fibrocytes.[5] Moreover, higher iodine intake and stimulation of thyroid function results in elevated expression of thyroid antigens and increased antibody production.[6–8] There is a growing body of evidence which suggests that higher thyroid antibody titers are associated with more severe and progressive orbitopathy, which supports the clinical findings of TED exacerbation post ICM exposure.[6,9]

For oculoplastic surgeons who take care of patients with thyroid eye disease, knowledge of the Wolff-Chaikoff effect and Jod-Basedow phenomenon following increased iodine intake is imperative. Patients should be cautioned against the elective use of iodinated contrast media and/or the risk of orbitopathy exacerbation following ICM administration. It remains unclear whether the mechanism of this effect is indirect through the thyroid tissue or direct through orbital fibroblasts. Future studies are required to better understand the basic and clinical science of this phenomenon.

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Figure 1

Case series of patients with TED flare-up following ICM administration

Case	Age, Gender	Previous thyroid therapy	Thyroid status, current therapy	Previous TED therapy	Method of ICM exposure	Post-ICM exposure symptoms (within 8-12 weeks)	Change in CAS, Proptosis (mm)	Subsequent TED intervention
1	62 F	RAI, thyroidectomy, repeat RAI	Hypothyroid, levothyroxine	Intraorbital steroids	CT angiography of the head and neck with and without contrast for evaluation of headache	New-onset symptoms of bilateral ocular surface irritation, tearing, and orbital pressure	+2, 0 mm OU	None
2	43 F	None	Hyperthyroid, methimazole	None	CT face with and without contrast for evaluation of the orbits for new onset pain and irritation	Worsening left-sided periorbital edema, erythema, strabismus, proptosis with new-onset relative afferent pupillary defect	+2, +7 mm OS only	Thyroidectomy, followed by orbital decompression§
3	39 F	RAI	Hypothyroid, levothyroxine	None	CT neck with contrast	New onset TED symptoms, with signs of early optic neuropathy	+2, +3 mm OD and +4.5 mm OS†	IV methylprednisolone*,§
4	50 F	None	Hypothyroid, levothyroxine	None	CT angiography	Worsening left-sided restrictive strabismus and proptosis	+2, +3.5 mm OD and +1 mm OS‡	IV methylprednisolone*, followed by teprotumumab, eventual thyroidectomy and orbital decompression thereafter
5	63 M	None	Euthyroid	Oral Prednisone	CT face with contrast for evaluation of the orbit	New onset bilateral restrictive strabismus	+2, +1.5 mm OD and +2.5 mm OS	IV methylprednisolone*,§

TED = Thyroid eye disease
ICM = Iodinated contrast media
CT = Computed tomography
CAS = Clinical Activity Score
*EUGOGO Protocol (European Group On Graves' Orbitopathy)[10]
† Symptom onset at 4 weeks post ICM, with comparison measurements obtained 8 months post exposure
‡ Symptom onset 2 weeks post ICM, proptosis comparison measurements based upon reduction seen at 9 months post medical therapy
§ Active ongoing disease, pending additional intervention

Figure 2

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17 Long-term Outcomes of Steroid-sparing Immunosuppression in Thyroid Eye Disease at a Tertiary Referral Centre in the United Kingdom

Raghavan Sampath
Ophthalmology, University Hospitals of Leicester UK, Leicester, United Kingdom

Introduction: The 2021 European Group on Graves' orbitopathy (EUGOGO) clinical practice guidelines for the medical management of Graves' orbitopathy recommend the use of immunosuppression in moderate-severe thyroid eye disease (TED) based on studies of a maximum of 36 weeks. We present the long-term follow up data on patients who have been treated with azathioprine (AZT) and /or mycophenolate mofetil (MMF) for moderate-severe disease at a tertiary centre in the United Kingdom.

Methods: Retrospective data was collected from case not review of all patients on steroid sparing immunosuppressive therapy for TED. Data collected included patient demographics, clinical activity score (CAS), dosing regime, side-effect profile and concurrent surgery was collected. ANOVA was conducted on CAS using GraphPad Prism and $p<0.01$ was considered statistically significant.

Results: 27 patients underwent such treatment for TED between 2018-2024. 10 were male and 14 female with mean age 62 (range 42-85). 17 patients were on MFF and 10 patients were on AZT. Prior to immunosuppression 15 patients were given IV glucocorticoids and 8 patients were given oral glucocorticoids. 10 patients had orbital decompression- 9 of which were longer term reactivation, 2 patients had squint surgery and 1 patient had orbital radiotherapy. Mean CAS prior to starting immunosuppression was 6, at 3 months 3.95, at 1 year 1.7 and after 2 years 0.67 ($p<0.0001$). All patients are still currently on immunosuppression with the average time span of immunosuppression being 24 months. One patient had neutropenia on MMF 1g BD; it was reduced and they are currently maintained on 750mg BD without any side effects.

Conclusions: We have demonstrated that MMF and AZT have good efficacy for treating moderate-severe TED in the longer term with a significant reduction in CAS. Both medications are well tolerated with a high safety profile.

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18 Nationwide Comparison of Orbital Decompression Patterns in the Era of Teprotumumab

Daniel B. Azzam, Alicia Casella, Yi Ling Dai, M. Reza Vagefi
Ophthalmology, Tufts Medical Center, Boston, Massachusetts, United States

Introduction: Teprotumumab has become widely available for the management of thyroid eye disease (TED) after Food and Drug Administration (FDA) approval in January 2020.[1-3] Prior investigations regarding surgical treatment trends for TED are limited and have assessed historical and institutional inclinations.[4,5] National trends after the introduction of teprotumumab remain unknown. The primary aim of the current study was to examine the impact of the FDA approval of teprotumumab on the nationwide practice patterns in orbital decompression surgery for TED.

Methods: A retrospective review was performed using the Centers for Medicare and Medicaid Services (CMS) national database. External (Current Procedural Terminology (CPT) codes 67414 and 67445) and endoscopic (CPT codes 31292 and 31293) techniques for orbital decompression billed in the United States from 2017-2022 were included. The primary outcome measure was patterns of orbital decompression volume before (2017-2019) and after the FDA approval of teprotumumab (2020-2022). A secondary outcome measure analyzed trends of the specialties performing orbital decompression surgery over this 6-year period. Chi-square tests and T tests were performed to determine statistical significance.

Results: A total of 3,434 orbital decompressions were billed to CMS from 2017 to 2022. Nationwide orbital decompression surgical volume demonstrated a statistically significant decline in the 2020-2022 period after teprotumumab became available ($p = 0.001$) (Figure 1). This shift was largely attributed to a decrease in usage of external orbital decompression CPT codes (decreased by 39.5% from 501/year in 2017-2019 vs 303/year in 2020-2022, $p < 0.001$), while endoscopic orbital decompression CPT codes were relatively less impacted (decreased by 23.2% from 193/year in 2017-2019 vs 148/year in 2020-2022, $p = 0.044$) (Table 1). Regarding the distribution of specialists performing orbital decompression surgery, the post-teprotumumab period exhibited a significant shift away from oculofacial plastic surgeons toward otolaryngologists ($p = 0.007$) (Figure 2). Similarly, the proportion of cases utilizing the endoscopic approach for orbital decompression significantly grew after teprotumumab's release (27.7% in 2017-2019 vs. 32.8% in 2020-2022, $p = 0.016$) (Table 2).

Conclusions: A nationwide evolution in surgical treatment patterns of TED was observed after FDA approval of teprotumumab. This was highlighted by a decrease in the total number of orbital decompression surgeries performed over the study period. Notable trends included a clear shift for surgery to be performed more often by otolaryngologists than oculofacial plastic surgeons with a rise in the frequency of endoscopic over external approaches. The COVID-19 pandemic may have limited access to surgery during the

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study period, and the dataset did not allow differentiation of when endoscopic and external approaches were billed simultaneously. Nonetheless, surgical treatment patterns for orbital rehabilitation of TED should continue to be monitored, especially as new therapeutic options are introduced.

Figure 1

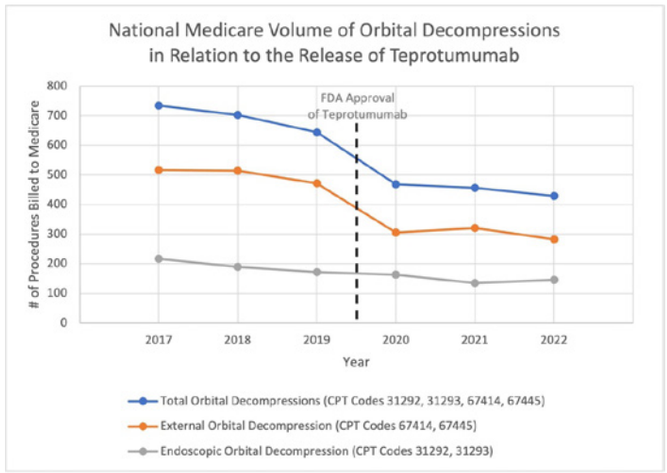

Figure 2

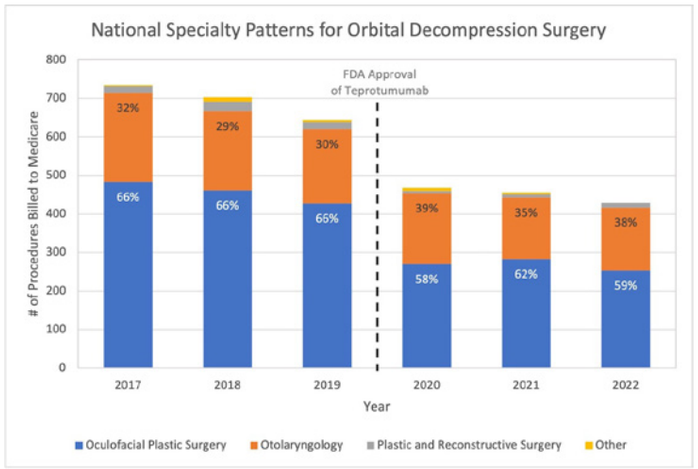

Table 1

Table 1. Nationwide Average Volume of Orbital Decompressions Compared by Approach and Specialty 2017-2022

	Average Volume 2017-2019	Average Volume 2020-2022	Change	P Value
Surgical Approach				
External Orbital Decompressions	501.0	303.0	-39.5%	**<0.001**
Endoscopic Orbital Decompressions	192.7	148.0	-23.2%	**0.044**
Specialty				
Oculofacial Plastic Surgery	457.0	268.7	-41.2%	**0.001**
Otolaryngology	209.7	169.0	-19.4%	**0.040**
Plastic and Reconstructive Surgery	20.7	9.0	-56.5%	**0.014**
Other[a]	6.3	4.3	-31.6%	0.624
Total	693.70	451.0	-35.0%	**0.001**

[a] *Refers to Oral & Maxillary Surgery, Neurosurgery, and General Surgery*

Table 2

Table 2. Nationwide Proportion of Orbital Decompressions Compared by Approach and Specialty 2017-2022

	Proportion 2017-2019	Proportion 2020-2022	Change	P Value
Surgical Approach				
External Orbital Decompressions	72.3%	67.2%	-7.6%	**0.016**
Endoscopic Orbital Decompressions	27.7%	32.8%	15.5%	
Specialty				
Oculofacial Plastic Surgery	65.9%	59.6%	-10.6%	**0.007**
Otolaryngology	30.2%	37.5%	19.4%	
Plastic and Reconstructive Surgery	3.0%	2.0%	-48.0%	
Other[a]	0.9%	0.9%	1.8%	

[a] *Refers to Oral & Maxillary Surgery, Neurosurgery, and General Surgery*

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19 Orbital Causes of Ostiomeatal Complex Occlusion

Marissa K. Shoji[1], Eman Al-Sharif[1,2], Akshara Legala[3], Catherine Y. Liu[1], Bobby S. Korn[1], Don O. Kikkawa[1]
[1]Oculofacial Plastic and Orbital Surgery, Shiley Eye Institute, San Diego, California, United States, [2]Princess Nourah bint Abdulrahman University, Riyadh, [3]Shiley Eye Institute, San Diego, California, United States

Introduction: Occlusion of the ostiomeatal complex may lead to maxillary sinusitis, silent sinus syndrome, and maxillary atelectasis. When infectious, symptomatic cellulitis and abscess formation may ensue. If non-infectious and asymptomatic, globe malposition and orbital floor collapse are the typical sequelae. While this can occur de novo, we have identified several predisposing orbital causes leading to ostiomeatal complex occlusion and asymptomatic maxillary sinusitis.

Methods: A retrospective chart review of cases of asymptomatic maxillary sinusitis at a single institution were reviewed. Cases that had idiopathic maxillary sinus occlusion (SSS) were excluded. Cases that had an identifiable orbital cause were included.

Results: Eight cases were identified with mechanical causes arising from the orbit (Table 1, Figure 1-3). Five cases had malpositioned orbital floor implants, and two cases had prior orbital decompression from thyroid eye disease (TED). One case had distensible venous malformation (highlighted here), which has not previously been reported in the literature as associated with ostiomeatal occlusion.

A 47-year-old woman presented with right enophthalmos progressively worsening over 30 years. While initially asymptomatic, she subsequently noted worsening 2 years prior to her presentation. She denied prior trauma, orbital or sinus surgery, sinus symptoms, or nasal obstruction. Her past medical and ocular history was otherwise unremarkable. Her exam was notable for a distensible blue-hued mass along her right lower eyelid that significantly expanded with Valsalva. She was also noted to have right enophthalmos. Neuroimaging demonstrated right enophthalmos with inferior bowing of the inferior and medial orbital walls, occlusion of the right ostiomeatal complex, and opacification of the maxillary sinus as well as an ill-defined enhancing soft tissue along the inferior and medial aspect of the right orbit with round calcification concerning for a distensible venous malformation (Figure 3). Given the location of the lesion, she underwent combination surgery with endoscopic sinus surgery with right maxillary antrostomy as well as direct bleomycin injection into the varix. At her postoperative week six visit, she noted significant improvement in her orbital symptoms, including marked reduction with Valsalva.

Conclusions: Occlusion of the ostiomeatal complex can lead to maxillary sinusitis and may be subclinical in nature. Orbital pathology may also cause mechanical ostiomeatal occlusion leading to subclinical maxillary sinusitis and represents a different mechanism from the idiopathic variety of SSS. We identified three additional causes: malpositioned orbital implants, post-orbital decompression for

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TED, and orbital varix. Oculoplastic surgeons should be aware of these associations and have a high index of suspicion when subacute maxillary sinusitis is seen in conjunction with orbital pathology.

Table 1. Characteristics of Patients with Orbital Causes of Ostiomeatal Occlusion

Patient ID	Age/ Gender	Cause of Occlusion	Relevant medical history	Affected Side	Presenting Symptoms	Enophthalmos (yes/no)	Hypoglobus (yes/no)	Diplopia (yes/no)	Relevant imaging findings	Management	Further procedures needed	Follow-up duration (months)	Outcome
1	33F	Orbital implant	Car accident 16 years prior with L orbital fracture s/p fracture repair	L	Diplopia	Yes	No	Yes	Surgical fixation of left zygoma and inferior orbital rim, with left orbital floor mesh that extends into superior aspect of left maxillary sinus in region of ostiomeatal unit, complete opacification of left maxillary sinus, left enophthalmos	Combined orbitotomy with implant removal (5 porous polyethylene and 1 titanium mesh) and endoscopic maxillary sinus drainage	Recommended but patient LTFU	1	Improvement but continued enophthalmos
2	31M	Orbital implant	Assault 7 years prior with L orbital floor and zygomaticomaxillary complex fracture s/p repair	r	Epiphora, sinking of eye	Yes	No	No	Left orbital floor mesh and fixation of inferior orbital rim with complete opacification of the left maxillary sinus, inward bowing, and obstruction of the ostiomeatal unit	Combined orbitotomy with implant removal, endoscopic dacryocystorhinostomy, endoscopic maxillary antrostomy	Placement of custom patient specific implant 9 months after previous implant removal	11	Resolution of enophthalmos
3	35F	Orbital implant	History of craniosynostosis with multiple prior facial surgeries by different providers	L	Facial swelling	No	Yes	No	Multiple implants including fixation of zygomatic arches and maxillary sinuses and maxilla, near complete opacification of left maxillary sinus with opacification of the left ostiomeatal unit, left inferior orbital wall and medial wall mesh	Combined orbitotomy with implant removal, endoscopic dacryocystorhinostomy, endoscopic maxillary mega-antrostomy, total ethmoidectomy, sphenoidotomy, turbinate resection, inferior turbinate submucous reduction	Removal of additional implant, placement of custom patient specific implant, lower eyelid retraction repair	18	Improvement in sinus symptoms and globe position
4	67M	Orbital implant	Left orbital fracture 18 years prior with 2 surgeries elsewhere	L	Sinus discharge and drainage from lower eyelid, diplopia	No	No	Yes	Left orbital floor implant with opacification of the maxillary sinus	Plan for orbitotomy with implant removal and endoscopic maxillary sinus drainage	NA	NA	NA
5	49F	Orbital implant	Left trauma with surgeries including enucleation s/p implant exchange	L	Left orbital pain, enophthalmos	Yes	Yes	No	Small and deformed left maxillary sinus, mesh repair of left orbital floor	Lost to follow-up	NA	3	NA
6	65F	Mucocele after decompression surgery	Thyroid eye disease s/p bilateral 3 wall decompression 14 years prior	L	Retrobulbar pressure, proptosis	No	No	No	Findings suggestive of proteinaceous mucocele extending into left ostiomeatal unit with mass effect of left middle turbinate, post-operative changes after bilateral orbital decompression	Endoscopic maxillary antrostomy, total ethmoidectomy, sphenoidotomy, septoplasty, inferior turbinate submucous resection	None	20	Improved symptoms
7	67M	Postoperative occlusion of ostiomeatal complex	Thyroid eye disease s/p bilateral 3 wall decompression 3 years prior	R	Retrobulbar pressure	No	No	No	Narrowing and occlusion of bilateral ostiomeatal units, post-surgical changes after bilateral orbital decompression, moderate mucosal thickening in left frontal sinus and bilateral maxillary sinuses	Observation	None	8	Stability
8	47F	Orbital varix	None	R	Enophthalmos	Yes	Yes	No	Inferior bowing of inferior and medial orbital wall, opacification of right maxillary sinus, enhancing soft tissue along inferior and medial right orbit with round calcification	Bleomycin injection into varix, endoscopic maxillary antrostomy	Plan for secondary implant placement	9	Improved lesion, continued enophthalmos

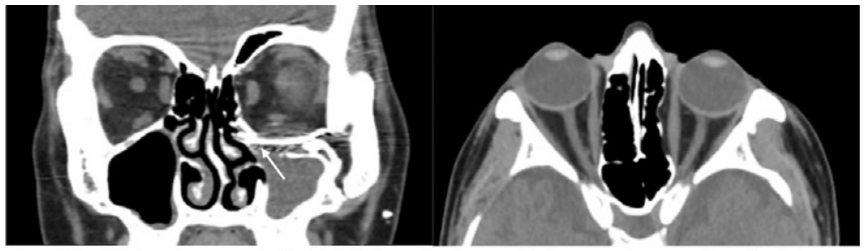

Figure 1. Case 1. This patient presented with diplopia in the setting of remote orbital trauma and surgery and was found to have enophthalmos. Imaging demonstrated occlusion of the left ostiomeatal complex by a left inferior orbital implant (white arrow) with bowing of the maxillary sinus walls and maxillary sinus opacification.

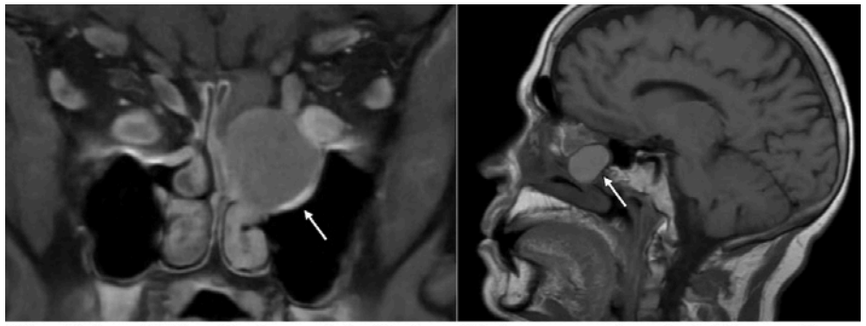

Figure 2. Case 6. This patient presented with retro-orbital pressure and proptosis 14 years after bilateral 3-wall decompression and was found to have a mucocele (white arrow) occluding the ostiomeatal complex.

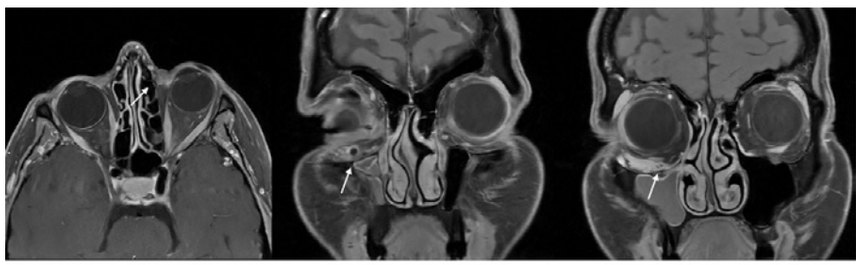

Figure 3. Case 8. This patient presented with progressive right enophthalmos and was found to have a right inferior orbital lesion with calcification consistent with varix (white arrows) with occlusion of the right ostiomeatal complex, maxillary sinus and orbital floor bowing, and opacification of the maxillary sinus.

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20 Orbital Decompressions for Thyroid Eye Disease Pre- and Post-Approval of Teprotumumab, 2016-2023

Evan Meyer[1], Alisha Kamboj[1], Ali Mokhtarzadeh[2], Ryan Larochelle[3], Mark Lucarelli[3], Andrew Harrison[1,4]
[1]Department of Ophthalmology and Visual Neurosciences, University of Minnesota, Minneapolis, Minnesota, United States, [2]University of Minnesota, Department of Ophthalmology and Visual Neurosciences, Minneapolis, Minnesota, United States, [3]Department of Ophthalmology & Visual Sciences, University of Wisconsin-Madison, Madison, Wisconsin, United States, [4]Department of Otolaryngology and Head and Neck Surgery, University of Minnesota, Minneapolis, Minnesota, United States

Introduction: A retrospective analysis was conducted to evaluate the number and type of orbital decompressions performed for thyroid eye disease (TED) in the period immediately preceding and following FDA approval of teprotumumab for management of adults with TED, to determine whether the availability of teprotumumab correlates with a change in orbital decompressions.

Methods: A retrospective chart review was conducted at two tertiary academic centers, analyzing all orbital decompressions for TED performed by three ASOPRS oculoplastic surgeons from January 1, 2016 through December 31, 2023. The data were stratified into two categories: “Pre-approval” was defined as the time period from January 1, 2016 through January 20, 2020, while “Post-approval” included cases from January 21, 2020 through December 31, 2023. These dates were chosen as teprotumumab received FDA approval for the treatment of adults with TED on January 21, 2020.

Results: Overall, 346 orbits of 198 patients underwent orbital decompression for TED by three ASOPRS oculoplastic surgeons at two tertiary academic centers between January 1, 2016 and December 31, 2023. Patient demographic data were similar between the Pre- and Post-approval groups, including mean age and gender distribution (51.1 vs 51.8 years, p=0.75; 68.8% vs 74.0% female, p=0.54). Both groups were similar in regard to patients’ thyroid diagnosis and prior thyroid treatment (p=0.33, p=1.0), as well as prior TED management, including history of treatment with steroids, orbital radiation, or prior orbital decompression (p=1.0, p=0.79, p=0.35). The percentage of patients treated previously with teprotumumab was different between the groups (0%, 19.1%). Indication for decompression was similar (p=0.68). Mean preoperative Hertel measurements trended higher in the Pre- vs Post-approval group (24.8 mm, 24.0 mm, p=0.057). In summary, Pre-approval, 218 orbits and 365 orbital walls underwent decompression (mean=1.67 walls per decompression); Post-approval, 128 orbits and 179 orbital walls underwent decompression (mean=1.40 walls per decompression). From the Pre- to Post-approval periods, the total number of orbits decompressed, orbital walls decompressed, and mean number of walls per decompression decreased by 41.3%, 51.0%, and 16.5% (p=0.036), respectively.

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Conclusions: There was a striking decrease in the number and extent of orbital decompressions when comparing the four years pre- and post-January 21, 2020. Patient demographics, thyroid diagnosis and treatment history, TED management history, preoperative exophthalmometry measurements, and indications for decompression were similar between the two groups, with the only identifiable difference being the time period and availability of teprotumumab. A limitation to this study is the concurrent COVID-19 pandemic. However, the findings are strengthened by the demonstration of similar disease severity (proptosis) and urgency of decompression (indication for surgery), and that the number of decompressions performed per year has not rebounded over time since 2020. Overall, these results suggest a strong association between approval of teprotumumab for the treatment of adults with TED and a decrease in the need for orbital decompression.

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21 Orbital Incidentalomas: Clinicoradiological Characteristics and Management Considerations

Ho-Seok Sa
Ophthalmology, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, Republic of

Introduction: Orbital incidentalomas refer to the incidental discovery of orbital masses during imaging studies performed for reasons unrelated to orbital pathology. This study aims to investigate the clinical characteristics, diagnostic approach, and management considerations of orbital incidentalomas.

Methods: A retrospective analysis was conducted on patients referred with orbital incidentalomas from March 2015 to July 2023. Reasons for imaging studies, presenting symptoms, ophthalmic examination findings, radiological characteristics of orbital masses, treatment modalities, and outcomes were evaluated.

Results: Among 43 patients, 20 (46.5%) were male, with a mean age at diagnosis of 57.1 years and a mean follow-up duration of 2.77 years. The most common reason for imaging studies was health check-ups (21 patients, 48.8%), followed by headaches (12 patients, 27.9%), dizziness (6 patients, 14.0%), facial trauma (3 patients, 7.0%), and generalized weakness (1 patient, 2.3%). Ophthalmic examination findings revealed proptosis (≥2mm) (18 patients, 41.8%), peripheral diplopia (9 patients, 21.4%), hypoglobus (≥2mm) (4 patients, 9.3%), palpable masses (2 patients, 4.8%), visual field defects (2 patients, 4.8%), eyelid swelling (1 patient, 2.4%), and optic nerve swelling (1 patient, 2.4%), with no observed visual acuity deficits. The mean longest dimension of masses on imaging was 16.27 ± 1.20 mm, with 5 patients (11.6%) having anterior orbital masses and 38 patients (88.4%) having posterior orbital masses. Differential diagnoses based on imaging included cavernous venous malformation (24 patients, 57.2%) and schwannoma (12 patients, 28.6%) as the most common, followed by dermoid cyst (2 patients, 4.8%), lymphangioma, fibrous dysplasia, optic nerve glioma, and meningioma (each 1 patient, 2.4%). Surgical excision was performed in 14 patients (32.6%) without complications, primarily for prominent proptosis (5 patients, 11.6%), patient preference (5 patients, 11.6%), suspected metastasis (2 patients, 4.8%), hypoglobus (2 patients, 4.8%), peripheral diplopia, palpable masses, and pressure sensation (each 1 patient, 2.3%). The remaining 29 patients underwent imaging surveillance for a mean duration of 2.78 ± 1.70 years, with size increase observed in 2 patients and decrease in 2 patients, without functional impairment.

Conclusions: Orbital incidentalomas are frequently discovered during health check-ups or neurological imaging studies, often accompanied by asymptomatic proptosis or peripheral diplopia. Common differential diagnoses include benign masses such as cavernous venous malformation and schwannoma. Surgical removal is safely performed for masses located in the anterior orbit with accompanying ophthalmic signs, while observation is preferred for asymptomatic posterior orbital masses.

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22 Orbital Perivascular Epithelioid Cell Neoplasm (PEComa): A Case Report and Systematic Review

Jane Spadaro[1], Christopher Hysell[2], Robert Folberg[2], Alon Kahana[3,4]

[1]Kahana Oculoplastic and Orbital Surgery, Livonia, Michigan, United States, [2]Clinical and Laboratory Pathology, Corewell Health William Beaumont University Hospital, Royal Oak, Michigan, United States, [3]Kahana Oculoplastic and Orbital Surgery, Livonia, Michigan, United States, [4]Ophthalmology, Oakland University William Beaumont School of Medicine, Royal Oak, Michigan, United States

Introduction: To describe the clinical course of a patient with orbital perivascular epithelioid cell neoplasm (PECOma) and to summarize the clinical findings, immunohistochemical results, and outcomes of ocular and orbital PECOMas in the literature.

Methods: A case report and systematic literature review. The PubMed database was searched for all cases of PEComas involving the orbit, globe, and ocular adnexa.

Results: A 33-year-old male presented with progressively worsening right periorbital pain in the setting of an enlarging inferomedial orbital lesion. External examination revealed 2 mm of relative right hyperglobus, with normal visual acuity, intraocular pressures, and full extraocular motility. Examination of the lower eyelid revealed a large, inferomedial soft mass with surrounding feeder vessels (Figure 1A & 1B). Magnetic resonance imaging (MRI) of the orbits demonstrated a round, multilobulated 2.1 x 1.6 x 1.8 cm lesion in the right inferomedial orbit, exhibiting mass effect and flattening of the globe, without any involvement of the extraocular muscles, fluid-fluid levels, or boney erosion (Figure 1C). Pathology following excisional biopsy revealed a tumor with a well-defined border without an infiltrative growth (Figure 1D). Histopathology demonstrated nests of epithelioid cells with clear to lightly eosinophilic cytoplasm (Figure 2A); there was no necrosis, mitotic figures, or vascular invasion. Immunohistochemical staining was positive for MART-1 melanocytic marker and TFE3 nuclear transcription factor (Figure 2B). Next generation sequencing (NGS) of sarcomere protein genes identified the fusion of the TFE3-NONO transcript, confirming the diagnosis of the melanotic perivascular epithelioid cell tumor (PEComa). At the last follow-up at 8 months, no disease recurrence was seen.

A review of the literature revealed 21 cases of orbital and intraocular PEComa (Figure 3).[1–16] Of the 19 primary lesions, 12 lesions were localized to the orbit, with 1 involving the lacrimal gland. Five lesions were intraocular, 1 involved the medial canthus, and 1 involved the inferior fornix. The average age of diagnosis was 25.5 years (range 4-71 years). The average time to diagnosis was 16 months (range 1-48 months). All but 1 patient underwent complete surgical excision (94.7%). Three patients received chemotherapy (15.7%; 2 with systemic[6,15] and 1 with topical[13]) and 1 received adjuvant radiation therapy (5.2%)[14]. At the time of final clinical follow-up, no patients had recurrence or progression of disease at mean follow-up of 29 months (range 3-120 months). Review of the immunohistochemical findings (Figure 4)

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revealed HMB-45 to be positive in about 89.5% of cases, followed by SMA (72.2%), and melan-A/MART-1 (47.1%), similar to what has been described in the literature.[17] Transcription factor E3 (TFE3) was present in 12 cases (100%). In the 5 cases, including our case, where NGS was performed, rearrangement of TFE3-NONO was the most common translocation (60%).[10,11,13]

Conclusions: PEComas of the orbit are rare, and histopathologic analysis is critical in confirming the diagnosis. While the majority of PEComas demonstrate benign features with good prognosis after surgical excision, long-term outcomes remain unclear.

Figure 1

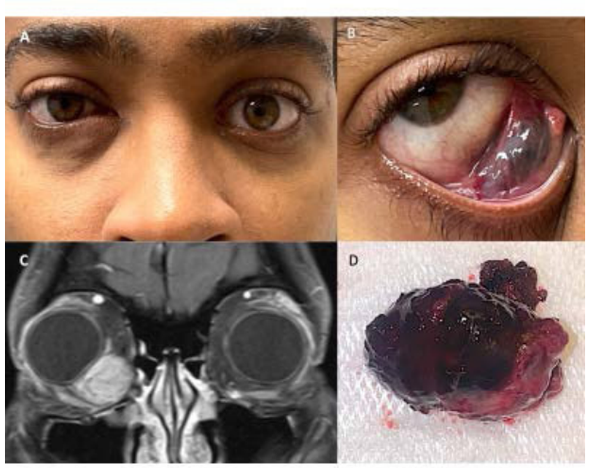

Figure 2

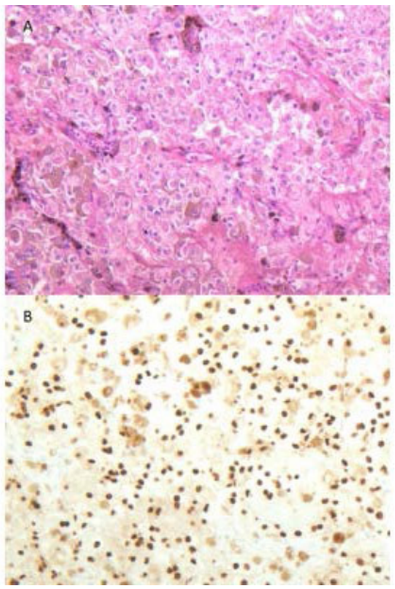

Figure 3

Clinicopathology Features and Outcomes

Case no.	Age/ Sex	Presenting Symptoms	Symptom Duration (mo)	Location	Size (cm)	Mitotic / Proliferation Index	Treatment	Outcome
1 (Iyengar et al. 2005)	9/F	Periorbital swelling	2	Inferomedial orbit	1.2 x 1 x 0.8	MIB <10% positive	Complete excision	NED at 7 months
2 (Guthoff et al. 2008)	54/M	Periorbital swelling	> 1	Inferotemporal orbit	1.5 x 1.0 x 1.0	Ki67 < 1%	Complete excision	NED at 17 months
3 (Furusato et al. 2009)	26/F	Periorbital swelling	4	Superotemporal orbit	2.0 x 1.7 x 1.4	Rare mitoses	Complete excision	NED at 24 months
4 (Furusato et al. 2009)	7/M	None described	NA	Inferior ciliary body with subretinal and scleral extension	1.33 x 0.99	NA	Excision	NED at 24 months
5 (Goto et al. 2015)	13/F	Vision loss	NA	Ciliary body	1.0 x 1.1 x 1.1	None	Complete excision	NED at 48 months
6 (Lubo et al. 2015)	48/M	EOM restriction	4	Inferomedial orbit	1.5 x 2.0	2 mitoses/ 50 HPF	Complete excision	NED at 36 months
7 (Alam et al. 2017)	6/M	Periorbital swelling, Proptosis, EOM restriction, Optic disc swelling	6	Medial orbit	NA	Nuclear atypia and mitosis present	Chemotherapy, followed by attempted complete excision	NED at 24 months
8 (Paliogiannis et al. 2017)	46/M	Painful lesion	NA	Medial orbit	1.5	2 mitoses/ 10 HPF	Complete excision	NED at 50 months
9 (Varan et al. 2017)	7/M	Periorbital swelling	3	Medial orbit	3.4 x 2.3 x 2	None	Systemic chemotherapy	NED at 6 months
10 (Nair et al. 2018)	9/F	Vision loss, periorbital swelling, proptosis, exposure keratopathy, EOM restriction	12	Superior orbit	5.2 x 3.5 x 2.8	Ki67 <5-7%	Complete excision	NED at 6 months
11 (Bi et al. 2021)	30/M	Vision loss, photophobia, tearing	48	Choroid	1.5 x 1.5 x 1.2	Ki67 3%	Enucleation	NED at 96 months
12 (Bi et al. 2021)	27/M	Vision loss	24	Choroid	1.0 x 0.6 x 0.4	KI67 2-5%	Enucleation	NED at 24 months
13 (Feu et al. 2021)	28/M	Lower lid lesion	NA	Inferior orbit	1.6 x 0.9	<1 mitosis per 10 HPF	Complete excision	NED at 12 months
14 (Gao et al. 2021)	17/F	Ocular redness, vision loss	36	Choroid	1.1 x 0.5	3 mitoses per 10 HPF	Enucleation	NED at 24 months
15 (Gao et al. 2021)	20/M	Foreign body sensation	NA	Medial canthus	1	NA	Complete excision	NED at 120 months
16 (Lin et al. 2023)	4/M	Vision loss, periorbital edema, EOM restriction, optic disc swelling	1	Inferior orbit	1.5 x 1.0 x 0.5	KI67 10%	Excision followed by local radiation (70 Gy)	NED at 4 months
17 (Park et al. 2023)	71/M	Recurrent subconjunctival hemorrhage	12	Inferior fornix	0.5 x 0.5	None	Excision of lesion x2 with margins, topical Mitomycin C	NED at 9 months
18 (Xu et al. 2023)	33/F	Proptosis, Periorbital swelling, ptosis, EOM restriction	48	Lacrimal Gland	3.5 x 3.0 x 2.0	2 mitoses/ HPF; Ki67 3%	Complete excision	NED at 6 months
19 (Our case)	21/M	Proptosis, pain	9	Inferomedial orbit	2.3 x 1.8 x 1.5	None	Complete excision	NED at 8 months

NA, not available
EOM, extraocular motility
NED, no evidence of disease

Figure 4

Immunohistochemical Results

Stain	Total (%)
HMB-45	17/19 (89.5%)
Melan-A/MART-1	8/17 (47.1%)
MiTF	1/7 (14.3%)
SMA	13/18 (72.2%)
Desmin	4/16 (25%)
Vimentin	4/9 (44.4%)
S100	1/18 (5.6%)
TFE3	12/12 (100%)
NONO-TFE3	3
RBM10-TFE3	1
PRCC-TFE3	1

HMB-45, human melanoma black
MART-1, melanoma-associated antigen recognized by T cells
MiTF, melanocyte inducing transcription factor
SMA, smooth muscle actin
TFE3, transcription factor 3

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23 Periostin, a Central Inflammatory Biomarker, is Expressed in Orbit-Involving IgG4 Disease

Catherine Y. Liu[1], Connor Zuraski[2], Alexander C. Lieu[1], Nicole Topilow[3], Eman Al-Sharif[1], Marissa Shoji[1], Don Pizzo[2], Cole Ferguson[2], Bobby S. Korn[4], Don O. Kikkawa[1], Jin Sook Yoon[5], Jin Sook Yoon[5]

[1]Ophthalmology, UC San Diego, La Jolla, California, United States, [2]Pathology, UC San Diego, La Jolla, California, United States, [3]Long Island, New York, United States, [4]Ophthalmology, UC Sandiego, La Jolla, California, United States, [5]Ophthalmology, Yonsei University, Seoul, Korea, Democratic People's Republic of

Introduction: Orbit-involving IgG4 disease can cause significant ocular burden and can be a harbinger of systemic involvement[1]. The underlying cause of disease is unknown, nor is there targeted therapy for treatment. Current immunosuppressive treatment tends to require a prolonged course, and the relapsing-remitting nature of the disease can put patients at significant risk of unwanted side effects from immunosuppression[2]. Periostin is a secreted extracellular matrix protein that is central to the pathogenesis of inflammatory conditions, including of the lung and kidney, as well as in cancer metastasis[3]. Evaluation of periostin and associated pathways in IgG4 disease is a step towards a better understanding of the condition. It could lead to improvements in diagnosis and may highlight potential novel therapeutic targets for treatment.

Methods: This is a multi-institutional study whereby orbital biopsy specimens taken from patients diagnosed with IgG4 disease were evaluated for expression of periostin. Patient demographics, age, gender, clinical disease location, and clinical severity were recorded. In all cases, routine histologic sections were examined. All samples were evaluated for periostin expression and localization in orbital tissue by immunohistochemistry with a specific anti-periostin antibody. Non-pathologic, fibrocollagenous tissue as well as non-diseased lacrimal gland tissue were used as controls.

Results: A total of 12 IgG4 disease patients with orbital manifestations (2 mild, 8 moderate, 2 severe) were included. Anatomically, 8 (67%) showed involvement of the lacrimal glands, and 4 (33%) showed multifocal disease beyond the orbit. Eleven (91.7%) IgG4-RD patients received oral steroids, 1 (8.3%) received intravenous steroids, and 2 (16.7%) received radiation therapy. The number of resolved, stable, and recurrent disease were 1 (8.3%), 10 (83.3%), and 1 (8.3%), respectively. Periostin showed strong and diffuse expression restricted to zones of pathologic fibrosis in the IgG4 samples. Meanwhile, periostin staining spared inflammatory and epithelial elements (e.g. lacrimal gland epithelium) in the same samples. Control fibrocollagenous tissue and normal lacrimal gland tissue showed minimal periostin expression.

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Conclusions: Periostin is a reliable biomarker in orbit-involving IgG4 disease, detected in pathologic fibrosis involving a variety of orbital presentations, as well as variable levels of clinical severity and chronicity of presentation. Its low level of expression in normal lacrimal gland and non-pathologic fibrocollagenous tissue suggests that periostin may play a role specifically in the pathogenic process of IgG4 disease. Future studies will help clarify its potential use as a prognostic indicator or as a therapeutic target.

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24 Recurrence of Proptosis in Thyroid Eye Disease after Teprotumumab

S. Elizabeth Dugan[1], William Tirone[2], Christopher Compton[1], Mohsen B. Kashkouli[1], Jeremy Clark[1]
[1]Department of Ophthalmology and Visual Sciences, University of Louisville School of Medicine, Louisville, Kentucky, United States,
[2]Department of Statistical Sciences, Duke University, Durham, North Carolina, United States

Introduction: The aim of this study is to identify a rate for proptosis recurrence in thyroid eye disease after treatment with teprotumumab and analyze the factors that may correspond with recurrence.

Methods: We conducted a retrospective study based on chart review. All patients who completed teprotumumab from 2020-2023 at our academic institution were included. Exclusion criteria were non-thyroid causes of proptosis, age under 18 years, and failure to complete all 8 infusions in the treatment series. The primary endpoint is recurrence of proptosis in either eye, defined as at least 2 millimeters from post-treatment baseline as measured by Hertel exophthalmometer. Secondary endpoints are as follows: sex, age, race, duration of thyroid disease, smoking history (current, former, or non-smoker), history of radioactive iodine, history of thyroidectomy, free triiodothyronine (fT3) levels, free thyroxine (fT4) levels, thyroid stimulating hormone (TSH) levels, TSH receptor antibody (TRAb) levels, thyroid stimulating immunoglobulin (TSI) levels, thyroid peroxidase (TPO) levels, thyroglobulin antibodies, and Clinical Activity Score (CAS). The data were analyzed via univariate and multivariate logistic regression.

Results: From 2020-2023, 79 patients completed the full series of teprotumumab infusions at our institution. Female patients were 80% of the group, and 82.5% were Caucasian. The median duration of thyroid disease was 6 years. Smoking history was present in 38.8% of patients. The median initial follow-up period after teprotumumab completion was 2 months (0-12 months), and median total follow up was 17 months (1-44 months). Before teprotumumab initiation, there were 12.7% patients with mild, 68.3% with moderate-severe, and 19.0% with sight-threatening EUGOGO severity. After completion of treatment, 79.7% (63/79) had proptosis reduction of at least 2 millimeters. The median of proptosis improvement was 2 millimeters (0-9 mm) (Fig 1). Out 63 patients, 27 (27/63, 42.9%) had recurrence of proptosis after completion of teprotumumab, and the median time for recurrence was 13 months (2-22 months). Out of all the patients who had recurrence, 29.6% (8/27) recurred with worse Hertel measurements, and 14.3% (4/27) recurred to their baseline level of proptosis. The rest of the patients with recurrence (55.6%, 15/27) remained partially improved. CAS changed from 4.6 (2-8) to 1.5 (0-4) after completing the treatment. The only factors indicative of potential recurrence are age (odds ratio 1.041, p=0.09) and EUGOGO sight-threatening disease (odds ratio 1.31, p=0.5) compared to mild. For all other factors measured, the 95% frequentist confidence intervals included zero, indicating predictive power is minimal.

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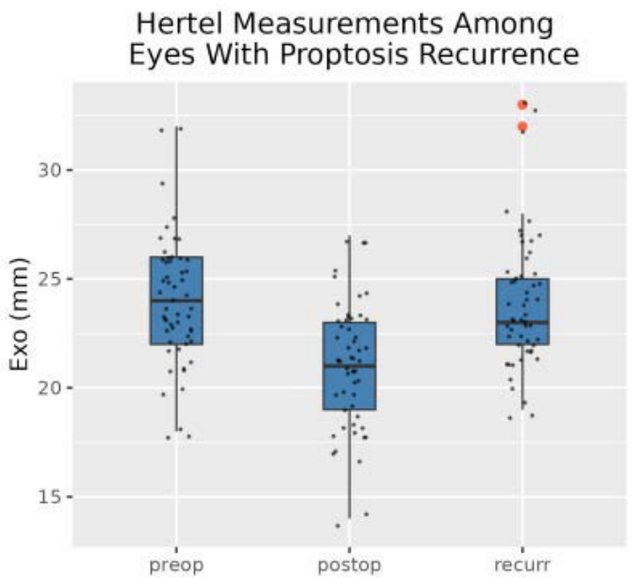
Conclusions: One-third of patients in our study demonstrated varying degrees of proptosis recurrence at a median of 13 months after completion of teprotumumab treatment. Over half of patients with recurrence still had partial improvement from their baseline Hertel measurements. While our study was underpowered to identify a correlation between proptosis recurrence and demographic information, history, and lab markers, our study indicates that age and EUGOGO sight-threatening disease may increase the likelihood of proptosis recurrence. Our study is also limited by lab requisition among referring endocrinologists and primary care providers, especially regarding inconsistencies among ordering TPO, TSI, TRAb, and thyroglobulin antibody.

Figure 1



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25 Solitary Orbital Myofibroma in a Pre-Adolescent Child

Bryce DeChamplain, Daniel Rubinstein
Ophthalmology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, United States

Introduction: We present a case describing the diagnosis and management of a rare orbital tumor and review previous reports of similar cases.

Methods: A single case is described, and the literature was reviewed to discuss orbital myofibromas. Express permission was obtained from the patient and his parents to display all clinical photographs.

Results: A 9-year-old male presented for rapidly evolving swelling of his right periorbital region. A firm, fixed mass was noted. CT of the orbits revealed a 2.7x1.6x1.8 cm mass of the lateral orbital rim with underlying bone erosion. The patient was admitted by the pediatrics service, and ophthalmologic exam demonstrated an inferolateral anterior orbital mass without significant proptosis (Figure 1A, 1B). MRI revealed a 1.9x2.2x2.7 cm rim enhancing mass with preseptal and postseptal extension and erosive osseous changes (Figure 2). Core needle biopsy revealed a low-grade spindle cell neoplasm but was not otherwise diagnostic. Excisional biopsy was undertaken. A swinging eyelid approach was taken to the orbital floor and lateral orbital rim. A firm, well delineated subperisoteal mass was noted extending into the orbit and along the anterior surface of the maxilla (Figure 3, Figure 4). The mass was excised, however erosion of the bone was noted at the lateral orbital rim. This was conservatively debrided with a burr to avoid a significant post operative deformity given the uncertain diagnosis. Histopathology and cytogenetic studies disclosed a myofibroma with a positive margin at the adhesion to the orbital rim. Despite this, the lesion has not recurred in several months of follow up.

Conclusions: Myofibromas are rare benign soft tissue tumors, usually seen in the head and neck in young children. They often present as a solitary enlarging unilateral orbital mass with associated bone erosion. Very few cases have been reported in the orbit, and even fewer in patients over the age of 5 years.[1, 2 3,4,5] Upon resection, positive surgical margins are common due to erosion and involvement of the underlying bone. Despite this, recurrence is rare, even with incomplete resection[2]. In this case, the tumor exhibited typical features but occurred in an atypical location. Aggressive bony resection was not pursued, however the lesion has not recurred. Surgeons should consider myofibroma in patients with an enlarging orbital mass and associated bony erosion, even if the patient does not fit the typical demographic profile for myofibroma. They should also be aware that significant bony resection may not be necessary to achieve a durable tumor free outcome.

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Figure 1

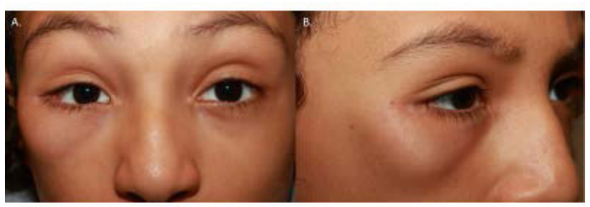


Figure 2

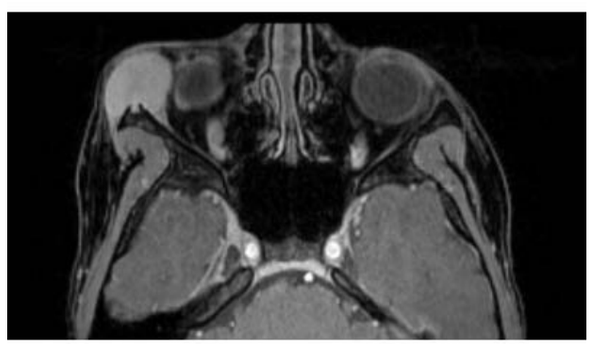


Figure 3

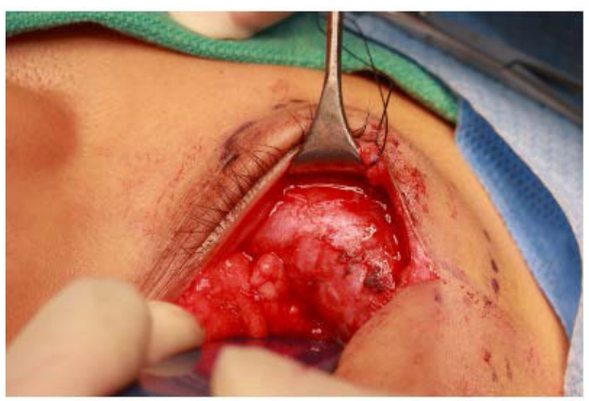
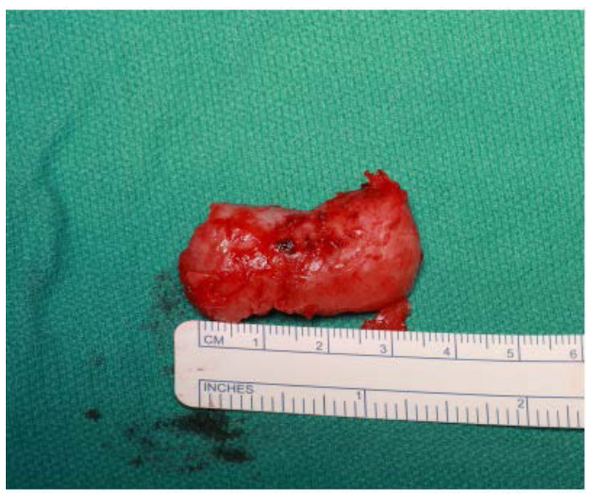


Figure 4



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26 Surgical Lymphatic Manipulation for Modulation of Orbital Immunity

Eric Song[1,2], Michelle M. Maeng[2]

[1]Department of Immunobiology, Yale School of Medicine, New Haven, Connecticut, United States, [2]Department of Ophthalmology and Visual Science, Yale School of Medicine, New Haven, Connecticut, United States

Introduction: The lymphatic system is a complex vascular network essential for biophysical and immunological functions, yet the concept of ocular immune privilege has obscured its understanding in ophthalmology. Recent discoveries of brain[1,2] and eye[3]–associated lymphatics have led the authors to chart orbit-associated lymphatics, showing that their manipulation can alter immune responses in mice.

Methods: Using Evans blue and fluorescent dyes, the authors mapped the lymphatic connections from various ocular compartments in mice by injecting the dyes into the subconjunctival, intracameral, intravitreal, retrobulbar, and lacrimal gland spaces. Furthermore, by surgically ligating individual lymph nodes, they highlighted the nodes' role in the drainage of antigens/dyes from each compartment, and utilized flow cytometry to characterize the immune responses in various lymph nodes. Finally, the translational potential of this finding was demonstrated by studying the effects of skewing the immune response in an orbital tumor model.

Results: Most compartments drained into the superficial cervical lymph nodes (mandibular), but intravitreal and retrobulbar dye injections revealed unique drainage patterns. Intravitreal injections resulted in ipsilateral superficial cervical lymph node drainage, in addition to bilateral drainage into the deep cervical lymph nodes—a pattern also observed after brain or cerebrospinal fluid injections. Retrobulbar injections demonstrated the broadest distribution, with dye reaching both the ipsilateral superficial and deep cervical lymph nodes, as well as the superficial parotid lymph node. Surgical ligation of these nodes caused dye accumulation in each compartment, confirming the nodes' crucial role in antigen drainage. Flow cytometry revealed distinct immunological microenvironments within each lymph node; the deep cervical nodes were the most suppressive immunologically, with the highest count of regulatory CD4 T cells, whereas the superficial nodes showed the most activating immune responses, indicated by the largest Th1 cell population. Selective surgical ligation of lymph nodes associated with the orbit led to biased drainage into alternative lymph nodes; ligation of the superficial and deep cervical nodes resulted in increased accumulation in the parotid node, while ligation of the parotid and superficial nodes led to increased drainage into the deep cervical node. Each experiment contains an n of 4-10 mice per condition.

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Conclusions: This study methodically dissects the ocular and orbital compartment, detailing their drainage into distinct lymph nodes. It goes beyond traditional tracing methods by incorporating surgical interventions to underscore the pivotal role of individual lymph node chain mediating drainage in these spaces. Significantly, the research illustrates the possibility of using surgical techniques to direct lymphatic drainage toward specific nodes, thereby allowing for customized immune responses—either to promote tolerance or to enhance immunogenicity within the orbit. These findings pave the way for future research aimed at surgically modulating the immune response as an adjuvant to medical therapy in ocular and orbital diseases—such as inhibiting immune responses in cases such as idiopathic orbital inflammation or activating immune responses in orbital tumors.

Figure 1

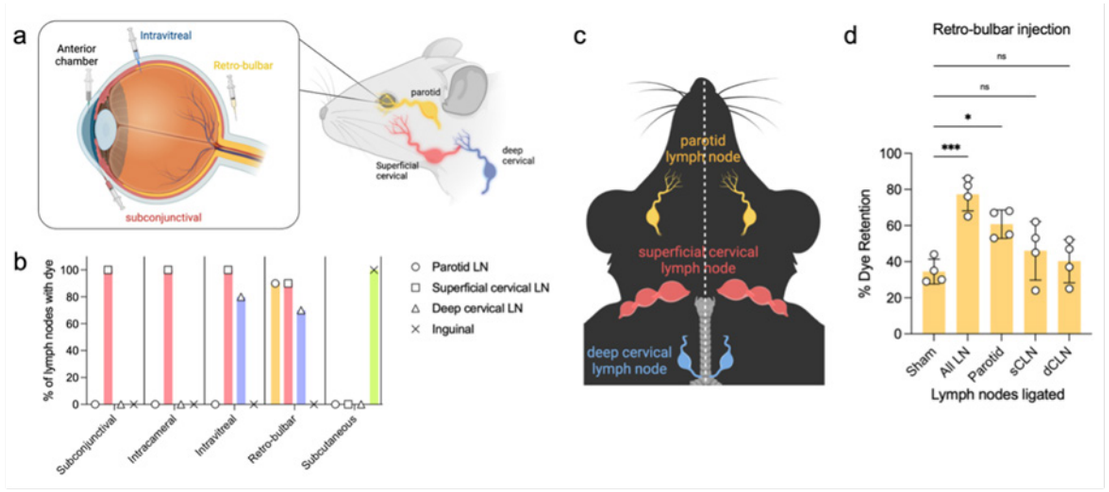

Figure: Different routes of ocular drug administration demonstrate unique lymph node drainage. a, Schematic illustrating different route of ocular drug administer methods and the possible draining lymph nodes. **b**, Data demonstrating the tropism of dye injected into different compartments of the eye. **c**, Schematic illustrating anatomical locations of lymph nodes ligated for data **d**. **d,** Example of dye retention quantified in a compartment changing depending on various surgical lymph node ligation.

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27 Systemic Effects of Teprotumumab Treatment on Thyroid Function in Patients with Thyroid Eye Disease: A Retrospective Study

Rafaella Penteado[1], Leo Meller[1], Marissa Shoji[1], Eman Al-Sharif[1,2], Don Kikkawa[1], Bobby Korn[1], Catherine Liu[1]
[1]Shiley Eye Institute, San Diego, California, United States, [2]Princess Nourah bint Abdulrahman University, Riyadh

Introduction: Teprotumumab, an IGF1-R inhibitor delivered systemically in the treatment of thyroid eye disease (TED), poses uncertainties regarding its systemic impact on thyroid hormone levels. This study aims to assess alterations in thyroid laboratory values among patients receiving teprotumumab treatment.

Methods: A retrospective chart review was conducted for patients undergoing teprotumumab treatment for TED at UC San Diego between January 2020 and December 2023. Inclusion criteria comprised patients receiving at least four infusions of teprotumumab, with pre- and post-treatment thyroid-stimulating hormone (TSH) measurements.

Results: Forty-six patients met the inclusion criteria, with a mean age of 55.9 (±14.6) years. Thirty patients presented with hyperthyroidism, 13 with hypothyroidism, and 3 with euthyroidism. The majority were female (n=37), and the mean pre-treatment Clinical Activity Score (CAS) was 4.3 (±0.9), significantly reduced post-treatment to 1.2 (±0.9) ($p<0.001$). The mean number of infusions was 7.5 (±1.1). Although there was a trend towards increased TSH levels post-treatment (mean: 2.2 ± 5.1) compared to pre-treatment (mean: 1.3 ± 2.6), this was not statistically significant ($p=0.266$). However, free thyroxine (T4) levels significantly decreased post-treatment (mean: 1.3 ± 0.4) compared to pre-treatment (mean: 1.7 ± 1.2) ($p=0.049$). Among patients with stable thyroid labs and medication (levothyroxine/methimazole) dosages for at least 6 months prior to treatment (n=23), a substantial proportion (n=12) required adjustments during teprotumumab therapy, indicating a lack of correlation between pre-treatment stability and stability during treatment ($p=0.353$).

Conclusions: IGF1-R is expressed in many tissues, including in isolated thyroid epithelial cells. Teprotumumab treatment for TED was associated with a trend towards increased TSH levels and decreased free T4 levels, irrespective of pre-treatment medication stability. Thyroid medication adjustment was required in over half of patients who were medically stable pre-treatment. These findings underscore the importance of close endocrine monitoring during teprotumumab therapy for TED.

28 The Proteomic Response to Teprotumumab in Thyroid Eye Disease

Andrea Lora Kossler1, Gabe Velez1, Linus Amarikwa2, Vinit Mahajan1
[1]Ophthalmology, Stanford University School of Medicine, Palo Alto, California, United States, [2]Ophthalmology, University of Nebraska, Omaha, Nebraska, United States

Introduction: Thyroid eye disease (TED) is a debilitating, autoimmune condition that often causes ocular surface inflammation. The thyrotropin antibody receptor (TRAb) has been associated with TED activity; however, patients can have elevated TRAb without developing TED. Tear proteins have been linked to TED activity and severity; however, validation studies are lacking.[1-7] This study evaluates tear protein profiles of TED patients treated with teprotumumab to identify possible biomarkers for TED and treatment response.

Methods: A case control study including 16 patients (32 eyes) with no history of TED and 11 patients (22 eyes) with active moderate-severe TED treated with teprotumumab. Samples were collected at baseline, and post-treatment. Tears were collected on Schirmer's tear strips and immediately stored at -80 degrees. Samples were analyzed using liquid chromatography-tandem mass spectrometry (LC-MS/MS) (Figure 1). Protein expression changes were evaluated by linear model fitting and empirical Bayes in limma and visualized on principal component analysis plots to identify candidate biomarkers.

Results: The analysis included 11 patients (9 female; age 45.1±10.5 years) with TED and 16 patients (11 female; age 56.8±17.3 years) with no history of TED, GD, or ocular surface diseases. Mean baseline CAS was 4.4±0.8 and baseline study eye proptosis was 21.8±3.8 mm. CAS response and proptosis response were 90% and 80%, respectively. When comparing TED tears to non-TED tears, 613 statistically significant proteins with 17 significantly upregulated proteins and 8 significantly downregulated proteins (over 100-fold) were found. Protein expression was then evaluated between pre and post-teprotumumab treated samples, and 433 significant proteins were found with 8 significantly upregulated and 17 downregulated (over 100-fold) proteins expressed (Figure 2 A & B). Functional analysis pathways demonstrated that over 400 significantly upregulated proteins in TED tears were involved in cell death pathways, whereas over 130 proteins involved in maintaining cellular survival were downregulated. Using principal component analysis, patients tear samples cluster in accordance with their healthy, TED, or post-treatment disease state. Protein profiles of 2 patients with a poor response to teprotumumab were identified. This study confirmed the importance of several proteins reported in TED tears and found several proteins of interest that may predict response to teprotumumab and serve as a biomarker of disease.

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Conclusions: This is the first study to assess the tear proteome in patients with TED treated with teprotumumab. This study identified possible biomarkers of treatment response and disease activity. We identified several hundred proteins in TED tears after statistical normalization. Using principal component analysis, we may be able to predict patients who may not respond to teprotumumab. Tear biomarkers are promising and warrant further study and validation.

Figure 1

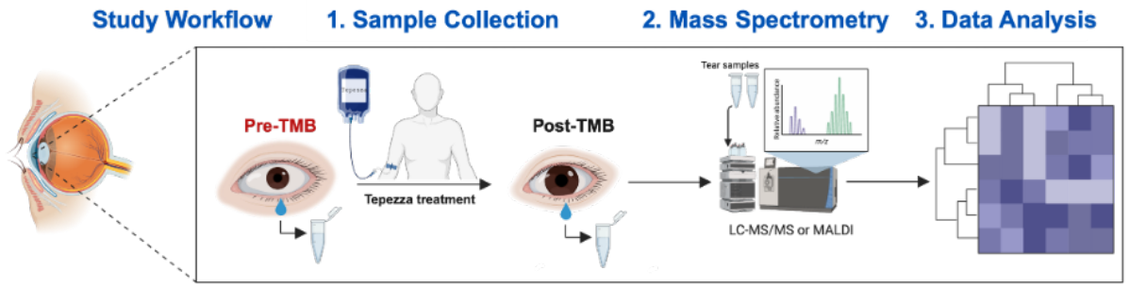
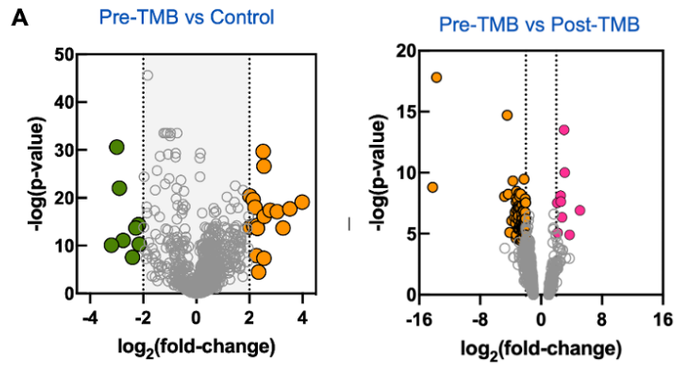


Figure 2

Figure 2: Volcano Plot. A. TED compared to control tears. B. Pretreatment vs. post-teprotumumab tears.



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29 Unveiling Predictors of Subsequent Teprotumumab or Surgical Decompression in Thyroid Eye Disease Patients after Initial Teprotumumab Therapy

Ashley Shirriff[1], Roman Shinder[2,3], Daniel Rootman[1]

[1]Ophthalmology, UCLA, Los Angeles, California, United States, [2]Ophthalmology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States, [3]Otolaryngology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States

Introduction: While teprotumumab is known to significantly improve proptosis, diplopia, and clinical activity score (CAS) in thyroid eye disease (TED), there exists a subset of patients who experience disease regression and later pursue additional treatment with a repeat teprotumumab course or surgical decompression.[1–4] We aim to explore what clinical variables and patient characteristics may be associated with disease reactivation requiring subsequent intervention post-teprotumumab.

Methods: In this cross-sectional cohort study, adult TED patients treated with teprotumumab between February 2020 and April 2024 at two institutions were included. Patients were grouped by treatment into teprotumumab only, teprotumumab followed by decompression, or teprotumumab followed by teprotumumab. Records were reviewed and clinical findings before and after teprotumumab treatment were extracted. Subsequent interventions were noted. Multivariable-adjusted logistic regression analysis was performed for both decompression and teprotumumab retreatment respectively, across 4 distinct covariate domains: (1) patient demographics (age, sex, duration of TED at initial teprotumumab), (2) prior thyroid treatment (radiation, thyroidectomy, medical therapy, or none), (3) baseline clinical findings prior to initial teprotumumab therapy (CAS, proptosis, motility restriction, strabismus, diplopia score), and (4) response to initial teprotumumab therapy (defined as the change observed in each variable after teprotumumab) with study eye selected at random. Adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated. ANOVA and Fisher's exact tests were used to compare variables across groups. Statistical analysis was performed using R software (version 4.3.2) with significance set at p-value < 0.05.

Results: A total of 63 patients (mean age 57.9±13.5 years; 69.8% female) were evaluated. Forty-one patients received teprotumumab only, while 22 pursued further treatment (10 decompression; 12 teprotumumab retreatment). The mean time from conclusion of initial teprotumumab to start of subsequent treatment was not different between the decompression and teprotumumab retreatment cohorts (8.0±6.3 and 11.6±3.5 respectively, p=0.139). There was no difference in time to follow-up assessment after initial teprotumumab among the study groups (p=0.302). Patient demographics and clinical findings presented in Table 1. Models for patient demographics and prior thyroid treatment did not reveal significant predictors of either retreatment modality. Baseline clinical findings model

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demonstrated that pre-teprotumumab proptosis was a significant predictor of pursuing decompression (OR: 1.32, 95% CI: 1.04 to 1.76, p=0.032) and baseline CAS was a significant predictor of pursuing repeat teprotumumab treatment (OR: 3.31, 95% CI: 1.38 to 10.87, p=0.021). The response to initial teprotumumab therapy model revealed that change in CAS (OR: 6.76, 95% CI: 2.06 to 35.60, p=0.008) was associated with repeat teprotumumab. No significant predictor of decompression was found for this model.

Conclusions: Each one-millimeter increase in baseline proptosis was associated with a 32% increase in the likelihood of pursuing decompression. Conversely, each one-unit increase in baseline CAS increased teprotumumab retreatment odds by a factor of 3.31, and each one-unit increase in the change in CAS after initial teprotumumab therapy increased retreatment odds by a factor of 4.04. More proptotic patients tended to be more likely to proceed to decompression, while more inflammatory patients tended to proceed toward retreatment with teprotumumab.

Table 1. Patient characteristics and clinical findings by study group.

Variable	Teprotumumab only	Decompression	Teprotumumab Retreatment	p-value[2]
N	41	10	12	
Patient characteristics				
Age	58.6 ± 14.7	57.6 ± 15.7	56.1 ± 10.4	0.771
Sex (female)	29 (70.7%)	6 (60.0%)	9 (75.0%)	0.7309
Disease duration (months)	8.9 ± 14.2	9.8 ± 15.7	2.9 ± 3.6	0.294
Prior thyroid therapy				
Radiation	4 (9.8%)	1 (10%)	2 (16.7%)	0.838
Thyroidectomy	3 (7.3%)	1 (10%)	0 (0%)	0.785
Medical therapy[1]	33 (80.5%)	7 (70%)	11 (91.7%)	0.507
None	6 (14.6%)	3 (30%)	0 (0%)	0.136
Baseline clinical findings				
CAS	3.6 ± 1.3	3.9 ± 1.3	4.8 ± 0.9	0.024*
Proptosis (mm)	21 ± 3.6	23.6 ± 3.7	22.7 ± 1.4	0.058
Motility restriction (degrees)	37.7 ± 30.0	29.0 ± 27.4	41 ± 26.4	0.604
Strabismus (prism diopters)	13.0 ± 17.3	12.3 ± 14.5	9.5 ± 12.7	0.809
Diplopia score	1.6 ± 1.1	1.2 ± 1.0	1.9 ± 1.0	0.290
Response to initial teprotumumab				
Change in CAS	2.1 ± 1.2	2.9 ± 1.7	3.8 ± 0.7	<0.001*
Change in proptosis	2.2 ± 1.5	2.7 ± 1.6	3.8 ± 2.0	0.017*
Change in motility restriction	15.9 ± 16.5	12.5 ± 13.0	32.9 ± 16.3	0.004*
Change in prism diopters	9.9 ± 14.3	13.7 ± 16.9	6.6 ± 8.8	0.494
Change in diplopia score	0.2 ± 1.0	0.1 ± 1.1	0.9 ± 0.7	0.049*

[1]Medical therapy including selenium, steroids, methimazole, propylthiouracil, Beta-blockers, and rituximab.

[2]ANOVA or Fisher's exact test.

*p < 0.05.

Data presented as mean ± SD or n (%). CAS = Clinical activity score.

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30 Zoledronate Associated Orbital Inflammation

Madeline Arzbecker[1], Cat Burkat[1], Suzanne van Landingham[1], Elaine Downie[2], Mihai Mititelu[1], Ryan Larochelle[1]
[1]Department of Ophthalmology & Visual Sciences, University of Wisconsin-Madison, Madison, Wisconsin, United States, [2]Department of Ophthalmology & Visual Sciences, University of Michigan, Ann Arbor, Michigan, United States

Introduction: Bisphosphonates inhibit osteoclast function and are prescribed for osteoporosis, Paget's disease, osteoclastic bone metastases, and multiple myeloma.[1,2] They may cause systemic inflammation[3] and ocular inflammation including conjunctivitis, anterior uveitis, episcleritis, and scleritis.[4] We present two rare cases of orbital inflammation after zoledronate administration, one with recurrence after steroid taper and another with optic nerve sheath involvement requiring high dose intravenous steroids.

Methods: Patient consent was obtained and data handling was compliant with HIPAA and the Declaration of Helsinki. A PubMed literature search was completed with permutations of medication-related terms (zoledronate, zoledronic acid, Aclasta, Zometa, Reclast) and orbital terms (orbit, orbital, orbitopathy). Abstracts without full text were excluded.

Results: Case 1: A 72-year-old male presented with headaches, vomiting, and right eye pain and swelling three days after his first zoledronate infusion for prostate cancer bone metastases. Visual acuity, intraocular pressure, pupils, and confrontational fields were normal. Abduction and depression were mildly limited. There was 6 mm of relative proptosis and chemosis (Figure 1). MRI revealed diffuse orbital inflammation (Figure 2). The patient improved rapidly with one dose of IV methylprednisolone, then inflammation recurred after 10 days of oral prednisone, necessitating a several-week taper.

Case 2: A 60-year-old female presented with weakness, fever, chills, vomiting, right eye pain and swelling, and photophobia 20 hours after a zoledronate infusion for osteoporosis. Visual acuity, color vision, pupils, and confrontational fields were normal. Intraocular pressure was 24. Motility was moderately limited in all directions. Exam revealed upper eyelid edema and erythema, chemosis, and anterior chamber inflammation (Figure 3). Imaging showed pre- and post-septal inflammation and optic nerve sheath enhancement (Figure 4). Intravenous antibiotics were administered given concern for infection, but there was no improvement in 24 hours. One mg/kg IV methylprednisolone was then initiated, with immediate improvement noted followed by complete relapse within a few hours. Given suboptimal dosing and evidence of optic perineuritis, her dose was increased to 1 g IV methylprednisolone daily for 3 days. She transitioned to an 8-week oral prednisone taper and resolved by 3 weeks.

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Literature search revealed 28 cases of zoledronate-associated orbitopathy, 19 providing full text (Figure 5).[5-23] All cases occurred within four days of the most recent infusion. Most cases involved diffuse preseptal and postseptal inflammation. Other patterns included scleritis (6), optic perineuritis (6), myositis (2), anterior ischemic optic neuropathy (1), and uniquely preseptal inflammation (1). Initial treatment route varied between intravenous (10), oral (8), and topical (1). One case reported recurrence of symptoms several months later.[8]

Conclusions: Zoledronate associated orbitopathy may mimic an infection with prodromal symptoms. Steroids are the standard treatment, but no consensus exists on appropriate dosing. Many authors describe 1 mg/kg oral dosing as is typical for idiopathic orbital inflammation, while others begin with a short course of intravenous steroids. Case 1 represents the second case of recurrence[8], likely due to a limited taper. Case 2 is the first description of treatment failure despite 1mg/kg intravenous dosing. In cases of optic nerve sheath involvement, a high loading dose may be appropriate.

Figure 1

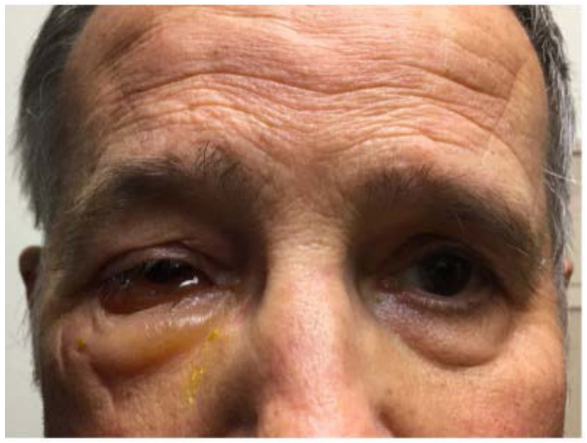

Figure 2

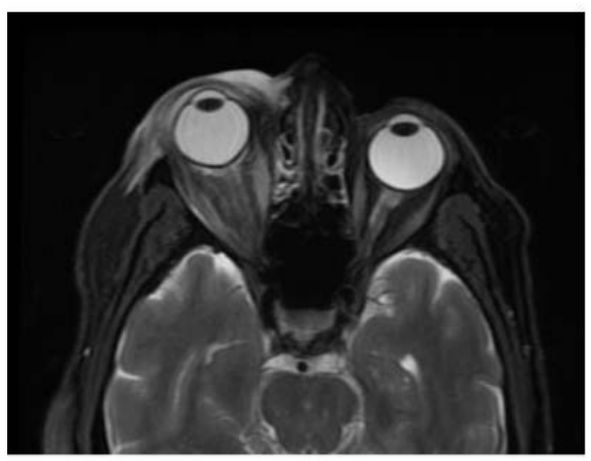

Figure 3

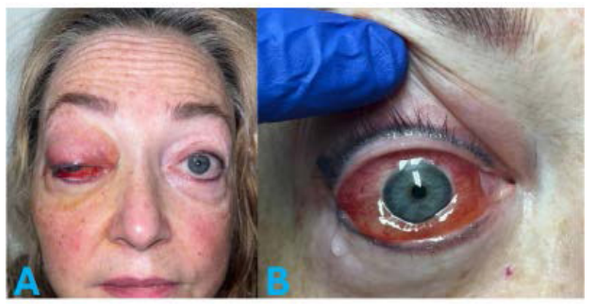

Figure 4

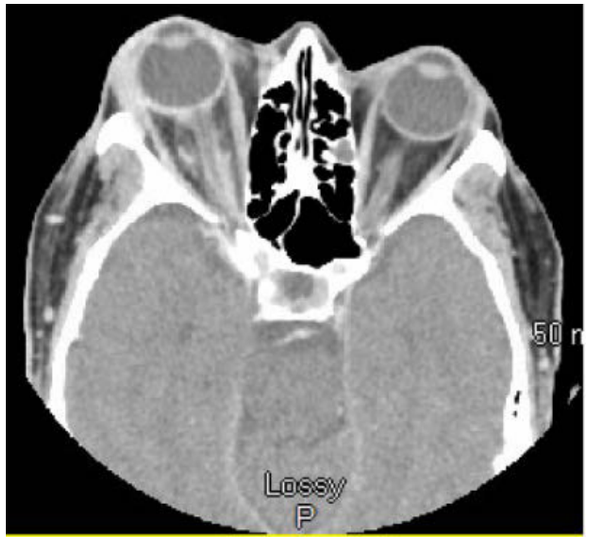

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Figure 5

#	Publication	Age(Sex)	Onset	Indication	Other PMHx	Orbital Inflammation	Intraocular Findings	Treatment	Time to resolution from treatment start
1	Sharma 2008	57(M)	3 days	Knee osteonecrosis	-	Pre- and post-septal	-	IVMP for 3 days then PO pred	3 days
2	Phillips 2008	55(M)	1 day	Metastatic renal cancer	-	Pre- and post-septal	-	60 mg PO pred for 10 weeks	3 days
3	Seth 2009	68(M)	1 day	Metastatic prostate cancer	HTN	Pre- and post-septal Scleritis AION	-	100 mg PO pred	7 days
4	Missotten 2010	71(M)	minutes	Metastatic prostate cancer	-	Pre- and post-septal	-	32 mg PO pred for 3 weeks	5 days, recurred 7 months later
5	Yeo 2010	62(M)	1 day	Charcot arthropathy	Type 1 DM	Preseptal	-	-	10 days
6	Yang 2010	89(F)	3 days	Osteoporosis	-	Pre- and post-septal Scleritis Optic perineuritis Extraocular muscles	-	1g IVMP for 3 days then PO pred	3 days
7	Procianoy 2010	60(F)	1 day	Osteoporosis	Autoimmune thyroiditis, breast cancer	Pre- and post-septal	-	80 mg PO pred for 6 weeks	12 days
8	Ortiz-Perez 2011	70(F)	1 day	Paget's disease	-	Pre- and post-septal	-	PO pred for 3 weeks	21 days
9	Kaur 2011	57(F)	Several hours	Osteoporosis	Esophageal, breast, and lung cancer	Pre- and post-septal	-	IVMP for 2 days	14 days
10	Schwab 2012	55(F)	4 days	Osteoporosis	Type 1 DM, hypothyroidism osteoarthritis, GERD	Pre- and post-septal Scleritis Optic perineuritis Myositis	-	1 g IVMP for 2 days then 60 mg PO pred	7 days
11	Boni 2013	75(F)	2 days	Osteoporosis	-	Pre- and post-septal	Anterior uveitis	IVMP	Several days
12	Rahimy 2013	68(M)	1 day	Osteoporosis	-	Pre- and post-septal	-	1 g IVMP for 3 days then 60 mg PO pred	3 days
13	Manuylova 2015	66(M)	4 days	Osteoporosis	HTN, HLD, GERD	Pre- and post-septal Optic perineuritis	Anterior uveitis	PO pred	After treatment
14	Umunakwe 2017	68(F)	12 hours	Osteoporosis	HTN, HLD, migraines, depression/anxiety	Pre- and post-septal Scleritis	Anterior uveitis	1 g IVMP for 1 day then 60 mg PO pred	80 days
15	Herrera 2019	56(F)	1 day	Osteoporosis	Sjogren's, SLE, Inflammatory demyelinating polyneuropathy	Pre- and post-septal Scleritis Optic perineuritis	-	50 mg PO pred for 1 week	7 days
16	Chehade 2019	65(F)	4 days	Osteoporosis	Lymphoma, breast cancer	Pre- and post-septal Scleritis Optic perineuritis	Anterior uveitis	Topical prednisolone	35 days
17	Keren 2019	58(F)	Several hours	Metastatic thyroid cancer	-	Pre- and post-septal Scleritis	Anterior uveitis	-	14 days
18	Khalid 2021	62(M)	3 days	Metastatic prostate cancer	Type 2 DM, HLD, AAA	Pre- and post-septal	-	1 mg/kg PO pred	7 days
19	Faryal 2021	45(M)	3 days	IgG kappa myeloma	-	Pre- and post-septal	-	500 mg IVMP for 3 days then 60 mg PO pred	21 days
20	*Arzbecker 2023*	*72(M)*	*3 days*	*Metastatic prostate cancer*	*HTN, HLD, CAD*	*Pre- and post-septal*	-	*IVMP x 1 day, then PO pred taper*	*30 days (recurred and required long taper)*
21	*Arzbecker 2023*	*60(F)*	*20 hours*	*Osteoporosis*	*HTN, HLD, DM2, GERD, hypothyroidism*	*Pre- and post-septal Optic perineuritis*	*Anterior uveitis*	*1 mg/kg IVMP for 1 day then 1g IVMP for 3 days then PO pred*	*21 days*

Figure 5. AAA = abdominal aortic aneurysm, CAD = carotid artery disease, DM = diabetes mellitus, GERD = gastroesophageal reflux disease, HLD = hyperlipidemia, HTN = hypertension, IgG = immunoglobulin gamma, IVMP = intravenous methylprednisolone, kg = kilograms, mg = milligrams, PO = oral, pred = prednisone, SLE = system lupus erythematosus.

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Eyelid Tarsus Cross-Linking with Rose Bengal and Green Light: A Potential Therapy for Floppy Eyelid Syndrome

Ghasem Yazdanpanah[1], Kevin Heinze[1], Oju Jeon[2], Kamran Avanaki[2], Eben Alsberg[2], Ali R Djalilian[1], Pete Setabutr[1], Ann Q Tran[1]
[1]Department of Ophthalmology, University of Illinois Chicago, Chicago, Illinois, United States, [2]Richard and Loan Hill Department of Biomedical Engineering, University of Illinois Chicago, Chicago, Illinois, United States

Introduction: The rate of Floppy Eyelid Syndrome (FES) recurrence after surgical management may be as high as 60% [1]. Cross-linking of the tarsal plate has shown promising effects to possibly increase the tissue stiffness in cadaveric specimens [2, 3]. In this study, we evaluated the biomechanical properties of porcine tarsal tissues cross-linked with Rose Bengal (RB) and Green Light (G-Light) compared to those cross-linked with Riboflavin-5-Phosphate (R5P) and Ultraviolet light (UV-Light).

Methods: Experiments were performed on porcine upper eyelid tarsus (Figure 1), roughly 10(H)´3(W) mm. R5P and UV-Light cross-linking was performed by applying 0.156% R5P in 20% dextran every minute on the tarsal tissues concurrent with UV-Light irradiation (6 mW/cm2) for 18 minutes [2, 3]. RB and G-Light cross-linking was performed by applying 0.1% RB solution in 20% dextran every minute on the tarsal tissues with concurrent G-Light irradiation (6 mW/cm2) for 10 minutes [4]. Controls were upper tarsus that did not undergo cross-linking. Biomechanical tests were performed by using a uniaxial test machine with live Optical Coherence Tomography (OCT), like previous reports [2, 3]. Pre-load (0.05 N) was applied to avoid laxity of tissues and then samples stretched with rate of 0.1 mm/s. The load (N) and disposition (mm) were recorded for 6 seconds. Elongation was recorded, where a higher value indicates less stiffness. The stress (MPa) was calculated by Load (N)/surface area (mm^2). The strain was calculated by disposition (mm)/primary length (mm). The Young's Modulus (MPa), a measure of a sample's ability to withstand change in length under lengthwise tension, was calculated as the slope of the linear portion of stress-strain curves. The tissue thickness before and after uniaxial biomechanical test was measured by analyzing the captured OCT images using ImageJ. The percent change in tarsal thickness was calculated from the pre-test – post-test tissue thickness. One-way ANOVA test with post Tukey's used for comparing the means.

Results: The recorded loads for tarsal tissues through the test time for the samples cross-linked with R5P+UV-Light and RB+G-Light were higher than not cross-linked tarsus ($p<0.0001$, Figure 2A). Moreover, the control tarsal samples were elongated more than the cross-linked samples ($p=0.028$, Figure 2B). The cross-linked tarsal samples have higher stress (MPa) compared to the control at the same strain ($p=0.002$, Figure 3A). The average Young's Modulus of the control tarsus was 7.1±1.6 MPa, significantly lower than those of cross-linked with RB+G-Light (46.5±6.4 MPa, $p=0.002$) and R5P+UV-Light (28±4.5 MPa, $p=0.016$). Furthermore, the average Young's Modulus of RB+G-Light cross-linked samples was significantly higher than R5P+UV-Light cross-linked samples ($p=0.025$). The change in tarsal

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thickness was higher in control samples (24.4±11.4%) compared to cross-linked samples (7.7±1.9% for R5P+UV-Light and 7.5±1.3% for RB+G-Light, $p<0.05$, Figure 4).

Conclusions: R5P+UV-Light and RB+G-Light cross-linked porcine tarsal specimens had higher recorded loads, less elongation, higher stress, higher Young's Modulus and less change in tarsal thickness compared to controls. R5P+UV-Light and RB+G-Light may increase the biomechanical strength of porcine tarsal tissues. Future studies on human tarsal tissues are necessary to evaluate the efficacy of the proposed cross-linking methodology and future utility.

Figure 1

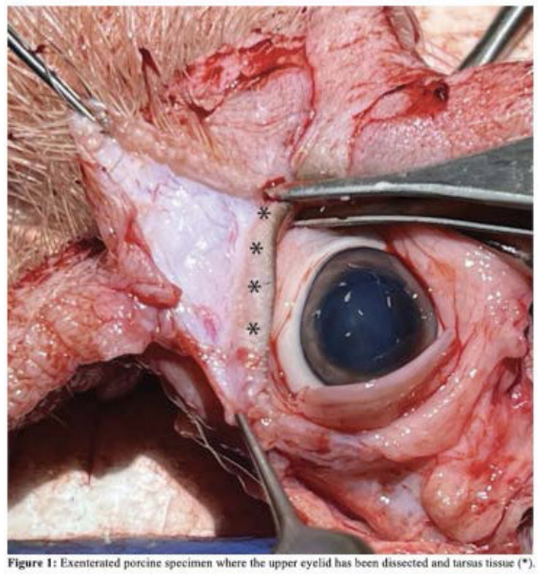

Figure 1: Exenterated porcine specimen where the upper eyelid has been dissected and tarsus tissue (*).

Figure 2

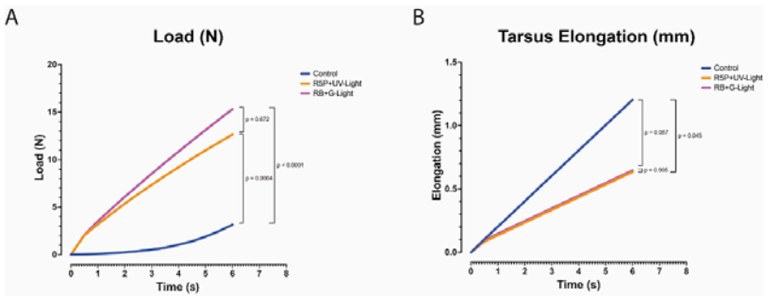

Figure 2: Raw results of uniaxial test results on porcine tarsal samples. (A) Mean of recorded loads (N) plotted in time during uniaxial tests. Tissues cross-linked with R5P + UV-Light or RB + G-Light showed more resistance against the applied force compared to the not cross-linked (control) tissues. (B) Mean of elongation (mm) of tarsal tissues during uniaxial test at a pre-determined force. Control specimens exhibited more extension/deformation compared to cross-linked tissues while receiving the applied force by the machine.

Figure 3

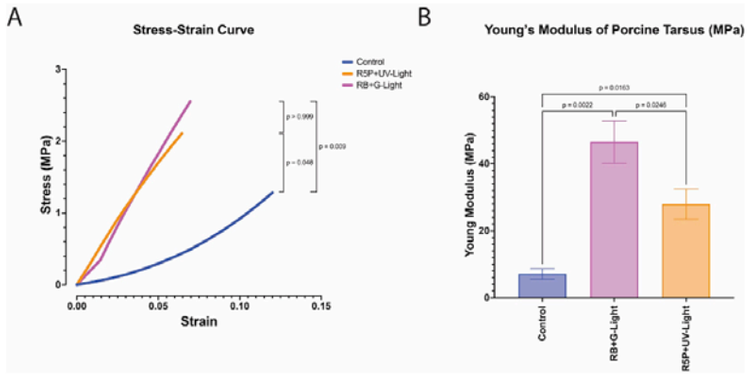

Figure 3: (A) Mean Stress-Strain curve of tarsal samples where higher stresses (Load/Surface area) suggest more stiffness of these tissues. (B) Mean of calculated Young's Moduli (slope of the linear portion of the stress-strain curve) of the various samples undergoing lengthwise tension by the uniaxial machine.

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Figure 4

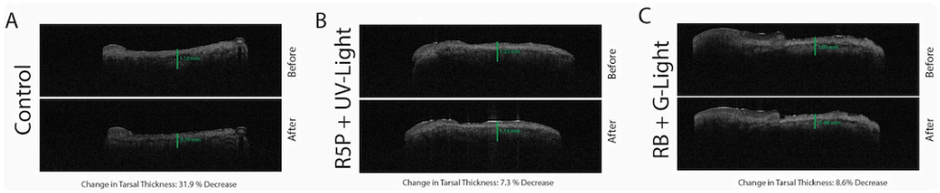

Figure 4: Examples of visualization of porcine tarsal tissues by OCT before and after uniaxial tests in (A) control, (B) R5P + UV-Light and (C) RB + G-Light. The green line highlights the measured decrease in tarsal thickness. The % change in tarsal thickness before and after treatment in these examples is highlighted below.

Figure 5

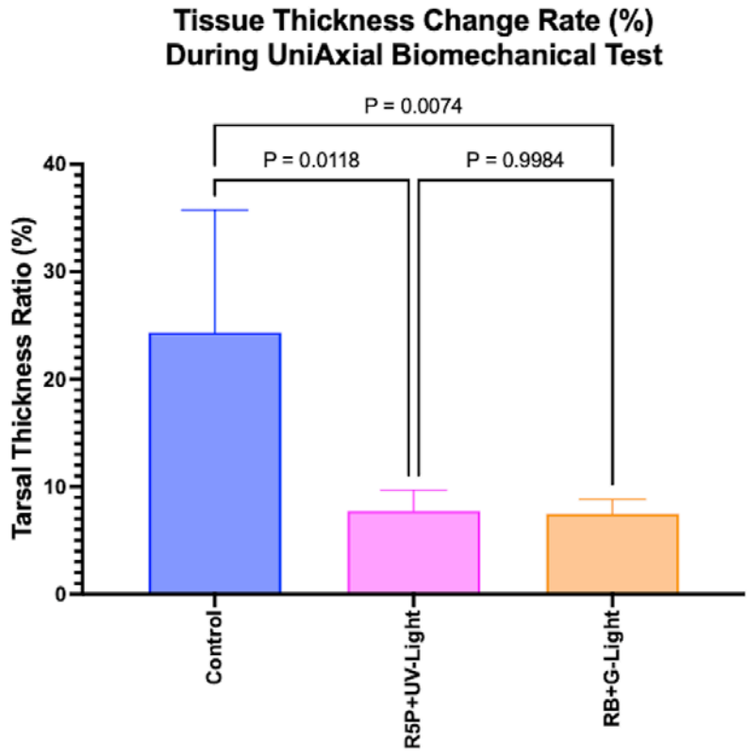

Figure 5: The mean tarsal thickness ratio (%) of control, R5P+UV-Light cross-linked, and RB+G-Light cross-linked tissues. The amount of decrease in tissue thickness is significantly more in control tissues as an indicator of higher tissue deformity. This means cross-linked tissues are more resilient to deformity.

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Nitinol Loop Suture Needle for Fascia Lata Frontalis Sling Ptosis Repair

Teresa Chen[1], Lung-Chi Lee[1,2], Patsuda Thariya[1,3], Jeremiah Tao[1]
[1]Division of Oculofacial Plastic and Orbital Surgery, Gavin Herbert Eye Institute, University of California, Irvine, Irvine, California, United States, [2]Department of Ophthalmology, Tri-Service General Hospital, National Defense Medical Center, Taipei, [3]Division of Orbital and Ophthalmic Plastic Surgery, KKU Eye Center, Khon Kaen University, Khon Kaen

Introduction: Nitinol loops act as a suture shuttle in tight spaces due to its elasticity under stress and shape memory and were originally developed for use in arthroscopic procedures.[1,2] In ophthalmology, nitinol loops have been used for retrieval of dislocated intraocular lens, mobilization of macular hole edges, removal of lens calcifications, and lens fragmentation[3–6]. Its use has not previously been reported in frontalis sling ptosis repair.

We routinely perform frontalis sling ptosis repairs with free needles. One downside to the free needle is the small hole diameter (1mm), which can cause snagging and stripping of the sling material, usually donor fascia lata, upon each pass. The nitinol loop suture needle has a larger loop (5mm), which allows for easier placement of the sling material and smoother passes from the eyelid to the brow. The purpose of this study was to assess the outcomes of this surgical technique with nitinol loop needle in the treatment of ptosis compared to the standard free needle.

Methods: Retrospective case series of consecutive patients between July 2023 and January 2024 performed in one hospital center with ptosis requiring frontalis sling ptosis repair. Age, gender, laterality, pre- and post-operative measurements of eyelid position were recorded. Type of needle, sling material, need to manipulate end of fascia strip, presence of stripping of fascia lata with the pass, and post-operative complications and subsequent management were also recorded.

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Results: A total of 12 patients were identified, with 7 patients (10 sides) undergoing frontalis sling ptosis repair with free needle and 5 patients (7 sides) with nitinol loop needle. Four patients had prior surgeries: 2 frontalis silicone sling, 1 frontalis autologous fascia lata, and 1 external levator resection. Pre-operative MRD1 were -0.30 ± 0.91 and -0.14 ± 0.63, post-operative MRD1 were 1.80 ± 0.54 and 2.29 ± 0.48 and change in MRD1 were 21.80 ± 0.54 and 2.43 ± 0.73 for free needles and nitinol loop needles, respectively with no statistically significant difference in lid position between the two techniques. All patients in the free needle group required cutting the end of the fascia lata strip thinner to fit in the needle hole, while none of the patients in the nitinol needle group required manipulation of the end of the fascia strip, which was statistically significant. Three patients in the free needle group had stripping of the fascia lata strip with the needle pass and none of the patients in the nitinol needle group did, but this was not statistically significant. Post-operative complications included one preseptal cellulitis that resolved with oral antibiotics and one left brow nodule that resolved with maxitrol ointment, both in the free needle group.

Conclusions: Nitinol loop suture needle requires less manipulation of the end of the fascia sling intraoperatively and can be used for frontalis sling ptosis repair without statistically significant difference in outcomes compared to standard technique with a free needle.

Figure 1: Tapered needle (1/2c 26.5mm) with nitinol loop

Figure 2: Step by step stills of surgical technique video

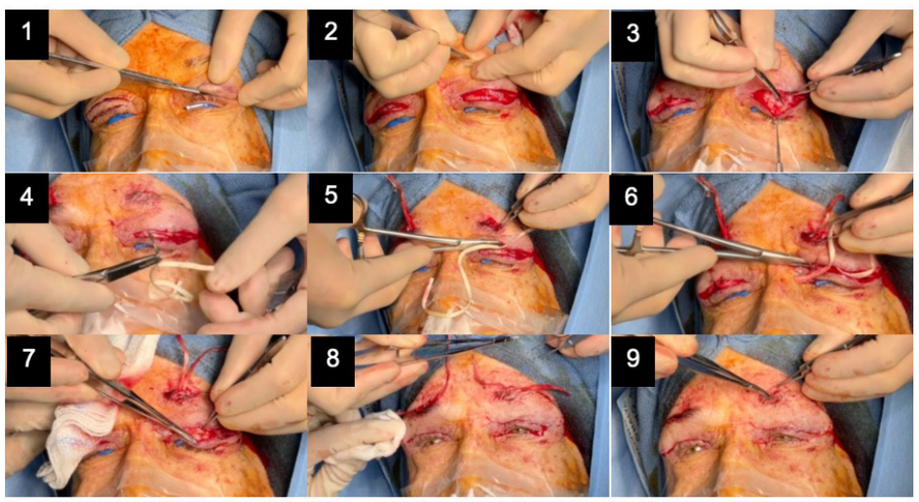

Table 1: Patient characteristics and outcomes

	Free Needle	Nitinol Loop Needle	p value
Number of patients	7	5	
Number of sides	10	7	
Laterality			
Right	3	4	
Left	7	3	
Age	33.3 ± 33.3 (range 2-74)	31.4 ± 36.6 (range 4-72)	
Sex			
Female	4	4	
Male	3	3	
Sling material			
Donor fascia lata	9	7	
Autologous fascia lata	1	0	
Intraoperative			
Required manipulation of sling end	10	0	**<0.00001**
Presence of shearing of fascia lata strip	3	0	0.110
Eyelid position			
Pre-op MRD1 (mm)	-0.30 ± 0.91	-0.14 ± 0.63	0.701
Post-op MRD1 (mm)	1.80 ± 0.54	2.29 ± 0.48	0.077
Change in MRD1 (mm)	2.10 ± 0.94	2.43 ± 0.73	0.451

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Inferomedial Orbital Strut Reconstruction with a Titanium Plate Under Nylon Foil Implant: Surgical Technique Video and Review of Two Cases

Jenny Wang[1], Michael Han[1], Paul Zhou[1], Teresa Chen[1], Patsuda Thariya[1,2], Jeremiah Tao[1]
[1]Division of Oculofacial and Orbital Surgery, Gavin Herbert Eye Institute, University of California, Irvine, Irvine, California, United States,
[2]Division of Oculofacial and Orbital Surgery, KKU Center, Khon Kaen University, Khon Kaen

Introduction: Orbital fractures with loss of the inferomedial strut (IMS) are are associated with greater enophthalmos and strabismus morbidity. Nylon foil implanted across the perimeter of a floor and medial wall defect, in a wraparound configuration, can recapture the normal orbital configuration and support buttresses. In some cases, particularly late fracture repair, nylon foil alone may excessively bow into the defect leaving inadequate inferomedial orbital support. The authors describe with video an orbital reconstruction technique using a single straight titanium plate under a nylon foil implant for IMS fracture repair, and review two cases.

Methods: Charts of 2 patients treated with nylon foil and titanium plate for additional inferomedial support were abstracted for findings, indications, results, and complications. The surgical technique was as follows: A lateral canthotomy incision was fashioned using a #15 blade. This was continued using straight scissors, then the inferior ramus of the lateral canthal tendon was severed. The conjunctiva and retractor band were incised near the fornix. Dissection was continued down to the infraorbital rim in the septal plane, where the periosteum was elevated and dissected posteriorly into the orbit. The orbital floor fracture was visualized, and orbital soft tissues were elevated from the fracture site in a hand-over-hand technique. A small incision was created at the caruncle and dissection was carried down to periosteum, which was elevated. Subperiosteal dissection was continued along the medial wall until the fracture was identified. A 0.35 nylon foil implant was implanted under direct visualization, spanning the fracture site's perimeter. To prevent bowing of the nylon foil into the sinus and loss of the inferomedial support, a titanium straight plate was secured to the inferomedial rim with a single screw into the extra orbital rim. The rest of the plate was configured underneath the nylon foil implant and extending posteriorly to recapture the native contour of the inferomedial orbit. The inferior fornix wound was closed using interrupted 6-0 chromic sutures. The lateral canthus was re-approximated using 4-0 polyglactin suture in a modified lateral tarsal strip technique.

Results: Patient 1 was a 30-year-old male who, after assault, suffered an orbital floor blowout fracture with defect measuring 26mm x 16mm on CT. He underwent a primary repair with nylon foil placement, subsequently complicated by a hemorrhagic cyst around orbital implant that was drained surgically. The nylon foil implant was exchanged. The patient had residual diplopia and imaging demonstrated the nylon implant across the perimeter of the defect but with central implant bowing into the maxillary sinus. Replacement of nylon foil with the addition of a titanium plate to reconstruct the IMS corrected the enophthalmos and diplopia.
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Patient 2 was a 25-year-old male who, after assault, had a large medial and orbital floor blowout fracture with defect measuring 23mm x 22mm on CT. The patient presented 6 months after assault and was found to have diplopia and enophthalmos. Given the chronicity of the fracture and intraoperative inferomedial bowing of a nylon wraparound implant, a titanium plate was placed to reconstruct the IMS and support for the overlying nylon foil. Surgery was uncomplicated and diplopia and enophthalmos resolved thereafter.

Conclusions: In this review series, a wraparound nylon foil additionally supported by a single titanium plate was safe and effective in reconstructing the inferomedial orbit in late repair and treating diplopia and enophthalmos

Figure 1: Pre-operative CT scans of patients 1 and 2.

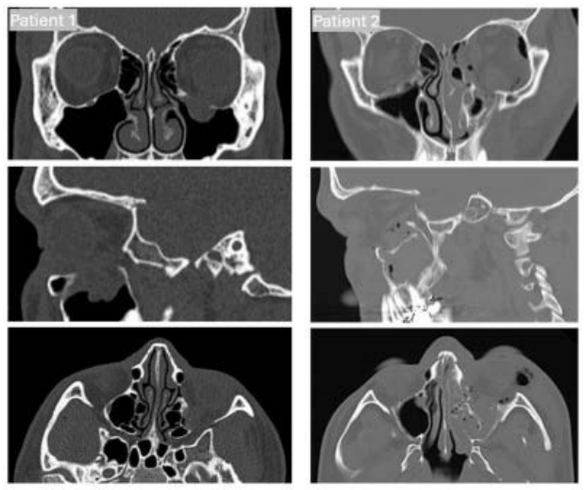

Figure 2: Drawing of inferomedial orbital strut reconstruction with a titanium plate under nylon foil implant.

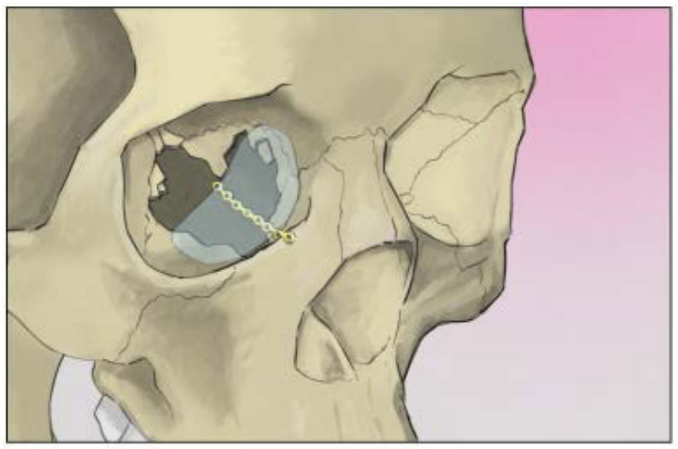

Figure 3: Step by step video stills of surgical video.

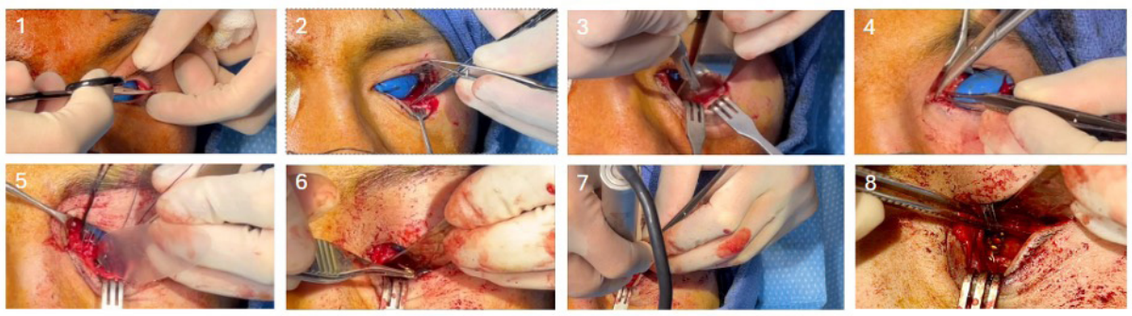

Figure 4: Before and after photo of patient 1.

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Sheath-Guided Orbital Triamcinolone Injection: A New Method of Triamcinolone Injection for Thyroid Eye Disease

Yuji Yamana, Tomoyuki Kashima, Masahiro Fujimoto, Ryo Kikuchi, Yuki Kamiya
Ophthalmology, Oculofacial Clinic Group, Tokyo, Japan

Introduction: Beneficial effects of orbital steroid injection for thyroid eye disease (TED) have been reported[1)2)3)4)5)6)]. However, these techniques still have room for improvement. A method was developed to facilitate penetration of steroids more deeply into the orbit. We evaluated the efficacy of this new method, termed sheath-guided orbital triamcinolone injection (SG-OTI), for TED.

Methods: This retrospective cohort study included patients diagnosed with TED who underwent SG-OTI. The inclusion criteria were a Clinical Activity Score (CAS) of ≥2 and local inflammation of the extraocular muscles. Patients were excluded if they had more severe TED and needed intravenous steroid pulse injection. A total of 1 mL triamcinolone acetonide (40 mg/mL) was injected inside the orbital rim after puncturing the orbital septum with a 24-gauge (3/4, 19-mm) needle and the indwelling sheath of this needle. A 27-gauge (40-mm) dull needle was advanced upward near the orbital muscle at four sites (medial and lateral aspects of the upper and lower eyelids) (Figure 1). We collected data on the CAS, exophthalmometry measurements (using magnetic resonance imaging [MRI]), and MRI indices (degree of inflammation, ratio of signal intensity [RSI] of muscle to white matter, and size of extraocular muscles). We did not investigate the superior oblique because it was difficult to detect by MRI in almost all patients. Three-dimensional MRI was generated using SYNAPSE VINCENT Ver. 5 (Fujifilm Medical, Tokyo, Japan). Data were analyzed using SPSS Statistics Ver. 27 (IBM Corp., Armonk, NY, USA). The Wilcoxon signed-rank test was used for comparisons.

Results: We analyzed 23 eyes of 12 patients (1 man, 11 women; mean age, 50.2±7.5 years; range, 25–72 years). The mean initial CAS was 6.0±1.0, which decreased to 2.5±1.5 (P=0.003) after 4 weeks. The mean exophthalmometry measurement was 24.2±0.195 mm, which decreased to 22.1±0.145 mm (P<0.001) after 4 weeks (Figure 2). The coronal maximum area of the extraocular muscles changed after 4 weeks (superior rectus, from 65.2±33.8 to 40.4±12.6 mm^2 [62.0%]; inferior rectus, from 55.4±8.2 to 53.1±9.3 mm^2 [95.9%]; medial rectus, from 37.2±5.8 to 27.8±2.0 mm^2 [74.7%]; lateral rectus, from 55.7±9.6 to 48.2±12.4 mm^2 [86.5%]; and inferior oblique, from 24.2±8.1 to 16.5±5.2 mm^2 [68.2%]) (all P<0.001) (Figure 3). The RSI decreased after 4 weeks (superior rectus, from 1.43±0.037 to 1.37±0.086 [95.8%] [P=0.013]; inferior rectus, from 1.19±0.066 to 0.89±0.037 [74.8%] [P<0.001]; medial rectus, from 1.49±0.075 to 1.22±0.11 [81.9%] [P<0.001]; lateral rectus, from 1.47±0.071 to 1.28±0.0048 [87.1%] [P=0.007]; and inferior oblique, from 1.31±0.0027 to 1.24±0.0056 [94.7%] [P<0.001]) (Figure 4).

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Conclusions: SG-OTI is effective for TED and can decrease the area and RSI of the extraocular muscles and improve proptosis. This new method can have more selective and effective effects on the extraocular muscles than existing local steroid injections in patients with TED.

Figure 1

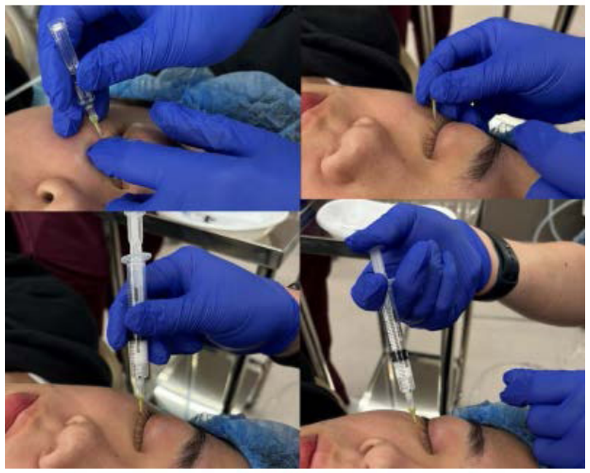


Figure 2

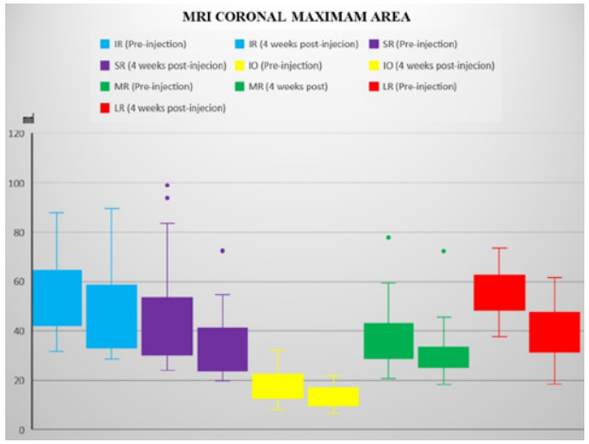


Figure 3

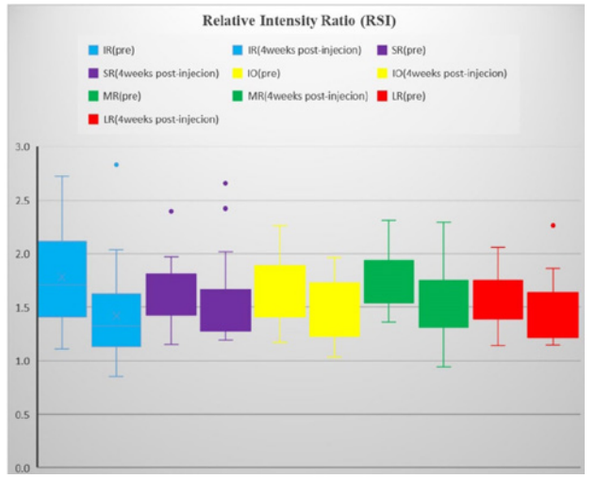
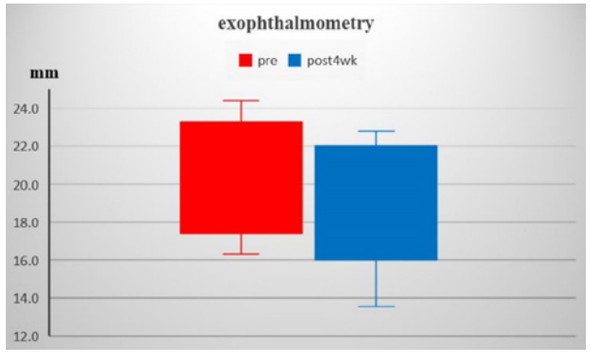


Figure 4



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Superior Fornix and Eyelid Reconstruction for Large Bilateral Upper Eyelid Coloboma

Karen Brown[1], Makayla McCoskey[1], Monica Ray[1], Tanuj Nakra[1,2]

[1]TOC Eye and Face, Austin, Texas, United States, [2]Department of Ophthalmology, Dell Medical School, The University of Texas at Austin, Austin, Texas, United States

Introduction: Upper eyelid coloboma is a rare congenital anomaly with partial or complete absence of the eyelid. In recent case series, the reported incidence of bilaterality ranges from 24-62% in isolated cases and is more commonly bilateral when associated with syndromes such as clefting disorders, Goldenhar or CHARGE syndrome.[1-3] Corneal adhesion occurs in approximately 46% in one population study, with poorly formed eyebrows occurring in about 50% of cases.[2] Direct closure with or without lateral canthal release and/or adjacent tissue transfer may be feasible for defects measuring up to 50% of the eyelid.[1,2,4] For larger defects, free grafts, flaps and multistage procedures are more commonly warranted. [1,2,5,6] Here we present a case of isolated bilateral large upper eyelid coloboma and describe first stage reconstruction in infancy for vision preservation.

Methods: Case report.

Results: A healthy female born at term without gestational or birth complications presented at 3 days of age with bilateral large (approximately 80-90%) full-thickness colobomas of the upper eyelids. The colobomas were associated with underdevelopment of the eyebrows and dense adhesion to the superior cornea bilaterally (Figure 1). Corneal adhesion resulted in restricted ocular motility and concern for obstruction of the visual axis during this crucial period of visual development. The procedure was performed at 7 weeks of age. The corneal adhesions were released with a crescent blade, with the adhesions noted to involve only the superficial corneal stroma on both sides. The superior fornix was reconstructed with bilateral buccal mucosal grafts to the exposed superior sclera. The anterior and posterior lamella were reconstructed with bilateral Cutler Beard flaps (Figure 2). To minimize the development of amblyopia, bilateral surgery was performed simultaneously. To avoid prolonged visual deprivation, the flaps were divided at 3.5 weeks (Figure 3). Postoperative course was complicated by 3-4mm of central orbicularis flap dehiscence on the right. Healing was otherwise routine. At 8 months postoperatively, there is significant improvement in ocular surface health (Figure 4). She has undergone patch treatment with her pediatric ophthalmologist for amblyopia and is able to fixate and follow bilaterally with equal vision noted on her most recent ophthalmic evaluation. Additional surgery will likely be needed as she grows older to achieve further functional and aesthetic reconstruction.

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Conclusions: Isolated large bilateral coloboma of the upper eyelid is a rare congenital condition that can threaten vision development and poses a reconstructive challenge. Reconstruction for commonly involves a multistage procedure, with the initial focus on ocular surface protection and maintaining visual function. Achieving a functional and aesthetic outcome remains challenging.

Figure 1

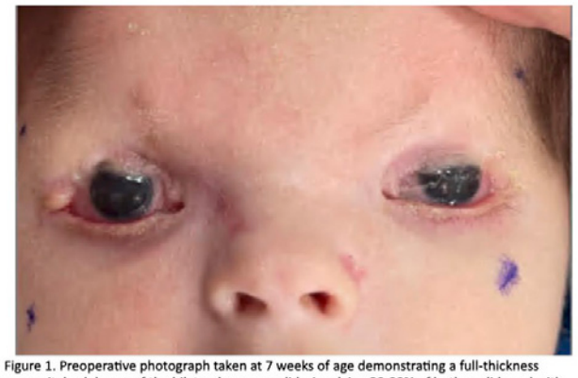

Figure 1. Preoperative photograph taken at 7 weeks of age demonstrating a full-thickness congenital coloboma of the bilateral upper eyelids, involving 80-90% of both eyelids and with associated brow maldevelopment and corneal adhesions.

Figure 2

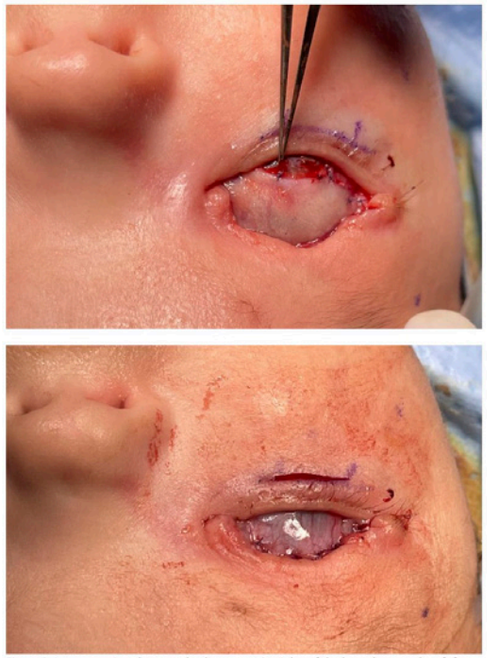

Figure 2. Intraoperative photographs demonstrating inlay of the buccal mucosal graft for reconstruction of the superior fornix (top) and conjunctival flap development during the Cutler Beard procedure (bottom).

Figure 3

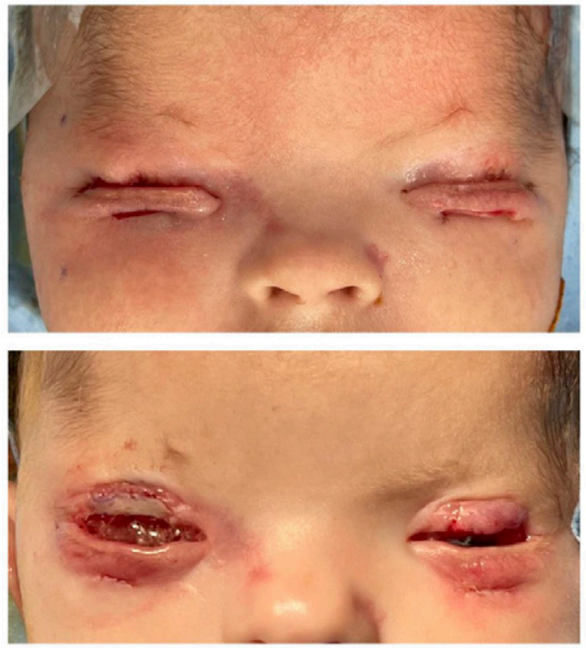

Figure 3. Photograph of the Cutler Beard procedure immediately after closure of the first stage (top) and immediately after separation of the flap (second stage, bottom).

Figure 4

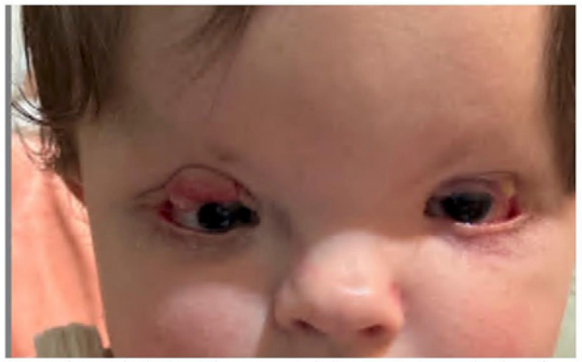

Figure 4. Photograph taken 8 months postoperatively demonstrating improved ocular surface protection. Central corneal scarring from preoperative ocular surface exposure is significantly improved. She has completed patch therapy and is able to fixate and follow bilaterally. Aesthetically, there is hypertrophy of the right upper eyelid soft tissues.

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Mathematical Modeling of Brow Curvature to Compare Outcomes of Direct Brow Lift and Internal Browpexy

Emily (Haochen) Xu, Cameron Yang, Sruti Akella
Ophthalmology, Ohio State University, Columbus, Ohio, United States

Introduction: Although brow descent is recognized as a main contributor to aging in the upper third of the face, brow curvature or shape is less commonly addressed in the literature despite its influence on overall appearance and youthfullness.[1] In this study, we utilize a polynomial modeling methodology[2,3] to quantify the changes in brow curvature after direct brow lift (DBL) compared to internal browpexy (IBP). To our knowledge, this is the first report directly comparing brow contour changes resulting from two different surgical approaches.

Methods: A retrospective review was performed on sequential patients who underwent blepharoplasty combined with either direct brow lift (at least 8 mm) or internal browpexy (with dissection performed at least 12 mm above the superior orbital rim) at a single institution between May 2017 and December 2023. All surgeries were performed by one of three ASOPRS-trained oculofacial plastic surgeons. For each patient, standardized images from the pre-operative and post-operative month 3 visits were analyzed by plotting 15 points along the inferior-most row of contiguous brow cilia in ImageJ (National Institutes of Health, Bethesda, Maryland). A fourth-degree polynomial best-fit curve ($f(x) = ax4 + bx3 + cx2 + dx + e$) was applied to the X and Y coordinates of these points. The coefficient of the second derivative polynomial ($f''(x)$) was obtained for all fourth-degree polynomials as a proxy measurement of brow curvature (brow curvature index, BCI). Increasing magnitude of the BCI from pre-op to post-op was indicative of an increase in brow curvature (Figures 1A, 1B). Categorical variables were compared using Chi-Square test, non-normally distributed continuous variables were compared using Mann-Whitney *U*, and paired continuous variables were compared using paired-samples T-test on SPSS (SPSS Inc., Chicago, IL).

Results: 70 eyes from 35 patients were included (Table 1). There was no significant difference in amount of eyelid skin resected between the DBL or IBP patients (P=0.11). The mean brow tissue removal in the DBL group was 9.21 ± 0.21 mm, and the mean distance of suture placement above the superior orbital rim in the IBP group was 16.61 ± 0.69 mm, both of which were similar between sexes in each group. 76.5% (26/34) of all brows that underwent DBL experienced any increase in brow curvature, compared to only 36.1% (13/36) of all IBP brows (P<0.001, Figure 2). Within the DBL group, the mean increase in preoperative to post-operative BCI was statistically significant (+2.75E-06, P<0.001). However, the mean increase of preoperative to post-operative BCI of the IBP group was not statistically significant (+3.17E-07, P=0.2). Within the DBL group, 77.8% (14/18) of men experienced an increase in brow curvature compared to 75.0% (12/16) of

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women (*P*=0.849). Within the IBP group, 43.8% (7/16) of men experienced an increase in brow curvature compared to 30.0% (6/20) of women (*P*=0.393) (Table 2).

Conclusions: Brow curvature increases more after a direct brow lift compared to an internal browpexy. This study also suggests that men develop greater changes in brow curvature regardless of surgical technique, which should be a consideration during preoperative counseling.

Figure 1. Sample brow tracing in ImageJ; Fig. 1A depicts brow tracing at pre-operative visit; Fig. 1B depicts brow tracing from visit at post-operative month 3 from blepharoplasty and direct brow lift.

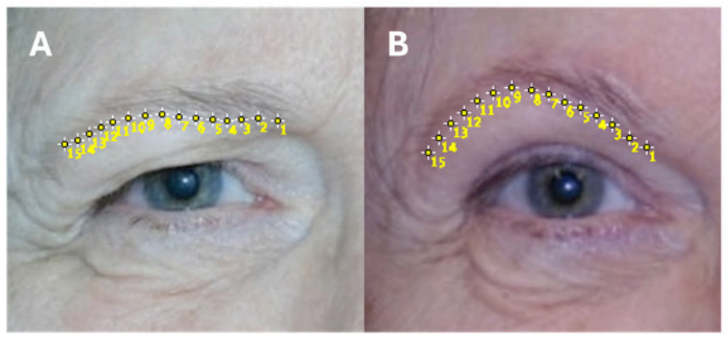

Table 1. Baseline demographics

		Direct Brow Lift (34)	Internal Browpexy (36)	*P*-value
Number (people)	*Overall* *Female* *Male*	17 8 9	18 10 8	0.615
Number (eyes)	*Overall* *Female* *Male*	34 16 18	36 20 18	0.615
Age (years ± SD)	*Overall* *Female* *Male*	69.9 ± 7.1 68.0 ± 9.4 71.5 ± 4.1	64.5 ± 8.0 65.3 ± 7.3 63.5 ± 9.2	**0.037**
Blepharoplasty tissue removal (mm ± SEM)	*Overall* *Female* *Male*	9.38 ± 0.86 9.44 ± 1.05 9.33 ± 0.71	8.75 ± 0.94 9.20 ± 0.92 8.44 ± 0.65	0.11
Brow tissue removal (mm ± SEM)	*Overall* *Female* *Male*	9.21 ± 0.21 9.31 ± 0.37 9.11 ± 0.26	N/A	0.654
Dissection above superior orbital rim (mm ± SEM)	*Overall* *Female* *Male*	N/A	16.61 ± 0.69 16.20 ± 0.88 17.13 ± 1.14	0.523

SD = standard deviation; SEM = standard error of the mean

Figure 2. Effectiveness of direct brow lift and internal browpexy on increasing brow curvature

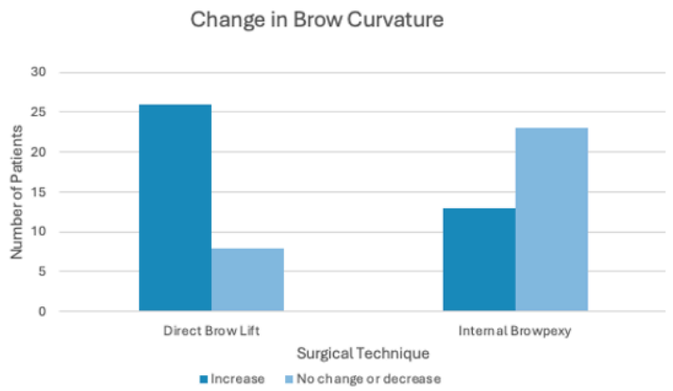

Table 2. Comparison of preoperative and post-operative brow curvature

		Preoperative BCI (*f''(x)*)	Post-operative BCI	Difference in BCI	Change in BCI	*P*-value
Direct Brow Lift (n=34)	*Overall* *Female* *Male*	-3.05E-06 ± 2.63E-06 -2.37E-06 ± 2.49E-06 -3.65E-06 ± 2.67E-06	-5.81E-06 ± 4.71E-06 -4.11E-06 ± 3.81E-06 -7.32E-06 ± 5.01E-06	+2.75E-06 +1.74E-06 +3.66E-06	Increase in curvature	**<0.001**
Internal Browpexy (n=36)	*Overall* *Female* *Male*	-7.64E-07 ± 2.69E-06 -1.26E-06 ± 3.17E06 -1.48E-07 ± 1.85E-06	-1.08E-06 ± 2.57E-06 -1.34E-06 ± 3.02E-06 -7.60E-07 ± 1.93E-06	+3.17E-07 +7.99E-08 +6.13E-07	Minimal increase in curvature	0.208

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A Peculiar Pathology: A Literature Review and Case of Periorbital Intravenous Lobular Pyogenic Granuloma

Persiana Saffari[1], Ben Glasgow[2], Kelsey Roelofs[3]

[1]David Geffen Medical School, University of California, Los Angeles, Los Angeles, California, United States, [2]Department of Ophthalmology, University of California, Los Angeles, Los Angeles, California, United States, [3]Department of Ophthalmology, University of Alberta, Edmonton, Alberta, Canada

Introduction: The purpose of this report is to discuss the clinical presentation, histopathologic findings, and literature surrounding periorbital intravenous lobular pyogenic granuloma (ILPG).

Methods: A 42-year-old male with a history of metastatic testicular cancer treated with right orchiectomy and chemotherapy now nine years in remission presented to clinic with a palpable, mobile, mildly erythematous subcutaneous nodule along the medial lower eyelid/cheek junction (Figure 1). He noticed worsening swelling in the area over several weeks and was prescribed cephalexin by another provider, which did not resolve the fullness. There was no associated pain or change in vision.

During excision, the lesion was noted to be well circumscribed and tubular in nature, without any gross pathologic change to the surrounding tissues. The specimen was processed for routine paraffin embedding. Immunohistochemistry was performed by standard methods.[1]

Results: Histopathologic findings include an intravascular lobular tumor composed of capillaries with endothelial cells and pericytes (Figure 2). Ectatic capillaries were noted centrally in the lobules. Marked reactivity to anti-Wilms tumor type 1 (WT-1) – a typical characteristic of ILPGs – and anti-Smooth muscle actin (SMA) was noted in the capillary structure.[1] Trichrome elastic stain showed smooth muscle and lamellar layers of elastic tissue, consistent with the lesion's intra-venular location. The patient is now two months post-excision with no recurrence.

A review of the literature identified six patients presenting with similar subcutaneous nodules that returned on pathology as ILPGs affecting the eyelid and/or surrounding periorbital region. All six patients were treated with local excision.[2–5] Including the present case, only one patient (1/7; 14.3%) noted pain as a symptom while five noted swelling or fluctuance of their mass (5/7; 71.4%). Of the three patients who had follow-ups at 2-7 years post-excision, none had recurrence.

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Conclusions: Intravenous lobular pyogenic granuloma can be included on the differential for a well circumscribed, subcutaneous mass in the periocular region. They commonly present with fluctuating fullness and swelling and are typically painless.

ILPG is classified as a polypoid-presenting solid tumor composed of epithelioid-appearing endothelial cells.[6] On histology, ILPG classically presents as an intraluminal polyp retained within the wall of a vein and is comprised of lobules of capillaries. On high power magnification, there are elongated spindle cells with numerous mitotic figures within the edematous fibromyxoid stroma.[6] ILPG is considered a pyogenic granuloma as its edema often resembles granulation tissue. On immunohistochemistry, WT-1 serves as a tremendous tool for differentiating between vascular malformations and cutaneous vascular tumors, as the WT-1 gene is expressed in the endothelium of tumors and hemangiomas but not vascular malformations.[7,8] This explains the strong reactivity ILPGs have to anti-WT-1.

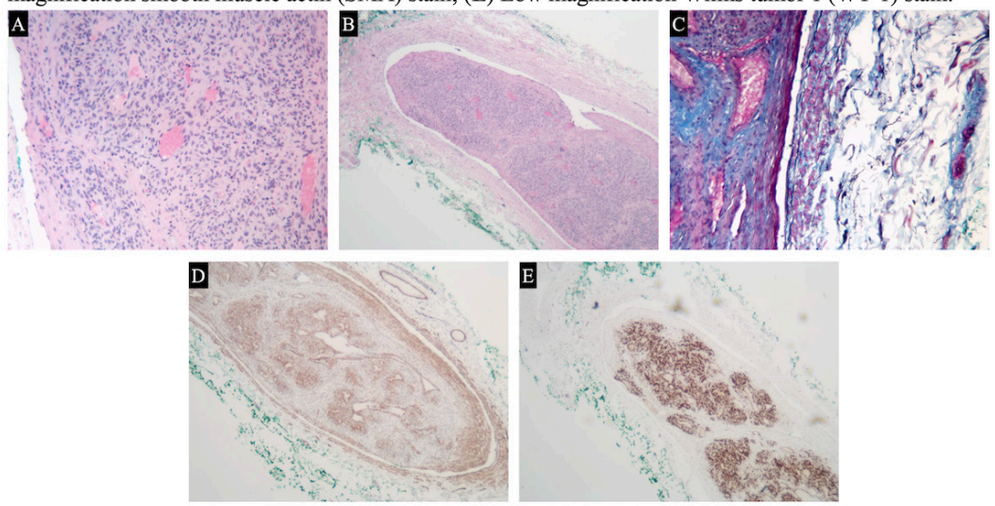
The etiology of periorbital ILPG is unknown at present. Most cases are managed with surgical excision, and recurrence appears to be uncommon. In sharing the cases and the histopathologic underpinnings of periorbital ILPG, we aim to elucidate this peculiar pathology for oculoplastic and reconstructive surgeons.

Figure 1

Figure 1. Photograph of subcutaneous nodule found on the left lower medial eyelid.

Figure 2

Figure 2. Histopathologic samples from the excised lesion. (**A**) High magnification hematoxylin and eosin (H&E) stain; (**B**) Low magnification H&E stain; (**C**) Trichome elastic stain of vessel wall; (**D**) Low magnification smooth muscle actin (SMA) stain; (**E**) Low magnification Wilms tumor 1 (WT-1) stain.



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Blinking Pattern and Dry Eye: A Videographic Analysis

Guy Ben Simon, Roee Arnon, Joel Gutovitz, Orit Ezra, Irit Barequet, Daphna Landau
Ophthalmology, Sheba Medical Center, Ramat Gan, Israel

Introduction: To explore possible association between blinking pattern and dry eye

Methods: A single center, cross sectional study. Two groups of patients participated in this study: patients diagnosed with dry eye syndrome vs. patients without dry eye diagnosis. The voluntary blink was recorded using a smart-phone high-speed camera, and the videos were blindly analyzed by a senior oculoplastic surgeon (GBS) for brow lift, blepharospasm, imbrication, lagophthalmos, margin entropion, retraction, lid separation delay, lash ptosis, dermatochalasis, and an increase in tear lake. Patients were assessed for dry eye using the ocular surface disease index score (OSDI), tear break-up time (TBUT), Schirmer's test, fluorescein and lissamine green stains. For each patient only the right eye was included to avoid inter eye correlation.

Results: 54 patients were included, with 27 in each group. The mean age was 65.3 years (range 26-87), and 31 (57%) were females. The mean visual acuity was 20/26. Dry eye patients were significantly younger (61 vs. 70 years, P=0.03). Additionally, they had a shorter tear breakup time (7 vs. 9 seconds), a lower Schirmer score (9 vs. 14mm), and increased fluorescein staining (P<=0.05 for all). Lissamine green staining was similar in both groups. The female gender was more prevalent in the dry eye group (78% vs. 37%, P=0.002, chi-square). Blepharitis and MGD were both associated with the diagnosis of dry eye. Initially, none of the blinking characteristics were more prevalent in the dry eye group. However, we noticed that 10 patients in the control group had OSDI scores similar to those of dry eye patients. Therefore, the data were reanalyzed according to OSDI score. Patients with moderate to severe dry eye (OSDI >= 23) experienced more eyelid margin rotation during blinking (P=0.037, chi-square).

Conclusions: Patients with moderate to severe dry eye, as indicated by their OSDI score, showed more eyelid margin rotation during blinking. This, along with the increased prevalence of blepharitis and MGD, may suggest potential surgical treatment options to address the ocular surface disturbances in dry eye patients.

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Effect of Subcutaneous Tranexamic Acid on Hemostasis and Ecchymosis in Oculofacial Procedures: A Double-Blind, Placebo-Controlled, Randomized Trial

Wenyu Deng[1], Michael Kozlov[2,1], Roman Shinder[1,3]

[1]Ophthalmology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States, [2]CUNY Brooklyn College, Brooklyn, New York, United States, [3]Otolaryngology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States

Introduction: Intraoperative bleeding can prolong surgical time, obscure exposure, increase cautery use with subsequent scarring, and necessitate using expensive hemostatic products. Postoperative bleeding may lead to delayed healing, patient discomfort, anxiety, and trips to the ER. Tranexamic acid (TXA) is a lysine analogue that acts as an antifibrinolytic by preventing plasminogen activation to plasmin. TXA has been used safely systemically and locally to reduce bleeding in periocular surgery, facelift, rhinoplasty, and other procedures. The aim of this study was to assess the hemostatic effect of subcutaneous TXA in varied oculofacial procedures.

Methods: Prospective, randomized, placebo-controlled, double-blind study of consecutive patients undergoing oculofacial procedures by a single surgeon (RS) between July 2020-July 2023. Exclusion criteria included age 200 mmHg, prior history of oculofacial surgery or trauma, and follow-up < 1 month. Antithrombotics were held seven days prior to surgery. Patients were randomized to either receive local anesthesia with or without TXA that was drawn up by a nurse. The same volume of local anesthetic was injected in all similar surgeries. For bilateral procedures (*e.g.*, blepharoplasty) patients were randomized to receive TXA solution in one eyelid while the contralateral lid received placebo. The TXA solution contained equal volumes of 1% lidocaine with epinephrine 1:100,000 and 0.5% bupivacaine with epinephrine 1:200,000 in addition to 100 mg/ml TXA to yield a concentration of 1mg TXA/1 ml local anesthetic. The placebo solution replaced the TXA with normal saline (Fig 1 shows an example of 2 ml solutions). Patient and surgeon were blinded to which solution was being injected. Most procedures were performed in an office-based procedure room under local anesthesia utilizing high temp handheld cautery when needed. DCR represented an exception which was performed in an operating room under general anesthesia utilizing monopolar cautery when needed. Cautery was not used in conjunctiva muller muscle resection, entropion/ectropion repair, or levator advancement procedures. Hemostatic agents were not used in any cases. Operative and cautery time were recorded by nursing staff. Photos were taken at postoperative day (POD) 7. Two blinded oculoplastic surgeons scored ecchymosis using the 4-point Winker-Black bruising scale. Patients recorded the POD the ecchymosis resolved.

Results: A summary of patient outcomes is illustrated in Table 1. Treatment groups for all procedures were similar in terms of gender, age, medical history, and ultimate histopathologic diagnosis when biopsy was performed. Duration of cautery and surgery, ecchymosis

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grade on POD 7, and duration to ecchymosis resolution were all significantly less for the patients treated with TXA for all surgical procedures (Fig 2). No complications including thromboembolic events were noted in the TXA group.

Conclusions: Subcutaneous TXA in local anesthetic proved safe and effective at reducing bleeding, surgical time, ecchymosis at POD 7, and a shorter overall duration of ecchymosis in this cohort. Clinicians may wish to consider the use of TXA when performing oculofacial procedures. Future studies are warranted to investigate ideal route and dose of TXA, utilization in patients taking anticoagulants, and for other oculofacial surgeries.

Figure 1

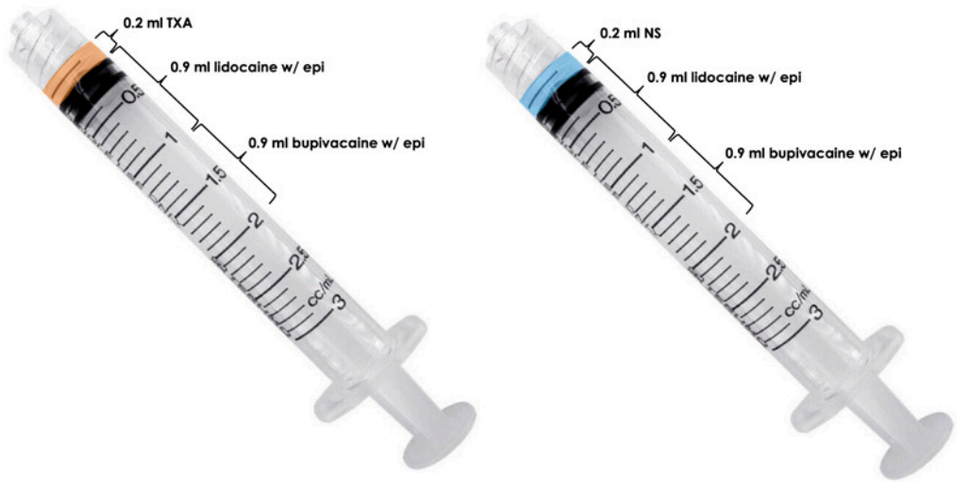

Figure 2

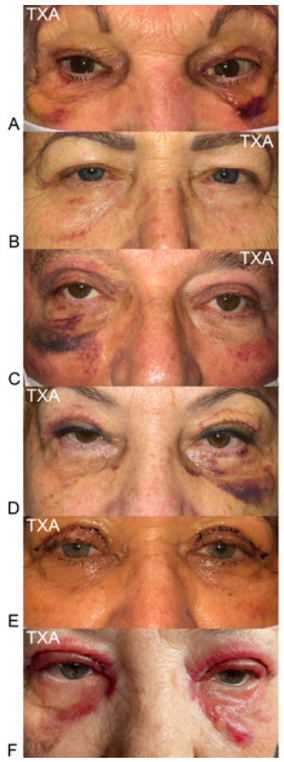

Table 1.

Criteria/Demographics	TXA	Placebo	P-value
Lacrimal gland biopsy 56 Patients (M=36%, F=64%); Mean age = 56.6 years (range = 24-87)			
Duration of surgery (minutes)	22.8	26.6	0.024
Duration of cautery (seconds)	11.2	28	<0.01
POD 7 ecchymosis (0=none, 1=mild, 2=moderate, 3=severe)	1.2	2.5	<0.01
Days until ecchymosis resolution	8.8	12.7	<0.01
Upper Blepharoplasty 1110 Patients (M=38%, F=62%); Mean age = 65.6 years (range = 38-87)			
Duration of surgery (minutes)	12.1	13.9	0.032
Duration of cautery (seconds)	24	73	<0.01
POD 7 ecchymosis	0.9	1.6	0.014
Days until ecchymosis resolution	12.3	15.6	0.026
DCR 238 Patients (M=36%, F=64%); Mean age = 67.6 years (range = 36-92)			
Duration of surgery (minutes)	26.4	29.8	0.021
Duration of cautery (seconds)	3.4	17.2	<0.01
POD 7 ecchymosis	1.1	2.4	<0.01
Days until ecchymosis resolution	8.3	12.1	0.019
CMMR 926 Patients (M=33%, F=67%); Mean age = 64.2 years (range = 27-98)			
Duration of surgery (minutes)	4.2	4.7	0.036
POD 7 ecchymosis	0.6	1.3	0.018
Days until ecchymosis resolution	6.4	8.7	0.011
Involutional Entropion 91 Patients (M=48%, F=52%); Mean age = 65.2 years (range = 57-101)			
Duration of surgery (minutes)	9.7	11.1	0.022
POD 7 ecchymosis	0.8	1.4	0.029
Days until ecchymosis resolution	7.3	9.1	0.027
Involutional Ectropion 114 Patients (M=46%, F=54%); Mean age = 69.2 years (range = 58-91)			
Duration of surgery (minutes)	8.4	10	0.021
POD 7 ecchymosis	0.7	1.3	0.019
Days until ecchymosis resolution	7.1	9	0.033
External Levator Advancement 46 Patients (M=37%, F=63%); Mean age = 65.8 years (range = 31-84)			
Duration of surgery (minutes)	18.4	22.6	0.024
POD 7 ecchymosis	0.6	1.2	0.029
Days until ecchymosis resolution	6.9	8.3	0.018

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Free Graft-on-Graft Reconstruction of Large Eyelid Defects

Wenyu Deng[1], Michael Koslov[2,1], Roman Shinder[1,3]
[1]Ophthalmology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States, [2]CUNY Brooklyn College, Brooklyn, New York, United States, [3]Otolaryngology, SUNY Downstate Health Sciences University, Brooklyn, New York, United States

Introduction: Classic surgical teaching advocates against a graft-on-graft reconstruction as blood supply would be suboptimal, and failure rate would be high secondary to necrosis. Traditionally, large full thickness eyelid reconstruction may utilize only one graft for either the anterior or posterior lamella, with the other lamella being repaired with a pedicle flap to provide blood supply to the adjacent graft. Such techniques have inherent drawbacks including obstructing the visual axis in a disfiguring way and requiring a second operation. Recent reports describe grafting techniques for full-thickness lid defects and demonstrated revascularization post-operatively via laser speckle contrast imaging.[1,2,3] Surgical success was attributed to the rich vascular supply in the periocular area. We herein describe our experience using a single stage graft-on-graft technique to reconstruct large full thickness eyelid defects after Mohs micrographic surgery.

Methods: This is a retrospective noncomparative review of consecutive patients who underwent graft-on-graft reconstruction for large (>50%) full thickness eyelid defects after Mohs micrographic surgery by the senior author (RS) within 24 hours of tumor excision between July 2021 – July 2023. Excluded were patients with follow-up <6 months, or prior eyelid trauma/surgery. The posterior lamella was reconstructed with a free tarsoconjunctival graft from the ipsilateral upper lid for lower lid defects or contralateral upper lid for upper lid defects. The anterior lamella was reconstructed using a full thickness skin graft harvested from the upper lid when able or postauricular area as a second line harvest site. The grafts were harvested and secured in typical fashion. Cautery was used by the Mohs surgeon at their discretion but not used in the recipient bed during reconstruction. Tobramycin/dexamethasone ointment was applied, and a pressure patch utilized for 5 days. Patients were seen at post-operative day 5, month 1, month 3, and month 6 with photographs taken and complications noted at each visit. Functional integrity, viability of grafts and cosmesis were evaluated at each visit.

Results: Nine patients (6 female, 3 male) with a mean age of 66 (22-87) years were included. Risk factors for poor wound healing included diabetes (3 patients), anticoagulants (3), smoking (3), obesity (3), COPD (2), and peripheral vascular disease (2). Three patients had upper lid reconstruction while 6 had lower lid reconstruction. No intraoperative complications occurred. The grafts survived in all patients with no cases of necrosis. All patients displayed functional integrity, and all were subjectively satisfied (Fig 1, 2). Complications included lateral canthal rounding (1), mild hypertrophic skin graft (1), and mild ectropion (1)—none of which required revision. Mean follow-up was 14.2 (6-22) months.
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Conclusions: The free graft-on-graft technique appears to be a viable option for the repair of large full thickness eyelid defects even among patients who have risk factors for poor wound healing. Advantages over more conventional lid sharing procedures include a single operation and avoiding the functional and cosmetic downsides that come between the first and second stages of such surgeries. Surgeons may wish to consider this technique especially when the involved lid is ipsilateral to the better seeing eye. Future larger studies are warranted to corroborate the promising findings in our cohort.

Figure 1

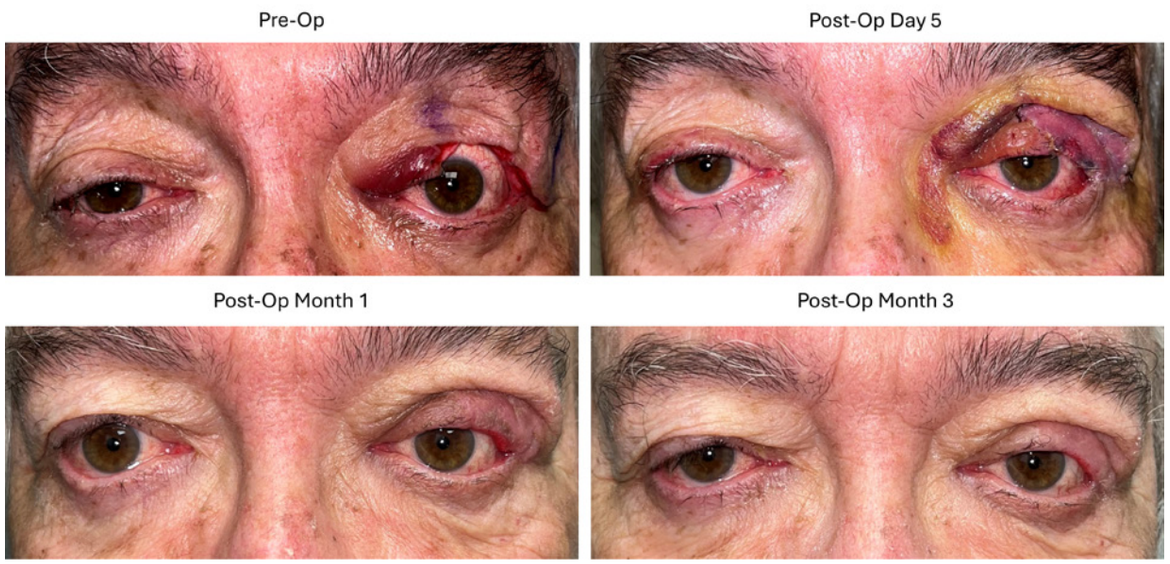
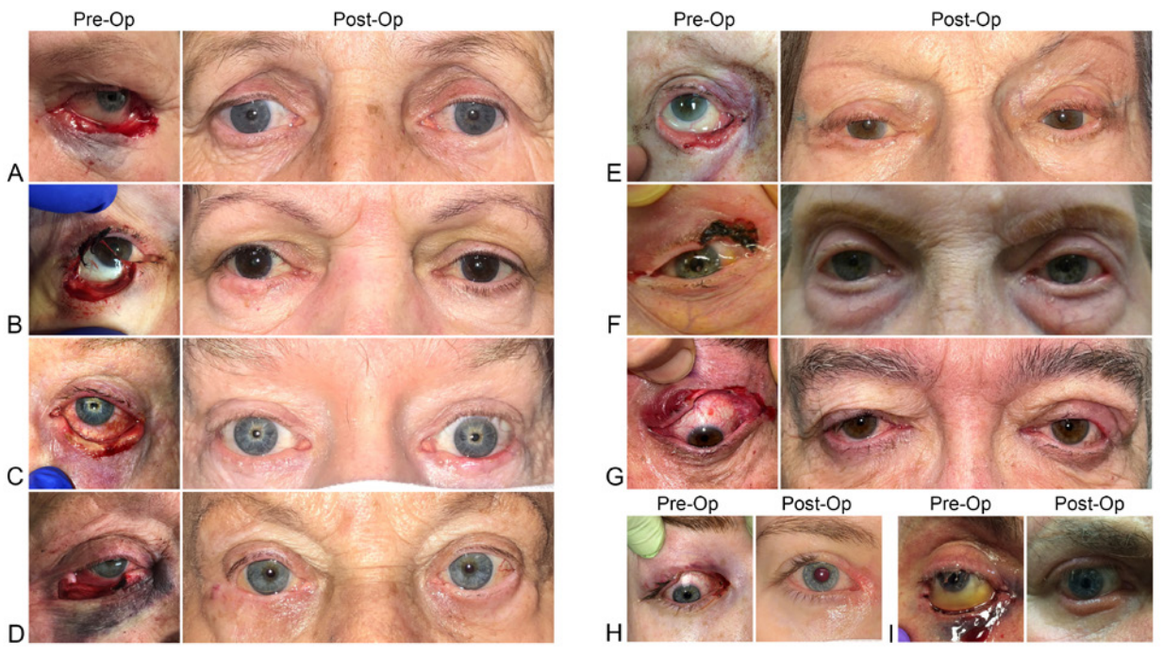


Figure 2



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Nonsurgical Treatment of Lower Lid Ectropion

Brett Pariseau[1,2]

[1]SSM Health Davis Duehr Dean, Madison, Wisconsin, United States, [2]Department of Ophthalmology and Visual Sciences, University of Wisconsin, Madison, Wisconsin, United States

Introduction: Patients with tight lower lid skin often have chronic blepharitis with skin contraction (cicatricial ectropion), or heavy cheeks and jowls dragging the lower lids downward (mechanical ectropion). In both cases, there is not enough lower lid skin to correct the ectropion with a simple lateral tarsal strip procedure. Traditionally, full-thickness skin grafts are used to lengthen the anterior lamella for cicatricial ectropion and patients with heavy cheeks require mid-face suspension. The author presents a lower lid ectropion protocol that has greatly decreased the need for skin grafting or midface suspension, and frequently corrects ectropion without surgery.

Methods: Patients are instructed to "heat, clean, stretch, Vaseline." This rhyme reminds patients to 1) apply warm compresses to their lids five minutes daily, 2) wash lashes, lids and face with glycerin facial cleanser twice daily, 3) hold a finger parallel to the lower lid lashes and push the lower lid upward to the top of the eye, holding a steady stretch for two minutes four times daily, 4) apply a light layer of petroleum jelly to the lower lids after lid pushups and at night after cleaning. Patients are advised to use artificial tears and lubricating gels to protect their eyes. They are followed every 1-3 months until the ectropion has resolved or improvement has stabilized.

Results: A series of before and after photos show representative patients whose ectropion resolved or greatly improved without surgery. The photos demonstrate how lower lid skin tone and elasticity improve with treatment. This protocol, developed in 2019, decreased the incidence of using skin grafts to treat lower lid ectropion from seventeen cases in 2015-2018, (4.25 annual incidence) to three cases in 2019-24 (0.56 annual incidence), a 7.6 relative rate reduction.

Conclusions: To the author's knowledge, this is the first description of a home treatment protocol for patients who never had surgery. Eyelid skin is dynamic and responds to environmental changes. Patients prefer avoiding lower lid skin grafts to treat their ectropion and are motivated to try home treatment prior to considering surgery. Once they see improvement and their eyes are more comfortable, they become even more driven. Using this lower lid ectropion protocol in our practice has decreased the incidence of skin grafting, reduced surgical complexity, improved patient compliance, and treats concordant blepharitis/meibomian gland dysfunction.

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Figure 1

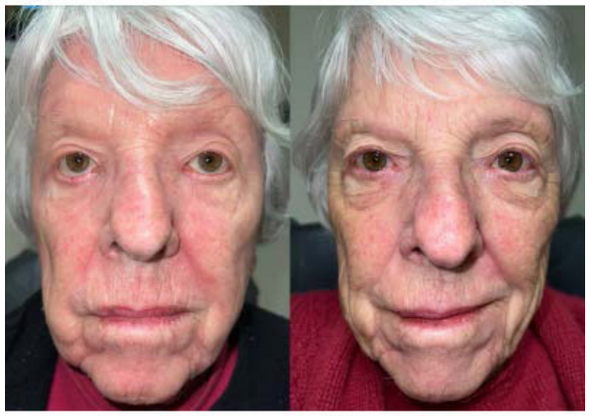


Figure 2

Figure 3

Figure 4

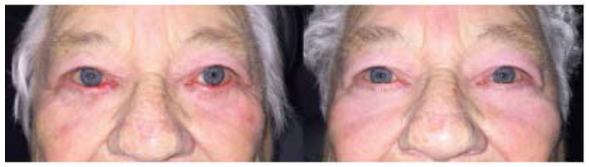
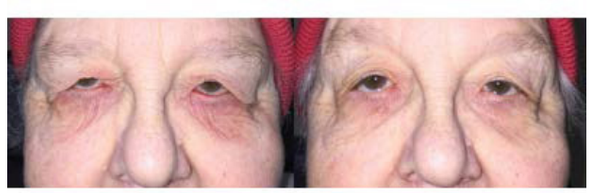


Figure 5



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Prophylactic Treatment of Monkeypox Associated Eyelid Lesions: A Case Report

Lisa Y. Lin[1], Aaron R. Kaufman[2], Amy Sbrolla[3], Elizabeth Hohmann[3], James Chodosh[4], Suzanne K. Freitag[1]
[1]Ophthalmic Plastic Surgery Service, Department of Ophthalmology, Massachusetts Eye and Ear, Harvard Medical School, Boston, Massachusetts, United States, [2]Cornea Service, Department of Ophthalmology, Massachusetts Eye and Ear, Harvard Medical School, Boston, Massachusetts, United States, [3]Department of Infectious Disease, Massachusetts General Hospital, Boston, Massachusetts, United States, [4]Department of Ophthalmology and Visual Sciences, University of New Mexico School of Medicine, Albuquerque, New Mexico, United States

Introduction: Human Monkeypox Virus (HMPXV) is an orthopoxvirus that causes mpox, a zoonosis with a characteristic mucocutaneous eruption. A global outbreak of mpox is ongoing since 2022. Monkeypox-related ophthalmic disease (MPXROD) is rare and includes periorbital skin lesions, conjunctivitis, and keratitis.[1] Some cases of fulminant ophthalmic involvement result in vision loss and death.[2] Herein, we present a case of MPXROD affecting the eyelid margin, managed with systemic tecovirimat and topical trifluridine eye drops to prevent autoinoculation of the ocular surface.

Methods: Case Report.

Results: A 24-year-old male with a history of ulcerative proctitis presented to an infectious disease clinic with 4 days of left upper eyelid swelling, and painful genital and buttock lesions. He reported recent unprotected sex with a new male partner and had not received vaccination for Mpox with the vaccine. On examination, he had numerous genital and anal vesicular lesions and shallow ulcerations, most consistent with HMPXV, which were swabbed for PCR for HSV and HMPXV. He was referred to the oculoplastic service for management of his eyelid lesions. He had two pustular lesions at the left medial upper eyelid margin, with focal erythema and edema (Figure 1) and a mild follicular reaction of the inferior palpebral conjunctiva just inferior to these lesions. There were no discrete ocular surface mpox lesions.

The patient was enrolled in the Study of Tecovirimat for Human Monkeypox Virus (STOMP) trial, an ongoing multi-center randomized clinical trial, while awaiting viral testing results.[3] The patient qualified for open-label treatment based upon ocular involvement and severe peri-anal lesions (tecovirimat 600mg every 12 hours for 14 days). Given a risk for auto-inoculation of the ocular surface from the marginal lid lesion location, he was treated with topical trifluridine 1% ophthalmic solution at twice daily dosing for 7 days to prevent ocular surface disease while limiting medication toxicity. His ophthalmic exam was monitored daily via telemedicine. PCR confirmed

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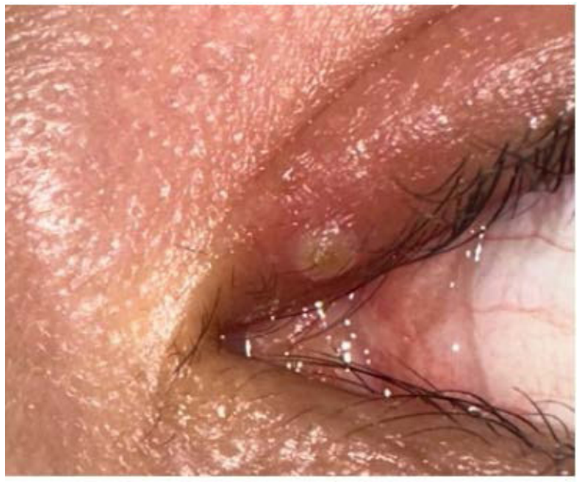
HMPXV infection. By day 3, his eyelid lesions had begun crusting, and by day 7, had fully resolved. He did not develop any new ocular surface signs. Two weeks after initiation of systemic treatment, his genital and anal involvement had nearly fully resolved.

Conclusions: We describe a patient with eyelid margin mpox lesions that were treated with systemic tecovirimat and topical trifluridine. Therapeutic treatment of MPXROD with trifluridine has been recommended,[1] but use of trifluridine for preventing ocular surface involvement has not been well characterized. Mild isolated eyelid HMPXV is also not well described in the oculoplastic literature. Oculoplastic surgeons should maintain a high clinical suspicion for HMPXV lesions in the ongoing global outbreak, as these lesions may mimic other diagnoses, such as molluscum contagiosum or HSV.[4] Evidence-based management recommendations in MPXROD are limited due to rarity. This case adds to the growing body of evidence on MPXROD management and suggests a possible role for prophylactic trifluridine in predominant eyelid involvement. Our patient showed clinical improvement of eyelid lesions and no further progression of his mild conjunctival follicular response with combined systemic and topical antiviral treatment.

Figure 1



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Prospective Randomized Controlled Study to Evaluate a Modified Botulinum Toxin Injection Pattern for Treatment of Benign Essential Blepharospasm

Collin Anderson[1], Robert Contento[2], Robert Hill[1], Bryant Carruth[1], George Salloum[1], Thomas Bersani[1]
[1]Ophthalmology and Visual Sciences, SUNY Upstate Medical University, Syracuse, New York, United States, [2]SUNY Upstate Norton College of Medicine, Syracuse, New York, United States

Introduction: The purpose of this study was to compare duration of effect, effectiveness of spasm control, and complication rates between an established versus a modified pretarsal botulinum toxin injection pattern for treatment of benign essential blepharospasm (BEB).

Methods: In this prospective randomized controlled study, an established botulinum toxin injection pattern[1,2] (onabotulinumtoxinA) was compared to a modified pretarsal pattern for treatment of BEB. Included were patients with clinically diagnosed BEB. Excluded were patients who had received prior myectomy. Patients were randomly assigned to receive the established pattern on one side, and the modified pattern on the other, effectively serving as their own controls (Figure 1). Dosing was approximately 50 units (U) total (25U on each side); 2 patients received 60U total (30U on each side), however the relative proportion delivered to the eyelid margin was consistent among all patients. Primary endpoints were duration of effect, effectiveness of spasm control, and complications, as rated by a follow-up questionnaire using a Likert 10-point scale. Two-tailed paired samples t-tests were used to compare means between groups ($a<0.05$).

Results: A total of 8 patients were enrolled, all of whom were female. Mean age was 71.0±9.53 years (M±SD). Mean time to follow-up was 110±26.9 days (Table 1). Mean duration of effect was 63.8±36.2 days for established pattern, 82.9±38.4 days for modified ($p=0.13$). Mean effectiveness on a scale of 0 to 10 (10 being most effective) was 6.63±2.13 for established, 7.38±2.13 for modified ($p=0.41$). Mean severity of spasms immediately after injection (0 to 10, 10 being most severe) was 4.13±3.04 for established, 3.13±2.47 for modified ($p=0.17$), whereas severity at follow-up was 6.75±3.20 for established, 4.75±3.37 for modified ($p=0.12$). Pain level during injection (0 to 10, 10 being most painful) was 2.63±2.20 for established, 4.63±3.25 for modified ($p=0.09$) (Table 2). For the established pattern, 5 patients complained of dry eye, 4 of tearing, 1 of diplopia, and 2 of ptosis. For the modified pattern, 6 patients complained of dry eye, 3 of tearing, 1 of diplopia, and 1 of ptosis (Table 3).

Conclusions: A modified pretarsal botulinum toxin injection pattern may afford BEB patients clinically significant improvement in both duration and effectiveness of spasm control, without added complications.

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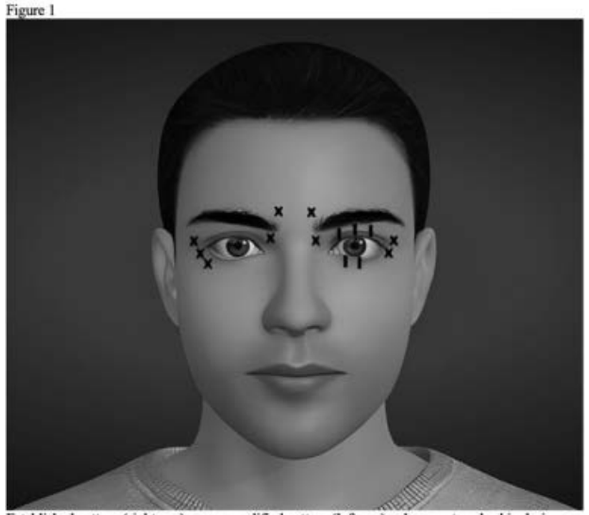
Figure 1

Figure 1



Established pattern (right eye) versus modified pattern (left eye), where pretarsal orbicularis around the eyelid margin is treated. x = 5 units, line = 1 unit.

Table 1
Patient Characteristics

	N=8, %
Sex (F)	8 (100)
	Mean±SD
Age (years)	71.0±9.53
Time to follow-up (days)	110±26.9

Table 2
Comparison Between Established and Modified Pattern

	Established (Mean±SD)	Modified (Mean±SD)	*p*-value
Duration of effect (days)	63.8±36.2	82.9±38.4	0.13
Effectiveness (0-10)	6.63±2.13	7.38±2.13	0.41
Spasm severity immediately (0-10)	4.13±3.04	3.13±2.47	0.17
Spasm severity at follow-up (0-10)	6.75±3.20	4.75±3.37	0.12
Pain at time of injection (0-10)	2.63±2.20	4.63±3.25	0.09

Table 3
Complications Between Established and Modified Pattern

	Established (N=8)	Modified (N=8)
Dry Eye	5	6
Tearing	4	3
Diplopia	1	1
Ptosis	2	1

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Scleral Contact Lens Designed to Reduce Ptosis

Zvi Gur, Shahar Luski, Itay Lavy, Nir Erdinest
Ophthalmology, Hadassah Medical Organization, Jerusalem, Israel

Introduction: Our study aimed to explore whether scleral contact lenses can be designed to reduce ptosis effectively.

Methods: Eight (8) patients, five (5) males, with an average age of 39.3±14, were included in this study. All had monocular ptosis. Four had worn rigid gas permeable lenses, three post-trauma, one with an oculomotor palsy. To create a type of upper lid support, all these patients were fit with an asymmetrical scleral lens design with a superior limbal clearance of above 250 microns. The patients were also fitted with a soft lens. The upper lid marginal reflex distance (MRD) was measured without a lens, the soft lens, and the scleral lens using the Image Pro-Plus Software (Image Pro-Plus 6.0; Media Cybernetics, Silver Spring, MD, USA). Statistical analyses were conducted using the Statistical Package for Social Sciences software 25.0 (SPSS Inc., Chicago, Illinois, USA). To assess MRD in each group paired t-tests were employed.

Results: The MRD did not change with the soft lens compared to without a contact lens. The MRD increased with the scleral lens compared with the soft lens with an average of +2.38±0.79 mm ($P<0.01$).

Conclusions: The superior excessive limbal clearance scleral lens design effectively decreased monocular ptosis in these patients.

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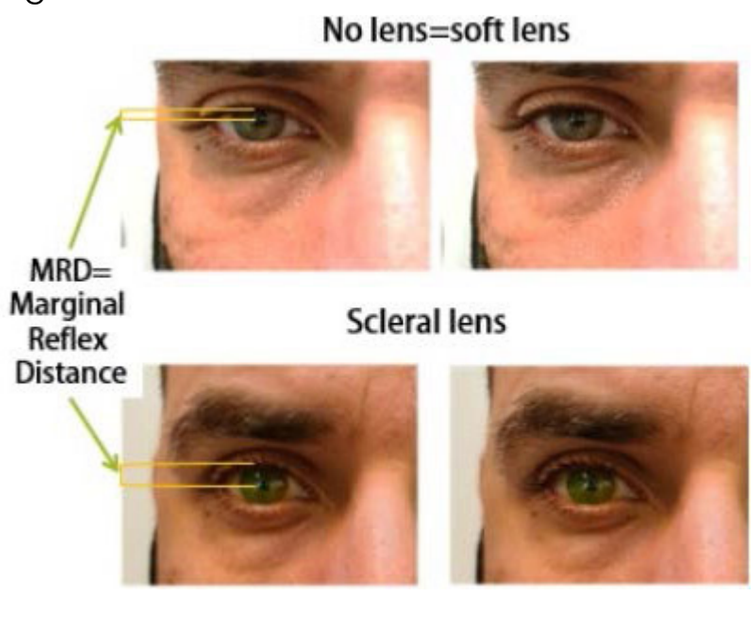
Figure 1



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Voluntary Maximal Eyelid Opening versus Levator Excursion as a Predictor of Success for Ptosis Surgery

Persiana Saffari[1], Daniela Markovic[2], Daniel Rootman[3]

[1]David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, California, United States, [2]Department of Medicine Statistics Core, University of California, Los Angeles, Los Angeles, California, United States, [3]Division of Orbital and Ophthalmic Plastic Surgery, Jules Stein Eye Institute, Los Angeles, California, United States

Introduction: The purpose of this study is to explore if preoperative voluntary maximal eyelid opening may serve as a good predictor of ptosis surgery outcomes.

Methods: In this cross-sectional study, subjects were screened if they carried a diagnosis of involutional ptosis, with levator excursion > 12mm, and underwent ptosis surgery. Those with preoperative photos captured with the eyelid in repose (primary position) and in voluntary maximal eyelid opening (VMEO) were included. Postoperative photos were obtained at least 1.5 months following surgery. Patient age, sex, laterality of surgery, and surgery type were extracted from patient records. The main outcome measures were postoperative changes in marginal reflex distance 1 (MRD1). Surgical success was defined as a postoperative change in MRD1 in primary position of > 2 mm.

MRD1 was measured preoperatively and postoperatively in primary position. VMEO was measured preoperatively as the MRD1 after the patient was instructed to open the eyes as widely as possible. Change in MRD1 with VMEO was calculated. Measurements were obtained utilizing ImageJ, scaled to the white-to-white corneal distance of 11.77 for males and 11.64 for females.[1] MRD1 measurements were obtained from the center of the pupil to the most proximal edge of the upper eyelid. Levator excursion was measured clinically utilizing a hand-held ruler during initial consultation with the primary surgeon. Multivariable logistic regression was performed to examine the association between preoperative measures and the odds of postoperative success.

Results: Across the 50 eyelids included in this study, the average age of study participants was 64.6 years (+/-19.2). There were 15 male (46.9%) and 17 (53.1%) female participants. Ptosis surgery was performed on 23 right (46%) and 27 left (54%) eyelids. Surgery type consisted of 45 Müller's muscle-conjunctival resections (MMCR) (90%), four MMCRs with tarsectomy (8%), and one external levator advancement (2%). Mean postoperative follow-up time was 3.64 months (+/- 2.1).

In multivariate modeling (Table 1), preoperative change in MRD1 with VMEO was shown to have a significant positive association with postoperative outcome (change MRD1 > 2mm) ($p<0.05$), while levator excursion ($p=0.375$) was not.

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Conclusions: Our multivariable model described preoperative change in MRD1 and VMEO MRD1, rather than levator excursion, as being predictive of successful postoperative outcomes following ptosis surgery. Further, change in MRD1 with VMEO was shown to have a strong positive association with postoperative change in MRD1 at the primary position, suggesting its fitness as a measurement prior to surgery. This study demonstrates the utility of VMEO as a preoperative measurement when evaluating potential candidates for surgical repair of ptosis.

Table 1. Multivariable logistic regression based on success measure of change in marginal reflex distance 1 (MRD1) > 2mm following ptosis surgery. Parameters (predictors) used by the model include preoperative MRD1 difference (which is the difference between preoperative voluntary maximal eyelid opening (VMEO) and repose MRD1) and preoperative levator excursion. An odds ratio (OR) > 1 indicates a positive association, while an OR < 1 indicates a negative association. $P < 0.05$ was set as significant.

Predictor	Odds Ratio (OR)	p-value
Preoperative Change in MRD1 (VMEO MRD1 - repose MRD1)	2.74488	0.02071
Levator Excursion	1.10688	0.37514

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A Systematic Review of Primary Non-Diploic Ectopic Orbital Meningiomas

Helena Lam[1], Christopher Bogaev[2,3], David Holck[1]

[1]Eyeplastx, San Antonio, Texas, United States, [2]Methodist Hospital Stone Oak, San Antonio, Texas, United States, [3]Neurosurgical Associates of San Antonio, San Antonio, Texas, United States

Introduction: Primary non-diploic ectopic orbital meningiomas represent a distinct very rare subtype of orbital meningioma. In addition to the inclusion of a local case, a systematic review was conducted of the current literature on the disease presentation and management to improve our recognition and management of this rare process.

Methods: A MEDLINE/Pubmed search "ectopic orbital meningioma" was conducted which revealed 44 results from 1973 to 2024. Articles were excluded for secondary etiology, recurrence, intradiploic source, involvement of the intracranial space, non-orbital location, non-meningioma histology, being a primary pathological or radiological study, and being in a non-English language. The remaining articles were reviewed. Our practice includes a case of a 66-year-old female who was referred for ptosis repair of the left eye, found to have superomedial upper lid swelling and a motility deficit in far adduction. Imaging revealed an ill-defined intraconal lesion without calcification abutted to the medial rectus with ethmoidal asymmetry. Discrepancy in exophthalmometry increased from 2 mm to 9 mm over the course of 25 months. Complete resection was successful through transcranial excisional approach without anterior orbitotomy without complication, subsequent radiotherapy, or recurrence.

Results: 16 articles met inclusion criteria and including the present case, 26 reports were reviewed. The average age of presentation was 35 years old (range 7-71), 23% of cases were pediatric, 15% geriatric, and 46% female. 88% presented with "normal" or visual acuity equal or better than 20/40 without pupillary abnormality. 46% were referred for proptosis, 27% for lid edema or ptosis, 4% for vision loss, however 62% also had a motility deficit or diplopia. Duration of symptoms was 22 ± 20 months. 35% of cases reported a history of head trauma and one was during pregnancy. The average proptosis was 5.1 ± 2.8 mm. 23% reported fundoscopic abnormalities, mostly optic disc edema or atrophy. On imaging, 54.2% were ill-defined, 45.8% well-defined, 29.2% with calcification, and 38.5% with sinus asymmetry. 61.5% were superomedial, 23% were intraconal, 7.7% were lateral or inferolateral, and 4% at the lacrimal fossa. Of those specified, 79.2% of cases were resected via anterior orbitotomy, 16.7% transcranially, and 4.2% endonasally. Total resection was accomplished in 68.4% of cases and subtotal in 31.6%. 19% received postoperative radiotherapy. 96% of reported pathological diagnoses were WHO grade I meningiomas. Recurrence was reported in 15.4% of cases at 7 ± 4 months.

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Conclusions: Most cases of primary non-diploic ectopic orbital meningioma are low grade meningiomas that present in the early 30s with a gradual painless progressive unilateral proptosis and motility deficit with normal vision. Imaging commonly reveals an ill-defined medial or superomedial lesion. Management is generally successful with total resection via anterior orbitotomy. Unlike intracranial meningiomas, average age of presentation is younger and equal sex predilection is seen.[1] Diagnosis without histopathology is difficult due to rarity and "ectopic" nature of the tumor. More future reports will help strengthen our understanding of the nature of this disease.

References:

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Assessment of Vision Status and Periocular Defects in Face Transplant Recipients

Kerri McInnis-Smith[1], Caroline Yu[1], Samir Mardini[2], Elizabeth Bradley[1]
[1]Department of Ophthalmology, Mayo Clinic, Rochester, Minnesota, United States, [2]Division of Plastic Surgery, Department of Surgery, Mayo Clinic, Rochester, Minnesota, United States

Introduction: Facial transplantation is an emerging reconstructive option for patients with severely disfiguring craniofacial defects. These injuries most often result from ballistic trauma, thermal burns, neurofibromatosis, or animal attacks.[1] Surgical teams are typically led by a plastic surgeon and involvement of an ophthalmologist varies. Our study aims to describe the visual status and ocular and periocular injuries for facial transplant recipients.

Methods: A descriptive study of the pre-transplant vision status and eye-related injuries of all face transplants completed worldwide between Nov 2005 and Aug 2020 with publicly disclosed patient names was performed. PubMed-indexed articles and publicly available media were reviewed for the search terms: “blind,” “sight,” “eye,” “vision,” “prosthesis,” and “low vision,” along with each recipient’s full name when available. Information collected included patient demographics, mechanism and date of injury, transplant institution, and any relevant pre-operative ophthalmic information regarding vision status. An ASOPRS surgeon and fellow reviewed published photographs and videos for evidence of anophthalmos, eyelid malposition, and anterior segment abnormalities.

Results: 48 face transplants were performed globally from Nov 2005 to Aug 2020, of which 2 were repeat transplants. Of the 46 patients, 27 had publicly available pre-transplant photographs and met study criteria. Ballistic trauma was the most common mechanism of injury (40.7% of cases), followed by thermal burn (18.5%), animal mauling (11.1%), neurofibromatosis (11.1%), electrical burn (11.1%), chemical burn (3.7%) and blunt trauma (3.7%). Either quantitative or qualitative vision status was available for 16/27 patients. Only 3 patients had subjectively good vision bilaterally, 3 patients had unilateral low vision and 6 described bilateral low vision (Figure 1). In addition, 2 patients had bilateral anophthalmos and 2 had unilateral anophthalmos, both with subjectively poor vision in the other eye. Eyelid and periocular abnormalities were present in most patients (88.9%) and, included medial and lateral canthal dystopia and displacement, interpalpebral adhesions, eyelid retraction, ectropion, telecanthus, ptosis and, in a few cases, complete loss of eyelids (Figure 2). On review of pre-operative photos and videos, only 3 patients had grossly normal bilateral eyes and periocular structures.

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Conclusions: Nearly all patients who undergo facial transplantation have some degree of vision impairment and periocular deformities. The goal of facial transplantation should include maintenance of, or ideally improvement, of visual function. Therefore, we recommend a baseline ophthalmologic exam be performed and that the multidisciplinary surgical transplant team include an oculoplastic surgeon.

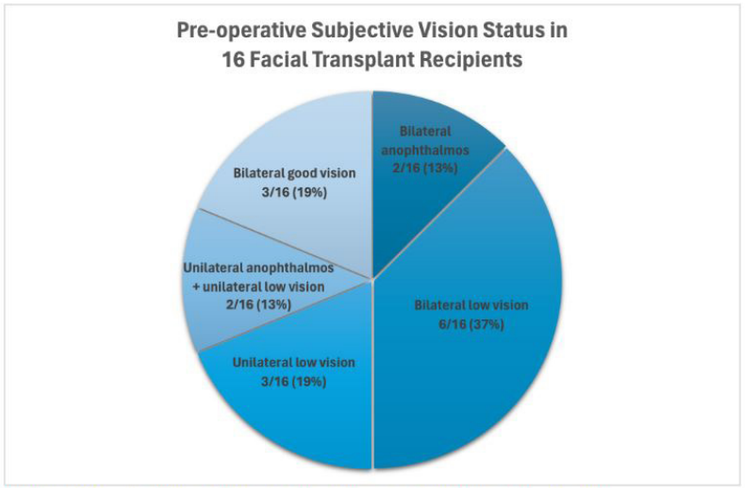

Figure 1: Pre-operative subjective vision status in 16 facial transplant recipients

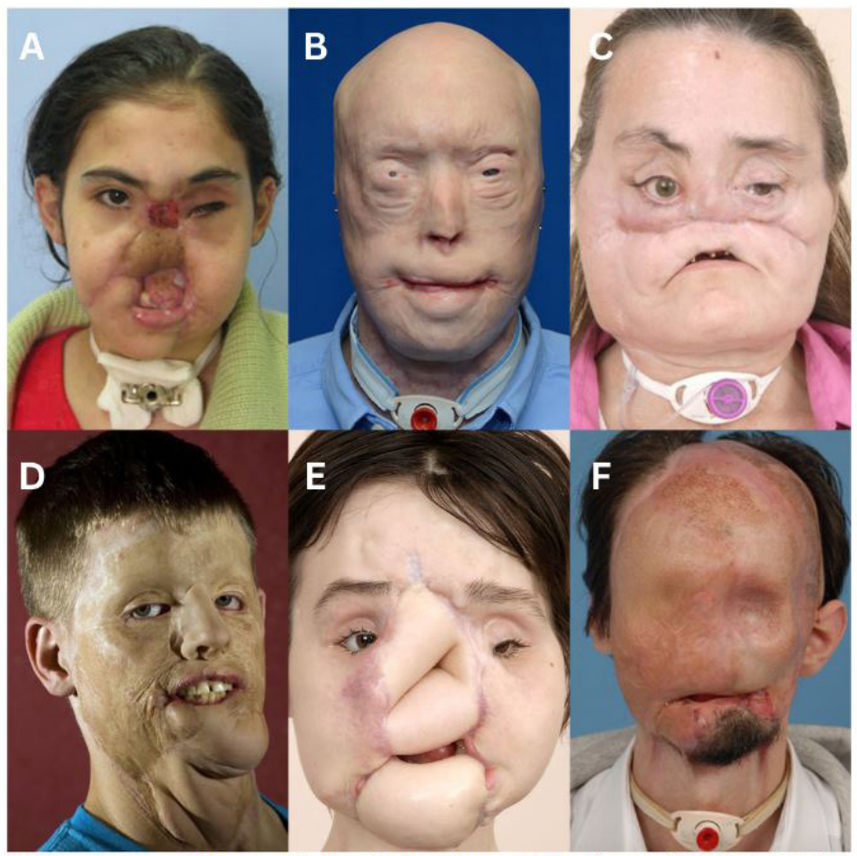

Figure 2: External photographs revealing various pre-operative eyelid and periocular abnormalities, including (A) canthal dystopia/displacement, (B) interpalpebral adhesions, (C) lower eyelid retraction, (D) ectropion, (E) telecanthus, and (F) complete loss of eyelids.

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Dynamicity of Pediatric Orbital Bone Marrow with Growth: An MRI Study

Shang-Te Ma[1,2], Ji Hye Kim[3], Kyung-In Woo[4]
[1]Ophthalmology, Oculoplastic, Taipei Medical University-Shuang Ho Hospital, New Taipei City, Taiwan (Greater China), [2]Samsung Medical Center, Seoul, Republic of Korea, [3]Radiology, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea, Republic of, [4]Ophthalmology, Oculoplastic, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea, Republic of

Introduction: Bone marrow (BM), the fourth largest organ by weight, exists in orbital bones and has certain dynamicity without exception. Orbital bone can harbor various inflammatory disease and tumors. BM in the skull is also home to the myeloid cells for central nervous system (CNS), and may offer a distinct microenvironment in certain pathogenesis. Previous literatures focused on describing the BM conversion process from red marrow (water predominance) to yellow marrow (fat predominance) within facial bone and calvarium. However, there were few researches investigating the features of BM surrounding the orbits. In this study, we aimed to reveal the conversion process in pediatric orbital bone marrow (BM) by MRI.

Methods: We retrospectively reviewed 120 orbital BM images (60 subjects) from normal pediatric brain MRI in 2023, and analyzed the images by signal intensities (SI) in T1-weighted, T2-weighted, and contrast-enhanced series. The segmentation of BM area in each orbital bone was performed manually. The SI of BM within frontal, zygoma, maxilla bone and trigone area in the sphenoid bone were studied, respectively.

Results: The SI of the BM can reflect its predominant component such as water (red marrow) or fat (yellow marrow). The SI in T1, T2WI in each orbital bone segment differs significantly between age groups (p<.001). Especially, the change is drastic around age of 7. Age has positive correlation with the SI of frontal BM in T1 and T2WI (p= .03 and <.001), while it has negative correlation with the SI in CE in frontal (p <.001), zygoma (p <.001), maxilla (p =.03) and sphenoid trigone (p =.004). The BM of maxilla and zygoma has higher SI than that of frontal and trigone area (p<.001).

Conclusions: Pediatric orbital BM shows dynamic change with growth from red to yellow marrow. The BM in frontal and trigone has slower conversion process than that in zygoma and maxilla, which might provide distinct site predilection in the orbital bone disease within pediatric age.

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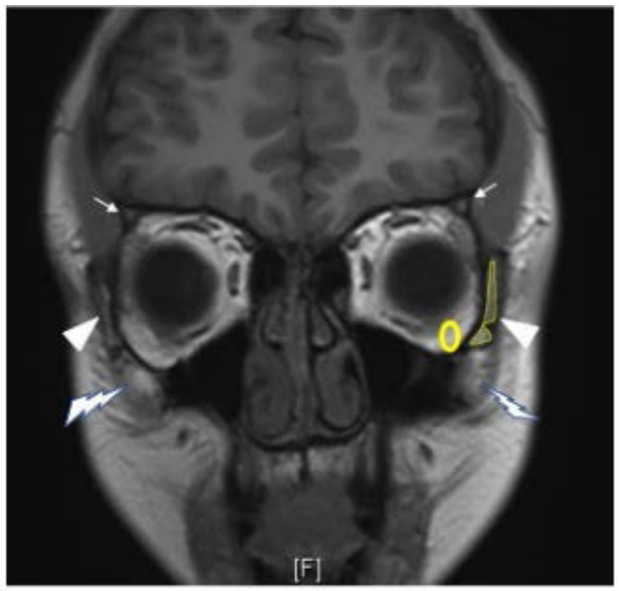
Figure 1



Normal brain MRI (T1WI) from a 14-year old boy. Thin arrow: bone marrow in the frontal bone; Arrow head: bone marrow in the zygoma; Lightning: bone marrow in the maxilla around the orbit. The segmentation of region of interest (ROI) was manually done. In this figure, we compared the bone marrow signal intensity in the left zygoma with the left orbital fat (yellow circle area).

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Factors Associated with Increased Mortality in Patients Exenterated Due to Acute Invasive Fungal Sinusitis with Orbital Involvement

Samuel Shing[1,2], Michael Rabinowitz[3], Leo Hall[4], Narmien Murdock[5], Mindy Rabinowitz[6], Jacqueline Carrasco[5]
[1]Dept of Otolaryngology- Head and Neck Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania, United States, [2]Loyola University of Chicago Medical School, Chicago, Illinois, United States, [3]Oculoplastics and Orbital Surgery , Wills Eye Hospital, Philadelphia, Pennsylvania, United States, [4]Wills Eye Hospital, Philadelphia, Pennsylvania, United States, [5]Oculoplastics and Orbital Surgery, Wills Eye Hospital, Philadelphia, Pennsylvania, United States, [6]Rhinology and Endoscopic Skull Base Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania, United States

Introduction: Acute invasive fungal sinusitis (IFS) is a life-threatening infection which afflicts immunocompromised patients and requires surgical intervention, e.g. serial debridement, orbital exenteration. Little is published regarding factors associated with increased mortality in cases of orbital exenteration. We aim to identify factors associated with increased mortality in exenterated patients to better understand which patients may not benefit from exenteration as compared to orbital preserving surgery.

Methods: An IRB-approved retrospective chart review for patients with biopsy-proven IFS at a single institution from 2000 – 2024 was performed. All patients with diagnosed “invasive fungal sinusitis” were included for analysis. ICD-9 and ICD-10 codes were employed in order to extract data from the electronic health record. Patient demographics, medical and surgical history, ophthalmologic exams, and duration follow-up and time to death were obtained where available. Orbital involvement was defined as biopsy-proven fungal involvement in the lamina papyracea, periorbita, orbital fat, extraocular muscles, optic nerve, or other periorbital tissues. Patients were divided into “orbital preserving” and “exenteration” cohorts, where “orbital preserving” was defined as serial orbital debridement without exenteration. Statistical analysis was performed using Fisher’s exact test and Mann Whitney U; statistical significance was determined by $p<0.05$.

Results: Fifty-five cases of IFS were identified, and twenty-nine were noted to have pathologically confirmed orbital involvement. Eighteen patients underwent surgery with orbital preservation and eleven patients underwent orbital exenteration. All received systemic antifungal therapy.

Patients undergoing orbital exenteration had higher incidence of hematologic malignancy and immunosuppressant use (immunosuppressed state), although these were not statistically significant.

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Exenterated patients had more diffuse pathologic involvement of orbital subsites compared to those patients in whom the orbit was preserved. All exenterated patients had positive disease in the orbital apex (p=0.0012). Patients who underwent orbital exenteration (e.g., had significantly worse visual acuity (p=0.0419) in the immediate preoperative examination.

Mortality was higher (73%) in the orbital exenteration group as compared to orbital preserving group (39%). Of the expired patients, 7/8 (88%) patients in the exenteration group were immunosuppressed as compared to 1/7 (14%) in the orbital preservation group. Among expired patients, average absolute neutrophil count (ANC) was significantly lower in the exenteration cohort compared to the preservation cohort (p=0.0186). Hematologic malignancy was the predominant etiology of immunosuppressed state in the exenteration cohort. Only 2 deaths in the preservation cohort were directly attributable to IFS. Average time to expiration was 173 and 33 days for orbital preservation and exenteration cohorts, respectively.

Conclusions: IFS with orbital involvement remains a challenging clinical entity. Exenterated patients expired more rapidly (average 33 days) than orbital preservation patients (average 173 days) despite more aggressive intervention. This was especially true among patients with an immunocompromised state or with higher systemic disease burden. We advocate for a new paradigm in which the decision to perform orbital exenteration is guided by reversal of immunosuppressed state, anatomical, and systemic factors associated with the likelihood to survive. Our data suggests that exenteration in certain immunocompromised patients or those with low ANC count may not provide significant clinical or survival benefit and should be reevaluated.

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Fulminant Orbital and Peri-orbital Varicella Gangrenosa: A Rare Subset of Necrotizing Fasciitis

Farzad Pakdel[1,2], Hamid Eshaghi[3], Sara Memarian[4], Benjamin Mousavi[4], Mehrdad Goudarzi[4], Niloofar Pirmarzdashti[4]
[1]Oculofacial plastic surgery, Farabi Hospital, faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic Of, [2]Cranio-Maxilofacial Research center, Tehran, Iran, [3]Department of Pediatric Infectious Disease, , Children Hospital, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic Of, [4]Tehran, Iran, Islamic Republic Of

Introduction: Introduction: Varicella gangrenosa is a rare and fatal complication of varicella that usually affects limbs and trunk. This form of necrotizing fasciitis has peculiarities in diagnosis and management. It will further become more complicated with purpura fulminans characterized by thrombosis of the microvasculature, that leads to purpuric lesions and extensive tissue necrosis. It is an extremely rare condition in the orbital and peri-orbital area. Appropriate and immediate diagnosis, treatment, including tissue debridement are of utmost importance for saving the life and orbit. We aimed to show and discuss on how to detect invisible tissue necrosis in orbit and paranasal sinuses, methods for surgical planning for tissue debridement in eyelids and peri-orbital area, intravenous acyclovir and novel modalities of systemic treatment.

Methods: An eleven year old boy was referred for oculofacial consultation for peri-orbital swelling occurred one day before referral. He was receiving intravenous antibiotics vancomycin and meropenem. The patient underwent systemic, and orbital evaluations, blood tests and MRI.

Results: Within few hours after the initial evaluation and getting MRI he showed violaceous hue around medial canthus. Extra-ocular movements of right eye showed severe restriction and visual acuity decreased to 2 meters counting fingers and afferent pupillary defect. MRI showed extensive hypoperfusion in peri-orbital, midface soft tissues and sinu-nasal mucosa. Laboratory tests showed thrombocytopenia. He was diagnosed to have purpura fulminans on the setting of varicella. The patient developed septic shock within 2 more hours preparing for operation. We made an urgent open and endoscopic debridement of the devitalized tissues. Finally, the child recovered from septic shock, improved in extra-ocular movements and regained 20/20 visual acuity and full extra-ocular movements.

Conclusions: Clinicians and orbital surgeons should be aware of this rare but fatal fulminating condition. Searching for orbital, deep facial and sinus mucosal necrosis are of utmost importance. Detecting necrotic tissues, urgent and appropriate debridement and appropriate control of systemic derangements can save the life, sight of the patient thus minimize morbidity and mortality.

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Figure 1

Figure 2

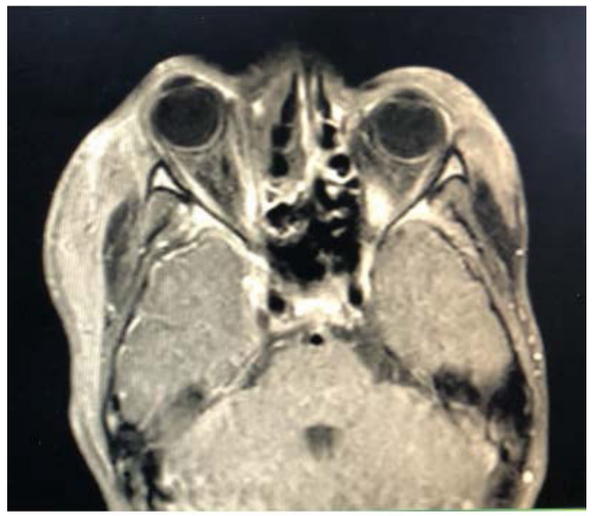


Figure 3

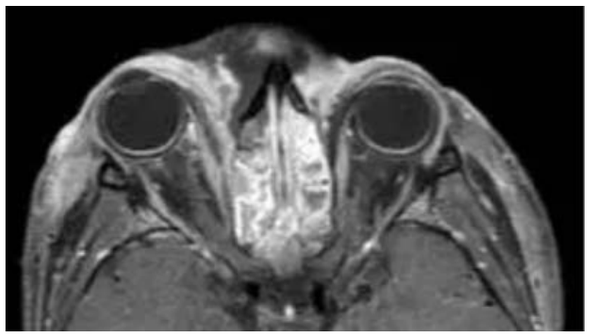
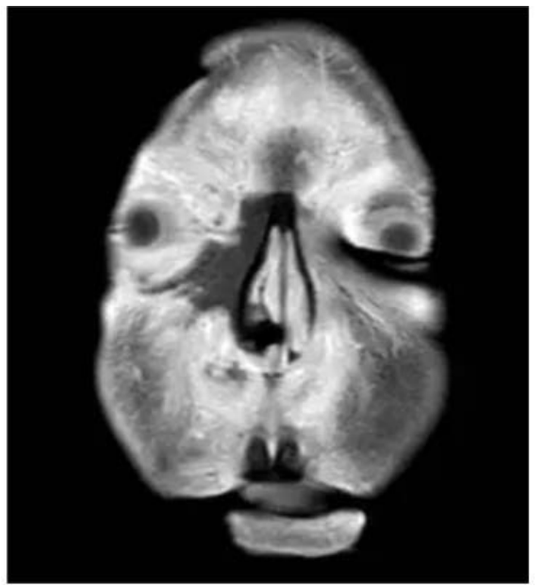


Figure 4



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Intact Fish Skin for Simultaneous Orbital Wall Reconstruction and Lower Lid Retractor Recession as Primary Stage for Planned Anophthalmic Socket Reconstruction

Ashtyn Vogt, Jeremy Tan
Department of Oculoplastic and Reconstructive Surgery, Dean McGee Eye Institute, Oklahoma City, Oklahoma, United States

Introduction: In the reconstruction of anophthalmic sockets, whether due to trauma, space-occupying lesions, or controlled debridement, particular emphasis is placed on maximization of final form and function. When permanent artificial implants are not feasible, various xenografts, allografts, and autografts, each with specific benefits and drawbacks, can be used for socket restoration. Recent advancements in reconstructive surgery have utilized decellularized intact North-Atlantic cod fish skin for improved healing and repair but have yet to be described in the setting of anophthalmic socket reconstruction.

Methods: In this case report, we describe a novel example of socket reconstruction with fish skin in a 58-year-old man after debridement of infected orbital hardware following trauma. Intact fish skin was utilized intraoperatively for re-establishment of the medial orbital wall and floor of the left eye and posterior lamella of the lower eyelid after tissue sacrifice and lower lid retraction due to persistent and extensive facial hardware infection.

Results: No further orbital or lower eyelid support was required and there was no evidence of inferior fornix shortening. Additionally, there was resolution of the previously persistent chronic orbital cellulitis and dacrocystitis. Subsequent evisceration of the left globe was planned due to a blind, disfigured eye from the initial trauma with placement of fat graph and final fitting of ocular prosthesis. The patient has consequently been seen at nine and twelve months post-operatively with maintained fornix and orbital projection without further surgical correction. The ocular prosthesis sits comfortably.

Conclusions: We conclude that decellularized intact North-Atlantic cod fish skin can be used for reconstruction of orbital walls and eyelid fornices in a simultaneous intervention with excellent outcomes for both cosmesis and utility.

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Figure 1

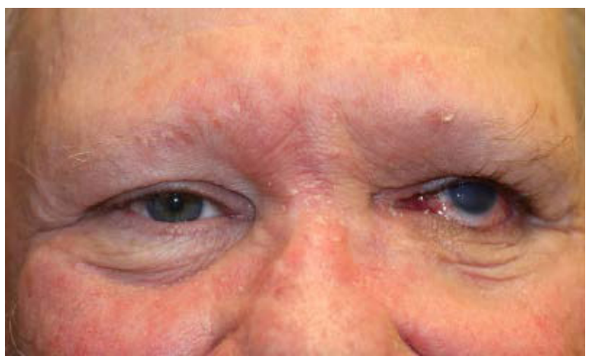


Figure 2

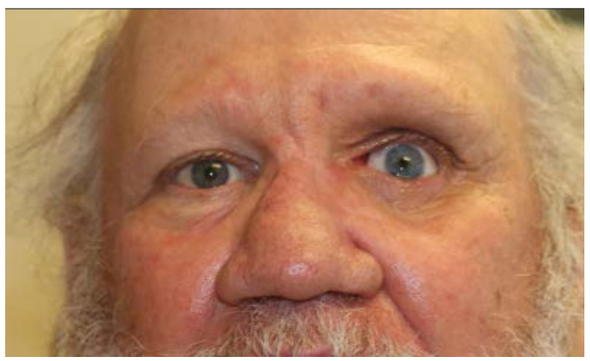
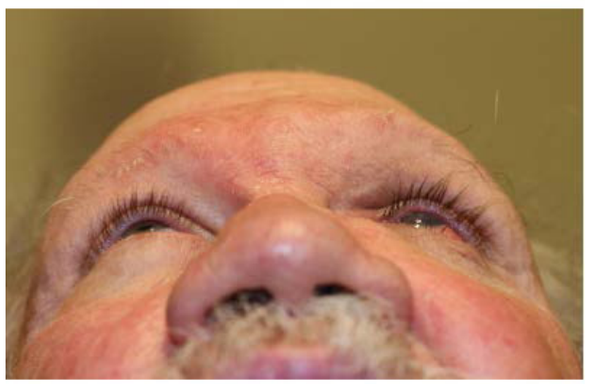


Figure 3



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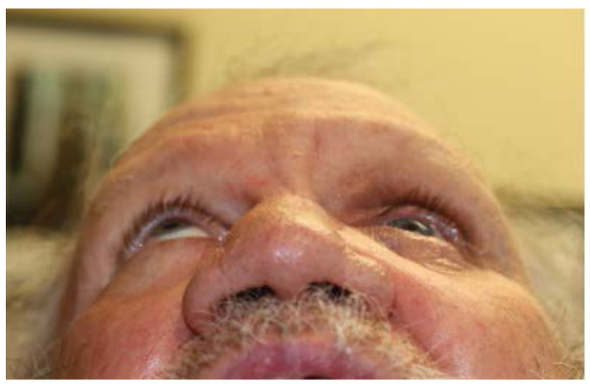

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Low Dose Radiation Therapy in Managing Myeloid Sarcoma-Related Compressive Optic Neuropathy

Ashley Ooms[1,2], Kyle Wright[3], Thai Do[1,2]
[1]Ophthalmology, Dean McGee Eye Institute, Oklahoma City, Oklahoma, United States, [2]Ophthalmology, University of Oklahoma Health Science Center, Oklahoma City, Oklahoma, United States, [3]Pathology, University of Oklahoma Health Science Center, Oklahoma City, Oklahoma, United States

Introduction: Orbital myeloid sarcoma (OMS) is an uncommon extramedullary manifestation of acute myeloid leukemia (AML). We present a rare case of OMS antedating bone marrow AML presenting with compressive optic neuropathy (CON) treated successfully with orbital radiation and chemotherapy.

Methods: This is a case report of radiation as an alternative treatment to surgical debulking in isolated OMS-related CON.

Results: A 15-year-old boy presented with progressive proptosis, eyelid edema, and diplopia for 2 weeks (Figure 1A). Baseline visual acuity was 20/20 in each eye with normal extraocular movement, intraocular pressure, and pupillary exam. Initial Brain MRI showed a homogeneously enhancing infiltrative mass in the right inferior orbit encasing the optic nerve and extending to the orbital apex (Figure 2A). Orbital biopsy was performed. There was no definitive immunophenotypic evidence of T/B-cell lymphoproliferative disorder on flow cytometry. Additional immunostaining revealed a proliferation of myeloblasts-like cells expressing CD45RO, CD34, and myeloperoxidase consistent with OMS. The patient was lost to follow-up. 4 months later, he presented to the hospital with worsening disease in the right eye with visual acuity of 20/40, diffused ophthalmoplegia, worsened proptosis, and a positive relative afferent pupillary defect (RAPD) consistent with CON (Figure 1B). Orbit MRI revealed significant interval growth of the mass and congestion of the orbital apex (Figure 2B). Complete blood count, peripheral smear, and bone marrow biopsy were negative for atypia or increased blast cells. The patient received volumetric modulated arc therapy for 2600 centigray (cGy) over 14 days. On day 5, visual acuity improved to 20/20 with resolution of rAPD and significant proptosis reduction (Figure 1C). Chemotherapy per the AAML 1831 protocol (cytarabine, daunorubicin, and gemtuzumab) was started on day 11. The patient underwent 5 chemotherapy cycles and maintained 20/20 vision in the right eye with resolved ophthalmoplegia and proptosis and near total resolution of the mass on imaging (Figures 1D, 2C).

Conclusions: Orbital radiation is an effective OMS treatment modality with rapid tumor burden resolution.

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Figure 1

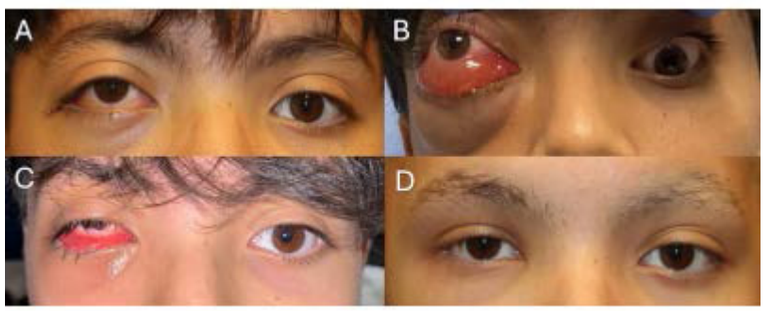
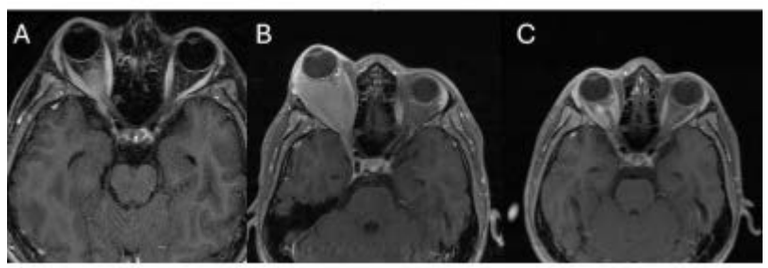


Figure 2



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Metastatic Melanoma to the Orbit Masquerading as Idiopathic Orbital Inflammation

Joshua Fernandes, Anna Sharabura, Matthew Pfannenstiel, Jason Sokol
Department of Ophthalmology, University of Kansas School of Medicine, Kansas City, Kansas, United States

Introduction: The presence of orbital melanoma is exceptionally uncommon. This case highlights a rare presentation of secondary orbital melanoma and reviews the current literature on orbital melanoma.

Methods: A retrospective chart review of the patient's presentation, workup, treatment, and follow up was conducted.

Results: A 39-year-old male presented to an outside hospital for acute onset left upper eyelid ptosis. Ophthalmic exam was notable for left-sided decreased visual acuity, upper eyelid ptosis, and optic disc edema.

MRI showed an enhancing left superior orbital apex mass. Laboratory studies were nonspecific with slightly elevated erythrocyte sedimentation rate (ESR), c-reactive protein (CRP), and antinuclear antibodies (ANA). The patient was diagnosed with presumed idiopathic orbital inflammation, treated with intravenous methylprednisolone, and discharged on oral prednisone. However, there was no improvement in his symptoms.

He was then referred to our oculoplastics clinic for further evaluation. An orbital biopsy was performed through a superior medial lid crease incision. One month later, surgical pathology showed malignant melanoma that was BRAF+ with a V600E mutation. CT chest/abdomen/pelvis for staging showed left chest nodal disease and likely pulmonary metastases.

Upon further questioning, the patient reported a history of a pigmented left forearm lesion that was removed five years prior to presentation. Outside pathology records were obtained, which showed a compound Spitz nevus extending to the skin shave biopsy peripheral margins with a maximum thickness of 2.95 mm. The lesion was reportedly treated with a laser without complete excision.

The patient was started on nivolumab/ipilimumab for systemic treatment of metastatic melanoma by Medical Oncology. His cancer was staged as Stage IV (cN3b, pM1c). There are no plans for orbital radiation at this time due to the risk of worsening vision. The patient's most recent MRI of the orbits showed a possible increase in the size of the orbital mass despite systemic treatment.

Conclusions: Melanoma with metastasis to the orbit is quite rare and should be suspected in patients with a history of pigmented cutaneous lesions presenting with eyelid ptosis and a superior orbital mass.

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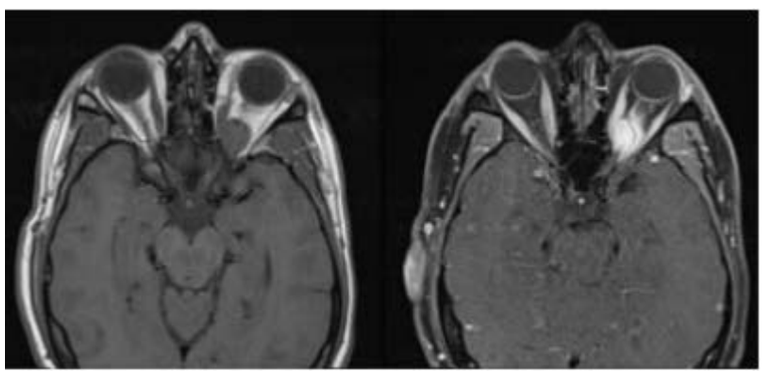
Figure 1



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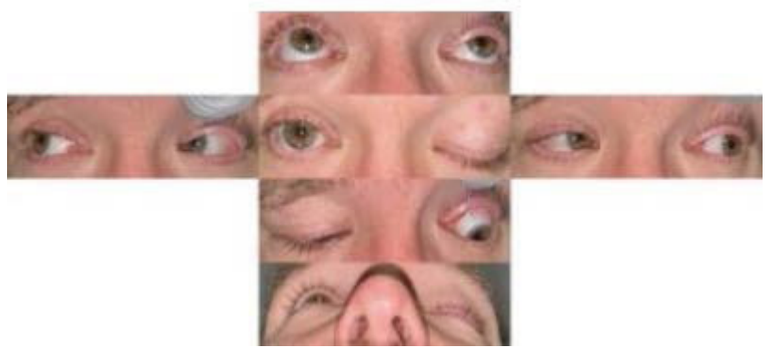

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Natural History of Diplopia Incidence and Resolution following Isolated Orbital Floor Fractures Presenting in a Level I Trauma Center Emergency Room

Roger Henry[1], Hadeel Sadek[1], Zhuojun Guo[2], Hassaam Choudhry[1], Roger Turbin[3], Paul Langer[4]
[1]Institute for Ophthalmology and Visual Science, Rutgers University, New Jersey Medical School (NJMS) , Newark, New Jersey, United States, [2]Department of Ophthalmology, University of Arkansas for Medical Sciences (UAMS) College of Medicine, Little Rock, Arkansas, United States, [3]Neuro-Ophthalmology, Ophthalmic Plastic Reconstructive & Orbital Surgery , Rutgers University, New Jersey Medical School (NJMS) , Newark, New Jersey, United States, [4]Ophthalmic Plastic and Reconstructive Surgery, Rutgers University, New Jersey Medical School (NJMS) , Newark, New Jersey, United States

Introduction: The optimal timing and surgical necessity for repair of isolated orbital floor fractures is actively debated, and studies derived principally from referral practices may suffer from ascertainment bias in their estimation of diplopia incidence; the purpose of this study is to characterize the incidence and natural history of diplopia in a population of patients with isolated orbital blowout fractures after initially presenting to a Level 1 Trauma Center Emergency Room (ER).

Methods: The charts of all adult patients who presented with isolated orbital floor fractures evaluated by the Ophthalmology service from July 2020 through March 2024 in a Level 1 trauma center were reviewed. Following the index visit, all patients were scheduled for follow-up as an outpatient within 1 week; patients with diplopia were subsequently followed with serial examinations to determine if the symptomatic diplopia resolved over time, or, if diplopia persisted, if the patient desired surgical repair of the fracture to address the diplopia. Patients with severe visual loss or a documented history of strabismus were excluded. Kaplan-Meier analysis was used to map diplopia resolution over time and quantify the median time to resolution (MTR) for pure orbital fractures managed non-surgically. Statistical analysis was performed with IBM SPSS version 29.0.1.0.

Results: Of 519 patients with periorbital factures evaluated over the study period, 338 had isolated orbital floor fractures and 71/338 (21%) exhibited symptomatic diplopia at presentation. The average age was 41, (standard deviation 16), 77% were male, and the majority of fractures resulted from assault (209/335, 59%). 149 patients complied with outpatient follow up (mean follow-up time 4.1 weeks post-injury, standard deviation 5.8 weeks). Of these patients, 45/149 (30%) had double vision at presentation, and in only 19/149 (13%) did diplopia persist after conservative follow up. Of the aforementioned 19 patients with persistent diplopia, 8 ultimately opted for surgical repair after at least 3 weeks of diplopia, 7/8 (88%) of whom achieved resolution of clinically significant double vision post-operatively (median post-op follow-up time 7.5 weeks). On Kaplan-Meier analysis, the median time to diplopia resolution in non-surgically

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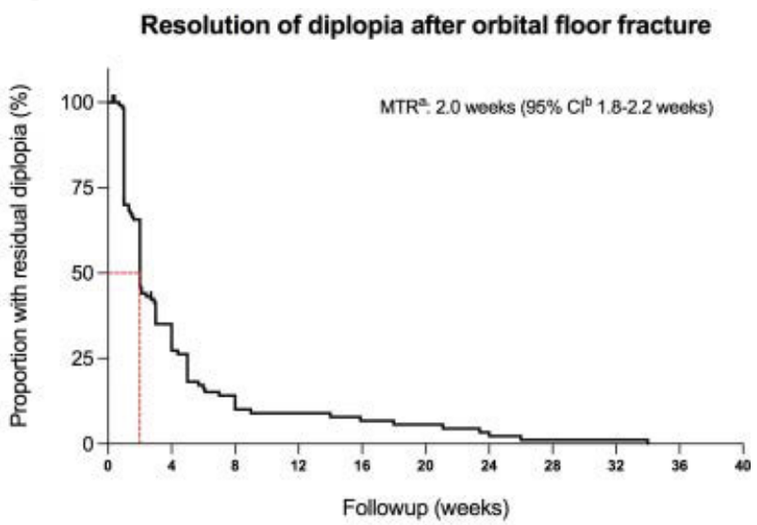
managed orbital fracture patients was 2.0 weeks (95% confidence interval, 95% CI 1.8-2.2 weeks). No patient lacking diplopia at initial presentation developed it in the subsequent follow-up period.

Conclusions: The great majority of patients (almost 80%) with isolated orbital floor fractures do not present with diplopia, and those without diplopia at presentation do not subsequently develop diplopia. In our study, of the patients with diplopia who maintained follow up, majority (nearly 60%) experienced resolution of diplopia with conservative management alone (median time to resolution 2 weeks), with surgery rectifying nearly all of the remaining few persistent cases. Overall, these data suggest that delaying surgical repair in patients with symptomatic diplopia secondary to isolated orbital floor fractures avoids unnecessary surgery without affecting surgical success in patients in whom diplopia persists.

Figure 1



[a]MTR- median time to resolution of diplopia
[b]95% CI: 95% confidence interval

Orbital Apex-Like Syndrome with Multiple Cranial Neuropathies Secondary to Chronic Inflammatory Demyelinating Polyneuropathy

Gabriella Schmuter[1], Richard Polo[1], Shanlee Stevens[1], Allison Coombs[1], Gary Lelli[1], Kyle Godfrey[1,2]
[1]Ophthalmology, Weill Cornell Medicine, New York, New York, United States, [2]Neurological Surgery, Weill Cornell Medicine, New York, New York, United States

Introduction: Chronic inflammatory demyelinating polyneuropathy (CIDP) is an autoimmune disorder that causes progressive weakness and impaired sensory function due to inflammation and demyelination of the peripheral nerves.[1]

Methods: The authors report a unique presentation of CIDP refractory to medical management with extensive orbital involvement of multiple cranial nerves, resulting in an orbital apex-like syndrome with optic and peripheral neuropathy.

Results: A 49-year-old male with refractory CIDP reported progressive visual deterioration and bilateral proptosis. Ophthalmologic exam revealed corrected visual acuity of 20/20 in the right eye and 20/25 in the left eye. The patient presented with exotropia, bilateral adduction deficits, and exophthalmos. Dilated fundus examination showed temporal disc pallor in the right eye and diffuse disc pallor in the left eye. Static perimetry visual field testing revealed a full field in the right eye and generalized depression in the left eye. Optical coherence tomography (OCT) indicated marked thinning of the retinal nerve fiber layer (RNFL) and ganglion cell complex (GCC) thickness of both optic nerves (Figure 1 and 2). Magnetic resonance imaging (MRI) of the brain and orbits with and without contrast revealed significant bilateral enlargement and abnormal signal of multiple cranial nerves within the orbit, including the oculomotor, trigeminal V1 segments, and abducens nerves (Figure 3 and 4). The imaging results, alongside clinical manifestations, suggested a condition resembling a bilateral orbital apex-like syndrome, likely exacerbated by cranial nerve compression at the superior orbital fissure and mechanical stretching of the cranial nerves, including the optic nerves. This was further complicated by chronic demyelination and inflammation associated with CIDP, possibly stemming from presumed prior papilledema.

Conclusions: Ophthalmologic manifestations of CIDP in the literature can vary widely, including ophthalmoplegia resulting in diplopia, gaze palsies, blurred vision, oscillopsia, and ptosis.[1] Additional complications may include papilledema and proptosis.[2-3]An orbital apex-like syndrome leading to compressive neuropathy from enlargement of multiple cranial nerves has not been previously reported. Surgical decompression can be a possible option to relieve symptoms and prevent further optic nerve damage in addition to systemic treatment. Mechanical compression and crowding at the apex due to the enlargement of multiple cranial nerves within the superior ophthalmic fissure, along with inherent demyelination and inflammation from the disease, lead to rare and severe complications

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in CIDP that can cause significant visual deficits. This case underscores the necessity for comprehensive evaluations by neuro-ophthalmology and oculofacial plastic surgery in patients with CIDP exhibiting unexplained visual symptoms. Prompt diagnosis and individualized evaluation and treatment plans are essential to avoid visual impairment. The complexities highlighted in this case advocate for further research to explore the pathophysiological mechanisms and optimal interventions for cranial nerve involvement in CIDP, aiming to improve patient outcomes through a targeted approach.

Figure 1

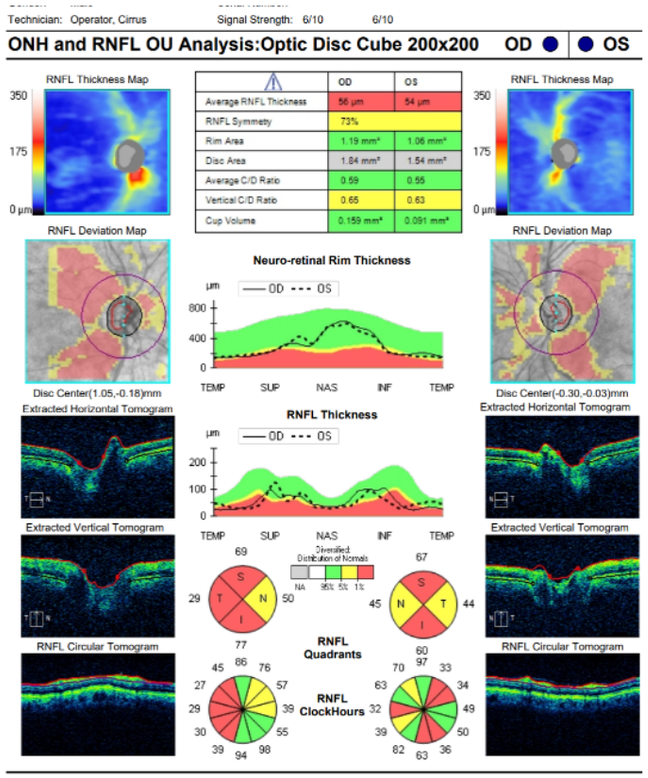


Figure 2

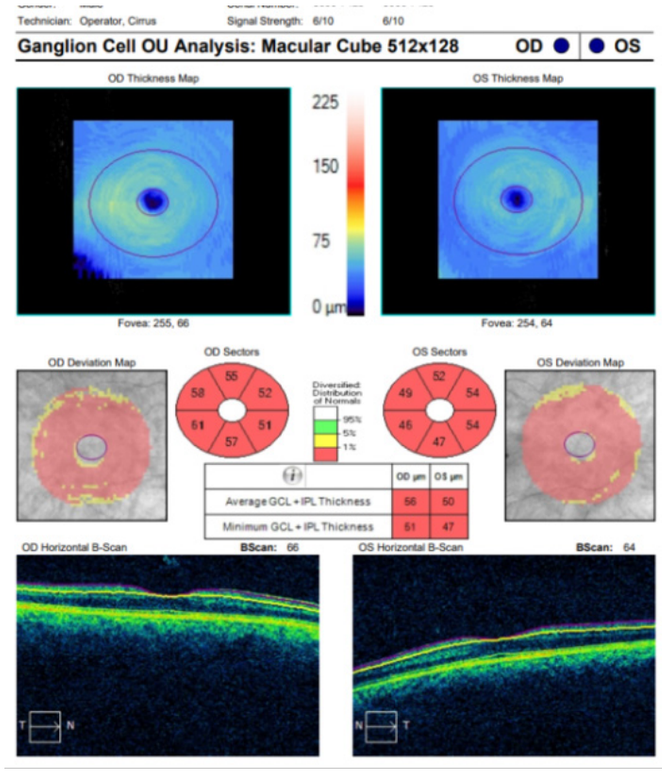


Figure 3

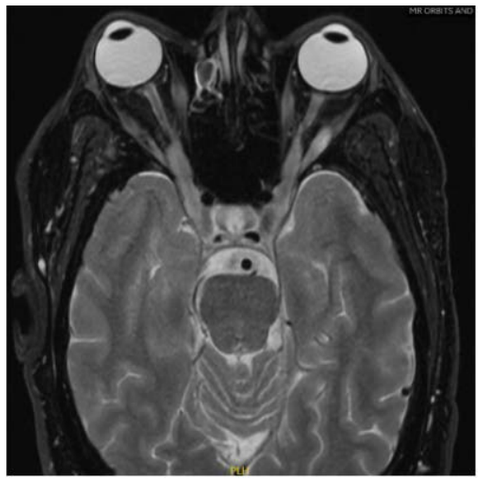
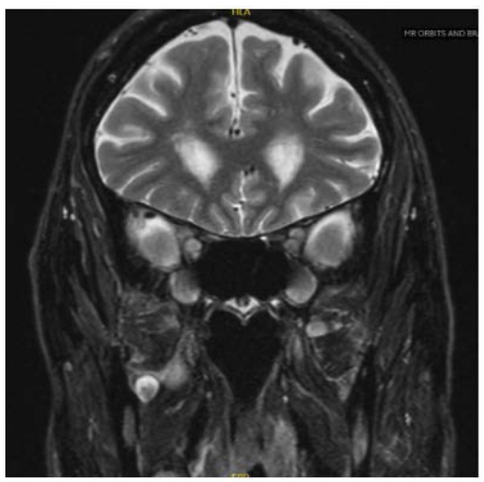


Figure 4



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Orbital Imaging Biomarkers for the Assessment of Thyroid Eye Disease

Bo Sook Han[1], Min Suk Seo[2], Kyung Min Lee[3], Sang Earn Woo[4], Namju Kim[5,6], Hokyung Choung[5,7], Sang In Khwarg[8,5], Min Joung Lee[2]
[1]Ophthalmology, Seoul National University Hospital, Seoul, Korea, Republic of, [2]Ophthalmology, Hallym University Sacred Heart Hospital, Anyang, Korea, Republic of, [3]Ophthalmology, Dongguk University Ilsan Medical Center, Goyang, Korea, Republic of, [4]Ophthalmology, Soonchunhyang University Hospital Seoul, Seoul, Korea, Republic of, [5]Ophthalmology, Seoul National University, College of Medicine, Seoul, Korea, Republic of, [6]Ophthalmology, Seoul National University Bundang Hospital, Seongnam, Other, [7]Ophthalmology, SMG-SNU Boramae Medical Center, Seoul, Other, [8]Ophthalmology, Seoul National University Hospital , Seoul, Korea, Republic of

Introduction: In the management of thyroid eye disease (TED), the assessment of disease activity is of great importance to select patients who required immunosuppressive treatment. Computed tomography (CT) is one of the most widely used imaging modality in patients with TED. A wide spectrum of radiologic changes has been reported in TED and these imaging findings potentially can be associated with disease activity of TED.

Methods: A retrospective study was conducted by revisiting the medical records of 85 patients with TED and 15 controls. A commercial software program (MEDIP PRO 2.0, MEDICALIP Co. Ltd) was used for manual orbital segmentation. The volumes and densities of each extraocular muscle (EOM), intraorbital fat, and lacrimal gland were calculated. CT parameters were compared among control, active TED, and inactive TED groups. CT parameters were compared among control, active TED, and inactive TED groups. Patients were divided into two groups according to the disease severity: mild TED and moderate to severe TED, and CT parameters were compared between active and inactive TED groups in each subgroup separately.

Results: The volumes of 4 recti muscles and the density of intraorbital fat were significantly different among control, active TED, and inactive TED groups (all $p<0.001$). In moderate TED group, the volumes of all recti muscles and intraorbital fat were significantly different between active and inactive TED groups ($p<0.05$). The densites of superior rectus and intraorbital fat were also higher in active TED group ($p=0.029$, $p<0.001$, respectively). In a subgroup of mild TED, the volume of inferior rectus and the density of intraorbital fat were significantly higher in active TED group ($p=0.022$, $p=0.013$, respectively)

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Conclusions: The volumes of 4 recti muscles and the density of of intraorbital fat were significantly different among control, active TED, and inactive TED groups. A stratified analysis by severity revealed that the volume of inferior rectus and the density of intraorbital fat were significantly higher in active TED than inactive TED regardless of the severity of TED. These findings suggest possible image biomarker candidates for the assessment of TED activity that may help identity patients who need immunosuppressive treatment in clinics.

Figure 1

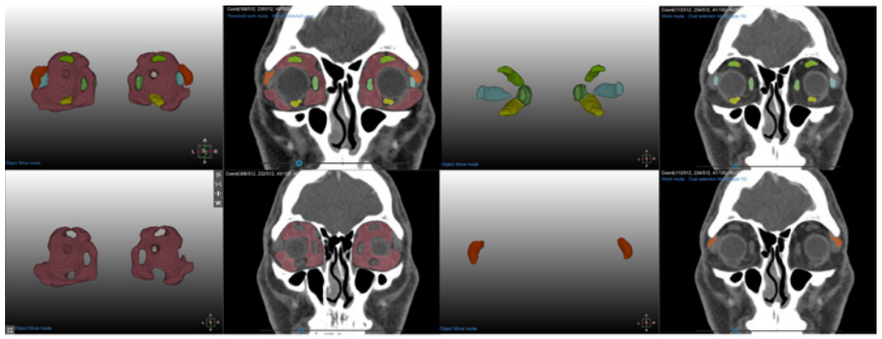

Figure 1. Measurement of the volumes and densities of intraorbital structures. The computed tomographic images of a patient were transferred in DICOM format to MEDIP PRO 2.0 software. Segmentation of extraocular muscles, fat, and lacrimal glands was conducted manually. Three-dimensional reconstructed images were automatically generated, and the volume and density of each structure were calculated.

Figure 2

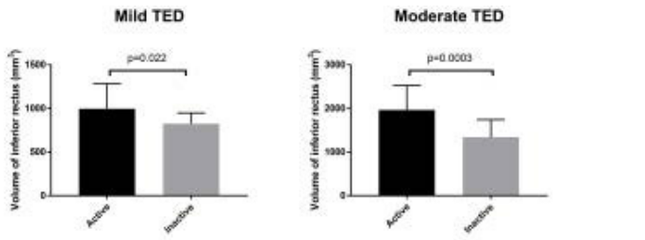

Figure 2. Comparison of the volume of inferior rectus between active and inactive TED groups

Figure 3

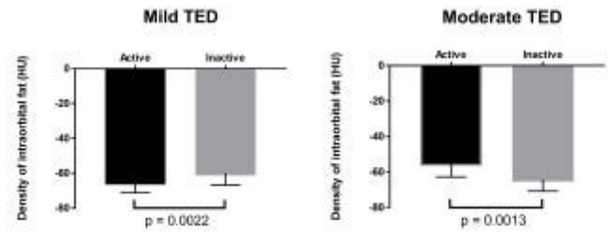

Figure 2. Comparison of the density of intraorbital fat between active and inactive TED groups

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Orbital Liposarcoma in a Patient with Multiple Primary Cancers

Kim Firn, Douglas Van Putten
Ophthalmology, Loma Linda University, Loma Linda, California, United States

Introduction: We report the first case of orbital liposarcoma in the context of concurrent non-syndromic multiple primary cancers and review the orbital liposarcoma literature.

Methods: We reviewed the literature using search terms “orbital liposarcoma” and “multiple primary cancers” in Pubmed to identify reported cases.

Results: A 38 year-old male presented with painless right eye nasal chemosis and proptosis progressing over three months with no initial vision changes or diplopia. Hertel exophthalmometry was 26 OD, 20 OS at base 130. MRI orbits in Figure 1 showed a right extraconal enhancing mass with inflammatory changes, lateral deviation of the medial rectus, and mild exophthalmos. Follow up imaging showed mass enlargement and optic nerve compression in Figure 2. ANCA, ANA, ACE, CXR, MRA/MRV brain/orbit were all within normal limits. Pathology showed well-differentiated liposarcoma positive for amplification of MDM2 with no positive genomic alterations for targeted therapy. Figure 3 shows myxoid lipogenic tumor in the left panel, entrapped skeletal muscle fibers in the middle panel, and occasional moderate nuclear atypia in the right panel. The mass was excised and later recurred. The patient presented again with a nasal subconjunctival mass and proptosis as shown in Figure 4. There is now a plan for neoadjuvant radiotherapy and surgical debulking.

The patient was concurrently diagnosed with renal clear cell carcinoma negative for associated germline mutations and papillary thyroid carcinoma. His wife was also diagnosed with papillary thyroid carcinoma, B cell non-Hodgkin lymphoma, and transitional cell bladder carcinoma during this time. The patient and his wife are of different ethnicities from different countries, and are not possibly related. The patient denies a family history of cancer. His wife’s family history is only significant for lung cancer in family members with smoking history. They do not know of any specific carcinogen exposure and neither has a history of smoking. The couple spent time at Los Alamos National Laboratory and live near a Superfund toxic waste site in California.

141 cases of primary orbital liposarcoma were reported in the literature.1-56 Some reports included multiple cases1-14 and one used SEER Medicare data to identify cases14, so individual cases may be represented more than once in this figure. None of these cases were associated with concurrent non-syndromic multiple primary cancers. One patient had a history of retinoblastoma,15 and one patient had Li-Fraumeni syndrome.16 No cases were reported in the setting of a partner with simultaneous new-onset cancer diagnosis.

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Conclusions: Orbital liposarcoma is a rare cancer that has been reported in over 100 cases, with only one case related to a familial cancer syndrome. This is the first report of orbital liposarcoma in association with non-syndromic multiple primary cancers in the patient as well as his wife. This case is likely associated with carcinogen exposure. Physicians should assess for other primary cancers and exposure risk in patients with similar presentations.

Figure 1

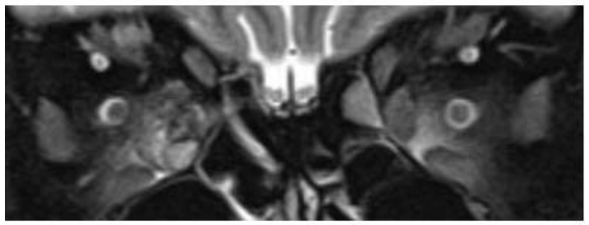


Figure 2

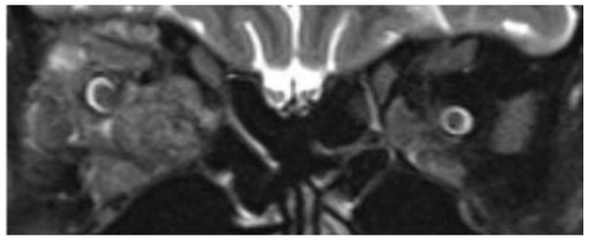


Figure 3

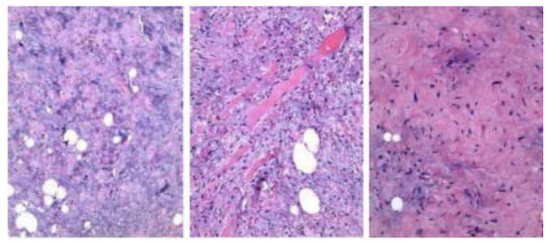
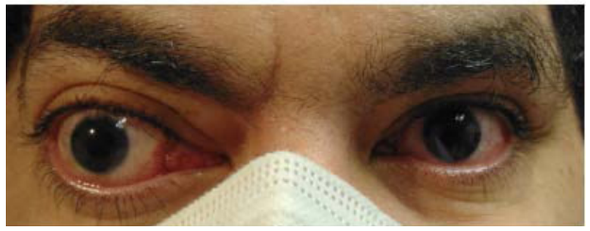


Figure 4



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Preliminary Outcomes Using a Novel Protocol for Management of Burn Patients at Risk of Orbital Compartment Syndrome

Rupin Parikh[1], Chau Pham[1], Julia Fleecs[2], Jamie Keen[3], Keith Carter[1], Erin Shriver[1]
[1]Ophthalmology, University of Iowa, Iowa City, Iowa, United States, [2]Carver College of Medicine/University of Iowa, Iowa City, Iowa, United States, [3]Ophthalmology, Edward Hines Jr VA Hospital, Hines, Illinois, United States

Introduction: Burn injuries can lead to devastating ocular and periocular sequelae that compromise vision. One severe and acute complication is orbital compartment syndrome (OCS). To date, there is no gold-standard protocol for management of these patients upon their presentation to the hospital. A protocol for the management of burn inpatients was developed and risk factors were identified in a previous investigation at the study institution (Mai et al, 2020; Table 1). This study is the first retrospective review assessing the outcomes of this novel protocol used in the management of burn patients at risk for orbital compartment syndrome.

Methods: A retrospective review was performed at the study institution to evaluate burn patients in which ophthalmology was consulted. Patients were excluded if they had a known history of glaucoma or if they had other conditions affecting the orbital pressure such as a traumatic retrobulbar hemorrhage. The following data were collected: age, gender, percent of total body surface area (%TBSA) involved, time of burn injury, use of vasopressors or albumin, type of intravenous fluids used, initial and final visual acuity, presence of chemosis, if brimonidine was initiated at presentation, frequency of intraocular pressure (IOP) checks, IOP measurements and number of hours each measurement was made after the injury, if surgical intervention was performed (canthotomy, lower cantholysis, upper cantholysis, lower septolysis, upper septolysis, lower eyelid split, and upper eyelid split), time to surgical intervention after the injury, and whether subsequent repair of the cantholysis was required.

Results: Twelve patients and 24 eyes meeting inclusion criteria were identified. Baseline demographics and clinical characteristics are noted in Table 2. The mean %TBSA in patients that underwent surgical intervention was 68.8%, compared to 12.8% in the non-surgical group. The average IOP that initiated surgical intervention was 45.8 mmHg. Surgical intervention was performed by ophthalmology-trained physicians bilaterally on 6 patients (50%). The average time from the initial injury to ophthalmology consultation was 9.3 hours, and when performed, the average time to surgical intervention was 5.4 hours later. A canthotomy and inferior cantholysis alone was sufficient in reducing the IOP in 4 eyes, while 2 eyes also required a superior cantholysis. An additional septolysis and/or eyelid split were required in 6 eyes (Table 3). The average one-hour post-surgical intervention IOP was 23.1 mmHg. Brimonidine was started on two patients that did not undergo surgical intervention (Figure 1). Four of the 6 patients requiring surgical intervention had initial IOPs < 30

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mmHg, and average time to IOP spike requiring surgical intervention was 10.3 hours (Figure 2). Two of the 6 surgical intervention patients expired from their injuries, and 3 required subsequent eyelid repair.

Conclusions: This study further supports close initial monitoring for OCS during the acute phase of presentation in burn trauma patients. Examination frequency can be adjusted based on the presence of risk factors such as %TBSA, use of vasopressors or albumin, or presence of chemosis.

Table 1:

	Significant Risk Factor	Patient (yes/no)
%TBSA	>50% and involving face	
	Likely Risk Factor (2 or more)	
Vasopressor	Used	
Albumin	Used	
Chemosis	Present	
	Recommendations:	
	Patient's IOP	
	Start Brimonidine? (Y/N)	
	Recommended IOP check frequency	
	Next IOP check due (date, time)	
	Cantholysis done? (Y/N)	

- Plastic and Cornea fellows should be aware of these cases.
- Start topical brimonidine three times a day if patient has TBSA>50% with face or 2 or more likely risk factors, continue until q12hr checks are complete.
- If TBSA>50% involving face, or 2 or more likely risk factors: IOP checks q4hrs until normalized x3, then extend to q12hrs x 2.
- For all others: IOP checks q8hrs x3, then qoD to PRN if stable.
- Consider canthotomy/cantholysis (c/c) for IOP >30; If doing c/c, contact fellow/staff immediately; do inferior AND superior.
- IOP check immediately after, then 1 hour after c/c.

Table 2. Patient demographics and clinical characteristics *(n=12)*

Age ± SD (yr)		40.0 ± 25.0	
Male (%)		8 (67%)	
Mortality (%)		2 (16.7%)	
	Total *(n=12)*	**Surgical *(n=6)***	**Non-surgical *(n=6)***
% TBSA burned ± SD	40.8% ± 34.1%	68.8% ± 24.7%	12.8% ± 7.8%
Albumin administered (%)	5 (41.7%)	5 (83.3%)	0 (0%)
Vasopressor administered (%)	5 (41.7%)	4 (66.7%)	1 (16.7%)
Conjunctival chemosis (%)	9 (75%)	6 (100%)	3 (50%)
Average initial IOP (mmHg)	23.3	26.3	20.4
Brimonidine started at onset (%)*	6 (50%)	4 (66.7%)	2 (33%)
OCS protocol initiated (%)†	5 (41.7%)	5 (83.3%)	0 (0%)

% TBSA, percentage of total body surface area burned; SD, standard deviatoin; OCS, orbital compartment syndrome; IOP, intraocular pressure

* The two surgical patients who did not receive brimonidine at onset eventually received it after the second IOP check

† OCS protocol (Table 1) initiated

Table 3. Surgical interventions

	Lower c/c	Upper c/c	Lower septolysis	Upper septolysis	Lower eyelid split	Upper eyelid split
Patient A:	X	X	X	X	X	X
Patient B:	X					
Patient C:	X	X			X	X
Patient D:	X	X	X	X		
Patient E:	X	X				
Patient F:	X					

Procedures listed in order performed from left to right

c/c, canthotomy/cantholysis

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Figure 1

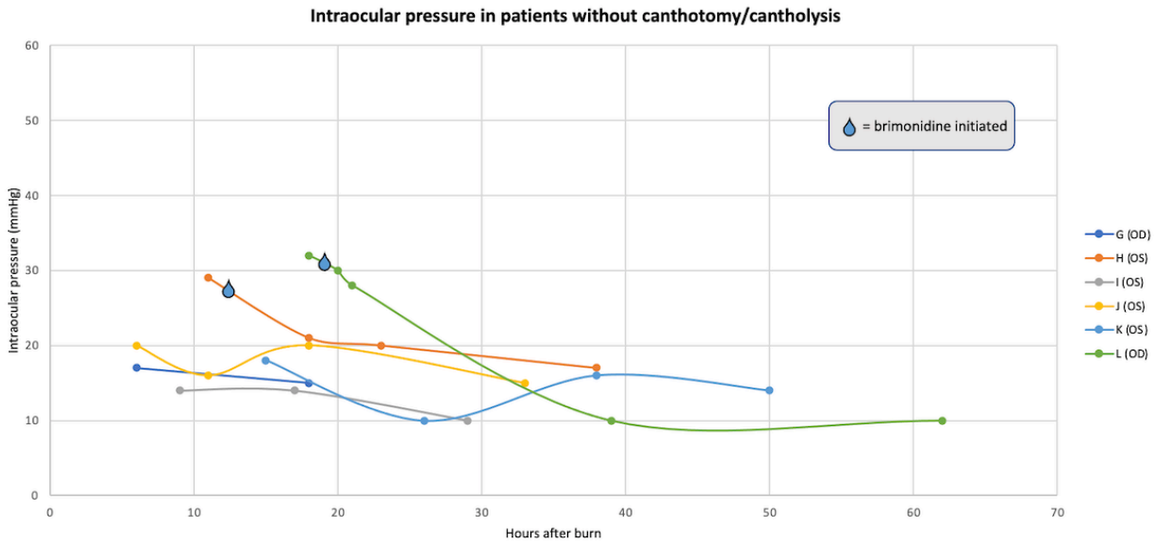
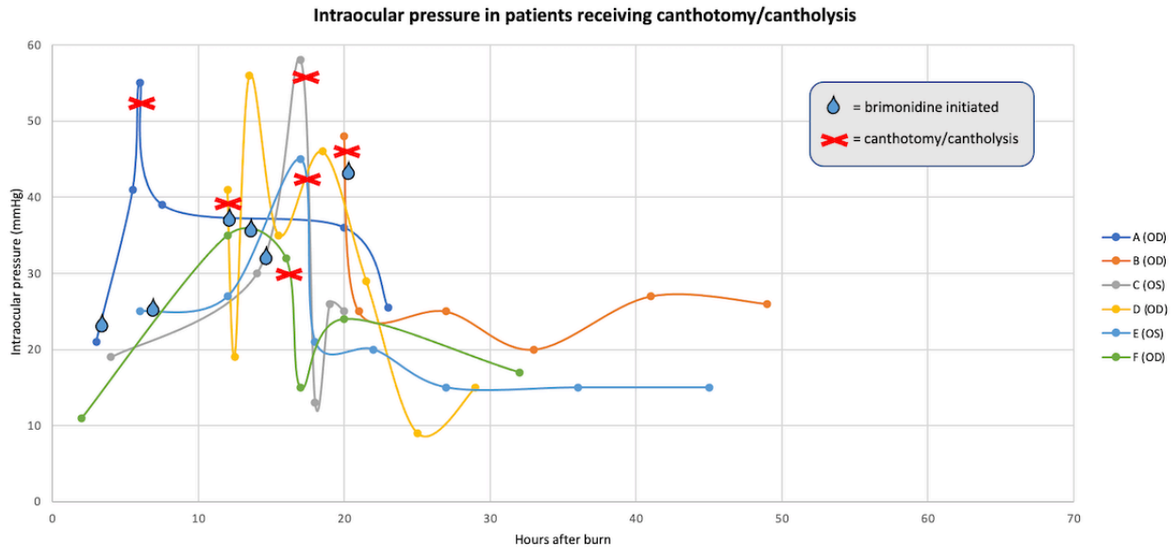


Figure 2



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RNFL and GCA Changes in Thyroid Eye Disease Patients Treated with Teprotumumab: A Short Term Study

Haana McMurray[1], Thanh-Duc Hoang[2], Rachel Lieberman[1], Jason Lewis[3], Sorana Raiciulescu[4], Eva Chou[1,5]
[1]Ophthalmology, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [2]Endocrinology, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, [3]Ophthalmology, Madigan Army Medical Center, Joint Base Lewis-McChord, Washington, United States, [4]Preventive Medicine and Biostatistics, Uniformed Services University of the Health Sciences, Bethesda, Maryland, United States, [5]Surgery, Uniformed Services University of the Health Sciences, Bethesda, Maryland, United States

Introduction: While many studies describe clinical improvements of thyroid eye disease (TED) with teprotumumab, the relationship between treatment of TED with teprotumumab and changes in optical coherence tomography (OCT) analysis in patients has not yet been characterized in the literature. The objective of this study was to characterize the changes in retinal nerve fiber layer (RNFL) and ganglion cell layer (GCL) thickness in patients with TED treated with teprotumumab.

Methods: This is a single center retrospective non-comparative case series of patients with TED who had initiated an eight infusion therapy of teprotumumab for TED between the years of 2020 and 2022 and had successfully completed an eight-infusion teprotumumab regimen. Pre and post treatment data capturing both clinical and OCT data to include Hertel exophthalmometer readings, CAS, color plate testing, intraocular pressures (IOP), visual field parameters, RNFL and GCA thickness analyses were obtained within three months before initiation of teprotumumab and within three months after their eighth teprotumumab infusion. Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) software, Version 28 (IBM Corp., Armonk, NY) and all mathematical figures were produced using GraphPad Prism 9.0 (GraphPad Software, In., San Diego, CA). Categorical and nominal data were compared using the Chi-Squared or Kruskal-Wallis test as needed, and continuous data were compared using the two-tailed Student T test, Mann-Whitney U, or Wilcoxon Rank Sum Test. Statistical analyses were also adjusted for multiple comparisons where appropriate. Descriptive data were reported as mean ± standard deviation or as median (IQR) for normally and non-normally distributed data respectively.

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Results: This study consisted of 13 patients (26 eyes) with an average pretreatment clinical assessment score (CAS) of four who completed an 8 infusion treatment of teprotumumab for TED. In this cohort of patients, significant improvements were measured in Hertel exophthalmometer readings, CAS, and color plate testing. No significant changes were observed in IOP, visual field parameters, or RNFL symmetry (Figure 1). Significant progressive reductions when comparing OCT data before and after treatment were observed in overall average RNFL thickness (16.7±24.6; p= 0.003; Figure 2) and GCL thickness (5.5±2.6; p<0.001; Figure 3). Progressive RNFL thinning was most prominent superiorly (15.1±18.1) and least pronounced temporally (2.0±13.4; Figure 4). GCL thinning was relatively uniform across sectors (decrease in thickness ranging between 5.0±4.4 to 6.0±5.6; Figure 5).

Conclusions: In this cohort of patients treated with teprotumumab for TED, patients experienced improvements in proptosis and OCT changes were consistent with improvements in subclinical optic nerve edema by way of significant reductions in RNFL thickness, particularly in the superior quadrant with significant and more modest and uniform thinning across GCL thickness sectors. This study supports the use of RNFL and GCL monitoring to detect and monitor subclinical optic nerve edema in TED, and the results of this study may guide clinicians on the expected RNFL and GCL changes in TED patients who receive teprotumumab.

Figure 1

	Before teprotumumab (Mean±SD or Median(IQR))	After teprotumumab (Mean±SD or Median(IQR))	N (eyes)	P-value
Hertel	22.8±2.8	21.2±3.2	18	*p<0.001
IOP	18.6±3.9	15.4±3.1	16	p=0.785
CAS	4.0 (1.0)	1.0 (2.5)	9	*p=0.007
PIP (x/15)	11.0 (2.0)	14.5 (2.8)	16	*p=0.006
HVF-MD	1.8±1.9	1.6±0.9	16	p=0.145
HVF-PSD	2.7±2.8	2.0±0.9	16	p=0.538
Proportion of reliable Visual Fields	9/16	8/16	16	
RNFL Symmetry (%)	82.1±13.3	76.1±30.8	12	p=0.491

Legend: Hertel = Hertel exophthalmometer readings; IOP = Intraocular pressure; CAS = Clinical Assessment Scores; PIP (x/15) = PseudoIsochromatic Plate (PIP) color vision testing results on a scale of x to 15; HVF-MD = Humphrey Visual Field Mean Deviation score; HVF-PSD = Humphrey Visual Field Pattern Standard Deviation score; RNFL Symmetry (%) = Retinal Nerve Fiber Layer (RNFL) Symmetry expressed as a percentage.

Figure 2

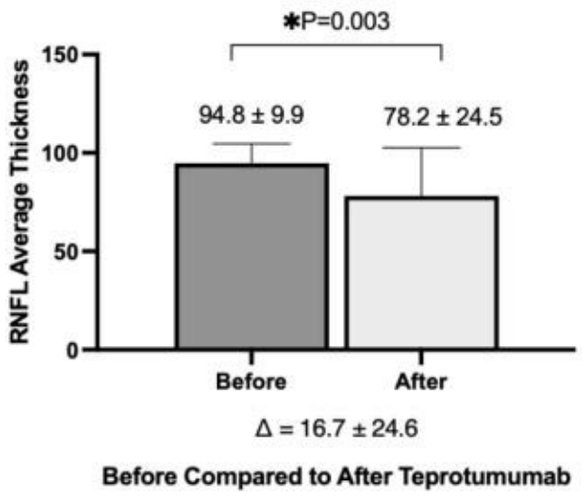

Figure 3

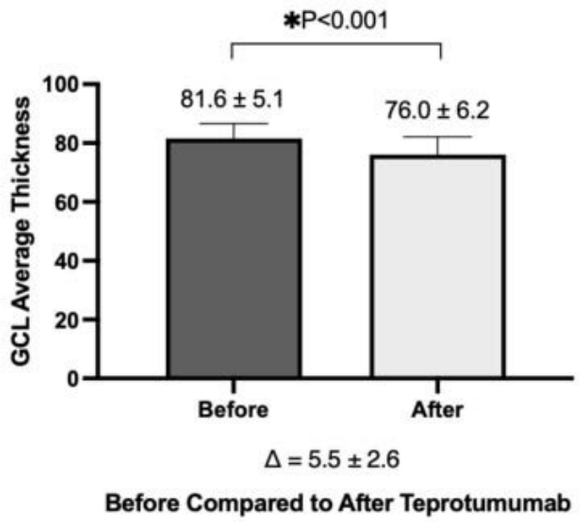

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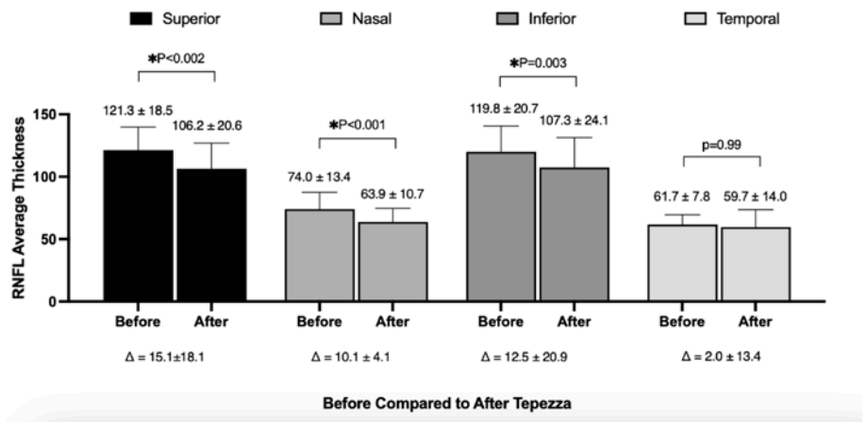
Figure 4



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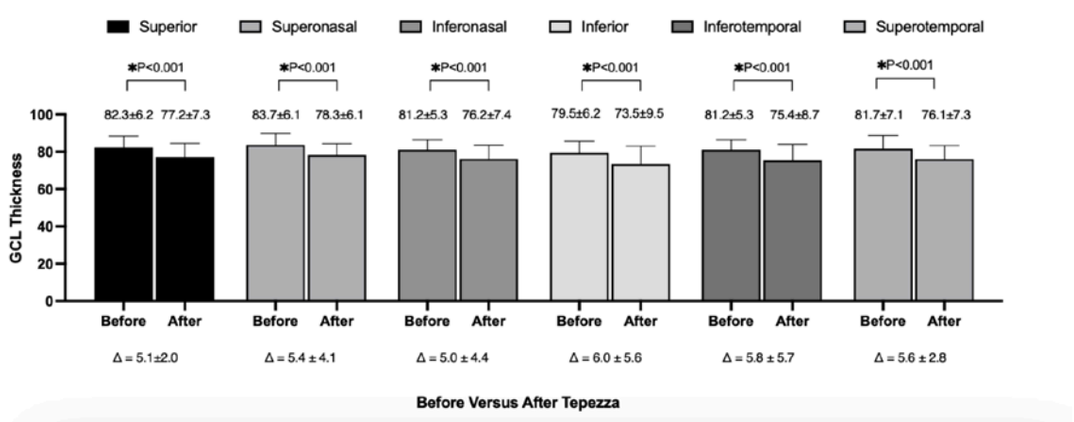

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The Effect of Hyaluronidase on Thyroid eye disease

Niloufar Bineshfar[1], Ishita Garg[2], Laura Gonzalez Hernandez[2], Hua Wang[3], Daniel Pelaez[3], Wendy Lee[1]
[1]Department of Ophthalmology, Bascom Palmer Eye Institute, University of Miami Miller School of Medicine, Miami, Florida, United States, [2]Bascom Palmer Eye Institute, University of Miami Miller School of Medicine, Miami, Florida, United States, [3]Dr. Nasser Al-Rashid Orbital Vision Research Center, Bascom Palmer Eye Institute, University of Miami Miller School of Medicine, Miami, Florida, United States

Introduction: Thyroid eye disease (TED) is an autoimmune disorder commonly associated with Graves' disease. Previous studies have demonstrated that orbital fibroblasts derived from individuals with TED secrete higher levels of hyaluronan (HA) compared to control fibroblasts. Furthermore, when stimulated by transforming growth factor β1 (TGFβ1), orbital fibroblasts can undergo myogenic differentiation, leading to progressive fibrosis in the TED orbit. HA degradation is catalyzed by enzymes called hyaluronidases. A recent study reported that in addition to HA degradation, hyaluronidase has an inhibitory effect on the TGFβ1-mediated myogenic differentiation of orbital fibroblasts in TED. These findings suggest a potential therapeutic role for hyaluronidases, as they target HA accumulation and subsequent fibrosis in TED-affected orbits. Although it has been determined that the retrobulbarhyaluronidase injection in humans doesn't reach the vitreous cavity (1), and doesn't impair the retinal cells function in a rabbit model of iatrogenic HA filler blindness (2), its effect on the optic nerve and retinal ganglion cells anatomy in mice and function is yet to be determined. The aim of our study is to characterize the effect and safety of hyaluronidase on orbital tissues and optic nerve in TED patients.

Methods: Twelve-week-old female C57BL/6 mice were treated via retrobulbar injection of hyaluronidase (left eye), versus phosphate-buffered saline (right eye) (Fig.1). Optical coherence tomography (OCT) and pattern electroretinography (PERG) were performed at baseline and 14 days following the injections. This was followed by whole mouse head fixation, decalcification, and sectioning for orbital histopathologic examination. Orbital adipose-derived stem cells (OASCs) from TED and healthy control patients with and without exposure to hyaluronidase were examined for cell viability and hyaluronan content.

Results: Retrobulbar injection of hyaluronidase in mice did not alter the gross morphology. *In vivo* ganglion cell function on PERG was comparable between the control and injected eyes and before and after the injections. Ganglion cell complex (GCC) and retinal thicknesses did not differ between the control and the injected eyes and did not change after the injections ($P > 0.05$) (Fig. 2). Hyaluronidase did not change the histological appearance of the orbital tissues.

Conclusions: Retrobulbar injection of hyaluronidase is tolerated without immediate adverse effects in mice. Our results suggest a potential future application of hyaluronidases in the treatment of TED.

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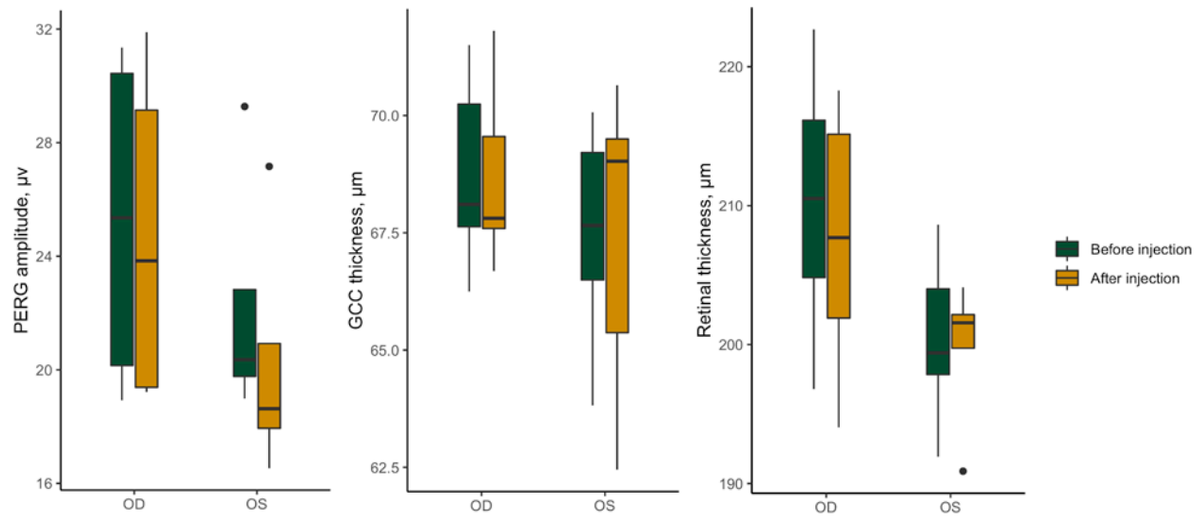
Figure 1

Figure 2



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The Role of Systemic Steroids in Orbital Subperiosteal Abscess Management: A Multicenter Study of Factors Impacting Utilization and Outcomes

Idara Akpandak[1], Jay Maturi[1], Elliot Cherkas[2], Radwa Elshawari[2], Alison Gibbons[1], Mannat Kaur[1], Davin Ashraf[2], Emily Li[1]
[1]Wilmer Eye Institute, Johns Hopkins University School of Medicine, Baltimore, United States, [2]Ophthalmology, Oregon Health and Science University School of Medicine, Portland, United States

Introduction: The role of systemic steroids for the treatment of orbital cellulitis (OC) with subperiosteal abscess (SPA) is contested, with studies drawing differing conclusions. Currently, there are no guidelines on the use of steroids in the management of SPA. The present study aimed to determine the impact of systemic steroid administration on clinical outcomes in the treatment of OC with SPA.

Methods: A retrospective cohort study was conducted at two tertiary care hospitals using ICD-10 codes to identify patients admitted with OC from January 1, 2003, to December 31, 2022. Inclusion criteria consisted of radiographic evidence of SPA. Demographic and clinical data were extracted. Primary outcomes assessed included hospital length of stay (LOS) and visual acuity (VA) at final visit.

Results: Search yielded 241 patients, including 118 patients treated with systemic steroids (49%). The mean age of study patients was 18.2 +/- 20.0 years. There were 236 patients (98%) with sinusitis and 152 patients (63%) who underwent surgery during hospitalization. Age, sex, immunosuppression, and diabetes mellitus did not impact likelihood of receiving steroids. Decreased visual acuity (20/50 or worse) was not associated with a higher likelihood of receiving steroids (p=0.98). Mean LOS was similar between steroid and non-steroid cohorts (5.48 +/- 3.21 days versus 5.02 +/- 3.27 days, respectively; p = 0.27). Steroid use was not associated with improvement in final VA (logMAR = 0.18 +/- 0.58 versus logMAR = 0.16 +/- 0.45, respectively; p = 0.88). Twelve patients were readmitted within 30 days of initial hospitalization, 7 of whom were in the steroid group (58%). Among patients who received systemic steroids, intravenous versus oral route of administration did not impact outcomes.

Conclusions: Adjunctive systemic steroid may not impact LOS or final VA in the treatment of orbital SPA. Further research is warranted to assess factors that may influence the role of systemic steroids in treating orbital infections.

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What's that Smell?: A Case of Pressurized Diesel Injury to the Orbit, Face, and Neck

Amee Azad[1], Lisa Y. Lin[1], Carolina A. Chiou[1], Doug Dembinski[2], Christopher Dwyer[3], Dane Slentz[4], Natalie Wolkow[1,5]
[1]Ophthalmic Plastic Surgery Service, Department of Ophthalmology, Massachusetts Eye and Ear, Boston, Massachusetts, United States, [2]Department of Plastic Surgery, Brigham and Women's Hospital, Boston, Massachusetts, United States, [3]Department of Otolaryngology, Brigham and Women's Hospital, Boston, Massachusetts, United States, [4]Division of Oculofacial Plastic and Reconstructive Surgery, The Medical Eye Center, Manchester, New Hampshire, United States, [5]David G. Cogan Laboratory of Ophthalmic Pathology, Massachusetts Eye and Ear, Boston, Massachusetts, United States

Introduction: High-pressure injection injuries are rare and can have high rates of morbidity. In the literature, these injuries are commonly reported in upper extremities and often require amputation.[1] High-pressure fluid can break through skin and fascia via micropunctures and lodge deep into soft tissues without direct bodily contact or visible cutaneous injury. Caustic substances subsequently trigger chemical irritation, inflammation, tissue necrosis, and secondary infection.[2] The few cases in the literature involving the face and orbit have similarly had unremarkable initial presentations, but ultimately required urgent orbitotomy, debridement, and even exenteration.[3–5] Herein, we present a case of a patient who suffered a high-pressure diesel injury to the neck, face, and orbit requiring multidisciplinary serial debridement.

Methods: Case report.

Results: A 25-year-old male with no past ocular history presented to an outside hospital with right-sided facial swelling following a high-pressure diesel injury (~350-500 pounds per square inch (PSI)) while servicing a vehicle. He was wearing eye protection at the time of the injury. At presentation, the right facial swelling was mild and his visual acuity was 20/25 on the affected side (Figure 1A). Given the nature of the injury, he was started on empiric antibiotics. Within twelve hours, he developed significant swelling of his right mid-face with firm, tense eyelids that could not be opened for formal assessment of intraocular pressure (Figure 1B). An urgent canthotomy/cantholysis was performed with an intraocular pressure of 28 mmHg and visual acuity (VA) of count fingers at 4' noted after the procedure. He was then transferred to a tertiary care referral center. Imaging at the time of transfer was notable for increasing hypodensities within the right inferior orbit and right face extending to the neck (Figure 2A and B). His VA was 20/70, and he reported the smell of diesel suggesting residual diesel in the nasal cavity. He subsequently demonstrated increased fluid collections in the right orbit and oculoplastics was consulted. Oculoplastics recommended initiation of high-dose corticosteroids and orbital debridement. Intraoperatively, black, thick material was noted in the inferior orbit along with necrotic tissue. Blood cultures remained negative and operative wound cultures grew normal skin flora. His white blood count and inflammatory markers normalized over 20 days. One and a

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half months after his last debridement, his visual acuity was 20/15 in the affected eye with normal intraocular pressure and no diplopia. He has a residual cicatricial ectropion of the right lower lid, right facial paralysis, and is planned for a lower lid ectropion repair and facial reanimation (Figure 1D).

Conclusions: A thorough clinical history for high-pressure injection injuries is vital for proper diagnosis and management of these rare injuries, especially as initial presentation can have no apparent cutaneous injury. Chemical cellulitis, inflammation, tissue necrosis, and secondary infection are the primary causes for poor outcomes, therefore urgent, serial debridements and high-dose corticosteroids are indicated to optimize functional outcomes. Cautery should be avoided due to the highly flammable substances involved and multi-disciplinary management with oculoplastics, plastic surgery, critical care, and otolaryngology can be beneficial for these complex injuries.

Figure 1

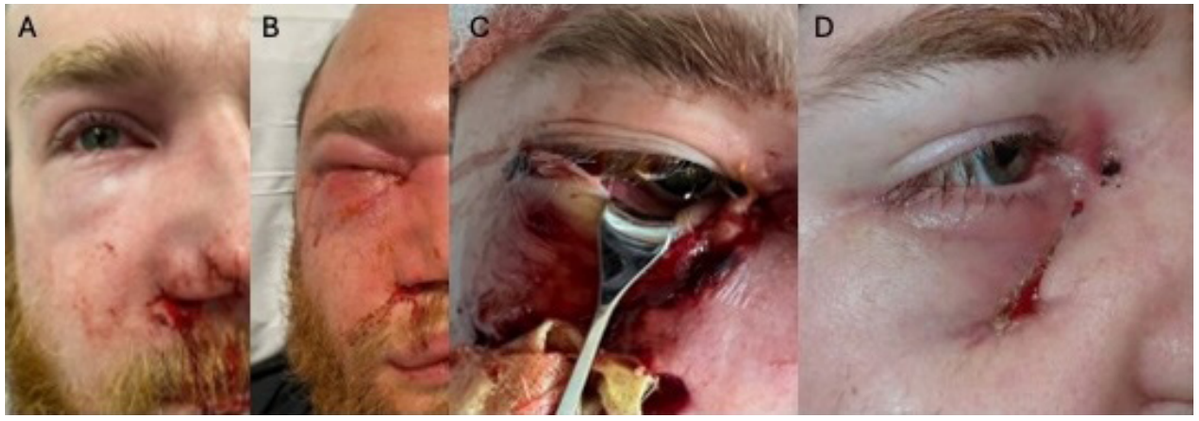
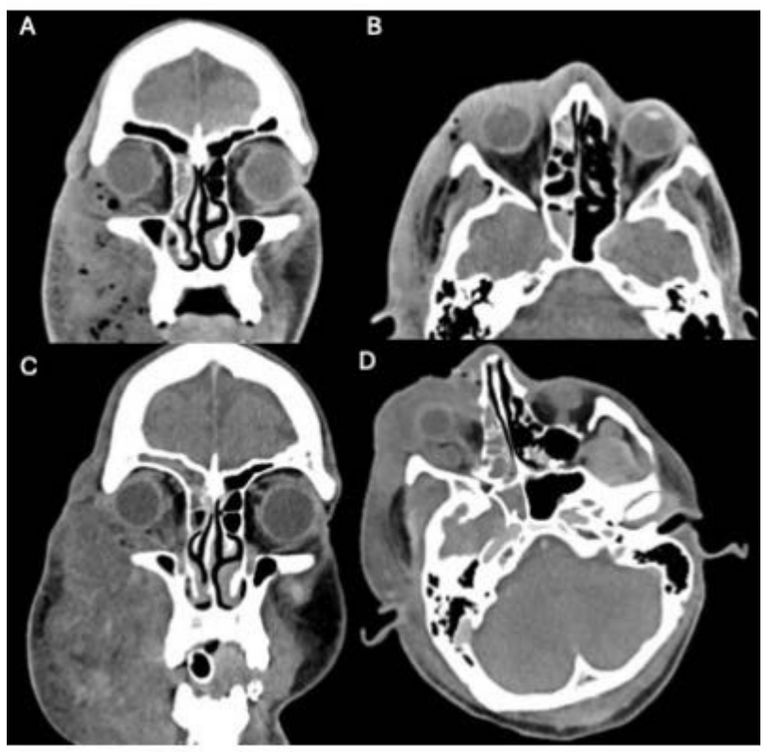


Figure 2



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A Case of Painless Periorbital Infarctions with Bilateral Subperiosteal Hematomas in a Child with Sickle Cell Disease

Marina Shenouda[1], Luke Farson[1], Ashkan Kashanchi[2], Timothy McCulley[2], Ying Chen[2]
[1]McGovern Medical School at the University of Texas Health Science Center at Houston, Houston, Texas, United States, [2]Ruiz Department of Ophthalmology and Visual Science, University of Texas Health Science Center at Houston, Houston, Texas, United States

Introduction: We present an unusual case of painless periorbital infarctions with bilateral subperiosteal hematomas in a child with sickle cell disease (SCD).

Methods: This is a case report reviewing history, exam, external photographs, and other clinical data.

Results: A 5-year-old African American girl with a history of SCD on hydroxyurea and penicillin prophylaxis presented to the emergency department with a week of periorbital swelling, abdominal pain, and low-grade fever. On exam, there was marked bilateral periorbital edema without overlying erythema (Figure 1). Extraocular movements were full. Visual acuity was unable to be measured due to lack of cooperation. Anterior and posterior exams were unremarkable. Urinalysis revealed a urinary tract infection (UTI), and intravenous (IV) antibiotics were initiated. Post-contrast magnetic resonance imaging revealed enhancement of the sphenoid bones and nonenhancing masses bilaterally, suggestive of bony infarcts and associated subperiosteal hematomas resulting in proptosis of the right globe (Figure 2). The patient received IV fluids, IV antibiotics for UTI, and blood transfusions for low hemoglobin. She also received 1 dose of IV methylprednisolone at 1mg/kg with marked improvement of her periorbital edema at discharge. She was discharged with oral trimethoprim-sulfamethoxazole for treatment of her UTI outpatient. At 6-month follow-up, the patient had stable mild periorbital edema without eye pain or vision changes.

Conclusions: Painless periorbital infarctions in SCD are very rare with only four cases reported in the literature[1-4], and the majority were unilateral at presentation. This is the first known case of painless bilateral periorbital edema with bilateral subperiosteal hematomas. Although orbital bony infarction is uncommon, children are at higher risk due to higher bone marrow content, though it is typically painful[5]. Formation of subperiosteal orbital hematomas are likely secondary to bone necrosis and subsequent bleeding[5]. Initial presentation may mimic orbital cellulitis[2]. Imaging of the orbits is vital as the lack of enhancement may help rule out an acute infectious process. The use of steroids could potentially decrease periorbital swelling and speed recovery[4]. However, more severe cases with compression and dysfunction of the optic nerve may require surgical intervention[5].

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Figure 1

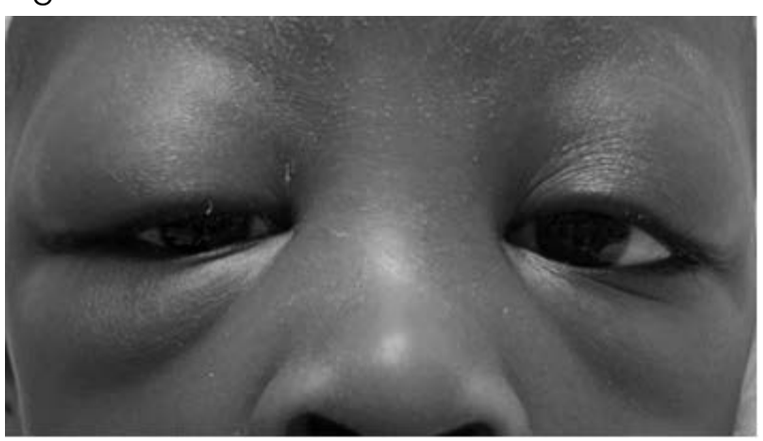
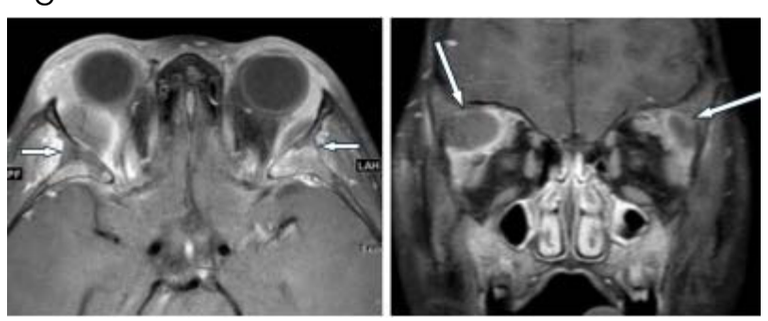


Figure 2



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A Rare Case of Solitary Fibrous Tumor involving the Nasolacrimal Duct System in a 12-Year-Old Female: A Case Report and Review of the Literature

Nishita Sheth[1,2], Emily Smith[3], Modupe Adetunji[2], Irene Lee[2], Julie Woodward[2], Thomas Cummings[3], Christopher Dermarkarian[2]
[1]University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, North Carolina, United States, [2]Ophthalmology, Duke Eye Center, Durham, North Carolina, United States, [3]Pathology, Duke University Medical Center, Durham, North Carolina, United States

Introduction: Solitary fibrous tumors (SFT) are rare neoplasms that typically arise from the pleura but can occasionally occur in extra-pleural locations, including the head and neck.[1] SFTs extending into the lacrimal sac are exceptionally uncommon, with limited cases in the literature.[2–13] We report the youngest case of solitary fibrous tumor with involvement of the nasolacrimal duct system.

Methods: A case report with literature review.

Results: A 12-year-old girl presented with a 6-month history of a painless, gradually enlarging, non-mobile mass in the right medial orbit near the anterior lacrimal sac fossa. She had no significant past medical history and denied any visual complaints, epiphora, diplopia, or ocular discomfort. Visual acuity was 20/20 in both eyes with intraocular pressure within normal limits. There was hyperglobus of the right eye. Computed tomography (CT) of the orbits with contrast was performed showing an ovoid well-circumscribed enhancing lesion adjacent to the right nasolacrimal system measuring approximately 10 x 11 mm (Figure 1A). An anterior orbitotomy was performed. The orbital mass was identified and found to be adherent to the underlying periosteum and continuous with the lacrimal crest, common canaliculus and nasolacrimal duct system. Pathology revealed a solitary fibrous tumor (1.2 x 1.1 x 1.1 cm) with hematoxylin and eosin (H&E) stain showing spindle cell morphology, a mitotic rate of 5 per 10 high power fields, and no necrosis (Figure 1B). Immunohistochemistry (IHC) was notably positive for CD34 (Figure 1C) with nuclear positivity for STAT6 (Figure 1D), and negative for S-100, consistent with a diagnosis of SFT. Figures 1B-D show unusual angiogenesis (“stag horn vessels”) which are characteristic of this tumor. Next generation sequencing confirmed NAB2-STAT6 gene fusion. The patient is to undergo a medial maxillectomy in conjunction with the otolaryngology service.

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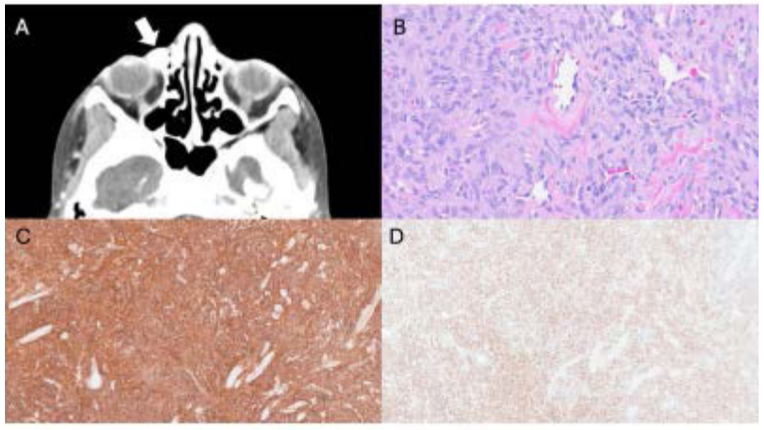
Conclusions: We report the youngest documented case of solitary fibrous tumor extending into the nasolacrimal duct system. To our knowledge, only 16 cases of solitary fibrous tumor involving the lacrimal sac have been reported, of which, average age was 43.[2-13] SFTs are typically thought to occur in the 3rd-5th decade of life.[1-13] While SFTs may be indistinguishable on imaging, on IHC, the CD34 and STAT6 positivity with S100 negativity aids in distinguishing SFT from other neoplasms.[14] While SFTs often exhibit non-aggressive behavior, complete excision remains crucial to mitigate the risk of recurrence.[1] Notably, SFTs with a high mitotic rate (≥ 4 mitoses per 10 high power fields) carry a heightened risk of malignant transformation.[1] The absence of proposed risk stratifying factors such as age over 45 years, tumor size exceeding 3 cm, and tumor necrosis in our patient suggests a lower risk of metastasis.[14] However, orbital SFT show a higher frequency of local recurrence than metastasis.[14] Thus, given our patient's mitotic rate of 5 per 10 high power field, positive surgical margins, and young age, re-resection for negative tumor margins is necessary to ensure no recurrence.

Figure 1



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A Novel 3D-printed Noninvasive Immobilizer for Head Stability During Surgery of the Orbit and Skull Base

Joseph Miller, Teresa Chen, Jeremiah Tao
Division of Oculofacial Plastic and Orbital Surgery, Gavin Herbert Eye Institute, University of California, Irvine, Irvine, California, United States

Introduction: The stability of the head during orbital and skull base surgeries is crucial for precise and successful outcomes. The Mayfield skull clamp is the most commonly used head immobilization device in cranial neurosurgical procedures and selected cervical procedures. However, these devices are invasive and introduce scalp as well as cranial morbidity. An unmet need may be a headrest device that is noninvasive and achieves head stability during orbital and skull base surgery. This study tests a novel 3D printed surgical headrest against conventional and previously manufactured designs using accelerometer-based measurements.

Methods: An accelerometer device was developed to track the acceleration of the headrest during simulated movements. Four headrest configurations were tested: no headrest, the Encompass 110000-200 Disposable Head Immobilizer headrest, and two new designs made from different materials; polyethylene terephthalate glycol (PETG), a hard plastic, and thermoplastic polyurethan (TPU), a soft plastic.

The headrest design has a top-down width of 239.78 mm, a depth of 183.95 mm from front to back, and a height of 220.6 mm (Figure 1). The top aspect of the headrest has a smoothly contoured, rectangular shape with rounded edges, ensuring an ergonomic interaction with the head. The left side view displays a gentle convexity peaking at 100.83 mm, which mirrors the natural curvature of the occipital region, promoting an anatomically aligned support structure. Observing the back side, a concave profile is evident, with a width of 196.89 mm and a concave profile width of 163.39 mm in the front, accommodating the posterior aspect of the head and neck respectively. This concavity transitions seamlessly to the front side, which showcases a symmetrical profile designed to cradle the user's head without imposing restrictive pressure points.

A whole body, non-embalmed cadaver's head was placed in each headrest condition and then subjected to controlled oscillations using Bellco Glass' Orbital Shaker. (SKU: 7744-02020) The acceleration data were recorded over a 3-second interval for each headrest configuration.

Results: The average absolute value of acceleration, in g-force, over 3 seconds for each headrest configuration was as follows: (1) no headrest: 0.019422 (2) Disposable Head Immobilizer headrest: 0.022974 g, (3) PETG headrest: 0.023563 g, and (4) TPU headrest: 0.016169 g.
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The TPU headrest had a 16.75% and 29.63% improvement in maintaining head stability relative to the no headrest and disposable headrest conditions respectively.

Conclusions: The results indicate that the TPU headrest provided greater stability compared to the PETG headrest, previously manufactured headrest, and the absence of a headrest. Specifically, the TPU headrest demonstrated the lowest acceleration values, suggesting superior stability simulated head movement. The study design led to slight interference of the cadaver body and the orbital shaker, giving rise to sharp spikes in acceleration in the headrest conditions.

In conclusion, this novel geometric configuration achieves high head stability in these experiments. In particular, a TPU material performed optimally. Further research may be indicated, but the design and material attributes identified in this study offers a potential noninvasive head stability device that may improve the safety and efficacy of orbital and skull base surgery.

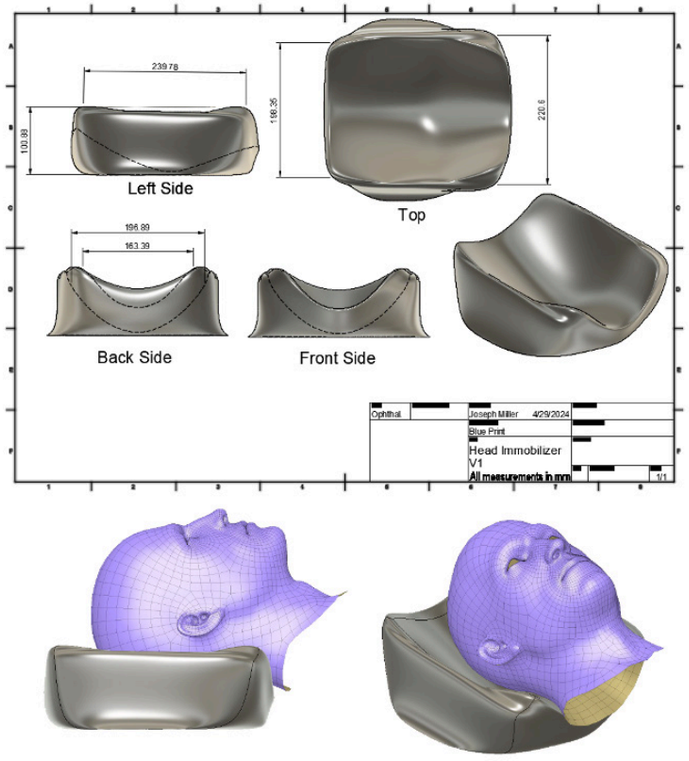

Figure 1: Blueprint of headrest and example of head resting in the headrest.

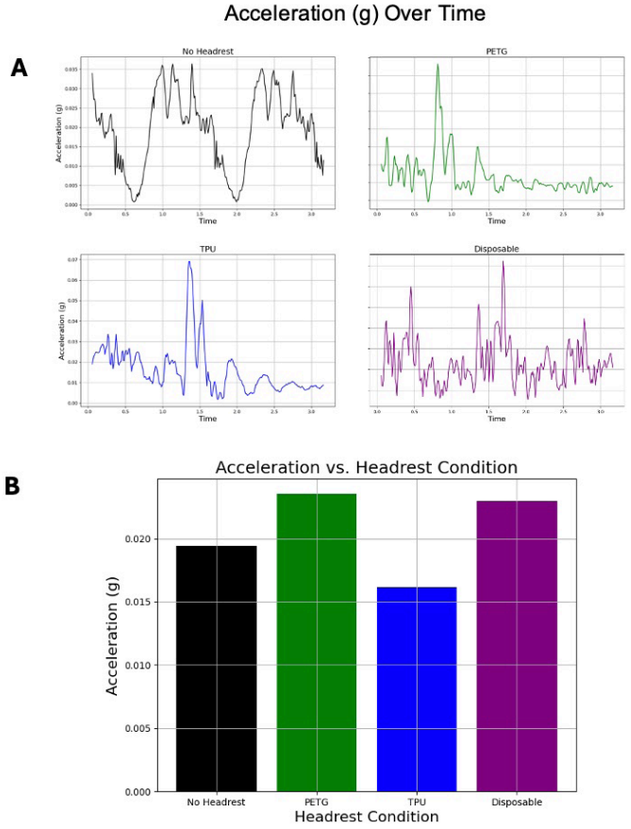

Figure 2. Depiction of acceleration tracked and averaged over the course of the 3 second time course.

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Centers for Medicare & Medicaid Services Reimbursement Declines for Chalazion Incision and Drainage

Jay Jaber[1], Taimur Siddiqui[1], Rapha Onyeka[1], Ryan Sorensen[1], Patrick Hunt[1], Richard Allen[2,3], Katherine Williams[2,3]

[1]Baylor College of Medicine, Houston, Texas, United States, [2]Department of Ophthalmology, Baylor College of Medicine/Cullen Eye Institute, Houston, Texas, United States, [3]Department of Surgery, Ophthalmology, Texas Children's Hospital, Houston, Texas, United States

Introduction: Despite regional and national advocacy, ophthalmologists face decreasing Medicare and Medicaid reimbursement rates across many sub-specialties.[1,2] Diminished reimbursement has been well described previously for cataract surgery and pediatric ophthalmology.[1,3,4] We aim to evaluate payment trends of a common oculofacial plastic surgery procedure, chalazion incision and drainage (I&D), in CMS reimbursement rates from 2000 to 2023. We hypothesize the CMS reimbursement for chalazion I&D has decreased when adjusted for inflation, thereby impacting physician specialty sustainability, hospital revenue, and patient care.

Methods: The Physician Fee Schedule Look-Up Tool from the Centers for Medicare & Medicaid Services (CMS) was queried for chalazion I&D surgery (HCPCS 67700). Comprehensive reimbursement data was extracted from 2000 to 2023. The average reimbursement and percent change was calculated and compared to the changes in the consumer price index over the same time period. Using data adjusted for inflation, trend analysis was performed for all included procedures. Adjusted R-squared and both the average annual and the total percent change in reimbursement were calculated based on these adjusted trends for all included procedures. Likewise, the compound annual growth rate was calculated.

Results: We report the amount compensated by CMS from 2000 to 2023 for both facility and non-facility chalazion I&D. All values include the initial value and the value once adjusted for inflation. The average facility reimbursement in 2000 (in 2000 USD) and 2023 (in 2023 USD) was $67.82 and $130.84, respectively. The percent change from 2000-2014 was 46% and –25% for the years 2014-2023. In comparison, the average non-facility reimbursement in 2000 and 2023 was $165.79 and $328.41, respectively. The percent change from 2000-2014 was 38% and –19% for the years 2014-2023. The presented data account for an overall negative trend when adjusted for inflation.

Conclusions: When adjusted for inflation, CMS reimbursement for all included procedures has steadily decreased from 2000 to 2023 with the largest decline seen in the last 10 years. This parallels previous reports of declining reimbursement rates across many specialties, including oculofacial plastic surgery.[1,5]

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While our insights are limited to chalazion I&D, future research should continue to expand to additional procedures to inform changes in reimbursement for the sub-specialty at large. Increased awareness and consideration of these trends will be important moving forward for policymakers, hospitals, and ophthalmologists.

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Ergonomics of Oculofacial Plastic Surgeons in Social Media Intraoperative Photos

Michael Han[1], Monica Botross[2], Teresa Chen[1], Jeremiah Tao[1]

[1]Division of Orbital and Ophthalmic Plastic Surgery, Gavin Herbert Eye Institute, University of California, Irvine, Irvine, California, United States, [2]Burnett School of Medicine, Texas Christian University, Fort Worth, Texas, United States

Introduction: Oculofacial plastic surgeons have high rates of musculoskeletal ailments.[1-3] We aim to characterize the ergonomic posturing of oculofacial plastic surgeons in intraoperative photos shared on social media.

Methods: Public Instagram posts of ASOPRS member oculofacial plastic surgeons operating were collected. The photos were qualitatively graded for the presence of excessive sagittal forward head tilt, visible thoracic kyphosis, deviation from upright posture, excessive outward distance between the elbow and torso, and elbow flexion with an angle less than 90 degrees (Figure 1). Two qualified graders were used to analyze the images and Kappa agreement scores were calculated. Relative risk ratios were calculated to examine the risk of poor ergonomics with gender, utilization of loupes and headlights, orbital versus eyelid surgery, or standing versus sitting while operating.

Results: A total of 68 images were selected for analysis from 68 unique Instagram profiles. Grader 1 observed 21 (30.9%) cases of head tilt, 20 (29.4%) with kyphosis, 5 (7.4%) with non-upright posture, 1 (1.5%) with outward elbows, and 32 (48.5%) with elbow hyperflexion. Grader 2 observed 26 (38.2%) cases of head tilt, 15 (22.1%) with kyphosis, 17 (25.0%) with non-upright posture, 9 (13.6%) with outward elbows, and 38 (57.6%) with elbow hyperflexion. Kappa agreement scores were 0.58 for head tilt, 0.58 for kyphosis, and 0.70 for elbow hyperflexion. Scores for non-upright posture and outward elbows were not included due to low agreement. 52 (76.5%) surgeons used loupes, 32 (47.1%) used headlights, 11 (42.3% of 26 visible photos) were performing orbital surgery, and 28 (41.2%) operated while standing. Both graders found that standing was significantly associated with relative risk (RR) (with 95% confidence interval) of head tilt [Grader 1: RR 2.32 (1.11-4.85) , Grader 2: RR 1.95 (1.06-3.59)] but protective against elbow hyperflexion [Grader 1: RR 0.27 (0.12-0.61), Grader 2: 0.45 (0.25-0.79)]. Grader 1 additionally found that loupe and headlight use were protective against elbow hyperflexion with RR 0.53 (0.34-0.83) and RR 0.55 (0.31-0.96) respectively. Grader 2 found that female surgeons were more likely to have elbow hyperflexion with RR 1.84 (1.19-2.84).

Figure 1: Representative photos of proper (L) and poor (R) operating ergonomics. The latter includes excessive sagittal forward head tilt, thoracic kyphosis, deviation from upright posture, excessive outward distance between the elbow and torso, and elbow flexion with an angle less than 90 degrees.

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Conclusions: The prevalence of poor ergonomics in oculofacial plastic surgery is high in this sample of publicly shared photographs of surgeons on Instagram, with 67.6-85.3% of photos demonstrating one or more ergonomic issues. Elbow hyperflexion and head tilt were the two most common ergonomic deficiencies. Both graders found that standing during surgery increased risk of sagittal head tilt but was protective against elbow hyperflexion. These data suggest that improved operating room posture and ergonomics may be an opportunity to reduce musculoskeletal issues in oculofacial plastics surgeons.[1]

Figure 1

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Evaluating Social Vulnerability Index and Visit Adherence in Patients Undergoing Oculofacial Surgery

Ghasem Yazdanpanah[1], Raine Solarin[2], Kevin Heinze[1], Pete Setabutr[1], Ann Q Tran[1]
[1]Department of Ophthalmology, University of Illinois Chicago, Chicago, Illinois, United States, [2]University of Illinois Chicago College of Medicine, Chicago, Illinois, United States

Introduction: The Social Vulnerability Index (SVI) is an index to represent how vulnerable a community is to disastrous events [1]. SVI is attributed to different themes and social factors (Figure 1), where higher percentiles indicate more vulnerability. SVI has been investigated in the field of ophthalmology as a tool to gauge how susceptible a patient is to clinical appointment non-adherence [2, 3]. The goal of this study was to investigate the relationship of SVI with patients undergoing oculoplastic surgeries and visit adherence.

Methods: This study has been approved by the University of Illinois Institutional Review Board. Information of patients who had elective versus urgent surgeries (surgery >24 versus 25% no-shows in scheduled visits. The 2020 census tract geographic Federal Information Processing System (FIPS) codes were obtained from Census Geocoder website [4] using residence addresses. Then, the FIPS codes were used to obtain the SVI scores for each patient using the 2020 census tract SVI data [1]. The distribution of enrolled patients' residence was plotted on the city map by uploading the place of residence coordinates in Google Map [5]. Statistical analyses performed using SPSS 29.

Results: We identified 1,053 individuals, of which 930 received elective oculoplastic surgeries and 123 underwent urgent surgeries. As summarized in Table 1, those who had urgent surgery were significantly younger (43.9±24.7 years) than those with elective surgeries (54.7±22.3 years, p<0.001), with a higher proportion of male individuals (57.6% vs. 41.4%, p<0.001). The distribution of race/ethnicity was not significantly different between the two groups (p=0.505) and the proportion of patients without a PCP was similar between the elective (73.2%) and urgent (76%) surgery groups (p=0.294). Patients opting for elective surgery were more likely to retain an email address on record (58.3% vs. 45.6%, p=0.005) and maintain an active MyChart status (60% vs. 44.8%, p=0.002). Figure 2 demonstrates the geographic distribution of included patients categorized based on urgency of surgery. Patients undergoing urgent surgery exhibited an increased incidence of visit non-adherence (28.8% vs. 20.3%, p=0.022, Figure 3). Binary logistic model showed that individuals underwent urgent surgeries have 1.71 times (95%CI:1.1-2.6, p=0.014) more likelihood to be not adherent to visits. Moreover, those with overall SVI percentile >74% have 2.82 (95%CI:1.78-4.47, p<0.001) times odds of being not adherent to visits adjusted based on the surgery urgency (Table 2).

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Conclusions: Our results showed that patients undergoing urgent oculofacial surgeries tend to be younger and have lower rates of electronic access and adherence to visits compared to those undergoing elective surgeries. Additionally, a higher SVI percentage is associated with a greater likelihood of lacking adherence to visits. These findings could have important implications for concentrated efforts to improve access and adherence, particularly for vulnerable patient populations.

Figure 1

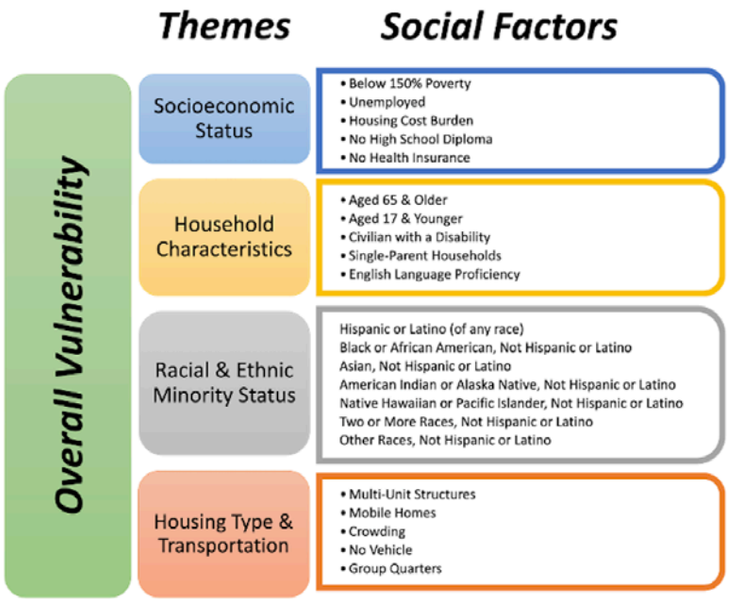

Figure 1: The Social Vulnerability Index (SVI) as defined by the 2020 U.S. Census data to determine relative social vulnerability of each census tract [1]. A total of 4 themes and 16 social factors are considered. The overall vulnerability encompasses all themes and social factors.

Figure 2

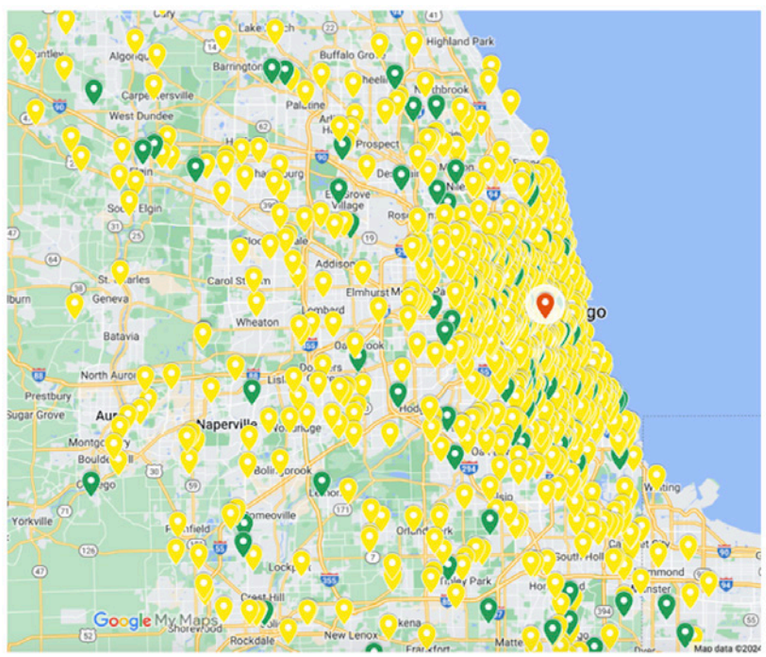

Figure 2: Geographic distribution map of place of residence of patients with urgent oculofacial surgery (green icon), with elective surgery (yellow icon) and our institute (red icon).

Figure 3

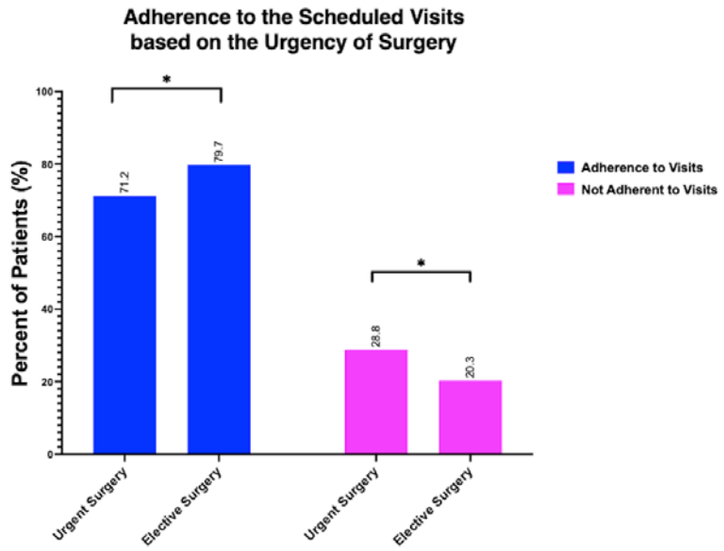

Figure 3: Percentage of population adherent to the scheduled visits or not adherent to the scheduled visits categorized based on the urgency of oculofacial surgery. *p<0.05

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	Elective Oculofacial Surgeries (N= 930)	Urgent Oculofacial Surgeries (N=123)	p-value
Age (y), mean±SD	54.7±22.3	43.9±24.7	<0.001
Gender (n, %)			
Male	385, 41.4%	72, 57.6%	<0.001
Female	545, 58.6%	53, 42.4%	
Race/Ethnicity (n, %)			
Asian/Non-Latinx	3, 2.4%	24, 2.6%	0.505
Black Non-Latinx	27, 29.6%	235, 25.3%	
Hispanic/Latinx	29, 23.2%	208, 22.4%	
White/Non-Latinx	44, 35.2%	312, 33.5%	
Multiracial Non-Latinx	1, 0.8%	16, 1.7%	
Native American/Pacific Islander Non-Latinx	0	19, 2%	
Non-Specified	11, 8.8%	116, 12.5%	
Have PCP?			
Yes	249, 26.8%	30, 24%	0.294
No	681, 73.2%	95, 76%	
Electronic Access to Patient			
Have Email Address on File	542, 58.3%	57, 45.6%	0.005
Active MyChart Status	558, 60%	56, 44.8%	0.002
Adherence to Visits			
Less than 25% no-show visits	741, 79.7%	89, 71.2%	0.022
More than 25% no-show visits	189, 20.3%	36, 28.8%	
Overall SVI Percentile (n, %)			
<24%	182, 19.7%	31, 25%	0.527
24-49%	137, 14.8%	15, 12.1%	
49-74%	252, 27.2%	33, 26.6%	
>74%	355, 38.3%	45, 36.3%	

Table 1. Summary of demographic data of patients and CDC-defined 2020 census tract overall social vulnerability index percentile included in this study separated by elective versus urgent surgeries. Statistical analysis performed with Chi-Square test. Key: PCP – primary care provider, SVI – social vulnerability index.

	OR (95% CI) of outpatient visit non-adherence(>25% No-Shows)	p-value
Oculofacial Surgery Urgency		
Elective	Ref	Ref
Urgent	1.71 (1.1-2.6)	0.014
Overall SVI Percentile		
<24%	Ref	Ref
24-49%	1.54 (0.86-2.7)	0.149
49-74%	1.64 (0.99-2.72)	0.052
>74%	2.82 (1.78-4.47)	<0.001

Table 2. Summary of the results of the performed binary logistic regression with outcome of adherence to the outpatient visits. Key: SVI – social vulnerability index; OR – odds ratio; CI – confidence interval

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Medicare Utilization and Billing Trends for Oculoplastic Procedures, 2013–2019

Matthew Lee[1], Philip Rizzuto[1], Justin Karlin[2]

[1]Brown School of Medicine, Providence, Rhode Island, United States, [2]Stein and Doheny Eye Institutes, UCLA, Los Angeles, California, United States

Introduction: Medicare currently serves over 63 million Americans.[1] Analysis of the Medicare Part B database provides insights into utilization, charges and reimbursement rates for various medical procedures. Notably, ophthalmic procedures have experienced the second largest cumulative reduction in Medicare Physician Fee Schedule spending across specialties compared to pre-pandemic levels.[2] Prior work has found declining reimbursement rates and utilization for selected oculoplastic procedures.[3] The present study aimed to conduct an analysis of trends in Medicare utilization, charges, and reimbursements for a wider range of oculoplastic procedures.

Methods: The Physician/Supplier Procedure Summary was queried to collect the number of approved services, charges, and reimbursements billed to Medicare Part B from 2013-2019 for all oculoplastic surgery (OS) CPT codes. Utilization, weighted mean reimbursements and charges, and charge-to-reimbursement ratios (CRRs, which represent the markup of charged amount versus payment rendered) were calculated for each procedure code. Procedures were organized into two categories: those common in all beneficiary age groups (“age agnostic”) and those more common in older beneficiary age groups. CRRs were calculated at the state level to compare billing trends across different regions in America. Two sample t-tests and linear regression analyses were performed.

Results: Out of 143 CPT codes, 17 were excluded from analysis due to fewer than 100 service counts from 2013 to 2019. Across all OS procedures included in the analysis, total utilization substantially declined (-25.2%) over the study period. Categories with the largest decline in utilization were orbital fracture (-38.0%) and enucleation (-37.0%) procedures. Procedures more commonly performed on older beneficiaries experienced a significantly greater decrease in utilization compared to age agnostic procedures ($p < .001$). Overall reimbursements also decreased (-4.2%), while charges (10.4%) and CRRs (16.1%) increased. Increasing charge was significantly associated with declining utilization ($p < 0.05$). Utilization of posterior-approach ptosis repair increased (12.9%) while that of anterior-approach ptosis repair decreased (-8.5%). Upper blepharoplasty utilization substantially declined (-20.5%). All 50 states exhibited a positive CRR.

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Conclusions: Charges for OS procedures steadily increased, which may reflect an attempt to compensate for declining reimbursements seen with the majority of procedures. The data suggest that surgeons are shifting away from anterior-approach ptosis repair and towards posterior-approach ptosis repair, possibly indicating a change in surgeon preference. Additionally, the steady decline in blepharoplasty utilization suggests an increasing trend towards cosmetic blepharoplasties, potentially influenced by the bundling regulations introduced by the CMS in 2009 and 2016. Further work, particularly looking at private insurance databases, is required to fully understand the broader utilization and billing trends for OS procedures.

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The Evolving Concept of Success and Factors Empowering Women in Ophthalmology to Achieve It

Tiffany Hu[1], Elaine Downie[2], Kendall Goodyear[3], Daniel Rootman[3], Kelsey Roelofs[4]

[1]University of California, Irvine, Irvine, California, United States, [2]Department of Ophthalmology, University of Michigan, Ann Arbor, Michigan, United States, [3]Department of Ophthalmology, University of California, Los Angeles, Los Angeles, California, United States, [4]Department of Ophthalmology, University of Alberta, Edmonton, Alberta, Canada

Introduction: Prior research has focused on the barriers faced by women,[2–5] with few studies exploring the qualities empowering women to achieve success. Furthermore, little has been written about how the concept of success may evolve throughout one's career. This phenomenological study explores the definition of success and the characteristics empowering its achievement among women in ophthalmology.

Methods: A descriptive qualitative study was designed using semi-structured interviews. Women members from ASOPRS and AAO were invited to participate. Interviews comprised of six open-ended questions (Table 1), were conducted through Zoom, and transcribed using Otter.ai. Interview data was analyzed using NVivo software and an inductive approach to thematic analysis, where research team-members independently reviewed and coded transcripts, was completed. Themes were then aggregated and agreed upon by consensus.

Results: 47 women participated: 10 (21%) early-career within the first five years, 16 (34%) mid-career between six-fifteen years, and 21 (45%) late career with over 15 years. Practice setting divided into: 30 academics (68%), 8 private-practice (17%), 6 hybrid (13%), 3 other (6%).

The definition of success often included a caveat–success is individualized and self-defined. While themes like excellent patient care were mentioned across all career stages, others were clustered by years of practice.

Early-career participants defined success more singularly as "achieving a goal determined by oneself," often using external benchmarks of professional achievements as their metric.

Mid-career individuals focused more on internal validation themes: "sense of fulfillment" and "personal gratification", emphasizing multi-dimensional aspects of holistic success in their professional career as well as in their personal life as a mother, wife, and friend.

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Those practicing over 15 years took an even broader outlook on success as "the journey", and "the ability to make a positive impact on those around you." From early-to-late career, the concept of success evolved from an outward perception to an inward feeling. Success was "no longer defined by material things, a position, or accomplishment, rather, a-sense of gratitude to where you've been, where you are, and where you're heading."

Themes about achieving success were often mirrored between 'aids' and 'barriers', and further subdivided into: external, internal, societal (Figure 1). Mentorship was the most universally mentioned aid. Managing non-professional responsibilities, particularly childcare, was the most ubiquitous barrier. Actionable suggestions commonly involved creative solutions for childcare support.

Conclusions: Medical training is often viewed as a linear trajectory defined by achieving external benchmarks; however, cultivating an individualized definition of success through self-reflection appears to be a critical foundation for achieving it throughout one's career. Appreciating the fluidity with which this definition evolves, recognizing the value of the journey, sharing experiences of failure, building a professional network with mentors/sponsors, and investing in personal support systems are critical. In addition, the need for solutions minimizing gender-specific barriers, including childcare, was highlighted.

While an overarching theme of dualities emerged for ''aids'/'barriers' to success, perhaps the most empowering message was the importance of self-reflection and self-advocacy: by knowing yourself, your goals, and capitalizing on your intrinsic strengths, you already have everything you need within you to achieve success.

Table 1. Questions asked to all participants during semi-structured interview.

Could you state your name, age, and current title/position?
How many years have you practiced?
Do you work in an academic or private practice setting?
How do you define success? (What does success mean to you?)
What are some of the barriers to achieving success that you have personally encountered?
What are some of the things that helped you to achieve success?
What are the characteristics that empower women to achieve success?
Have you achieved success so far?
If yes, in what ways have you achieved success so far?
If not, why do you feel you have not achieved success so far?
Lastly, on the topic of empowering women to achieve success in oculoplastic surgery, is there anything I didn't ask you that I should have? Or anything in general that you would like to add?

Table 2. Breakdown of participants based on stage of career and practice type.

Stage of Career	**Number of Participants (Percentage)**
Early-career (practicing 5 years or less)	10 (21%)
Mid-career (practicing 6 – 15 years)	16 (34%)
Late-career (practicing over 15 years)	21 (45%)
Practice Type	**Number of Participants (Percentage)**
Academic	30 (64%)
Private-practice	8 (17%)
Hybrid (academic and private-practice)	6 (13%)
Other (government, HMO)	3 (6%)

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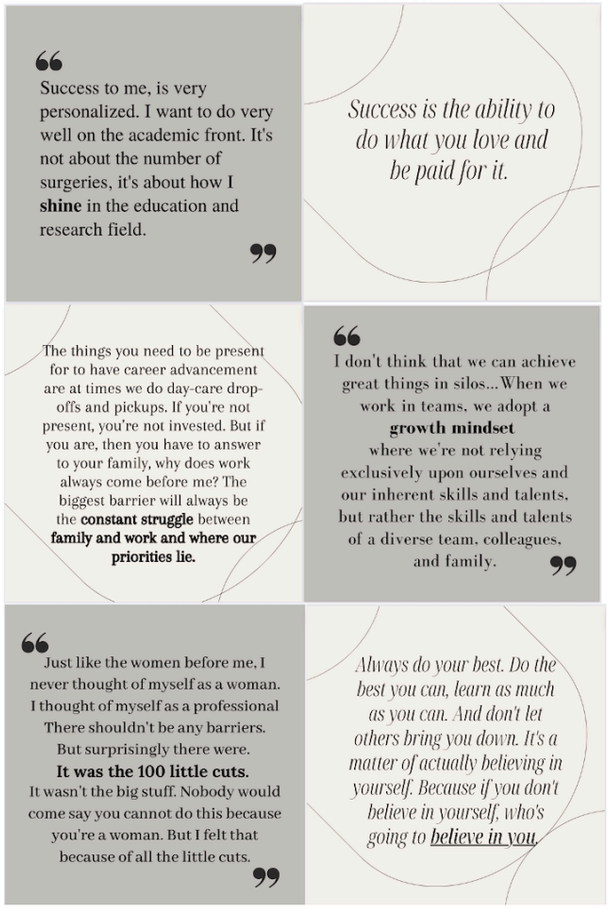
	Aid to Success	Barrier to Success
Internal	**Who you are:** Passion, emotional intelligence, collaboration, fulfillment, effort, perseverance, drive, humility, ability to prioritize, efficiency, flexibility, organized, time management, resilience, confidence, self-acceptance	**Self-doubt**
	What you do: self-advocacy, self-reflection and identification of core values, using failure to guide, becoming well trained, maintaining your own well-being, saying no when opportunities do not align with your goals	**Lack of defined goals**
Societal		**Discrimination based on appearance, background and/or gender**
External	**Mentors and sponsors**	**Lack of mentorship, sponsorship or professional supports** Navigating uncharted territory
		Time Balancing between professional and personal realm Within professional sphere (Clinical vs research vs administrative)
	Supports Professional: supportive institutions and colleagues, professional networks and societies Personal support systems	**Responsibilities outside of the professional realm** Childcare, family
		Situational Governance, legislation, political, misalignment with leaders or colleagues
		Financial Funding for research and/or clinical endeavours

Figure 1. Illustration of common themes and sub-themes identified as intrinsic, societal, and extrinsic factors impacting the ability to achieve success listed in descending order of frequency noted within each category.

Figure 2: Quotes from interviews divided based on interviewee's career stage. The first row is Early-career, the second row is Mid-career, the third row is Late-career.



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