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SYLLABUS

Continuing Medical Education

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Moderators: Kian Eftekhari, MD and Ashley Campbell, MD

7 am

Bupivacaine Uptake and Elution from Porous Polyethylene Orbital Spheres in Post-Enucleation/ Evisceration Pain Control

Emily Charlson, Clinton Kolseth, Giancarlo Garcia, Andrea Kossler, Benjamin Erickson
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Introduction: Pain after enucleation or evisceration with orbital implant placement is often treated with retrobulbar infiltration of local anesthetic. After several hours, pain frequently returns, requiring oral narcotics for relief. In effort to provide more durable post-operative pain control, porous orbital implants have be infused with bupivacaine prior to placement within the anophthalmic socket. Bupivacaine loading capacity and release kinetics in this setting remain unknown. Here, we quantify and compare bupivacaine uptake and elution from porous polyethylene orbital implants to determine loading and time course of drug release.

Methods: 20mm porous polyethylene orbital implant spheres were placed within a 0.5% bupivacaine containing syringe and loaded using a manual or pump-assisted vacumm. Bupivacaine was recovered by washing the sphere in an ethanol sonicating bath and quantified using liquid-chromatography-mass spectrometry (LCMS). Sphere weight was determined pre and post treatment. The volume of loaded bupivacaine, efficiency, and maximal capacity of fluid uptake of the sphere were calculated. Loaded spheres were then submerged in a balanced salt solution (BSS). A small aliquot of BSS was obtained for analysis at 30 min, 1 hr, 2 hrs, 3 hrs and 24 hrs and the fraction of released bupivacaine measured by LCMS. A bupivacaine-fluorescein loaded orbital sphere was then wrapped in cadaveric sclera and placed within a cadaver orbit. After 1 hour, the orbit was extenterated and the bupivacaine-fluorescein visualized under blue light illumination.

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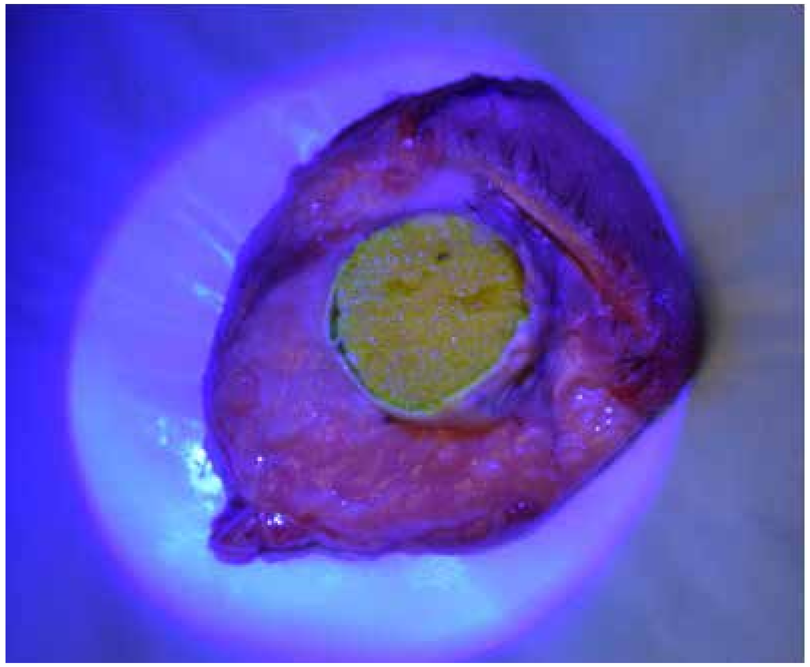
Results: Three orbital sphere replicates were used for each assay. An average total of 1.22 ml of fluid can be loaded into the spheres. After 90 sec of bupivacaine uptake under a manually-created vacuum, an average of 96.7% of the total volume available for uptake had been saturated. With prolonged loading time of 10 min, this increased marginally to 97.3%. Under a pump-assisted vacuum, these values were lower at 92.9% at 90 sec and 93.9% at 10 min. An average of 97.6% of loaded bupivacaine was solubilized into ethanol and recoverable via LCSM quantification. Bupivacaine release was on average 48.9% at 30 min, 63.0% at 1 hr, 69.2% at 2 hrs, 83.6% at 3hrs, and 96.6% at 24 hrs into BSS. In a cadaveric model, fluorescein-spiked bupivacaine showed complete saturation of the porous polyethylene. After 1 hr within a cadaveric orbit, the majority remained in close proximity to the implant [Figure 1].

Conclusions: Our results show that intraoperative bupivacaine-uptake of porous polyethylene orbital spheres under 90 secs of a manually-created vacuum is effective and produces almost complete saturation of implant loading capacity. Approximately half of loaded bupivacaine is released from the sphere within 30 minutes, the majority by 3 hrs and is mostly complete at 24 hrs into BSS. In a cadaveric model, fluorescein-containing bupivacaine showed saturation of a scleral wrapped orbital sphere. After 1hr, the majority of fluorescence remained in close proximity to the sphere suggesting that the analgesic action of bupivacaine may be most concentrated at the site of implantation. Additional modifications to the anesthetic and/or implant can likely be instituted to slow drug elution and prolong analgesic effect.

Figure 1



7:04 am

Punctal Impatency after Dupilumab Treatment for Atopic Dermatitis

Liza Cohen[1,2], Michael Yoon[1,2], Debora Lee[3], Jeremiah Tao[3]
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Introduction: Conjunctivitis is a known side effect of dupilumab, a monoclonal antibody that inhibits interleukin (IL)-4 and IL-13 signaling and is used to treat moderate-to-severe atopic dermatitis.[1,2] Cicatricial ectropion with punctal stenosis has been reported in a patient taking dupilumab,[3] yet complete punctal obstruction has not been described. Herein, we report 3 additional cases of punctal impatency with dupilumab, and the treatment rendered in each case.

Methods: Retrospective interventional case series.

Results: *Case 1*: A 34-year-old man with a 20-year history of severe systemic atopic dermatitis (AD) treated with dupilumab intramuscular injection every other week for 7 months presented with irritation, redness, and tearing of both eyes, which began 1 month after starting dupilumab. He had been treated with topical tacrolimus and loteprednol etabonate ophthalmic ointments with minimal improvement in symptoms. Clinical examination showed bilateral eyelid dermatitis with edema and hypopigmentation, secondary lagophthalmos, lower eyelid cicatricial ectropion, conjunctival papillae, and obstruction without visible patency of all 4 puncta (Figure 1). Attempted dilation and irrigation confirmed the lack of patency. Due to the known association between dupilumab and conjunctivitis as well as the severity of his epiphora resistant to topical therapy, dupilumab was discontinued. At follow-up 7 weeks after stopping dupilumab, epiphora was nearly resolved, and all 4 puncta were patent and had recanalized (Figure 2). Irrigation demonstrated patency of the lacrimal system from both lower puncta to the nose.

Case 2: A 31-year old man with severe AD treated with dupilumab was referred for evaluation of irritation, redness, and tearing of both eyes. He was taking biweekly dupilumab 300 mg injections for AD and topical prednisolone acetate 1% for his ocular symptoms. Clinical exam revealed bilateral eyelid dermatitis with edema, conjunctival injection, and stenosis of all 4 puncta (Figure 3). Decision was made to reassess after clearing of conjunctivitis, for which erythromycin was added, and to consider punctoplasty with silicone stent if epiphora persisted.

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Case 3: A 53-year old woman with severe recalcitrant AD treated with dupilimab was referred for evaluation of irritation, redness, dryness and tearing of both eyes that developed 2 years earlier. Four months prior to symptom onset, she had started biweekly dupilumab injections with satisfactory response after having failed systemic steroids, cyclosporine, methotrexate, and aprelimast. Ocular symptoms were reported to worsen after injection and then subside. At presentation, she was taking a course of topical loteprednol taper for a flare up, prednisolone acetate 1% as needed, artificial tears, and eyelid cleanser for her ocular symptoms**.** Medical history was also significant for hepatitis C, hypothyroidism, asthma, osteopenia, and secondary adrenal insufficiency due to previous chronic steroid use. Clinical examination revealed bilateral mild papillary conjunctivitis, meibomian gland dropout, stenosis of all 4 puncta, and high tear film in both eyes (Figure 4). Given her preference in continuing dupilumab and the severity of her epiphora, the patient underwent bilateral probing upon which punctal (both upper and lower) stenosis were detected, and silicone tubes were inserted bilaterally. One week later, epiphora had resolved with patency of all 4 puncta.

Conclusions: Punctal obstruction resulting in epiphora is an important side effect of dupilumab. In severe cases, cessation of the medication or punctoplasty may be indicated to restore punctal patency and treat epiphora.

Figure 1

Figure 2

Figure 3

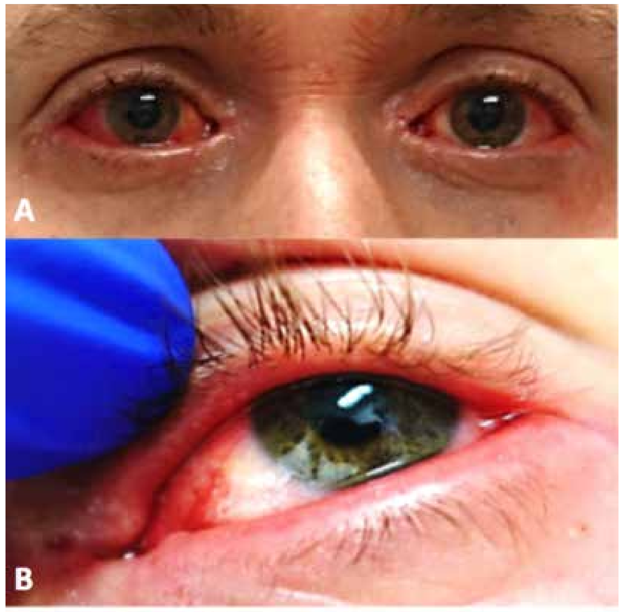
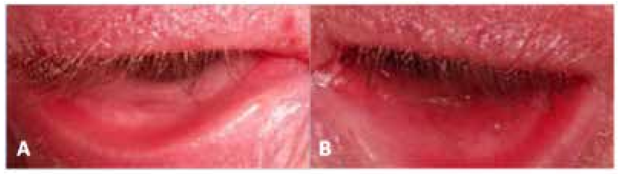


Figure 4



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7:08 am

Beta Adrenergic Receptor Profile of Conjunctival Pyogenic Granulomas

Angel Jiang[1], Elzbieta Mechel[1], Rachelle Mendoza[2], Rong Xia[2], Mengru Li[2], Roman Shinder[1]
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Introduction: Pyogenic granulomas (PG) are common acquired benign vascular lesions that occur on mucocutaneous surfaces secondary to inflammation from chalazia, surgery, or trauma. They can cause discomfort, spontaneously bleed, and be cosmetically bothersome. Treatments include topical steroids, excision, cryotherapy, electrocautery, and laser ablation. Recent reports demonstrated that timolol, a non-selective ß-blocker, may be an alternative, non-invasive treatment with fewer side effects than steroids. No prior reports have attempted to characterize the beta-adrenergic receptor profile of conjunctival PG. In this histopathological study, the authors investigate the expression of beta-1 and beta-2 adrenergic receptors in conjunctival PGs in order to confirm that ß-blockade has a scientific basis for treatment, and if so, to determine whether the beta-1 or beta-2 receptor is more numerous, and thus, a better selective treatment target.

Methods: Twenty-five previously excised conjunctival PGs were studied. Immunohistochemistry was performed on 4um serial sections of the specimens with anti-beta-1 and -2 adrenergic receptor antibodies. Two pathologists independently interpreted the staining of endothelial, inflammatory, and squamous cells in the specimens using a semiquantitative scoring system adapted from Chisholm et al: 0 = negative (50% cells stained, Fig 1C). Tissue controls included human heart, cerebral cortex, and hippocampus for the beta-1 receptor and human endometrial adenocarcinoma for beta-2.

Results: Specimens were obtained from 16 males and 9 females with a mean age of 46 (range 6-76). Mean lesion diameter was 3.9 mm (range 1-12). Table 1 summarizes the staining characteristics of the specimens. Beta-1 adrenergic receptor expression was stronger among endothelial and inflammatory cells, with 24 (96%) specimens and 22 (88%) specimens scoring 3, respectively. Squamous cells did not stain as strongly, with 17 (68%) specimens scoring 3. Beta-1 staining was at least weakly positive in endothelial and inflammatory cells of all samples, and in the majority of samples' squamous cells. Beta-2 adrenergic receptor expression was strongest among squamous cells with 13 (52%) specimens scoring 3. This contrasts inflammatory cells (1 specimen, 4%) and endothelial cells (none) with regards to strong staining. As with beta-1, beta-2 adrenergic receptor staining was at least weakly positive in all cell types in the majority of samples. Beta-2 staining was at least weakly positive in 17 (68%) of inflammatory and squamous cells, and 13 (52%) of endothelial cells. Overall, beta-1 receptor expression was stronger than beta-2 with a mean staining score across all cell types of 2.63 for beta-1 and 1.44 for beta-2.

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Conclusions: Our study demonstrates at least weak expression of the beta-2 adrenergic receptor among endothelial, inflammatory, and squamous cells of conjunctival PGs, indicating that nonselective beta-blockade has a scientific basis in the treatment of ocular PGs. Our results further show that beta-1 receptor expression is higher among all cell lines than that of beta-2. This suggests that selective beta-1 blockade such as with betaxolol may be a superior treatment strategy to avoid possible side effects associated with beta-2 blockade, including bronchospasm.

Figure 1

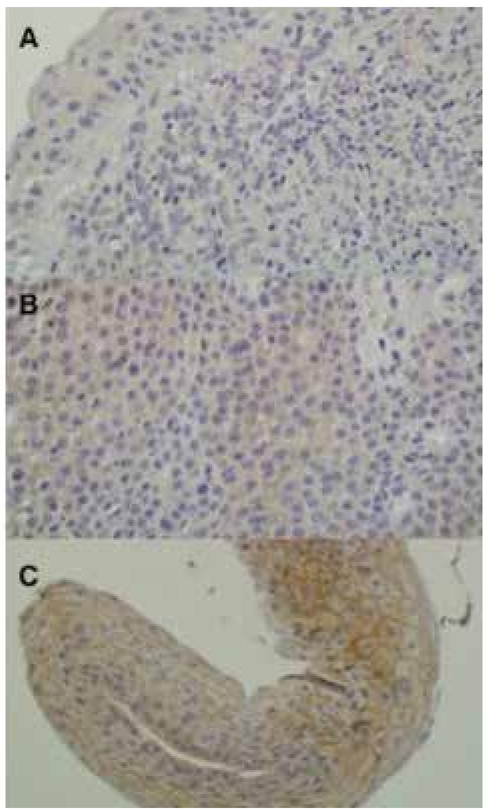

Figure 2

Table 1. Staining scores of conjunctival PGs

	Beta-1 adrenergic receptor			Beta-2 adrenergic receptor		
Cell type	Inflammatory	Endothelial	Squamous	Inflammatory	Endothelial	Squamous
Score:	Total number of samples with select score			Total number of samples with select score		
0	0	0	8	8	12	8
1	0	0	0	0	0	0
2	3	1	0	16	13	4
3	22	24	17	1	0	13
Overall mean score across all cell types	2.63			1.44		

References:

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7:12 am

Tear Trough: Real or Virtual?

Sathyadeepak Ramesh[1,2], Robert Goldberg[3], Allan Wulc[1], Alan Brackup[1]
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Introduction: Much has been written about the tear trough, also known as the nasojugal fold. Conventional wisdom holds that the tear trough is a superficial depression that is formed by an underlying ligamentous attachment to the bone, named the orbital retaining ligament (ORL) or the tear trough ligament[1]. In our experience, we have noted that the presence of a tear trough is not necessarily a "deformity" or marker of aging – rather, young, attractive patients have particular phenotypes of the tear trough as well, which may be aesthetically pleasing. Moreover, we observe that we can alter the tear trough by operating on structures other than the orbital retaining ligament. We hypothesize that the clinically observed tear trough, rather than being a fixed anatomic structure, is a virtual topographic landmark that is created by the confluence of light and shadows of the adjacent structures.

Methods: In this study, retrospective analysis was performed on patients who presented to the authors' oculoplastics clinics from 2015 – 2018, to answer specific research questions.

Primary outcome variables were marginal reflex distance-2 (MRD2), lower eyelid length, and nasojugal fold depth. MRD2 was measured from the pupillary center to the lower eyelid margin. Lower lid length was measured from the lower eyelid margin at the midpupillary line to the first convexity in the cheek[2]. The depth of the nasojugal fold was graded from 0-3, using a scale previously published[3].

To define aesthetic ideals of the tear trough, 20 patients and 20 models (10 male, 10 female) from the age of 16 – 30 years old were selected from analysis. To study the impact of orbital fat excision, 15 consecutive patients who underwent lower lid blepharoplasty with fat excision alone were identified. To study the effect of elevation of the malar fat, 10 consecutive patients who underwent a preperiosteal endoscopic midface lift were identified. To study the effect of anterior lamellar rejuvenation on the tear trough, 10 consecutive patients who underwent laser resurfacing to the lower eyelids or full face were identified. To study the effect of orbital retaining ligament release on the tear trough, 15 consecutive patients who underwent fat transposition lower blepharoplasty in the preperiosteal plane were identified.

Primary outcome variables were measured in each group and data analyzed with ANOVA.

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Results: A total of fifty patients met inclusion and exclusion criteria and were included in the study. For ideal patients, the nasojugal fold was significantly less prominent in ideal female models compared to all other groups ($p<0.0001$). The nasojugal fold was significantly effaced after all types of procedures ($p<0.0001$), but was significantly more effaced after fat transpositional lower blepharoplasty ($p<0.01$) than all other procedures.

Conclusions: A slight, medial tear trough is present in youth in many patients, and complete obliteration is not necessary for rejuvenation. The clinical tear trough is a virtual topographic structure distinct from the anatomic tear trough ligament, and can be altered in a variety of ways. Lower blepharoplasty should focus on addressing these individual components in the context of patient-specific factors, to provide a natural, aesthetically pleasing result.

Figure 1

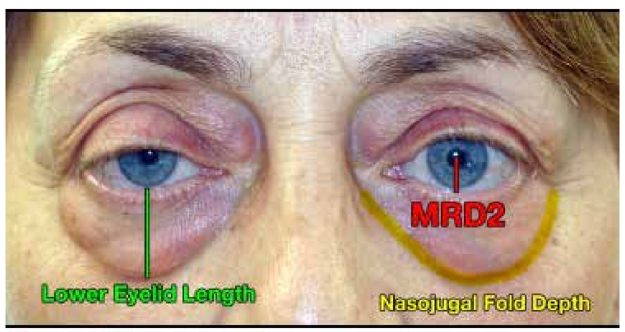


Figure 2

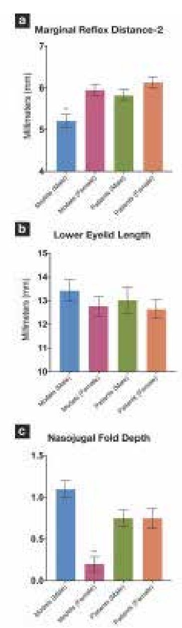


Figure 3

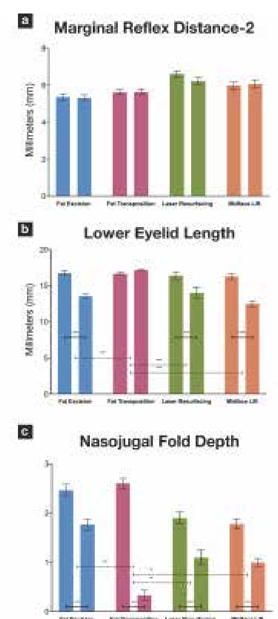
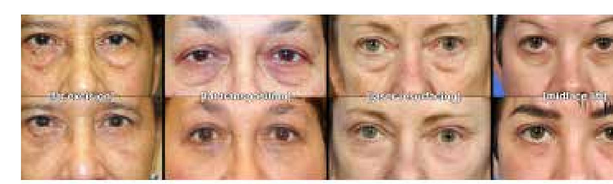


Figure 4

Figure 5



References:

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3. Barton FE, Ha R, Awada M, Dallas MD. Cosmetic Fat Extrusion and Septal Reset in Patients with the Tear Trough Triad: A Critical Appra.

7:16 am

Functional Genomics of Orbital Fat in Relation to Extraorbital Adipose Depots

Sathyadeepak Ramesh[1,2], Shoaib Ugradar[3], Cynthia Boxrud[3], Daniel Rootman[3,4]

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Introduction: Orbital fat is distinct from fat from other sites in its unique chemical composition[1], is not responsive to typical systemic or hormonal stimuli for adipocyte growth or death (including weight gain/loss)[2], and does not change with aging[3]. Embryologic studies have suggested a different origin for orbital fat cells[4]. Functional genomics and proteomics have been employed to understand the orbital fat in diseased and normal states[5-11], but the genomics of orbital fat in relation to other systemic adipose depots (subcutaneous, visceral, etc.) has never been studied. We believe that understanding differential gene expression in the healthy orbit compared with extraorbital adipose tissue will allow a deeper understanding of orbital disease and possibly provide therapeutic options. As such, we performed single-cell mRNA expression analysis to characterize the functional genomics of orbital and extra-orbital adipose depots in healthy individuals.

Methods: In this prospective study, adipose tissue was procured during routine surgery from postmenopausal females without any adipose or orbital disorders, from the orbital fat (central upper eyelid fat pad), ipsilateral deep facial fat (malar fat pad), and abdominal subcutaneous fat. The mean age was 59 ± 3.1 years.

Potential participants were excluded if they had any medical / surgical history, or if they had taken any medications 3 months prior to the procedure. Following removal, all fat pads were immediately frozen in dry ice and taken for analysis. Quantitation of mRNA in each sample was performed using a Nanodrop 8000 spectrophotometer (Thermofisher, Waltham, USA). Ultraviolet light (260 nm) was used to quantify mRNA levels from each sample. Single cell sequencing was used to characterize mRNA expression profiles within each tissue (Genechip 3000, Thermofisher, Waltham, USA). Results were analyzed with a repeated-measures ANOVA with multiple-comparisons correction. This study was partially funded by a grant from the ASOPRS Foundation.

Results: Seven patients were included in this study, providing 21 fat samples. Mean concentration of mRNA expressed in the orbit, malar fat pad, and abdomen was 3.3 ± 1.4 ng/µL, 19 ± 8.6 ng/µL, and 25.8 ± 9.3 ng/µL, respectively (Figure 1). Mean mRNA concentration was significantly different between all three sites ($p<0.001$). Single cell mRNA expression analysis showed significant differences between the orbital and peripheral fat pads ($p <0.05$), including transcripts involved in adipose tissue homeostasis.

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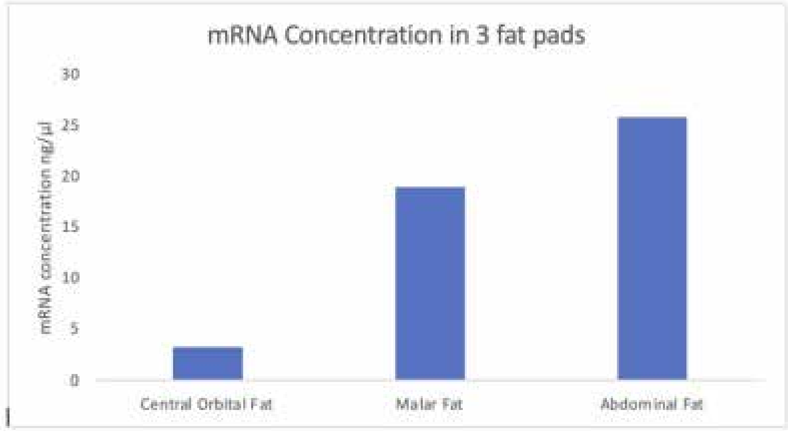
Conclusions: The abundance and expression profile of mRNA within the central orbital fat is significantly different to that of the malar and abdominal fat pads. Since metabolic activity has previously been related to mRNA abundance profiles, these findings may explain the relative resistance of orbital fat to changes in over body mass, when compared to abdominal fat. Clarification of mRNA transcripts in healthy adipose can guide interpretation of functional genomics in diseased states.

Figure 1



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7:24 am

Cutaneous Eyelid Melanoma in an African American Child

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Introduction: Cutaneous melanoma of the eyelid constitutes less than 1% of all eyelid malignancies and of all cutaneous melanomas. Such cases in the pediatric population are even rarer, and exceedingly so in darkly pigmented individuals.

Methods: This case report describes the clinical presentation and evaluation, pathology, and the treatment outcome with relevant literature review.

Results: A 9-year-old African American boy with a history of asthma presented to the dermatology clinic with a left upper eyelid growth. The patient's mother reported first noticing a "pimple", which then grew over a 3-month period, with intermittent bleeding and scabbing as the patient attempted to pick it off. On exam, an elevated, circular pigmented lesion with smooth surface was noted (Fig 1A), and a shave biopsy was performed (Fig 1B). The biopsy revealed a deep penetrating melanoma with prominent pagetoid scatter, poor maturation, and Breslow thickness of 1.3mm. Mitotic index of 1/mm^2 and loss of p16 expression were noted (Fig 2 A-G). There was no histologic evidence of ulceration and BRAF immunostaining was negative. Patient underwent wide local excision with 5mm margins and concurrent sentinel node biopsy (Fig 1C). The initial sentinel node in the upper parotid was positive for melanoma, leading to parotidectomy and selective neck dissection. 31 remaining lymph nodes were negative for tumor. The remaining eyelid defect was reconstructed by primary closure in a delayed fashion after permanent pathology confirmed clear margins (Fig 1D). Systemic oncology work-up included a brain MRI and CT chest/abdomen/pelvis, which were unremarkable. Genetic testing for hereditary melanoma was negative for any clinically significant mutations or variants. Patient continues to be observed with close clinical monitoring and serial imaging without further treatment.

Conclusions: This is the first reported case of cutaneous eyelid melanoma in an African American child with nodal metastasis. Clinical features of melanoma in the pediatric population can be more atypical, and judicious use of CUP criteria (color changing, ulceration, pyogenic granuloma-like lesions) in addition to the conventional ABCDE criteria (asymmetrical shape, border, color, diameter, evolving lesion) should be considered. While rare, the diagnosis of melanoma in patients with Fitzpatrick skin type 6 is still possible, and cannot be excluded without a definitive biopsy.

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Figure 1

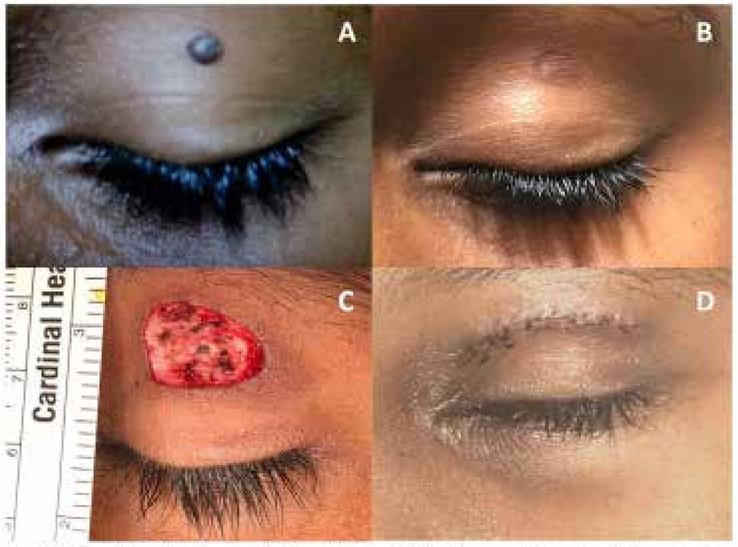

Figure 1: (A) Pigmented lesion of the left upper eyelid. (B) 1 month s/p biopsy. (C) Wide local excision with 5mm margins. (D) Reconstruction by primary closure.

Figure 2

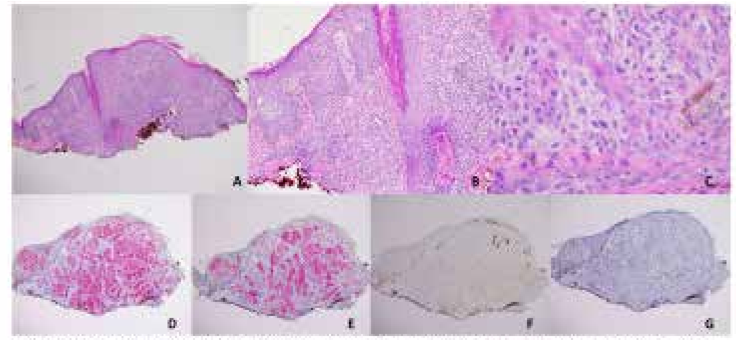

Figure 2: (A) H&E 4x demonstrating hypercellularity. (B) H&E 10x demonstrating nests of tumor cells within the epidermis with scattered pigmentation. (C) H&E 40x showing marked pleomorphism, prominent nucleoli, multiple mitotic figures, and pigmentation. (D) Immunostain is positive for SOX10, a nuclear melanocytic marker, and for (E) Melan-A, a cytoplasmic melanocytic marker. (F) Immunostaining for p16 shows scattered but minimal positivity, while (G) Ki-67 is strongly positive.

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7:28 am

Eyelid Malposition Following Repair of Complex Orbito-facial Trauma

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Introduction: We report the rate of lower eyelid malposition following repair of complex orbito-facial fractures (multi-wall fractures or prior orbital fracture repairs requiring revision), by ophthalmic plastic surgeons via a transconjunctival or swinging eyelid approach.

Methods: A retrospective chart review was performed on patients who presented to our institution from January 1, 2011 to May 12, 2019 for surgical repair of complex orbito-facial trauma (defined as multi-wall orbital fracture or secondary revision). Cases from two ophthalmic plastic surgeons (MKY and SKF) were reviewed for fracture type, time to surgery, surgical approach, implant type, subsequent eyelid malposition (entropion, ectropion, and eyelid retraction), and need for surgical correction of eyelid malposition. A Chi-squared analysis was performed.

Results: 81 patients (51 male, mean age 39.2 ± 19.2 years) had orbito-facial fractures repaired by ophthalmic plastic surgeons (MKY, SKF). Fifty-seven patients had multi-wall fractures (Group 1), and 24 underwent secondary revision (Group 2). The mean time from injury to surgical repair in Group 1 was 14.2 ± 60.9 weeks. The mean time from prior fracture repair to secondary revision was 93.8 ± 200.3 weeks. The mean follow-up was 27.2 ± 45.3 weeks. Twenty-six cases were repaired via a transconjunctival approach and 55 via a transconjunctival approach with lateral canthotomy and cantholysis (swinging eyelid approach). Implant type included 60 porous polyethylene (14 with additional titanium plates), 15 porous polyethylene/titanium hybrids, 1 pre-formed titanium, 1 absorbable gelatin film, 2 with inferior rim plating alone, and 2 with no implant. Conjunctiva was closed in twenty-eight patients. Fourteen patients developed eyelid malposition (17.3%): 7 retraction (8.6%), 4 ectropion (4.9%), and 2 entropion (2.5%). Five patients with eyelid malposition required surgical correction (6.2%) (Table 1). A Chi-squared analysis showed no statistically significant difference in rates of eyelid malposition when comparing surgical approach (p=0.882), conjunctival closure (p=0.256), or implant type (p=0.901) (Table 2). Rates of eyelid malposition were similar between groups (9 of 57 in Group 1 [15.8%] vs. 5 of 24 in Group 2 [20.8%], p=0.589). A sub-analysis of Group 2 showed no statistically significant difference between rate of eyelid malposition and prior implant type (p=0.140).

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Conclusions: The rate of eyelid malposition after orbital fracture repair via a transconjunctival approach is commonly cited as 8.8%,[1] although it is likely lower for ophthalmic plastic surgeons. In the present study, the occurrence of lower eyelid malposition following multi-wall fracture repair (15.8%) and secondary repair (20.8%) was relatively high. While studies in the literature include a mix of isolated and multi-wall fractures, none assess multi-wall or secondary repair alone. These categories seem to carry a higher complication rate and thus could be viewed together as complex orbito-facial fractures. The reasons for this are not yet clear, although it may be related to increased dissection and tissue manipulation causing scarring. Patients should be counseled accordingly about potential complications and expectations following repair of these complex fractures.

Figure 1

Patient	Eyelid Malposition	Fracture type	Time to fracture repair (weeks)	Surgical approach	Implant type	Conjunctival closure	Surgical correction	Follow-up (weeks)
Group 1: Multi-wall fractures								
1	Retraction	Medial, floor	2.1	SE	Titanium	Yes	No	24.0
2	Retraction	ZMC, floor, inferior rim	1.9	SE	PPE, titanium plate	No	No	83.0
3	Retraction	ZMC, floor	2.3	SE	PPE	Yes	No	212.9
4	Ectropion	Medial, floor	2.4	SE	PPE/T	No	No*	11.1
5	Retraction	Medial, floor, roof	114.7	SE	PPE	No	No	13.1
6	Retraction	Medial, floor	2.3	SE	PPE/T, screws	No	No	21.1
7	Ectropion	ZMC, floor	3.1	TC	PPE	No	Yes	6.3
8	Entropion	ZMC, medial, floor	5.6	TC	PPE	No	Yes	5.7
9	Entropion	ZMC, floor	2.4	SE	PPE/T, screws	No	No	76.0
Group 2: Prior orbital floor fracture repairs requiring revision								
10	Ectropion	Medial, floor	32.9	SE, DCR skin incision	PPE	No	Yes	25.0
11	Ectropion**	ZMC,medial , floor, roof, lateral	36.0	SE	PPE, screw	No	Filler	21.1
12	Retraction	Medial, floor	3.6	SE	PPE	Yes	No	0.9
13	Entropion**	Floor	31.1	TC	PPE	No	Yes	11.1
14	Retraction	ZMC, roof, floor	13.0	SE	PPE/T, screw	No	No	67.9

Table 1. Lower eyelid malposition following complex orbito-facial fracture repair

* = Surgical correction considered, but patient lost to follow-up
** = Eyelid malposition noted prior to fracture revision surgery
SE = swinging eyelid; TC = transconjunctival; PPE = porous polyethylene, PPE/T = porous polyethylene/titanium hybrid

Figure 2

Categorical comparison		Percent	χ^2	p-value
Surgical approach	Transconjunctival	11.5% (3/26)	0.015	0.357
	Swinging eyelid	20% (11/55)		
	Conjunctival closure	10.7% (3/28	1.290	0.256
	No conjunctival closure	20.8% (11/53)		
Implant type	Porous polyethylene only	17.4% (8/46)	0.015	0.901
	Titanium (sheet or plate)	18.5% (6/32)		

Table 2. Chi-squared analysis of rates of lower eyelid malposition following complex orbito-facial fracture repair

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7:32 am

Orbito-scleral-sinus Invasion of a Basal Cell Carcinoma in a Patient with Human Immunodeficiency Virus after Treatment on Vismodegib

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Introduction: Neglected basal cell carcinoma of the eyelid (BCC) can lead to giant BCC tumors.[1] Patients with human immunodeficiency virus (HIV) are at a higher risk for developing multiple and more aggressive skin cancers.[2] We present the first case of orbito-scleral-sinal BCC in a patient who failed vismodegib treatment, subsequently found to have HIV.

Methods: Case report.

Results: A 45 year-old-male presented with Fitzpatrick Type 2 skin presented with a small ulcerative non-healing left lower eyelid lesion. The patient was lost to follow-up until four years later. At that time, multiple new skin lesions were found on the mid-back, upper cheek, and clavicle and diagnosed as morpheaform BCC. The patient was started on vismodegib for one year; however, there continued progression of the eyelid lesion. The patient was referred to our clinic seven years later with total destruction of the lower eyelid and inferior fornix, extension to the sclera, ptosis and proptosis (Figure 1A). The visual acuity was 20/200 and posterior exam showed optic disc edema with an inferior exudative retinal detachment (Figure 1B). Ultrasound imaging illustrated an irregularly shaped hypoechoic lesion with deep infiltration into the sclera (Figure 1C). Magnetic resonance imaging revealed an erosive extraconal mass at the junction of the orbital floor and maxilla involving the maxillary and paranasal sinuses (Figure 1D). Given the extensive nature of the patient's disease and poor clinical response to vismodegib, the patient was tested for HIV and found to be positive with a CD4 count of 258 cells/uL. The patient underwent a left orbital exenteration, superior maxillectomy, resection of the pterygopalatine fossa, external ethmoidectomy and reconstruction with a radial forearm fasciocutaneous free flap followed by post-operative radiotherapy. Intraoperatively, gross bone invasion was seen to the orbital floor, lateral wall and maxilla. Negative margins were obtained. Pathology showed basophilic cells with peripheral palisading within periocular tissue extending into sclera (Figure 2A, B) and a chronic retinal detachment (Figure 2C). The patient's viral load was now undetectable with rising CD4 counts. Nine years following initial presentation, the patient is well with no signs of recurrence or distant metastasis.

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Conclusions: Basal cell carcinoma of the eyelid with orbito-scleral-sinal invasion is a rare occurrence. The use of neoadjuvant vismodegib followed by local tumor resection for advanced periocular BCC as an eyelid-sparing technique or in cases of metastatic BCC has shown promising results.[3] There are few reports looking at vismodegib response in the HIV population. Thus, in the setting of advanced periocular BCC with atypically aggressive disease, an evaluation of HIV should be considered.

Figure 1

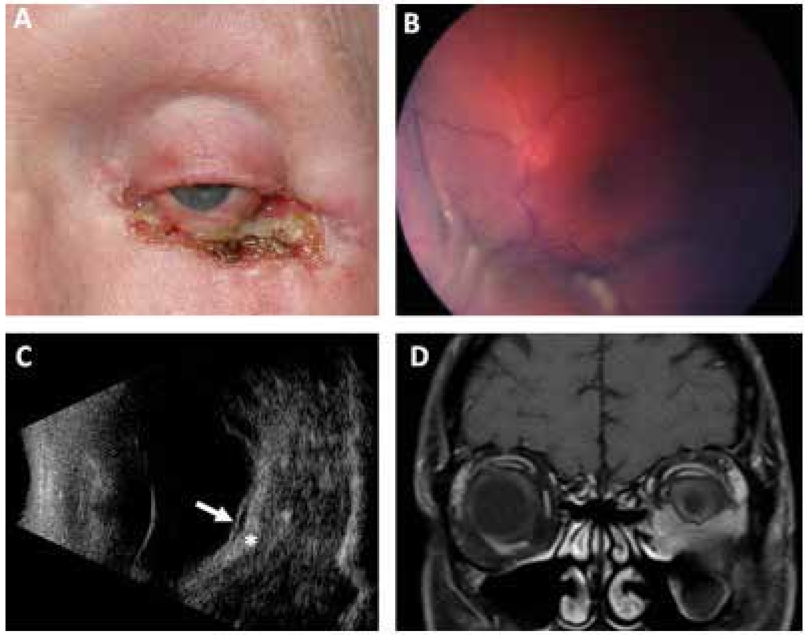
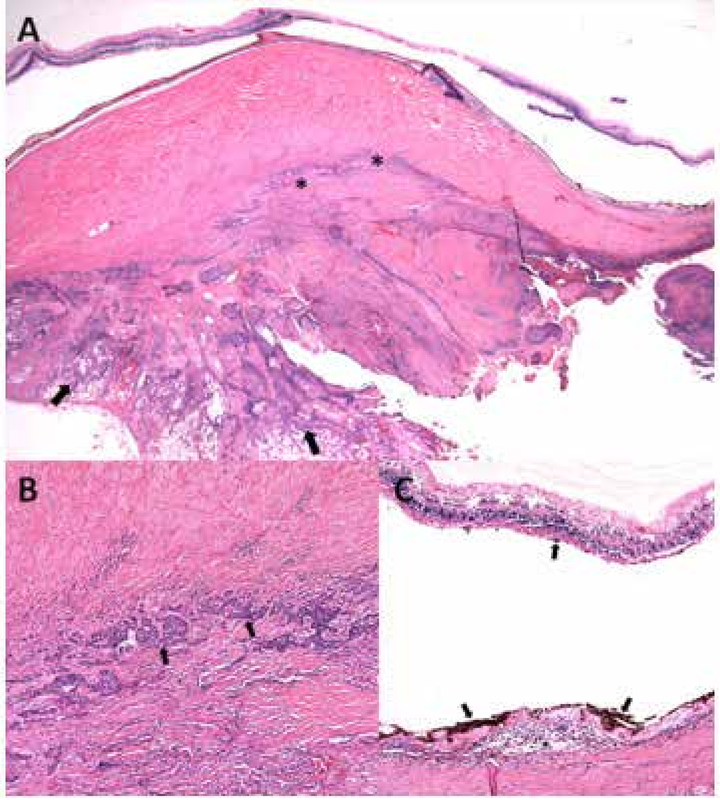


Figure 2



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7:36 am

Metabolic Profiling of Malignant Eyelid Tumors

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Introduction: Many studies have investigated the pathogenesis of cutaneous malignancies, however the metabolic processes influencing to these pathways have not fully been described. Our aim is to further investigate the metabolic processes underlying eyelid malignancy.

Methods: Eyelid samples were collected from patients with basal cell carcinoma, squamous cell carcinoma and sebaceous cell carcinoma and from control patients without lesions who were undergoing blepharoplasty. Tissues were analyzed using ultrahigh-performance liquid chromatography (Shimadzu LC Nexera X2) and high-resolution mass spectrometry (QTRAP 5500). The extracted MRM peaks were integrated using MultiQuant 3.0;2 software (AB Sciex). Principal component analysis and multivariate regressions were performed to assess difference in the metabolic profiles of eyelid tumors versus controls, while controlling for potential confounders. For biological interpretation, pathway enrichment analysis of significant metabolites was performed using MetaboAnalyst 4.0. The most significantly altered metabolites were then reviewed for their role in cellular metabolism.

Results: Specimens came from 30 patients (12 malignant tumors, 18 controls). The subjects were matched for age and gender. In the tumor group the mean patient age was 70.6 years (range of 36-93 years), with 63.2% of patients being male. This compared to the control group, with the mean age of 72.6 years (range of 53-92 years), and 63.2% males. Among the final histopathologic diagnoses, there were 7 basal cell carcinomas (BCC), 3 squamous cell carcinomas (SCC), and 2 sebaceous carcinomas. Analysis of these tissues revealed 130 metabolites. Multivariate logistic regression identified 35 metabolites with levels that differed significantly between the tumor and control groups. Most of the metabolites belonged to amino acid metabolism (e.g. Spermine, 3-Hydroxykynurenine), nucleotide metabolism (e.g. Uracil), blood cell metabolism (e.g. Erythritol), or multiple/generalized metabolic processes (Eryhthro-dihydrosphingosine, nicotinamide). When comparing tumors to controls, a significant deficit of Spermine (p=2.96e-07), 3-Hydroxykynurenine (p=4.24e-05), Eryhthro-dihydrosphingosine (p=4.65e-05), and Nicotinamide Riboside (p=7.06e-05) was identified among these metabolites. Meanwhile a higher concentration of Erythritol (p=4.96e-06), Uracil (p=5.25e-06), and Nicotinamide (p=1.16e-05) were found in the tumor samples.

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Conclusions: This pilot study differentiated the metabolic makeup of basal cell carcinoma, sebaceous cell carcinoma and squamous cell carcinoma compared to unaffected eyelid skin. Altered amino acid and nucleotide metabolism may be key factors associated with tumor pathogenesis. Further elucidation of these biomarkers may improve our understanding of tumor pathogenesis and to support development of novel molecular targets in treatment of eyelid/skin tumors.

Figure 1

	Peaks(mz/rt)	t.stat	p.value	-log10(p)	FDR
1	Spermine	-6.6844	2.9635e-07	6.5282	2.4893e-05
2	Erythritol	5.6315	4.9555e-06	5.3049	0.00014702
3	Uracil	5.6102	5.2506e-06	5.2798	0.00014702
4	Nicotinamide	5.3205	1.1554e-05	4.9373	0.00024263
5	3-Hydroxykynurenine	-4.8444	4.244e-05	4.3722	0.00065146
6	Erhythro Dihydrosphingosine	-4.8107	4.6533e-05	4.3322	0.00065146
7	NR	-4.6581	7.0607e-05	4.1512	0.00084728
8	Propionyl Carnitine	3.8228	0.00067436	3.1711	0.0070807
9	Kynurenine	3.7409	0.00083803	3.0767	0.0078216
10	Betaine	-3.583	0.0012697	2.8963	0.010665
11	G1P	3.5189	0.001501	2.8236	0.011437
12	N1-Methylnicotinamide	3.4862	0.0016339	2.7868	0.011437
13	IMP	3.3652	0.0022339	2.6509	0.014434
14	Creatinine	-3.2284	0.003169	2.4991	0.019014
15	Pyroglutamic Acid	-3.1204	0.0041611	2.3808	0.023302
16	Glycine	2.9677	0.0060836	2.2158	0.031939
17	GSH	2.9197	0.0068449	2.1646	0.033822
18	Thiamine	2.7358	0.01068	1.9714	0.049838

Figure 2

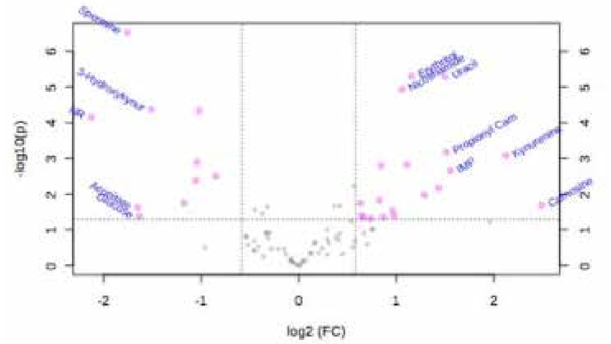


Figure 3

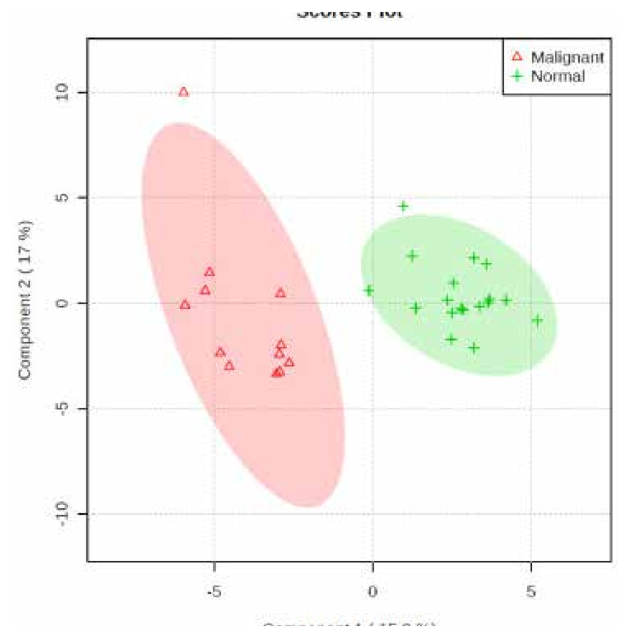


Figure 4

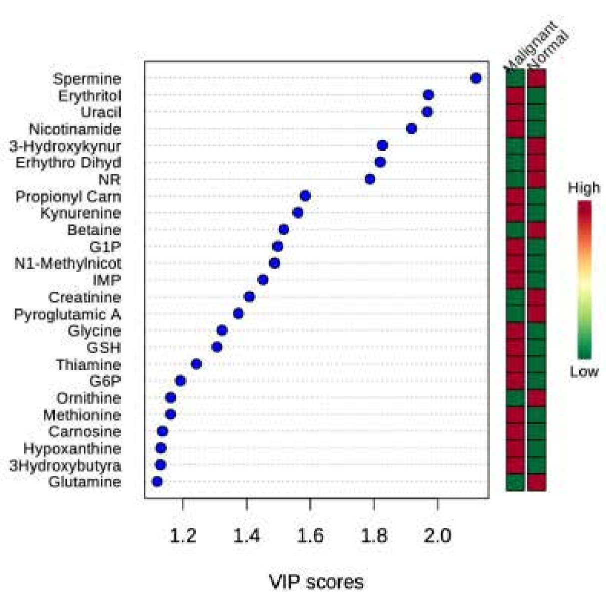
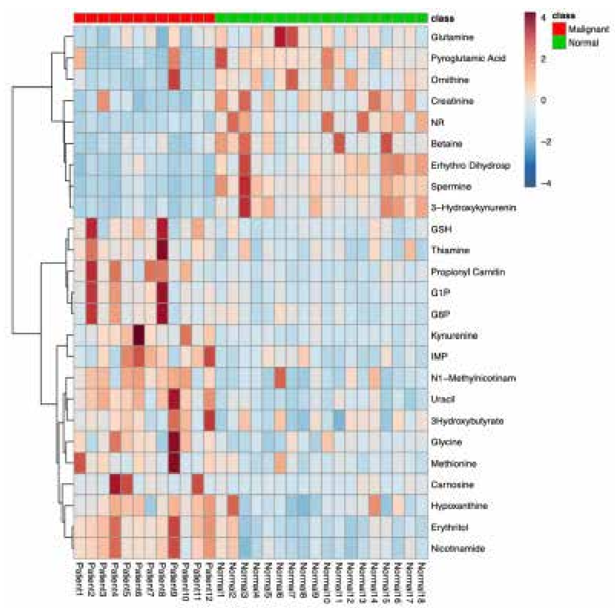


Figure 5



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7:40 am

Topical Prostaglandin Analogue Use is Associated with Ptosis Repair Failure

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Introduction: Prostaglandin analogue (PGA) use is associated with numerous ophthalmic side effects, including ptosis. Prostaglandin-associated changes to the structures of the eyelid are beginning to be elucidated. This project seeks to compare the rate of ptosis repair failure among patients with and without history of PGA use.

Methods: A retrospective, case-controlled review was performed of all patients who underwent ptosis surgery at a tertiary referral center by 4 physicians over an 8-year period. Inclusion criteria were patients who underwent ptosis surgery by external levator advancement/resection (ELR) or mullers muscle conjunctival resection (MMCR), patients with documentation of presence or absence of topical PGA use, and patients with documentation of postoperative outcome. Patients were excluded if they were less than 18 years of age, underwent frontalis suspension, or did not have at least 3 months postoperative follow up. Surgical failure was defined as patient-reported or physician-reported dissatisfaction with postoperative eyelid height or postoperative upper eyelid margin reflex distance (MRD1) of less than 2 mm.

Results: Of the 259 patients (435 eyelids) that met the study criteria, 47 patients (75 eyelids) had history of PGA use. The average age was 72 and 67 for patients with and without a history of PGA use, respectively. Mean preoperative MRD1 was 0.5 mm for both groups. The rate of ptosis recurrence was 37% and 13% in patients with and without a history of PGA use, respectively ($P = 0.0001$). The surgical success rate in patients with PGA use compared to patients without PGA use diverged increasingly over time (figure 1). Of the patients with PGA use, there was no statistical difference in outcomes when comparing presence or absence of a glaucoma filtering bleb on the operative side ($P = 0.626$). ELR was performed on 58 eyelids (77%) and MMCR was performed on 17 eyelids (22%) with no difference in rate of surgical failure ($P=0.576$).

Conclusions: Prostaglandin analogue use is associated with increased risk of ptosis repair failure, regardless of the presence of a glaucoma filtering bleb. In patients using a PGA, the surgical approach does not appear to be associated with ptosis repair failure. In patients undergoing ptosis repair, we found no difference in the presenting MRD1 with respect to PGA use. Preoperative counseling of the risk of ptosis recurrence is recommended in the setting of PGA use.

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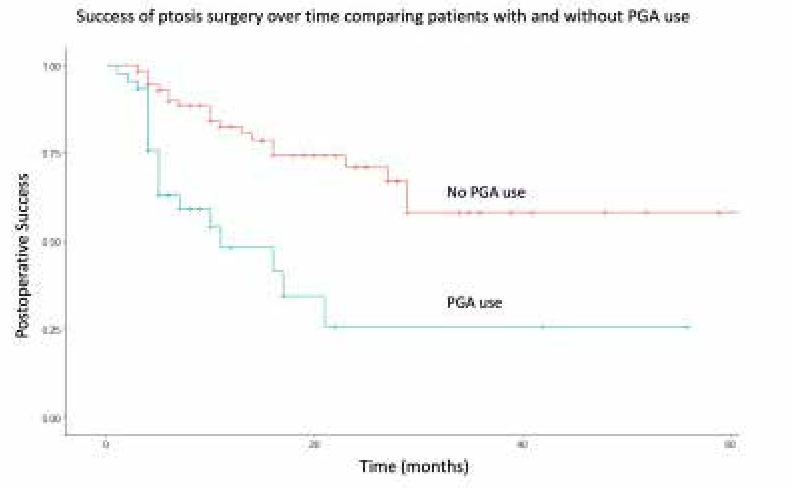
Figure 1



7:44 am

Prognostic Factors for Orbital Exenteration, Nodal Metastasis, and Death from Disease in Locally Advanced Conjunctival Squamous Cell Carcinoma

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Introduction: Ocular Surface Neoplasia (OSSN) is a spectrum of disease mostly seen as in-situ carcinoma involving bulbar conjunctiva. Less frequently invasive conjunctival SCC can present as locally advanced tumors with involvement of large segments of the palpebral and bulbar conjunctiva or with orbital invasion and can be associated with significant ocular morbidity and mortality. The purpose of this report is to explore the prognostic factors associated with orbital exenteration, nodal metastasis, and death from disease in patients with locally advanced conjunctival squamous carcinoma.

Methods: All consecutive patients with a diagnosis of conjunctival SCC treated between January 1999 and August 2018 were reviewed and patients with AJCC 8th edition T designation of Tis/T1/T2 were excluded. Data retrospectively collected included age, gender, AJCC 8th edition TNM criteria. Main outcome measures were orbital exenteration, nodal metastasis, and death from disease.

Results: patients were identified with AJCC designation of T3 or T4. This group was further analyzed and had a median age of 63 years (range: 47-75 years); there were 10 men; 13 patients (81%) were Caucasian. Nine patients had T3 tumors at presentation; the rest had T4 (n=7). In the T3 group, the eyelid was involved in 7 patients, the caruncle in 5 patients and the tarsus in 1 patient. 6 patients (38%) had exclusively non-bulbar tumor location and 10 (63%) had a combined bulbar and non-bulbar location. Thirteen patients presented with a primary tumor and 3 with recurrent tumor. Tumor size ranged from 9 to 45 mm (median=19 mm). Two patients had peri-neural invasion. 2 patients (13%) had a history of renal transplant; both presented with T4a tumors.

Nine patients had orbital exenteration (56 %): 8 of these presented with T4 tumors and 1 with a T3. All patients staged as T4 required an exenteration despite all attempts at more conservative therapy. Two out of 9 patients with T3 at presentation had an orbital exenteration; one of these had progressed to T4 at the time of exenteration.

Follow-up ranged from 11 to 83 months (median=32). Overall, 4 patients (25%) had nodal metastasis: 2 had T3 and 2 had T4 tumors at presentation; one had presented with nodal metastasis at presentation and the other 3 developed nodal metastasis during follow up. At last follow-up, 13 patients (81%) had no evidence of disease and 2 patients had died of disease.

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Conclusions: Orbital exenteration was strongly associated with T4 conjunctival SCC. Organ transplantation was a significant risk for local recurrence, more advanced stage at presentation, and orbital exenteration. The overall risk of nodal metastasis for T3/T4 conjunctival SCC was about 25% and the risk of death from disease was slightly more than 10%.

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8:03 – 8:43 am

Moderators: Anne Barmettler, MD and Kenneth Feldman, MD

8:03 am

Cost-effectiveness Analysis of Blepharoptosis Repair

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Introduction: As healthcare costs continue to rise, cost-effectiveness studies have gained interest. Our study aims to determine the cost-effectiveness of external levator advancement (ELA) and internal levator advancement (ILA) for blepharoptosis repair using Markov modelling. This model allows simulation of a hypothetical cohort of patients moving through different health states over time, each associated with their own costs, utility values, and transition probabilities.[1] Utility values measure quality of life with a time component. Markov modeling has successfully been used to determine cost-effectiveness of ophthalmologic interventions such as cataract surgery and macular degeneration screening.[2,3]

Methods: We constructed a Markov model that created a simulation in which patients with blepharoptosis were treated with ELA, ILA, or no surgical intervention. Model inputs were sourced from previously published data (Figure 1, Table 1).[4-12] Cost-effectiveness was determined by the incremental cost-effectiveness ratio (ICER), which was calculated as the incremental cost in dollars per quality-adjusted life year (QALY) gained. Treatments with an ICER below a willingness-to-pay (WTP) threshold of $50,000/QALY were considered cost-effective. This value describes the maximum amount the average person would willingly pay for a particular outcome, in this case, to gain one additional QALY. Most studies have set this value at $50,000/QALY, one of the most stringent thresholds, but there is speculation that this threshold is outdated, and people may now pay over $100,000/QALY or higher.[7] Our analysis also assessed which model input factors most influenced cost-effectiveness.

Results: Both ELA and ILA were determined to be cost-effective with ICERs below the WTP threshold of $50,000/QALY. ILA was found to have an ICER of $11,180/QALY while ELA had an ICER of $13,624/QALY. The cost-effectiveness of both procedures were dependent on the costs of the procedures, patient age, and the decrease in the quality of life caused by a visual field defect from blepharoptosis. If ILA were to cost more than $20,113, or if ELA were to cost more than $16,480, then ptosis repair would not be cost-effective compared to no surgical intervention. Our model also determined that if patients were 92 years and older, ptosis repair would not be cost-effective.

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If patients were minimally bothered by blepharoptosis, ELA or ILA would also not be cost-effective. Our study also simulated 10,000 iterations assuming varying distributions of each model input, and at a WTP threshold of $50,000/QALY, ptosis repair overall is more cost-effective than no surgical intervention nearly 100% of the time.

Conclusions: Both ELA and ILA are cost-effective treatments for patients with blepharoptosis, According to our model, ILA appears to be more cost-effective compared to ELA due to its lower cost and lower revision rates. As scrutiny of uptrending healthcare costs continue, cost-effectiveness analyses are important to further assess the impact of oculoplastic procedures on quality of life in relationship to cost. Ptosis repair improves quality of life and is economically beneficial compared to no surgery.

Figure 1

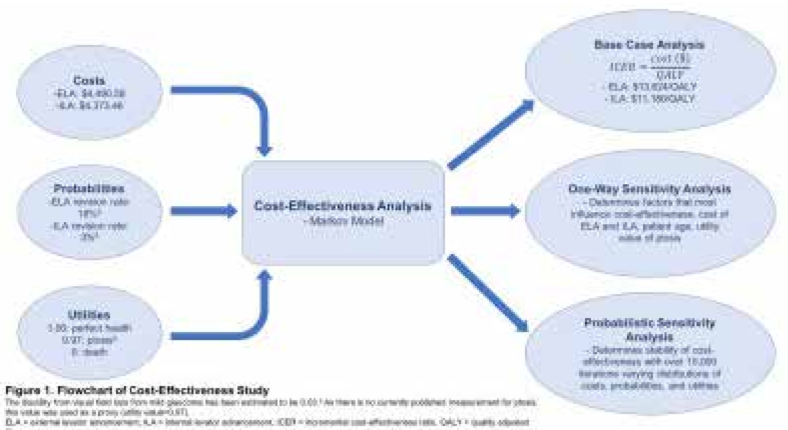

Figure 1. Flowchart of Cost-Effectiveness Study

Figure 2

Table 1. Cost inputs (2019 US dollars)

Service	CPT code	Cost ($)
External Levator Advancement (ELA)	-	4,490.58
Surgeon's fee for ELA[8]	67904	612.30
Ambulatory surgical center fee[8]	0244	2,966.24
Anesthesia fees[9]	144	277.87
Post-operative medications[10]	-	226.91
Cost of medical visits[8]	99213	103.80
Opportunity cost of surgery[11]	-	202.64
Opportunity cost of medical visits[12]	-	100.82
Internal Levator Advancement (ILA)	-	4,373.46
Surgeon's fee for ILA[8]	67403	495.18
Ambulatory surgical center fee[8]	0244	2,966.24
Anesthesia fees[9]	144	277.87
Post-operative medications[10]	-	226.91
Cost of medical visits[8]	99213	103.80
Opportunity cost of surgery[11]	-	202.64
Opportunity cost of medical visits[12]	-	100.82
Incremental Cost for Blepharoplasty	-	558.97
Surgeon's fee for blepharoplasty[8]	15823	558.97

CPT = current procedural terminology

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8:09 am

Effects of Aspirin on Post-operative Bruising and Bleeding Complications in Upper Eyelid Surgery

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Introduction: Aspirin is one of the most widely used anti-platelet medications used for prevention and treatment of thromboembolic disease[1,2]. The current recommended guideline for upper eyelid surgeries, including blepharoplasty and blepharoptosis repair, is routine discontinuation of aspirin 1-2 weeks prior to surgery[3,4]. This guideline, however, is not supported by prospective evidence. We evaluated the effects of aspirin versus placebo in patients undergoing upper lid blepharoplasty and/or levator advancement or plication blepharoptosis repair in this randomized, prospective study.

Methods: Patients who presented between October 2017 to April 2019 requiring blepharoptosis repair and/or upper eyelid blepharoplasty who were concurrently taking 81mg aspirin were randomized to receive 1 week of aspirin tablets or 1 week of placebo tablets prior to surgery. Intraoperative bleeding was subjectively graded by the surgeons as below average, average or above average bleeding. Post-operative bleeding complications were noted as well as peri-operative thromboembolic complications. Photos were obtained at the patient's first post-operative visit and later judged by two blinded evaluators as having none, mild, moderate or severe bruising based on a set of standardized photos (Fig. 1) The two groups were subsequently compared.

Results: A total of 48 patients and 89 eyelids were evaluated. 52 eyelids were included in the aspirin group and 37 eyelids were included in the placebo group. There were no patients who experienced hemorrhage, hematoma, or retrobulbar hemorrhage. No patients experienced vision loss. No patients experienced a thromboembolic event. There was no statistically significant difference in the number of patients who experienced mild post-operative bleeding (p value 0.41). In the aspirin group, 9 lids were graded as "none" (17.3%), 20 lids were graded as "mild" (38.5%), 23 lids were graded as "moderate" (44.2%) and 0 lids were graded as "severe" (0%) (Fig. 2, Fig. 3). In the placebo group, 3 lids were graded as "none" (8.1%), 17 lids were graded as "mild" (45.9%), 15 lids were graded as "moderate" (40.6%) and 2 were graded as severe (5.4%) (Fig. 3, Fig. 4). There was no statistically significant difference in bruising rating between groups (p value 0.21). There was no statistically significant difference in the intraoperative bleeding rating between groups (p value 0.41) (Fig. 5).

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Conclusions: Continuation of aspirin does not appear to effect outcomes with respect to bleeding complications and post-operative bruising in patients undergoing upper eyelid blepharoplasty or blepharoptosis repair. We suggest changing the current guidelines to recommend routine continuation of low dose 81 mg aspirin before upper eyelid surgery.

Figure 1

Fig. 1
Standardized photos for the Winkler-Black bruising scale. Top left-none, top left-mild, bottom left-moderate, bottom right-severe

Figure 2

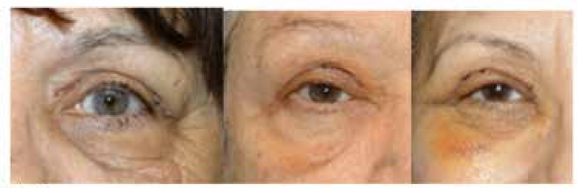

Fig. 2
Bruising in aspirin group-study samples, right to left, none, mild, moderate

Figure 3

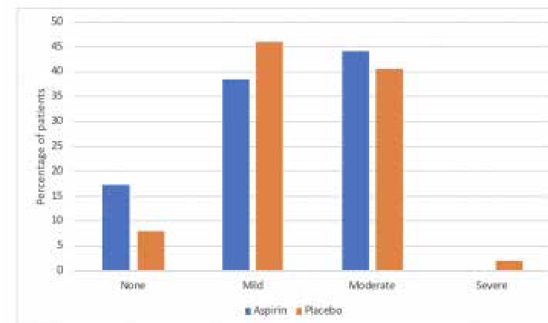

Fig. 3
Percentage of patients with bruising gradation by group

Figure 4

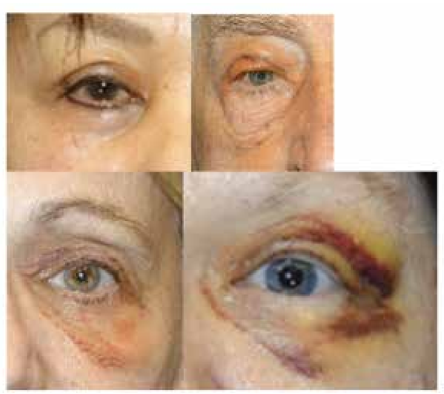

Fig. 4
Bruising in placebo group-study samples, top left-none, top right-mild, bottom left-moderate, bottom right-severe

Figure 5

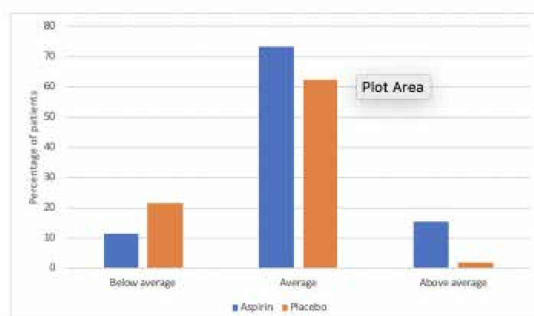

Fig. 5
Percentage of patients with intraoperative rating of bleeding-below average, average, or above average

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8:15 am

Fibrin Glue for the Reduction of Bruising in Upper Eyelid Blepharoplasty

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Introduction: The goal of this study is to assess if fibrin glue reduces bruising and bleeding related complications following upper eyelid blepharoplasty surgery.

Methods: IRB approval was obtained before conducting the study. The control group consisted of patients undergoing upper eyelid blepharoplasty surgery without the use of fibrin glue. The treatment group consisted of patients undergoing upper eyelid blepharoplasty surgery who received fibrin glue applied to the wound bed prior to closure. All the surgeries were performed by a single surgeon utilizing the same technique except for the use of fibrin glue. First post-operative visit photos were graded by two masked observers for amount of post-operative bruising. The observers utilized a scaled grading system ranging from no bruising (0) to severe ecchymosis or hematoma formation (10). Microsoft Excel software was used to perform two tailed T-test to establish significance between the two groups. Chart data including age, sex, race, co-morbidities, anti-coagulation use and complications such as dehiscence and hematoma formation was also collected for comparison.

Results: Comparison of the two groups showed that the use of fibrin glue dramatically reduced post-operative bruising. Figure One shows a pilot patient that received fibrin glue only on the left eye with a representative reduction in bruising in the treated eye. A total of 198 patients were enrolled in the control group and 143 patients in the treatment group for a total of 396 and 286 eyes respectively. The control group had an average time to follow up of 12.6 days and had a mean bruising score of 3.69 (95% Confidence Interval: 3.51 - 3.87). The treatment group had a mean bruising score of 2.18 (95% Confidence Interval: 1.99 - 2.37) at 9.6 days after surgery. Despite the shorter length to follow up, the treatment group showed a 41% reduction in bruising which was highly significant ($p = 1.75E-26$). When narrowing the treatment group to more closely standardize the days to follow up, the reduction in bruising was even greater. The treatment group had a bruising score of 2.18 at 9.6 days versus a score of 4.23 in the control group at 9.2 days. This represented a 52% reduction in bruising with the use of fibrin glue ($p = 3.60E-18$) The incidence of eyes developing severe bruising or hematoma also showed a statistically significant reduction from 1.8% to 0.3% with the use of fibrin glue.

Conclusions: Blepharoplasty is one of the most common plastic surgery procedures with approximately 100,000 procedures performed every year in the United States. Bruising and bleeding are exceedingly common after surgery. In the most severe cases, bleeding can lead to orbital hemorrhage (one in 2,000) and vision loss (one in 10,000)[13]. Reduced bruising and bleeding after eyelid surgery can (continued)

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decrease downtime and improve patient satisfaction in mild cases and potentially save vision in severe cases. This study conclusively demonstrates that fibrin glue can be utilized during blepharoplasty surgery to reduce the post-operative bruising. Although the impact on a relatively rare complication such as hemorrhage leading to vision loss cannot be definitively determined from a study of this size, a global reduction in post-operative bleeding and bruising might translate to a lower incidence of vision threatening complications.

Figure 1

References:

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8:21 am

5-Fluorouracil as First Line Therapy for Conjunctival Cicatrix in OCP and SJS

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Introduction: We examine an association between 5-Fluorouracil (5-FU) injection treatment and clinical status in patients with conjunctival cicatrix secondary to Stevens-Johnson Syndrome (SJS) or Ocular Cicatricial Pemphigoid (OCP).

Methods: Retrospective cohort study of patients with SJS and OCP who manifested ocular symptoms secondary to conjunctival cicatrix and were treated by the Kellogg Eye Center Oculoplastics Service 2009-2019. Use and number of 5-FU injections (1 to 12) were used as categorical and ordinal exposure variables, respectively. Pre-injection clinical status and status at least 6 months post-injection (Median=18 months) were used to assess outcomes. Seventy-six eyes met inclusion criteria (a severe form of disease). Demographic variables included age, sex, and race. Clinical variables included best corrected initial and final visual acuity (FVA), overall improvement documented post-operatively by the oculoplastic surgeon, number of mucous/amniotic membrane graft procedures (MMGs), hyperemia, misdirected eyelashes, symblephara, corneal scarring at last encounter, and need for systemic therapy. Use and number of 5-FU injections was recorded. A Fisher exact test using significance £ .05 was used to test the association between 5-FU injections and clinical variables. When testing the hypothesis, a 2-sided Z-test was used. Univariate and multivariate unconditional logistic regression were used to assess relationships (adjusted odds ratio-adjOR and 95% Confidence Interval-CI) between injections, disease type, and clinical outcomes as dependent variables, with sex, age and systemic therapy as confounding variables. For the logistic regression, diagnostic AIC score and analysis of residuals were used. Statistical analysis was performed in R v3.5.1 and figures were made in Prism 8.1.1.

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Results: patients (76 eyes) were included, 47.36% male and 52.63% female. SJS was reported in 26 eyes, and OCP in 50 eyes. In the SJS group, 10 eyes received 5-FU injection. In the OCP group, 15 eyes received 5-FU injection. 5-FU injection was associated with FVA improvement (p=0.05), overall improvement (p=0.00, adjOR: 38, 95%CI: 4.4-333), and fewer MMGs (p=0.00). 5-FU injection was possibly associated with improved corneal scarring at last encounter (p=0.06, adjOR: 0.2, 95%CI: 0.06-0.7), but did not reach significance. Number of 5-FU injections was associated with FVA improvement (p=0.05) and fewer MMGs (p=0.04). A number of 1-4 injections was associated with overall improvement (p=0.0, adjOR: 26, 95%CI: 2.8-248), and a trend toward fewer misdirected eyelashes at last encounter (p=0.07, adjOR: 0.1, 95%CI: 0.0-0.6). A number of 5 or more injections was possibly associated with improved corneal scarring at last encounter (p=0.06, adjOR: 0.05, 95%CI: 0.0-0.6). On subgroup analysis, 5-FU injection was associated with overall improvement in the SJS group (p=0.04). In the OCP group, 5-FU injection was associated with FVA improvement (p=0.00), reduced hyperemia at the most recent encounter (p=0.02, OR: 0.2, 95%CI: 0.03-0.9), and less corneal scarring at the most recent encounter (p=0.00, OR: 0.12, 95%CI: 0.0-0.6).

Conclusions: Our results indicate that 5-FU injections in patients with SJS or OCP contribute to improved clinical outcomes and fewer MMG procedures. Given the data and potential for vision-saving therapy, we suggest that additional studies are warranted, including a prospective clinical trial.

Figure 1. Univariate logistic regression for 5-FU injection.

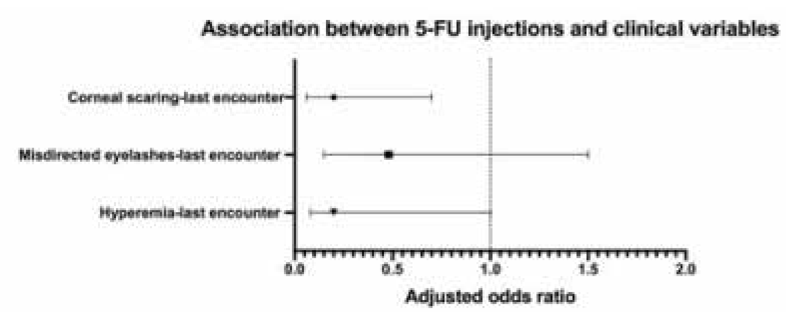
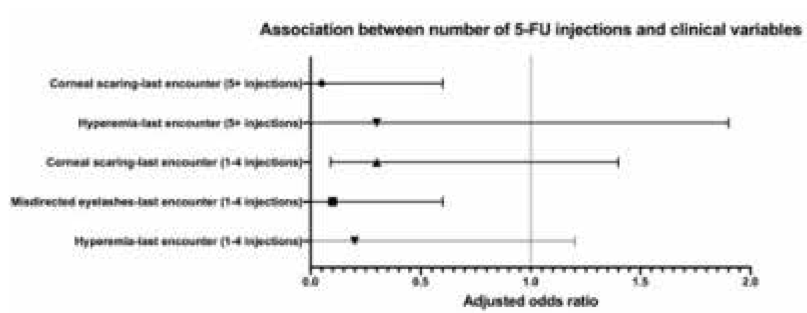


Figure 2. Univariate logistic regression for number of 5-FU injections.



8:27 am

Silicone Scaffold Support using the Bilayer Dermal Regeneration Matrix Template for Correction of Complex or Recurrent Lower Eyelid Retraction

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Introduction: Lower eyelid retraction can be both cosmetically as well as functionally problematic, and unfortunately, recurrence of retraction may occur and is particularly challenging. Despite the availability of acceptable spacers, revisions often lead to further fibrosis, retraction, and suboptimal results. In patients with complex or prior failed retraction surgery, we have used a bilayer dermal regeneration matrix template in the posterior lamella for correction of recurrent lower retraction. To the best of our knowledge, this has not been previously described for lower eyelid retraction.

Methods: Retrospective review of patients undergoing lower eyelid retraction repair using the described technique (by 4 surgeons) was performed from 2005 through 2019.

Collected data included patient demographics, symptoms, preoperative/postoperative lower eyelid position, inferior scleral show, lagophthalmos, etiology of retraction, major/minor complications, and follow-up (minimum 6 months).

A transconjunctival approach below inferior tarsus was used, with the elliptical/crescent bilayer dermal regeneration matrix template sutured between tarsus and the recessed inferior retractors. Vertical height of the implant ranged 7mm-12 mm centrally, with the silicone layer posteriorly against the globe (Fig 1, 2). In 9 cases, a Frost tarsorrhaphy was placed for 1 week with no corneal abrasion from the implant edges. Additional concurrent procedures included: tarsal strip, lateral tarsorrhaphy, removal scar tissue, midface lifting. The posterior silicone layer loosened and either spontaneously extruded or was removed in office at 3-4 weeks postoperatively, on average (range 3-9 weeks), and a new white dermal layer was visible bridging the spacer area (Fig 3, 4).

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Results: 16 patients (22 eyelids) were identified from 4 practices (CB, RF, MH, BW) who underwent eyelid retraction repair using the bilayer implant. Ages ranged 11-72 years; 10 M:17 F. 4 patients had bilateral lower eyelid surgery. Three patients underwent upper eyelid surgery with the bilayer implant. Indications for surgery included lagophthalmos, exposure keratopathy/irritation, tearing, asymmetry/appearance, difficulty wearing ocular prosthesis. 30% had failed prior retraction surgery, that had included use of either a porcine acellular dermal graft, bovine dermal matrix, human cadaveric acellular dermal matrix, conjunctival rearrangement, recession of inferior retractors, and/or horizontal tightening.

Etiology of retraction was thyroid eye disease/negative vector orbit in 36.4% of eyelids. Other etiologies included: s/p orbital trauma repair (13.6%), involutional (13.6%), coloboma (9.1%), ocular cicatricial pemphigoid (9.1%), socket contracture (9.1%), postblepharoplasty (4.5%), other (4.5%).

Follow-up ranged 7 months-14 years. One patient was lost to follow-up/deceased. Postoperative measurements were taken at a minimum of 1 week, 3-6 weeks, 2-4 months. Postoperatively, 95.2% had good improvement of lower retraction (defined as 1mm or less below the inferior limbus) and resolution of preoperative symptoms (Fig 5). Postoperative elevation of the lower lid ranged 1-3.5mm as compared to preoperative measurements. When used in the upper lid for conjunctival scarring, the implant improved the superior fornix depth.

Complications were minimal and included transient conjunctival injection, eyelid edema, and foreign body sensation, treated with lubricating tears and ointment. No patients had corneal abrasions, pyogenic granuloma, or required early removal due to pain. All but 3 patients were satisfied with final results (1 socket contracture unable to wear prosthesis, 1 coloboma, 1 thyroid eye disease).

Conclusions: The bilayer dermal regeneration matrix template has been used in other oculoplastic applications, such as exenteration or facial reconstruction, but has not been described in the correction of eyelid retraction. The bilayer template consists of a silicone meshed layer that requires removal, and a second dermal replacement layer comprised ofa three-dimensional matrixof collagen and chondroitin-6-sulfate. When used as a posterior lamellar spacer graft,the firm silicone layer may provide a rigid scaffold, or frame, in the critical early postoperative weeks to minimize retraction, similar to the concept of an extended Frost tarsorrhaphy or filler to the lower lid to support the eyelid and to further stretch/lengthen the tissue layers in an upward vector during healing. Biointegration of the matrix may also minimize postoperative contraction. The silicone layer appeared to be well tolerated due to its location in the inferior fornix with minimal movement, while its temporary nature avoided the potential complications of the rigid, permanent porous polyethylene spacers, such as outward winging of the spacer, or implant extrusion.

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The bilayer dermal regeneration matrix template may be considered a reasonable alternative to other spacers to reduce the vertical palpebral fissure, particularly in challenging/complex, or recurrent cases. It also worked well for first-line correction of thyroid retraction. Suboptimal results may have occurred due to active cicatrizing conjunctival disease, or residual negative vector of the cheek and orbit. High cost may be a consideration, and it has not been studied directly against hard palate and other spacer materials.

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

References:
1. Barmettler A, Heo M, et al. A prospective, randomized comparison of lower eyelid retraction repair with autologous auricular cartilage, bovine acellular dermal matrix (Surgimend), and porcine acellular dermal matrix (Enduragen) spacer grafts. Ophthalmic Plast Reconstr Surg 2018.
2. J Tan, J Olver, M Wright, et al. The use of porous polyethylene (Medpor) lower eyelid spacers in lid heightening and stabilization. Br J Ophthalmol 2004;88:1197–1200.

Moderator: Jeremiah P. Tao, MD, FACS

8:45 am

Introduction

Jeremiah P. Tao, MD, FACS

8:46 am

Origins of Oculoplastic Surgery

George B. Bartley, MD

Although the origins of a discipline often are difficult to define, key milestones typically are readily identifiable. This presentation will highlight several important events in the evolution of oculoplastic and orbital surgery.

For more information, please refer to David Reifler's magnificent and comprehensive review:

1. Reifler DM. The American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS). Norman Publishing. San Francisco. 1994.

Additional references are listed in the following essay:

1. Bartley GB. Oculoplastic and orbital surgery. Millennia in the making. *Ophthalmology* 2015;122:224-226.

8:54 am

Fond Memories: The Early Years of ASOPRS

Allen M. Putterman, MD

I. Pre ASOPRS Fellowships

II. 1969- ASOPRS-AAO Palmer House Meeting

III. Proliferation of Fellowships

IV. Executive Committee Ladder

V. ASOPRS Thesis

VI. Memorable Moments

VII. Friendships

VIII. My Gratitude

9:03 am

The 2nd 25 Years

Tamara R. Fountain, MD

9:11 am

Women in ASOPRS: Progress Towards Parity

Arthika Chandramohan[1], Emily Charlson[2], Molly Timmerman[3], Andrea Kossler[2]

[1]Department of Ophthalmology, Byers Eye Institute, Stanford University, Palo Alto, California, United States of America, [2]Division of Ophthalmic Plastic, Reconstructive Surgery & Orbital Oncology, Department of Ophthalmology, Byers Eye Institute, Stanford University, Palo Alto, California, United States of America,[3]Department of Physical Medicine and Rehabilitation, Veterans Affairs Palo Alto Health Care System, Palo Alto, California, United States of America

Introduction: Reflecting upon the past 50 years of ASOPRS history, it is important to acknowledge the well-documented [1-5] disparity in rates of career advancement for women in ophthalmology despite near-even representation in training. This study aims to characterize trends in female leadership throughout the ASOPRS organization over the past fifty years.

Methods: This retrospective, cross sectional study examines female representation rates from all levels of training and career development within ASOPRS. Data were examined from 2008-2018 and were collected from AAMC reports based on ACGME-accredited residency program responses in the GME Track Resident Survey, and publicly accessible data including published ASOPRS membership and leadership rosters. A difference of proportions was conducted to assess for disparity in attrition and representation rates. The percentage of females within ASOPRS leadership teams were examined to assess for late-career achievement. The number of female ASOPRS program directors was collected as representative of career achievement within the academic sector.

Results: The number of women enrolled in ophthalmology residency programs over the studied period of 10 years remained near-constant and just under fifty percent (average 42%) with similar attrition rates as men (0.57% for men, 0.80% for women). In contrast, only 20.5% of all ASOPRS members are women as of the most recent data available from 2018 though women initially represented just 1 of 5 founding fellows and only 4% of charter fellows. Interestingly, a higher percentage of young ASOPRS members (those eight years or less out of fellowship training) were women (35.2%) and of the last published ASOPRS match results (2019-2021), nearly half are women (13 of 28). When looking at markers of later career achievement, of the 61 ASOPRS accredited fellowships, nine programs currently have female program directors compared to none of 35 from 1969 to 1994. Within ASOPRS executive leadership, over the last 7 years 30.1% of executive committee roles have been occupied by females compared to 4.7% over the first 25 years. In addition, 3 of the last 10 presidents (as compared to 2 of the first 25). In the first documented years of a nine-member executive committee (1993, 1994) there were no women serving as members (Figure 1).

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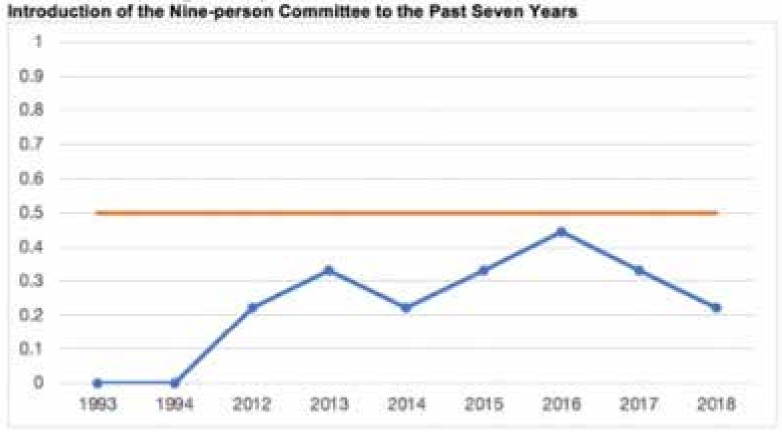
Conclusions: In recent years, there is an increasing female delegation within ASOPRS, specifically as more women enter careers in oculoplastic and reconstructive surgery. While great improvements have been made, there still exist disparate representation of women, especially in holding executive leadership positions and serving as academic role models within ASOPRS.

Figure 1

FIGURE 1. Comparing the Proportion of Women on ASOPRS Executive Committee from the Introduction of the Nine-person Committee to the Past Seven Years



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1. Svider, Peter F., et al. "Gender differences in successful National Institutes of Health funding in ophthalmology." *Journal of surgical education* 71.5 (2014): 680-688.
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4. Chao, Daniel L., Joyce C. Schiffman, and Steven J. Gedde. "Characterization of a Clinician–Scientist Cohort in Ophthalmology: A Demographic Analysis of K Grant Awardees in Ophthalmology." *Ophthalmology* 120.10 (2013): 2146-2150.
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9:16 am

AAO and ASOPRS

David W. Parke II, MD, Chief Executive Officer, AAO

The American Academy of Ophthalmology (Academy) congratulates ASOPRS on its 50th anniversary and appreciates the invitation to be a part of the program.

The oculofacial community has been integral to the Academy almost since the Academy's birth in 1896. World War I changed many things in American medicine—one of which was the addition of instruction courses in ophthalmic plastic surgery to the Academy's Annual Meeting. Many were presented by John Martin Wheeler, M.D., heralded by some as the "Father of American Ophthalmic Plastic Surgery".

In 1952 ophthalmic plastic surgery was formalized as a discrete curriculum area with the establishment of the Academy's Committee on Reconstructive Plastic Surgery chaired by Dr. Wendell Hughes. The manual "Ophthalmic Plastic Surgery" was published by this group in 1961. ASOPRS was established in 1969 and awarded a seat on the Academy Council with establishment of that body.

Today, over 6% of Academy members have completed a fellowship in oculofacial plastics and declare it to be their primary or secondary area of subspecialty focus.

The formal engagement of ASOPRS and ASOPRS leadership in Academy activities is broad and impactful for both organizations. This includes Quality of Care guidelines such as the Ophthalmic Technology Assessment panel which is used to establish preferred clinical practices and for payer coverage decisions. ASOPRS assists in development of IRIS Registry quality measures on topics as central as ptosis and entropion.

The two organizations work collaboratively and effectively on issues of advocacy dealing with coding, code bundling, chart audit, local coverage decisions, and state-based advocacy including scope of practice legislation.

Together, the Academy and ASOPRS worked together to develop the Oculofacial Plastic Surgery education center. It has 123 chapters containing over 500 videos. This is now in the process of being duplicated on the ASOPRS web site as well. ASOPRS members should also take great pride in being the first subspecialty organization to proactively step forth and support the Minority Ophthalmologist Mentoring (MOM) Program. The goal of this program is to interest minority medical students in applying to ophthalmology and mentor them through the process.

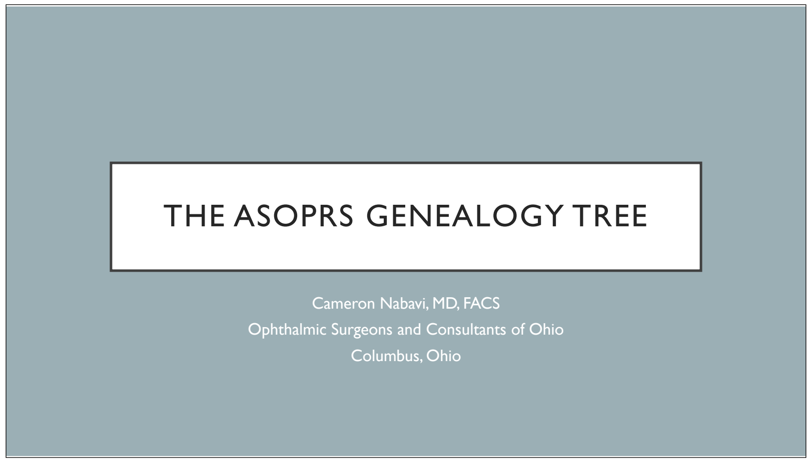
In the first 49 years of ASOPRS history, no member was ever elected Academy president. Now between 2018 and 2021, two of the four Academy Presidents (Keith Carter and Tamara Fountain) will serve in that position, leading 32,000 of their colleagues.

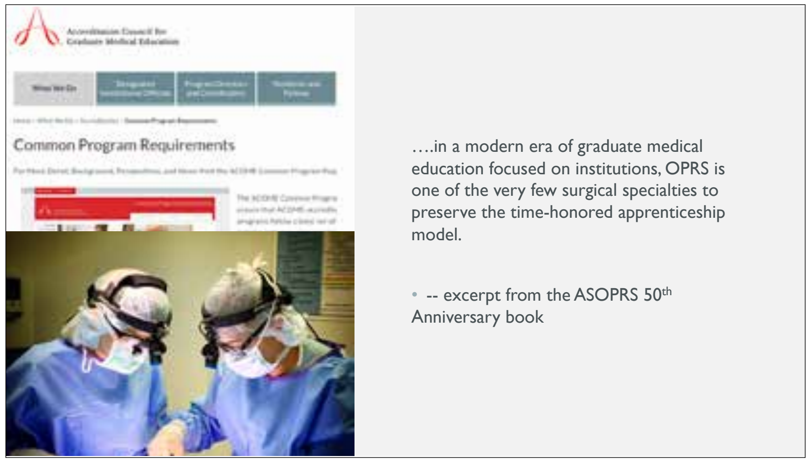
ASOPRS and the Academy are, in my opinion, a model of successful educational, quality of care, communication, and advocacy collaboration that benefits both physician members and their patients.

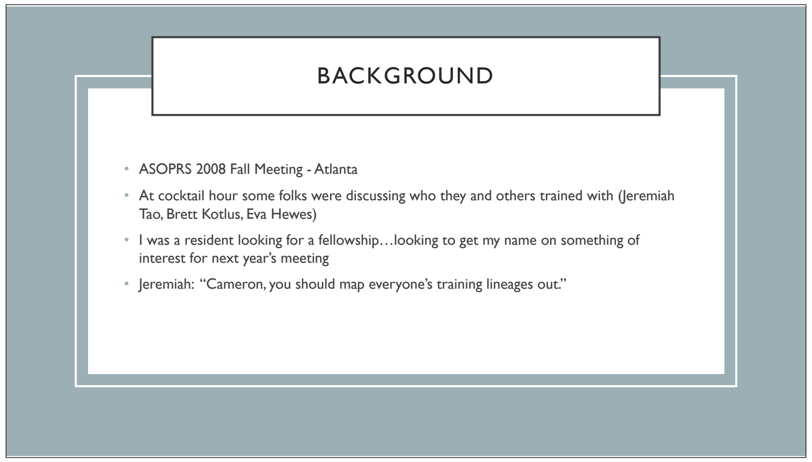
9:24 am

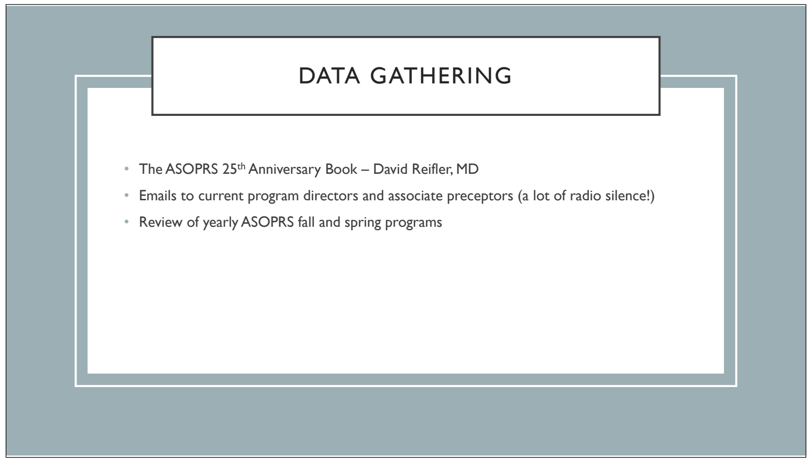
The ASOPRS Genealogy Tree

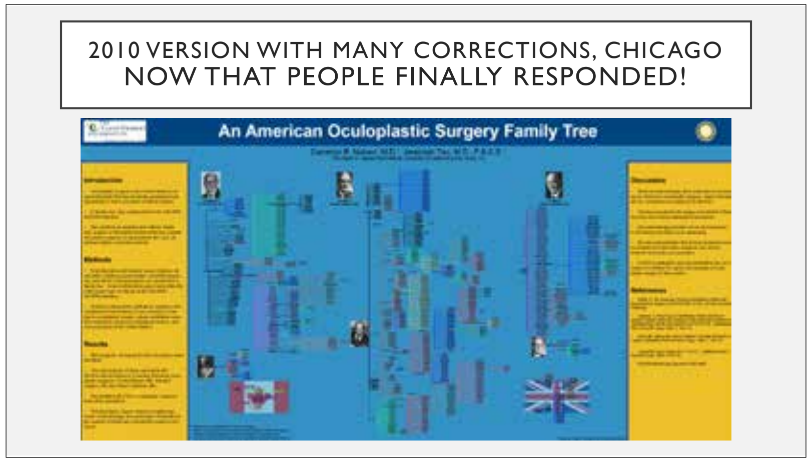
Cameron B. Nabavi, MD











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SOME FINDINGS FROM 2010

- 93% of American oculoplastic surgeons link to these 3 pioneers:
  - Crowell Beard
  - Wendell Hughes
  - Alston Callahan
- Byron Smith, who trained with Hughes, may be the most "prolific" in terms of subsequent trainees

CHALLENGES

- Some don't link neatly to one preceptor
- International preceptors and trainees.
- Category II ASOPRS Members

2019 ASOPRS GENEOLOGY TREE

LIVING DOCUMENT! SEND UPDATES/CORRECTIONS

- cnabavi@yahoo.com
- 858-405-3080

OPRS Around the World

9:29 am

An Introduction of Oculoplastics Association of India (OPAI)

Usha Kim, MD, President, Oculoplastics Association of India

How the members of OPAI have been benefitted by ASORPS

Opportunities for partnerships and fellowship possibilities in India

Spectrum of the orbital diseases in India

9:34 am

The Asia-Pacific Society of Ophthalmic Plastic and Reconstructive Surgery (APSOPRS): First Two Decades

Raoul Henson, MD, President, Asia Pacific Society of Ophthalmic Plastic and Reconstructive Surgery

The APSOPRS was conceptualized by Professor Reynaldo Javate, APSOPRS founding president, a couple of years before its inception in 2000. He was urged by an ASOPRS member to form the APSOPRS in order to have an oculoplastic society in the Asia-Pacific (As-Pac) region. During that time the only major international oculoplastic societies were the ASOPRS and ESOPRS. Since the As-Pac region has almost 4 billion of the world's population, it's but fitting to have a society serving this area of the globe. The first meeting of the society was held in Manila in December 2000 with just over 50 members. This was held every two years on a rotational basis in different As-Pac countries to promote the exchange of ideas and camaraderie among its members. After 20 years and 10 presidents, the society has grown to more than 200 members from twenty (20) As-Pac countries.

APSOPRS' main objective is to unify the Asian ophthalmic plastic and reconstructive surgeons and societies into a cohesive and productive organization. In a matter of two decades the society has achieved this objective and is now organizing oculoplastic societies in smaller underserved countries in the region. Another important role of the society is education and training. Members of the society have top notch fellowship programs and have trained regional oculoplastic surgeons who are now practicing in far flung areas to serve the poor and the indigent. A number of APSOPRS members and institutions have also excelled in research and are now considered one of the top research arms in the world. Lastly, the society has been growing as a leader in sharing its expertise on regional diseases and Asian surgical procedures. They have sponsored courses and sessions in Asian, American, European and other international meetings. From a budding group twenty years ago, the APSOPRS has now evolved into a world-class society ready to conquer the region and the rest of the world in the next twenty years.

9:39 am

Brazilian Oculoplastic Surgery Society

Roberto Limongi, MD, President, Brazilian Oculoplastic Surgery Society

Besides the ASOPRS, the Brazilian Oculoplastic Surgery Society (BOSS) is one of the oldest ophthalmic plastic surgery organizations worldwide. In 2019, BOSS celebrates its 45th year and the very same year ASOPRS celebrates its 50th. Brazilian oculoplastic surgeons have many linkages to ASOPRS with many of our leaders having trained with ASOPRS members. The subspecialty has seen significant growth in Brazil in recent decades. Many of the opportunities and challenges parallel those in the United States. Akin to board recognition efforts in the US, in Brazil we are actively seeking a seat in the "Brazilian Medical Association" that will further achieve appropriate recognition for our unique expertise and skills. In addition to partnering in exchange of knowledge with shared symposia, trainee exchanges, and research collaborations, BOSS and ASOPRS can partner in campaigns to educate the public. The public visibility of our subspecialty is important and BOSS has been very successful with the use of a professional marketing agency.

9:44 am

European Society of Ophthalmic Plastic and Reconstructive Surgery

Haraldur Sigurdsson, MD, President, European Society of Ophthalmic Plastic and Reconstructive Surgery

9:49 am

Australia & New Zealand Society of Ophthalmic Plastic Surgeons

Charles Su, MD, President, Australia & New Zealand Society of Ophthalmic Plastic Surgeons

This presentation gives a brief history of the Australian and New Zealand Society of Ophthalmic Plastic Surgeons (ANZSOPS). There have been many of our members who have ASOPRS members as mentors, and also many fruitful collaborations between members of the two societies.

9:54 am

History of Oculoplastics in Southern Africa

Carol Willies, MD, Past President, South African Society of Oculoplastic Surgery

SASOPS our very own South African Society is just 13 years old. It all started in 2005 in Johannesburg where it was the brain wave of 3 colleagues.

First SASOPS committee elected at a meeting piggy backed to our OSSA meeting held in 2006 at Sun City. Inaugural SASOPS Congress 2007 in Joburg attended by Dr Bill Nunnery, Dr Richard Collin and Dr Carol Lane.

Subsequently meetings have been held annually in different parts of SA. Highlights will be detailed.

The presentation will cover the various meetings, the guest speakers involved and the impact of the meetings and the guest speakers in mentoring the South African Ophthalmology Oculoplastic Society doctors.

It will show how practical skills of the members were improved by the Overseas expert Oculoplastic surgeons coming into theatre and assisting in the transferring of surgical skills. Special mention of Dr Bill Nunery.

As our SASOPS MEMBERS knowledge and skills have grown I hope to highlight the individual doctors and their contributions to the South African Medical Society thus benefitting our patients in providing better Oculoplastic care. In addition, mentioning those of our colleagues that have contributed to the Global Oculoplastic Society by their publications and presentations.

South Africa is a large country with a total of 61 million people. We have approximately 350 Ophthalmologists. The Oculoplastic needs within the current state patients is large. They are looked after by approximately 10% of ophthalmologist in the country. This may change with our looming NHI.

It would be a great contribution by ASOPRS members particularly making themselves available as potential speakers for future SASOPS meetings and if ASOPRS members could offer mini-fellowships at their units or practices in the US, to visiting SASOPS ophthalmologist members.

In summary the purpose of this presentation is to provide insights to those delegates attending the San Francisco meeting of the colourful landscape of Oculplastics in Southern African. To show our SASOPS as a society that has grown and developed and has been greatly benefited by the assistance of International Oculoplastic colleagues.

10:34 – 11:04 am

Moderators: Catherine Y. Liu, MD and Harsha S. Reddy, MD

10:34 am

Time-Resolved Imaging of Contrast KineticS (TRICKS) Magnetic Resonance Angiography in the Evaluation of Orbital and Periorbital Masses: An Update of Our Experience

Gande Li[1], Gregory D. Avey[2], Tabassum A. Kennedy[2], Mark J. Lucarelli[3], Cat N. Burkat[3]

[1]University of Wisconsin-Madison, Madison, Wisconsin, United States of America, [2]Department of Neuroradiology; University of Wisconsin-Madison, Madison, Wisconsin, United States of America, [3]Department of Ophthalmology & Visual Sciences, University of Wisconsin-Madison, Oculoplastic, Orbital, & Cosmetic Facial Surgery, Madison, Wisconsin, United States of America

Introduction: To reexamine the impact, accuracy, and utility of Time-Resolved Imaging of Contrast KineticS (TRICKS) MRA for characterizing orbital and periorbital masses

Methods: A retrospective chart review of patients with orbital and periorbital masses imaged with TRICKS (GE Healthcare [Chalfont St Giles, England]) MRA from August 1, 2011 through April 1, 2019 was conducted.[1] TRICKS protocol allows relatively high spatial resolution and provides dynamic intravascular flow information that has not been previously available without more invasive studies.[2-3] TRICKS MRA images of patients were compared to their initial non-TRICKS MR or CT studies and pathology results whenever available.

Results: The imaging records of 68 patients were reviewed; these did not include our cases reported in a separate study prior to 2011. Both genders were represented relatively equally (53% female). The majority of the masses (61, 90%) were intra-orbital (26 on the left, 30 right, 5 bilateral). The remaining 7 masses were located directly adjacent to the orbit(s). 55 (80.9%) patients in this series had traditional MRI or CT images prior to receiving TRICKS MRA, and TRICKS helped clarify diagnoses and/or redirect management in 30 (54.5%) of lesions.

The majority of lesions (53, 76.8%) were classified as vascular masses, and 49 (92.5%) of them were classified as low-flow. Of the low-flow lesions, 22 (44.9%) were venous malformations/cavernous malformations, 9 (18.4%) lymphangioma/lymphatic/venolymphatic malformations, and 11 were venous varices (22.4%), others (14.3%).

Of the 15 cases with histopathological data, interpretation of MRI with TRICKS successfully predicted 13 (86.7%). However, TRICKS interpretation also misdiagnosed 3 very slow-flow vascular masses and one no-flow solid mass (rhabdomyosarcoma) in this series.

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Conclusions: To the best of the authors' knowledge, this is the largest study to date of patients evaluated with MRI with TRICKS MRA for orbital and periorbital masses. TRICKS protocol is an effective advanced imaging modality that can aid patients with clinical and radiological diagnostic uncertainty with relatively high accuracy and provide high-resolution dynamic flow information without resorting to traditionally more invasive angiographic imaging modalities. However, TRICKS protocol may have some limitations in distinguishing very slow-flow vascular masses from solid tumors due to the difficulty to obtain flow dynamics in these masses. Limitations of the study include lack of histopathologic confirmation in all cases.

References:

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2. Kunishima K, Mori H, Itoh D, et al. Assessment of arteriovenous malformations with 3-Tesla time-resolved, contrast-enhanced, three-dimensional magnetic resonance angiography. J Neurosurg 2009;110:492–9.
3. Ramey NA, Lucarelli MJ, Gentry LR, Burkat CN. Clinical usefulness of orbital and facial Time-Resolved Imaging of Contrast KineticS (TRICKS) magnetic resonance angiography. Ophthalmic Plast Reconstr Surg. 2012 Sep-Oct;28(5):361-8.

10:40 am

Analysis of the Efficacy and Safety of Optic Nerve Sheath Fenestration with Idiopathic Intracranial Hypertension: An 8 Year Review

Peter Timoney[1], Kevin Tomasko[2], Jeremy Clark[2], Christopher Compton[2], Hui Bae Lee[2], Jason Sokol[3]
[1]Ophthalmology, University of Kentucky, Lexington, Kentucky, United States of America, [2]Ophthalmology, University of Louisville, Louisville, Kentucky, United States of America, [3]Ophthalmology, Kansas University, Prairie Village, Kansas, United States of America

Introduction: Given the prevalence of obesity in adults is approximately 40% in the United States[1], idiopathic intracranial hypertension (IIH) is a more common disorder with resultant visual loss and headaches. Optic nerve sheath fenestration (ONSF) is a frequently used surgical management option in patients with IIH with optic nerve compromise that are refractory to medical management or in patients who present fulminantly to prevent further visual loss and occasionally improve headaches.[2]

Methods: A retrospective chart review was performed on all patients undergoing ONSF from January 2011 to January 2019. Primary outcome measures included visual acuity, optic nerve head findings, visual field results, whether or not an optic nerve sheath window was performed, and whether or not a repeat ONSF was performed. Other measured variables included the prevalence of headaches, headache relief, opening cerebrospinal fluid (CSF) pressure and whether or not any CSF diversion procedures were performed.

Results: A total of 121 eyes in 82 patients (74% were female) that underwent an ONSF were identified with an average of 13 months follow up with four repeat ONSFs. Papilloedema improved in 87% of patients who underwent an ONSF. There were no operative complications noted. 51% of patients underwent an optic nerve sheath window at the time of surgery that measured approximately 2 mm x 1-2 mm and 50% of these patients experienced a significant improvement in papilloedema. Visual acuity remained stable in 70% of eyes and improved in 26% of eyes post-ONSF. 4% of eyes had a worsening of vision but had associated optic nerve gliosis and atrophy. Visual field (VF) defects were present in all eyes undergoing ONSF with stabilization of VF defects in 88% of patients and improvement in 12% of patients. 83% of patients presented with headaches and 43% stated some improvement in headaches post-ONSF.

Conclusions: Although ONSF has little or no effect on intracranial pressure, it is a safe and relatively effective surgical procedure in reducing papilloedema, stabilizing visual field defects and in preventing visual loss in IIH in the 12 month postoperative period as evident in this 8 year review. ONSF may also assist in alleviating headaches in this sub-population. An optic nerve sheath window may be favored over a slit if anatomically feasible in more effectively reducing existing papilloedema.

References:

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10:46 am

Analysis of Bony Landmarks on the Orbital Floor

Shoaib Ugradar, Daniel Rootman
Oculoplastics, UCLA, Los Angeles, California, United States of America

Introduction: Clinically it can be observed that the orbital floor demonstrates significant variation in bony landmarks. This variation has been sparsely described in the literature. The purpose of this study was to accurately characterize the bony landmarks of the orbital floor in three-dimensional space and to assess the degree of variation in these structures.

Methods: In this observational cohort study, CT scans obtained through routine care over a 12-year period were screened for study entry. Caucasian adults with CT scans of ≤ 1mm slice resolution were eligible for study entry. Only normal orbits without any orbital pathology as identified on imaging or in patient charts were included. In cases with two normal orbits, only one was included, left or right randomly selected.

The image processing software, Mimics (Materliase, Leuven, Belgium) was used to create 3D reconstructions of the normal bony orbits in each patient. Bony landmarks were assessed in 3D space. The landmarks included: distance between the inferior orbital fissure (IOF) and the orbital rim, distance along the IOF between the anterior most portion and the infraorbital groove, distance between the infraorbital groove and the inferomedial orbital strut, the angle formed between the inferior orbital fissure and the inferomedial orbital strut and the distance between the posterior maxillary sinus and the entrance of the optic canal into the orbit. The relationship between the posterior maxillary sinus and the optic canal was further characterized by marking the X, Y and Z coordinates between these two landmarks.

To test the reliability of measurements, another member of the team performed the same measurements on ten randomly selected orbits. The intraclass correlation coefficient (ICC) was calculated.

Results: The sample included 100 normal orbits from 100 patients. There were 58 females and 42 males. The mean age (SD) of the patients was 48 (19.6). The mean (SD) distance between the tip of the IOF and the orbital rim was 18.49 mm (2.11). The mean (SD) distance between the tip of the IOF and the infraorbital groove was 7.31 mm (2.23). The mean (SD) distance between the infraorbital groove and the inferomedial orbital strut was 12.98 mm (2.65). The mean (SD) angle formed between the IOF and the inferomedial strut was 69.18° (12.9). The mean (SD) distance between the posterior maxillary sinus and the optic canal was 15.7 mm (3.40). The mean (SD) X, Y and Z distances between these two landmarks were: X = 7.51 mm (3.52), Y = 9.56 mm (3.51) and Z = 9.87 mm (2.98). The average ICC for all measurements was 0.984.

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Conclusions: There is considerable variability in key bony orbital landmarks, with the greatest being that of the relationship between the posterior maxillary sinus and the optic canal. Knowledge of this variation has implications particularly for orbital decompression and fracture surgery.

Figure 1

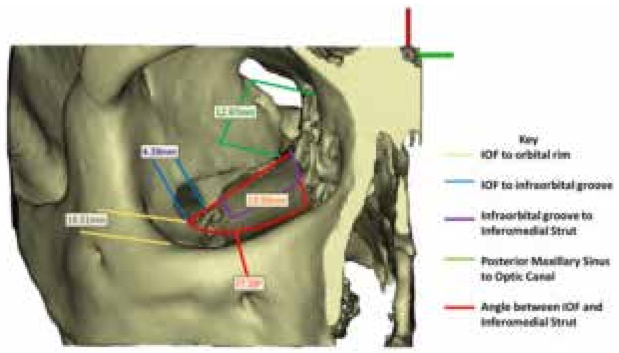

Figure 1: Measurements of bony landmarks along the Orbital Floor

Figure 2

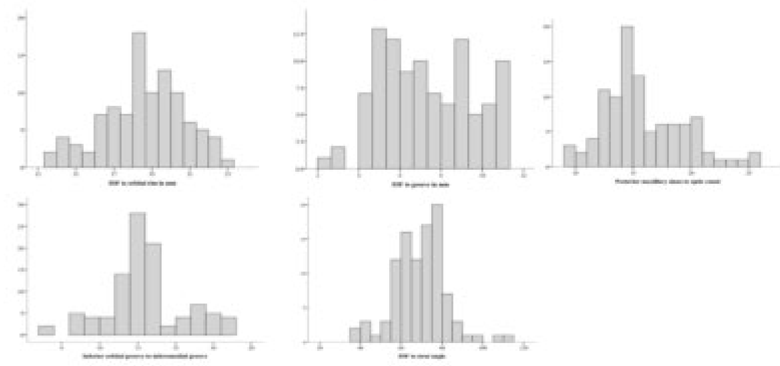

Figure 2: Graphs depicting the distribution of measurements of bony landmarks across the orbital floor

10:52 am

A Novel Orbital Compartment Pressure Sensing Retractor & Cadaveric Testing Platform

Henry Bair[1], Giancarlo Garcia[2], Benjamin Erickson[2]
[1]Stanford University School of Medicine, Stanford, California, United States of America, [2]Byers Eye Institute, Stanford University School of Medicine, Palo Alto, California, United States of America

Introduction: Orbital compartment syndrome (OCS) is an emergent condition in which orbital compartment pressure (OCP) elevation produces ischemic retinal and optic nerve injury. It is most commonly caused by retrobulbar hemorrhage, secondary to craniofacial trauma or following periocular surgery.[1,2] Lateral canthotomy/cantholysis is generally the first line treatment,[3] with applanation tonometry measurements of intraocular pressure (IOP) frequently used as proxies for OCP.[4,5] However, it is difficult for inexperienced practitioners to obtain reliable and actionable readings in the setting of trauma as well as to assess whether adequate release has been achieved. We present validation of a novel pressure-sensing eyelid retractor that directly and continuously measures OCP in a cadaveric testing platform.

Methods: A parallel beam load cell is anchored to a 3D printed handle, which separates paired retractor blades with nesting claw tips (**Figure 1**, red arrow indicates load cell). The load cell is connected to an amplifier/microcontroller running Arduino open source code with output via a mini-B USB port (Arduino.cc, Ivrea, Italy). The blades are spaced to permit compression and load cell deflection without contact at forces exceeding the equivalent of 100 mmHg. Output can be calibrated to correspond with mmHg values, permitting use of familiar metrics for clinical decision making.

For testing, a novel and reusable cadaveric platform was developed. An inflatable neonatal sphygmomanometer bladder was inserted in the lateral extraconal orbit via a temporal lid crease incision (**Figure 2A**), allowing for repeated manual adjustments of OCP with pressure monitoring via an aneroid gauge (**Figure 2B**).

The retractor is inserted between the lower eyelid and sclera (**Figure 3**), and may remain in place collecting continuous measurements until full release of the tarsoligamentous sling with canthotomy/cantholysis. The retractor can then be placed under the upper eyelid to assess residual compartment pressure and inform the need for additional interventions.

Results: Using the cadaveric platform, the sphygmomanometer bladder was progressively inflated, and pressure readouts were correlated with IOP, as measured by a digital tonometer, and OCP, as measured by the retractor (units in load cell voltage output were converted to mmHg using linear interpolation) (**Figure 4**). There was close correspondence among all measurement techniques, although the retractor was able to obtain measurements corresponding with pressures of 70-100 mmHg, which produced a high reading error on the tonometer.

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Finally, canthotomy/cantholysis was performed on the cadaveric model, with the retractor in place to obtain real-time measurement of changes in OCP during the procedure. The retractor was able to demonstrate rapid dissipation of pressure with successful release of the tarsoligamentous sling (**Figure 5**, blue arrow denotes initiation and red arrow denotes completion of procedure).

Conclusions: Unlike applanation tonometry, retractor placement requires no specialized training. Rather than obtaining pressure values over random millisecond intervals, which is highly vulnerable to sampling bias, the lowest measurement obtained with the retractor can be taken as an accurate reflection of OCP, providing reliable and actionable information to guide emergent canthotomy/cantholysis and other indicated procedures. Ease of use can help facilitate appropriate clinical decision, especially in environments without immediate access to ophthalmic consultation.

Figure 1

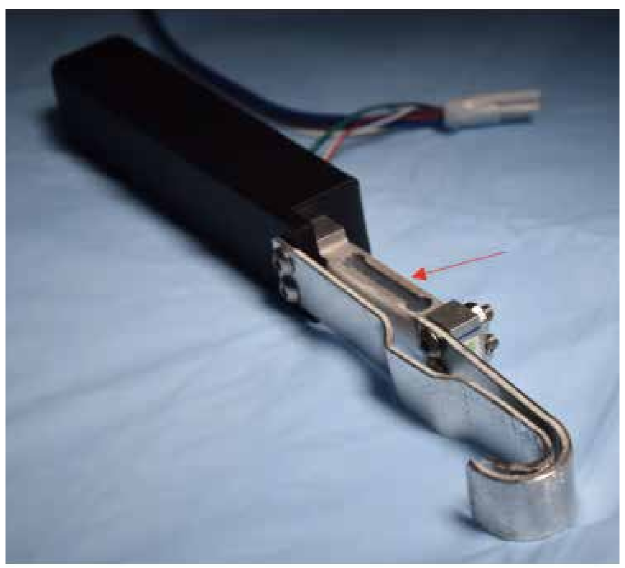


Figure 2

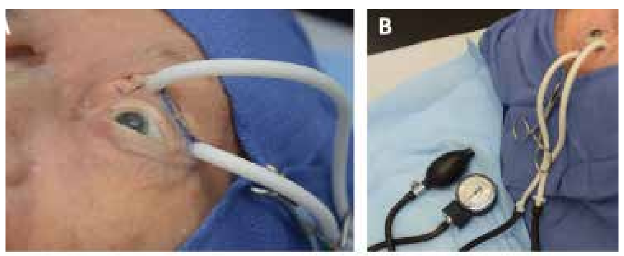


Figure 3

Figure 4

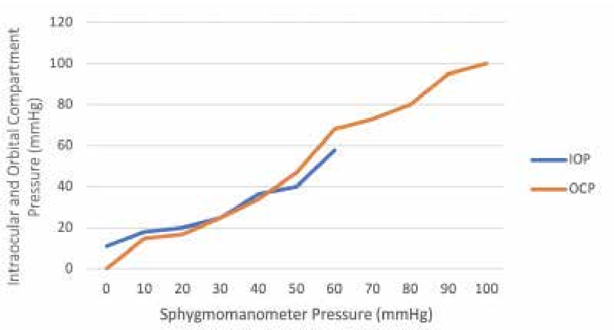
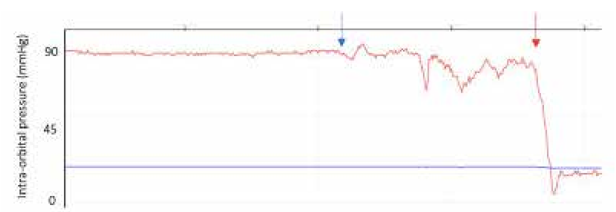


Figure 5



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4. McInnes G, Howes DW. Lateral canthotomy and cantholysis: a simple, visionsaving procedure. CJEM 2002; 4:49–52.
5. Zoumalan CI, Bullock JD, Warwar RE, Fuller B, McCulley TJ. Evaluation of intraocular and orbital pressure in the management of orbital hemorrhage: an experimental model. *Arch Ophthalmol*. 2008 Sep;126(9):1257-60.

11:06 am

Surgery of the Skull Base and Orbit: A Neurosurgical Perspective

Ian Dunn, MD

11:30 am - 12:30 pm

Using Photography and Videography to Enhance your Practice (Non-CME)

Richard C. Allen, MD, PhD, FACS; Bobby S. Korn, MD, PhD, FACS; and Robert A. Goldberg, MD, FACS

How to Capture and Edit Surgical Videos like a Rockstar!

Bobby Korn, MD, PhD

Nothing captivates a speaker's message like a masterfully edited video. This session will present how to optimize the capture of raw video and transform this footage into a finished product. A detailed workflow will be presented using the Apple Final Cut Pro NLE system and Panasonic Lumix platform. Specific hardware and software components will be discussed.

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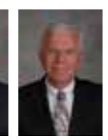
Challenges in Producing Oculoplastic Surgery Videos

Richard C. Allen MD PhD FACS
Professor, Dept. of Ophthalmology
Cullen Eye Institute, Baylor College of Medicine
Alkek Eye Center, Texas Children's Hospital, MD Anderson Cancer Center, St. Luke's Hospital, Houston Methodist Hospital, Ben Taub General Hospital
Houston, TX USA

- Financial disclosure
  - Advisory Board
    Horizon Pharma

- I've been fortunate
  - Great mentors
  - Great resources

- Mentors
  - Tom Oetting MS MD
    - The power of social media
    - Eyerounds.org
  - W. Lee M. Alward MD
    - The power of a good video resource
    - Gonioscopy.org



- Resources
  - University of Iowa Hospitals and Clinics
    - Photographers
    - Videographers
    - Library support

- Ophthalmic videos
  - Cataract surgeons were the pioneers
    - Quick surgery
    - Easy to video through the microscope

- Recognition of a lack of video resources for oculoplastic surgery education
  - My goal: provide a comprehensive video resource for oculoplastic surgery education

- Traditional teaching
  - Classroom
    - Limited by number of seats
    - 50-75 minute increments
    - One style fits all

- Traditional teaching
  - Apprenticeship
    - Very limited numbers
    - Requires on-site presence
    - Can be abusive
    - Probably most effective in teaching a skill
    - Often exposed to one way of doing things

- Are we teaching efficiently using traditional teaching methods in oculoplastic surgery?
  - Classroom
    - Some students are not receptive
    - Not reaching our target audience
  - Apprenticeship
    - One at a time
    - Requires on-site instruction

- Teaching as a commodity
  - Protecting one's intellectual property/investment
  - Limiting the dissemination of knowledge
  - Big business for higher education in some countries
  - For the academic physician
    - How much money do you really make from a book?

- The argument to disseminate knowledge freely
  - Demand is great
  - Resources are scarce
  - Geography is limiting
  - Unstable countries may limit travel

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- World-wide education/care
  - Mission trips/Orbis
    - One patient at a time
    - Teaching a person to fish
    - Teaching the teachers
    - Limitations
      - Restricted geographically
      - Single visit without reinforcement
      - Dissemination of knowledge is slow

- Fellowships for foreign applicants
  - Again, one at a time
  - A lot of cost and energy for the fellow
    - Less likely to freely disseminate knowledge in their home country
    - Knowledge they attained is valuable/costly

- My approach
  - Surgical videos
    - Free access
    - No login
    - Short (on average 2-3 minutes)
    - Transcription of narration provided for translation
    - Target audience self-selects

- Free to download
  - Asked (but not enforced) to restrict to education
  - Request for acknowledgement of source

- www.oculosurg.com
  - Over 300 edited, narrated videos
  - Cover eyelid, lacrimal, and orbital surgeries

- Potential video systems
  - Overhead ceiling mounted
  - In-light
  - Microscope
  - Headlight mounted/GoPro
  - Endoscope
  - Manual video
  - Main disadvantage: you were not necessarily videoing what you were seeing as you were with a video system through the microscope

- Standard ceiling mounted

- Overhead/hidef, wide screen

- Lower def

- Limits of ceiling mounted

- In-light cam

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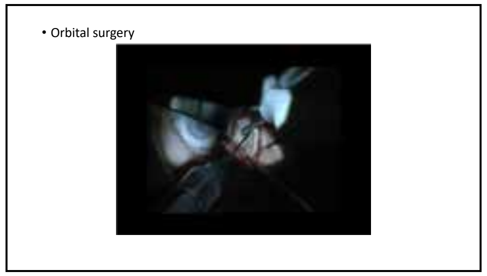

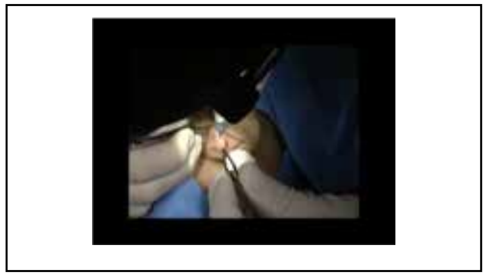

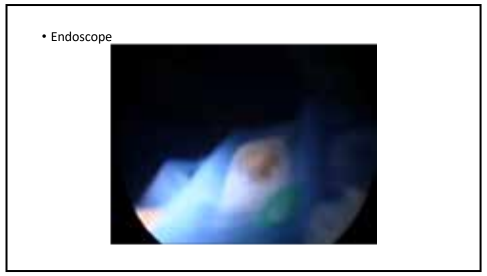

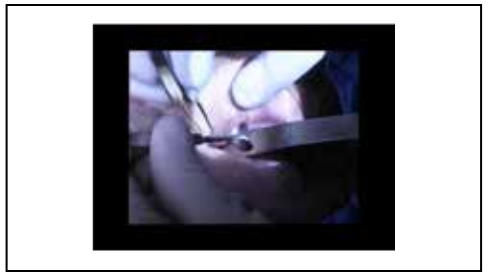

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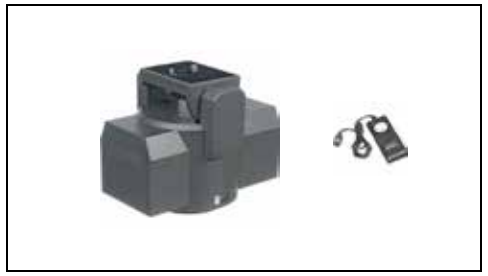
- Intraoral

- Challenges
  - The three "H's"
    - Hands
    - Head
    - Holes

- Other challenges
  - Surgeries were often long
    - Would require extensive editing
    - Editing software could be user unfriendly
    - Narration can be burdensome

- Advancements
  - Decrease in price of equipment
  - User friendly editing and narration
    - MAC
    - Adobe

- My preferences
  - Overhead system
    - Panasonic AG-UCK20GJ compact camera head
    - Panasonic AG-UMR20PJ compact digital recorder
    - Panasonic-C20020G 65' cable
    - Bescor MP-101 Motorized pan and tilt head MP101
    - LED flat panel display (32"-42"-50")
    - HDMI cable between display and digital recorder
    - SD 16 or 32 GB Cards for recording



- Invest in a good microphone

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- What makes a successful video?

- My tricks
  - Having a critical mass of videos
  - Short
  - Narrated
  - Transcribed narrations for translation

- Thank you!
  - Visit www.oculosurg.com
  - Free oculoplastic surgery video library
  - Over 300 narrated, edited videos!
  - @oculoplasticsurgeryvideos (facebook)
  - @oculoplasticsurgeryjournalclub (facebook)
  - @RichardAllenMD (twitter)

Moderator: Chris R. Alabiad, MD

Panelists: Robert C. Kersten, MD, Andrew R. Harrison, MD and Cat N. Burkat, MD, FACS

12:30 pm

Cocaine-induced Midline Destructive Lesion Complicated by Pyoderma Gangrenosum-like Ulcer

Patrick Staropoli, Ann Tran, Kenneth Fan, Chrisfouad Alabiad
Oculoplastics, Bascom Palmer Eye Institute, Miami, Florida, United States of America

Introduction: Chronic intranasal inhalation of cocaine can result in nasal septal perforation and cocaine-induced midline destructive lesions (CIMDL) in 5% of users.[1] These complex periorbital facial ulcerations are diagnostically challenging and multiple etiologies should be considered. Pyoderma gangrenosum is a rare but serious ulcerating skin condition that occurs in the setting of pathergy and is often misdiagnosed.[2] We present a case of a patient with a CIMDL complicated by a pyoderma gangrenosum-like ulcer in the setting of chronic cocaine use, palatal perforation surgery, and traumatic dog bite.

Methods: Case report

Results: A 72-year-old female presented nine months after an unrepaired dog bite to the left lower midface (Figure 1 A, B). The patient had a longstanding history of chronic inhalational cocaine use and palatal perforation requiring surgery about 4 years prior. On examination, there was a large friable ulcerative lesion with central necrosis and hyperkeratotic rolled boarders measuring 2.5 x 1.5 cm on the left midface causing a cicatricial ectropion and severe exposure keratopathy. There was a full thickness nasal soft tissue and septal defect with destruction of the lacrimal system. Biopsy of the lesion showed acute and chronic inflammation with no evidence of malignancy, vasculitis, or infection (Figure 2). Magnetic resonance imaging revealed paucity of the sinonasal structures with lack of turbinates, nasal septum, and mild soft-tissue enhancement extraconally in the inferomedial periorbital region (Figure 3 A, B). The patient returned one year later after poor follow up with extension of the lesion to the left temple, scalp, and midface with preservation of the nasofacial sulcus and nasolabial folds (Figure 4 A, B). The patient denied further cocaine usage. Repeat biopsy showed similar results. Laboratory work-up revealed elevated ESR, CRP, and platelets however ANCA-MPO, ANCA-PR3, HCV, Syphilis, and HIV were negative. At this point, an underlying inflammatory etiology was suspected, particularly pyoderma gangrenosum. The patient was given a trial of intravenous steroids over three days with significant improvement and granulation of the prior area of necrosis (Figure 4 C, D). The response to immunosuppressive treatment supported pyoderma gangrenosum, a diagnosis of exclusion. The patient was transitioned to oral prednisone and cyclosporine to insure maximal medical rehabilitation prior to facial and periocular reconstruction.

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Conclusions: In complex non-healing ulcers, multifactorial conditions should be considered. We present a rare case of a pyoderma gangrenosum-like ulcer with an underlying pathergy stimulus of traumatic dog bite and CIMDL. This case highlights the importance of diagnostic evaluation prior to surgical intervention.

Figure 1

Figure 2

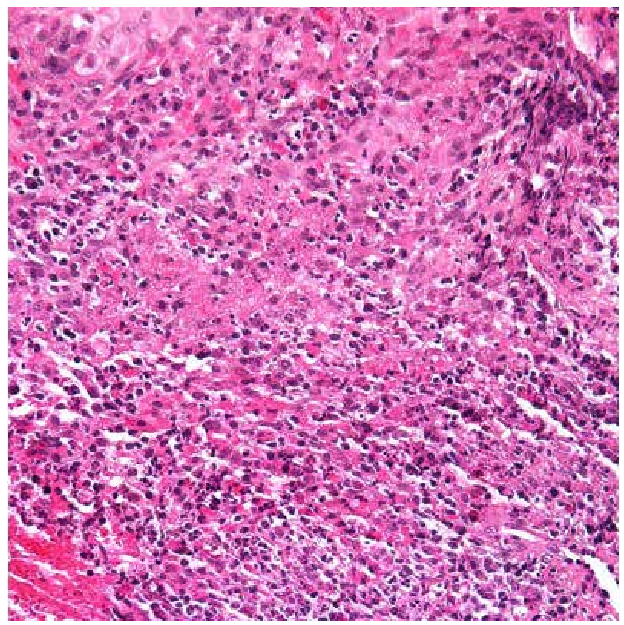

Figure 3

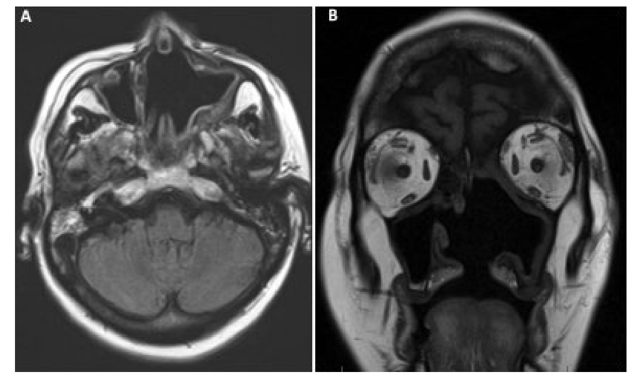

Figure 4

References:

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2. Su WP, Davis MD, Weenig RH, Powell FC, Perry HO. Pyoderma gangrenosum: clinicopathologic correlation and proposed diagnostic criteria. *Int J Dermatol*. 2004;43:790–800.

12:42 pm

Post-meningitic Subdural Hygroma after Lateral Wall Orbital Decompression

Minwook Chang[1,2], Zvi Gur[1], Catherine Liu[1], Don Kikkawa[1], Bobby Korn[1]
[1]Ophthalmology, UC San Diego, La Jolla, California, United States of America, [2]Ophthalmology, Dongguk University Ilsan Hospital, Gyeonggido, Korea

Introduction: Orbital decompression is a generally well tolerated procedure however, as with any surgery, complications may occur. Of these, intracranial complications are the most serious. In this case report, we describe the management of post-meningitis subdural hygroma after lateral wall orbital decompression.

Methods: A retrospective chart review of a patient who was referred to a tertiary referral center after complications resulting from lateral wall decompression for thyroid related orbitopathy. Data reviewed included: demographics, ophthalmic exam, clinical and microbiological laboratory results, orbital and brain imaging and operative reports.

Results: A 53 years old male underwent right orbital decompression at an outside facility. Postoperative day (POD) 1 visit was uncomplicated. However, by POD #6, the patient presented to the emergency room with fever, meningeal signs, and dehiscence of the eyelid crease incision with discharge of clear fluid. He was diagnosed with bacterial meningitis and referred for care. IV antibiotics, ICU admission and multilayered wound closure were initiated. The patient did well until 2 days later where worsening headache and nausea were noted. A 4.0mm midline shift was noted as well as formation of a subdural hygroma. Neurosurgery performed urgent burr hole placement with drainage of 100ml of straw-colored fluid. The patient did well for 24 hours before symptoms recurred. Repeated Scan showed midline shift worsening to 6.5mm. The patient was taken back to OR and brain tissue noted to be plugging the previously placed burr holes. A peritoneal shunt was performed to prevent re-accumulation of CSF as well as concurrent orbitotomy to repair the dural tear with fat plug and dural sealant adhesive. The patient's condition stabilized and eventually discharged to home.

Conclusions: This case highlights the diagnosis and management of a life-threatening intracranial complication after orbital decompression that has never been reported before in the literature.

References:
1. Sellari-Franceschini S, Dallan I, Bajraktari A, Fiacchini G, Nardi M, Rocchi R, Marcocci C, Marinò M, Casani AP. Surgical complications in orbital decompression for Graves' orbitopathy. Acta Otorhinolaryngol Ital. 2016 Aug; 36(4):265-274.
2. Badilla J, Dolman PJ. Cerebrospinal fluid leaks complicating orbital or oculoplastic surgery. Arch Ophthalmol. 2007 Dec;125(12):1631-4.

12:54 pm

Lower Eyelid Retraction in Prominent Eye After Cosmetic Surgery

Sanja Galeb Cypen
Duke Eye Center, Durham, NC, United States of America

This patient presented with a compliant we often see as oculoplastic surgeons—a second opinion of symptomatic lower eyelid retraction following cosmetic lower eyelid blepharoplasty. She has already undergone reconstructive surgery although is unable to provide much history and does not have the records. My question to the audience is two-fold. First, what surgical options could be presented to the patient? And second, how would the surgery be billed—functional through insurance versus cosmetic?

1:10 pm

Editing Genomes and the Future of Medicine

Jennifer Doudna, PhD

1:41 – 2:34 pm

Moderators: M. Reza Vagefi, MD and Jasmina Bajric, MD

1:41 pm

Orbital Complications of Dermal Hyaluronic Acid Filler

Morris Hartstein[1], Shirin Hamed Azzam[2], Daniel Briscoe[2], Cat Burkat[3]

[1]Ophthalmology, Shamir Medical Center, Zerifin, Israel, [2]Ophthalmology, Emek Medical Center, Afula, Israel, [3]Ophthalmology, University of Wisconsin, Madison, Wisconsin, United States of America

Introduction: Dermal hyaluronic acid filler injections continue to grow in popularity as a method of facial rejuvenation. We report a series of cases demonstrating various complications involving the orbit after filler injections. Treatment methods and possible mechanisms are discussed.

Methods: Retrospective review of four patients who underwent HA filler injection to the face with subsequent orbital complications.

Results: Case 1: 65 year old female underwent HA filler injection to the NLF. Two months later, she presented with progressive swelling of the right lids. CT scan demonstrated a large mass in the inferior orbit (Figure 1). The patient underwent excisional biopsy which revealed a massive foreign body reaction (Figure 2). Case 2: 63 year old female underwent dermal filler injection to the forehead and lateral brow. One year later, she presented with a mass in the right anterior orbit demonstrated on CT. She underwent orbitotomy with removal of the masses. Pathology revealed foreign body reaction and granulomas surrounding bluish material. Case 3: 67 year old female with mass in right inferomedial orbit. The patient had undergone filler injection one year earlier. Orbitotomy revealed liquid mass consistent with filler. Case 4: 47 year old female underwent filler injections to the NLF, cheeks and tear trough, and developed sudden inability to adduct the right eye. Neuroophthalmology consult felt this was a partial third nerve palsy that was filler-related. The ophthalmoplegia did not improve after 10 months and therefore strabismus surgery was performed.

Conclusions: We present four cases of orbital complications secondary to dermal filler injection. Possible mechanisms include inadvertent direct injection or filler migration. Filler migration implies that the filler is present at a location other than the injection site. This is a possible mechanism as the orbit symptoms did not appear directly after the injection, in some cases occurring a year after injection. However, unrecognized intra-orbital injection could also explain how the HA material crossed the septum. In all cases, however, surgical intervention was required. Orbital complications may occur long after the filler injection and since the site is distant from

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the injection, patients will not immediately make the connection. Fillers should be considered in the differential diagnosis of patients presenting with new onset orbital disease.

Figure 1

Figure 2

References:
1. Jordan DR, Stoica B. Filler migration: A number of mechanisms to consider Ophthal Plast Reeconstr Surg (2015) 31:257-262.
2. Molesh R, Mukari A, Krausz G, Hartstein ME, Hamed Azzam S. Orbit mass secondary to migration of dermal hylauronic acid filler JAAD (2019).

1:47 pm

Force Required to Inject a Column of Filler through Facial Arteries

Shoaib Ugradar[1], Alan Le[2], Blake Katsev[2], Sathyadeepak Ramesh[3,4]
[1]Stein Eye Institute, Los Angeles, California, United States of America, [2]Los Angeles, California, United States of America, [3]Eye and Facial Plastic Consultants, Philadelphia, Pennsylvania, United States of America, [4]Wills Eye Hospital, Philadelphia, Pennsylvania, United States of America

Introduction: Injectable fillers have become an integral part of noninvasive facial rejuvenation, but vascular occlusion is a dreaded complication of such injections. The force required by the fingertip onto the plunger of the syringe to cause retrograde migration is unknown.

Methods: In this in vitro cadaver study, twelve 2cm arterial segments were harvested from the facial arteries of cadavers. Four fillers were tested—Juvederm Voluma, Belotero Balance, Restylane, and Radiesse.

A specialized rig was constructed to measure the force required to push a column of filler through the arterial segment (Figure 1). Filler syringes were attached to a horizontally mounted microtensile load cell, which included a linear motor (Ibex Engineering, Newbury Park, CA) capable of high speeds (100 mm/s) and 20 nm resolution, with a strain gauge (LSB200, FUTEK, Irvine, CA) having 5 µN force resolution. Each syringe of filler was connected to a rigid 10 cm long polyvinyl chloride tube (Baxter, Deerfield, IL) with a 25g needle attached to the opposite end. This tubing was selected since it does not expand or collapse with pressure changes. Injection pressure required to force a column of filler for 1cm at a velocity of 500 µm/s was measured. Five oculoplastics specialists were subsequently recruited and asked to inject the filler at a typical injection pressure. Statistical analysis was performed with a repeated-measures ANOVA with multiple comparisons correction.

Results: For each of the four fillers, three separate trials were performed in each portion of the experiment. Data are summarized in Tables 1-3. The overall effect of filler viscosity on the pressure required to move the material for the first 1cm of the arterial segment at 500 µm/s was significant ($p<0.001$). Radiesse required significantly more pressure to cause propagation of the material compared to all other materials ($p<0.01$); none of the other fillers differed significantly from each other (Figure 3). Typical injection pressures generated by experienced injectors were significantly lower than the pressure required to cause propagation of filler at the desired velocity, and significantly lower than systemic mean arterial pressure (Table 4). Measured pressure required to cause filler propagation was well within the normal range of the finger strength that can be generated by humans[9].

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Conclusions: Typical injection pressures from fingertip to plunger are much lower than required to cause propagation of filler intravascularly at a typical velocity. However, required injection pressure to cause intravascular propagation requires only 50-75% of the reserve strength of the fingertip, and 5-10% of that of the thenar eminence. Initial propagation of a column of material, followed by subsequent shearing and embolization of smaller particles, may be responsible for observed clinical complications of intravascular injection.

Figure 1

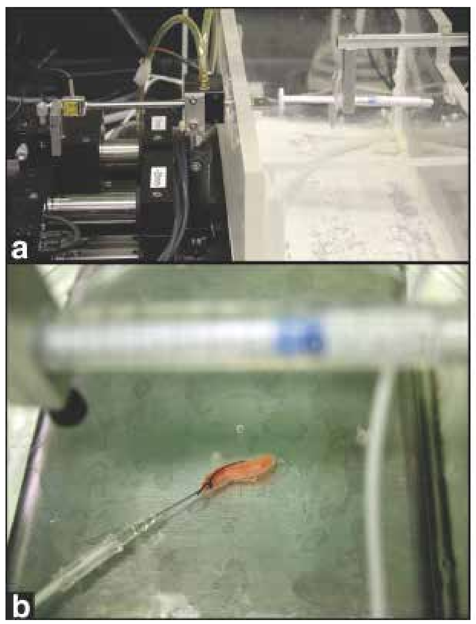

Figure 2

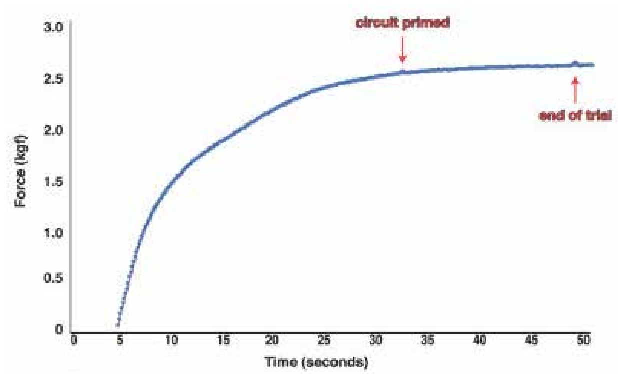

Figure 3

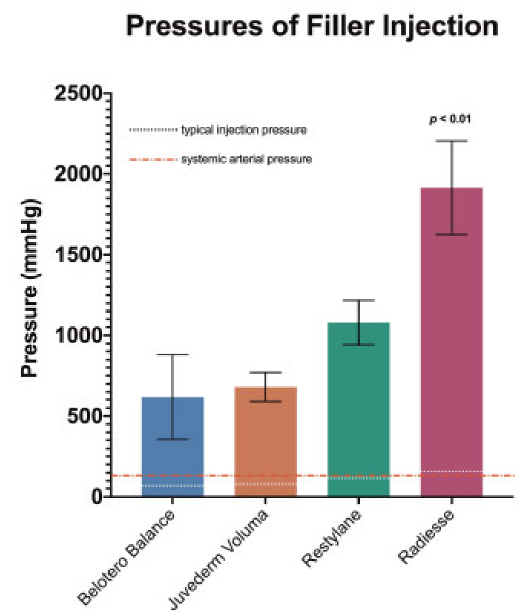

Figure 4

	Juvederm Voluma	Restylane	Belotero Balance	Radiesse
Trial 1	750.5	1179.8	489.2	1641.0
Trial 2	697.2	1137.0	589.0	1845.5
Trial 3	601.2	921.6	803.9	2136.9

[illegible]

	Mean Pressure (mmHg)	Standard Deviation	Viscosity (cPa)	p
Juvederm Voluma	684.1	0.11	81.8	ns
Restylane	1081.3	0.19	119.2	ns
Belotero Balance	617.9	0.36	9.2	ns
Radiesse	1902.5	0.39	849.8	<0.01

[illegible]

	Injection Pressure (mmHg)
Typical Pressure Generated by Experienced Oculoplastic Specialist	17.3 – 88.8
Measured Pressure to cause Filler Migration in vitro	617.9 – 1081.3
Maximum Pressure Generatable by Fingertip (Male)	1380.2 – 2355.8
Maximum Pressure Generatable by Fingertip (Female)	808.1 – 1548.5
Maximum Pressure Generatable by Thenar Eminence (Male)	10,942.0 – 12517.4
Maximum Pressure Generatable by Thenar Eminence (Female)	4805.0 – 6285.8

[illegible]

	Measured Mean Force (kgf)	Plunger Surface Area (cm²)	Calculated Injection Pressure (mmHg)
Juvederm Voluma	0.077 ± 0.009	3.23	17.7
Restylane	0.083 ± 0.008	3.14	20.0
Belotero Balance	0.14 ± 0.01	3.14	31.6
Radiesse	0.19 ± 0.01	2.85	49.3

[illegible]

Figure 5

	Injector 1	Injector 2	Injector 3	Injector 4	Injector 5
Juvederm Voluma	0.081	0.079	0.084	0.055	0.068
	0.074	0.073	0.08	0.060	0.054
	0.083	0.074	0.078	0.064	0.07
Restylane	0.087	0.091	0.095	0.059	0.081
	0.094	0.069	0.101	0.055	0.078
	0.079	0.088	0.099	0.099	0.08
Belotero Balance	0.14	0.148	0.133	0.146	0.123
	0.15	0.151	0.126	0.135	0.115
	0.13	0.155	0.14	0.144	0.14
Radiesse	0.187	0.192	0.189	0.21	0.193
	0.18	0.206	0.195	0.2	0.191
	0.174	0.201	0.197	0.198	0.187

[illegible]

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References:

1. Sundaram H, Liew S, Signorini M, et al. Global Aesthetics Consensus: Hyaluronic Acid Fillers and Botulinum Toxin Type A—Recommendations for Combined Treatment and Optimizing Outcomes in Diverse Patient Populations. *Plast Reconstr Surg*. 2016;137(5):1410-1423.
2. Carle M V, Roe R, Novack R, Boyer DS. Cosmetic facial fillers and severe vision loss. *JAMA Ophthalmol*. 2014;132(5):637-639.
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4. Chang S-H, Yousefi S, Qin J, et al. External Compression Versus Intravascular Injection. *Ophthal Plast Reconstr Surg*. 2016;32(4):261-266.
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1:53 pm

Prospective Evaluation of 3 Different Hyaluronic Acid (HA) Gels to Varying Doses of Hyaluronidase *In Vivo* – 4 Year Follow Up

Sandy Zhang-Nunes[1], Christine Ryu[1], Kenneth Cahill[2], Daniel Straka[2], Cameron Nabavi[2], Craig Czyz[2], Jill Foster[2]

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Introduction: Several HA gel fillers are available, each with different rheologic and cross-linking properties. Their reversibility by hyaluronidase is useful for managing complications; however, not enough is known about their dose response to hyaluronidase.[1-3] We sought to determine the response of three different hyaluronic acid (HA) gels to varying doses of recombinant human hyaluronidase Hylenex. This study includes long term natural course of intradermal in vivo implantation of filler.

Methods: Each of 18 arms of 9 subjects were prospectively randomized to receive subdermal injections of HA gel (Restylane, Juvederm, or Voluma). Seven sites on each arm were randomized to receive 0.2 mL of HA gel in anticipation of dissolution 1 week later with varying doses of hyaluronidase, 2.5-20 units, or control. The outcome measures of firmness, elevation, and diameter were measured preinjection, and at varying time points to beyond 4 years. Figures 1-2 represent using 2.5 units for dissolution. Subjects, graders, and injectors were masked.

Results: The most dramatic changes for all fillers occurred starting at the 30-minute time point through hour 3, with continued gradual degradation up to day 3, then minimal change through week 2. A mild dose response was found for Juvederm and Restylane; however, a clear dose response was seen from 2.5 to 10 units for Voluma, with 2.5 units behaving more like controls of saline only or no hyaluronidase. Restylane controls were present to beyond 4 years in one arm.

Conclusions: All fillers had a dose response, with Voluma exhibiting it most clearly (Figures 3-5). Voluma required higher doses of hyaluronidase for dissolution, more than 20 units per 0.2 mL of filler. Restylane appeared to respond most quickly to hyaluronidase, even 2.5 units, and was fastest to dissolve on its own. In one case, filler lasted for over 4 years in vivo without dissolution.

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Figure 1

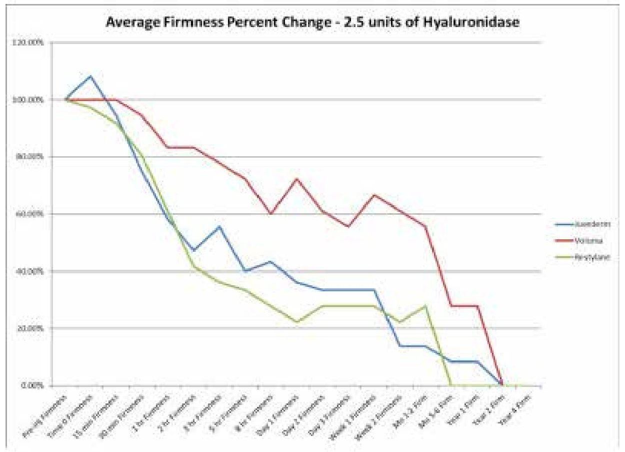
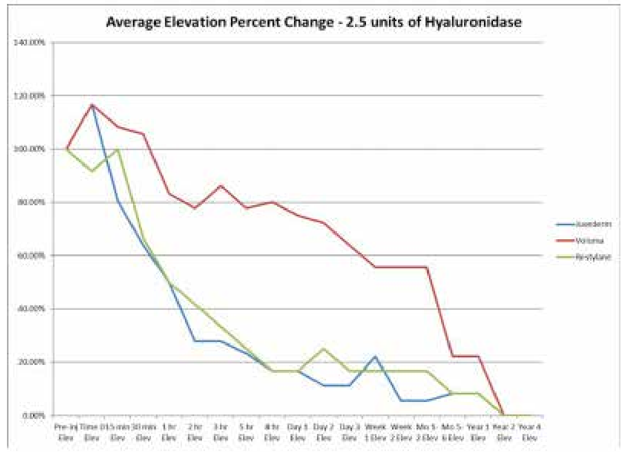


Figure 2



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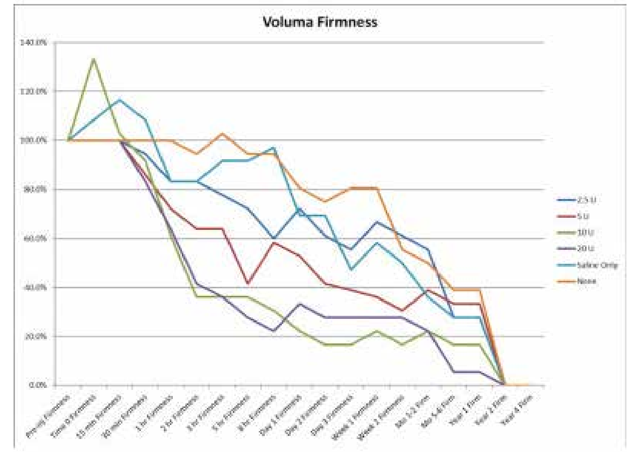

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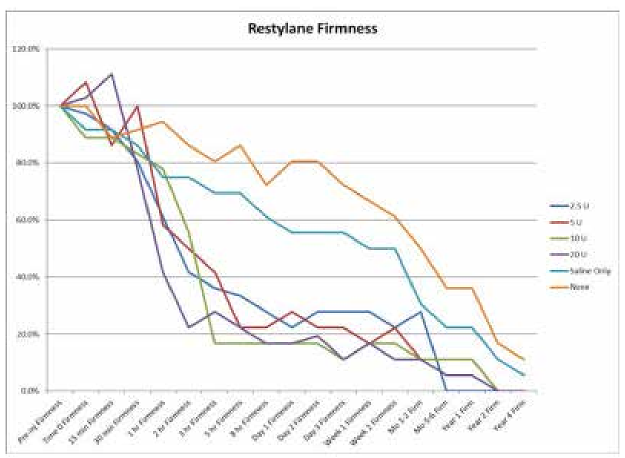

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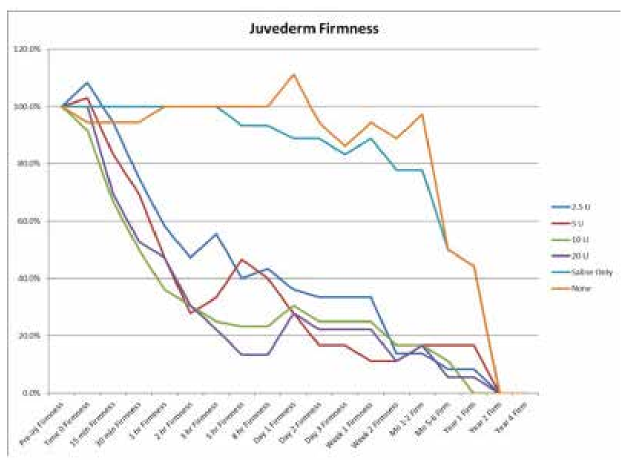

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1:57 pm

Response of 12 Different Hyaluronic Acid (HA) Gels to Varying Doses of Hyaluronidase

Christine Ryu, Jonathan Lu, Sandy Zhang-Nunes
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Introduction: With increasing use of the many HA fillers in the US market, mild complications like overfilling are common, and performing partial reversal with hyaluronidase is helpful. Individual filler responses to hyaluronidase are not well characterized. We sought to evaluate how much hyaluronidase may be needed for each filler on the US market by doing an ex vivo comparison of the 12 commonly used fillers' response to varying doses of recombinant human hyaluronidase.

Methods: All twelve commercially available HA gels widely available in the US were evaluated. For each HA gel, 0.2mL aliquots were placed on six microscope slides each. Four samples received 2.5, 5, 10, or 20 units of recombinant human hyaluronidase. For controls, one sample received saline only injection and another was not injected. Saline was used as needed to standardize the volume of all injections to 0.15 mL. Photos were taken from bird's-eye and lateral views with a ruler of HA gel samples before injection, immediately after injection, and at varying time points up to 3 hours post-injection. Height measurements were normalized based on pre-injection heights.

Results: Restylane Lyft®, Restylane-L®, and Belotero® had the greatest loss in height with hyaluronidase. These three were also sensitive to saline only injections; however, Restylane Lyft® and Restylane-L® non-injected controls demonstrated the least loss of height while the Belotero® control had the greatest decrease in height (Figures 1-3). Despite its decreased height, Belotero® never appeared to turn into slush as Restylane-L® (Figure 4) and Restylane Lyft® did. Volbella®, Versa®, and Juvederm Ultra® consistently had moderate responses to hyaluronidase. Restylane Silk® was resistant to dissolution until 20 units of hyaluronidase. Voluma® (Figure 5) and Vollure® showed little decrease in height at higher doses of hyaluronidase. For all injections, the most significant decrease in height occurred within the first minute. Restylane Lyft® and Restylane-L® showed another steep decline in height after 30 minutes at all doses of hyaluronidase but not for saline only.

Conclusions: Restylane Lyft® and Restylane-L® demonstrated the greatest dose response to hyaluronidase and saline only injections. The mechanical force of saline injection caused a noticeable decrease in HA gels' heights within the first minute. However, by the end of the three hours, 20 units of hyaluronidase was more effective at dissolving HA gels, indicating that hyaluronidase had a longer term effect on dissolving HA gels beyond the initial mechanical force of injection. This may be helpful for determining how much hyaluronidase may be needed for each filler, particularly when compared to existing in vivo and ex vivo data on more limited numbers of fillers.[1-3]

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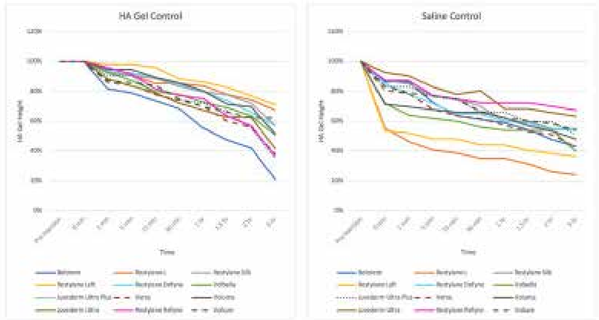
Figure 1



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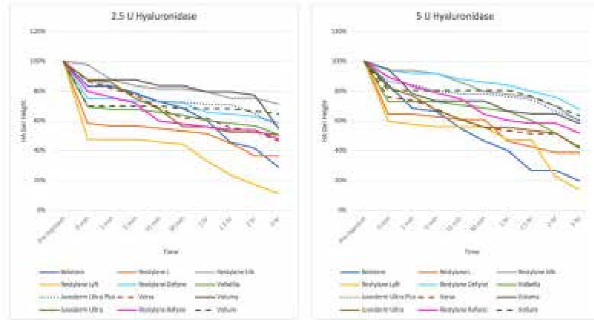

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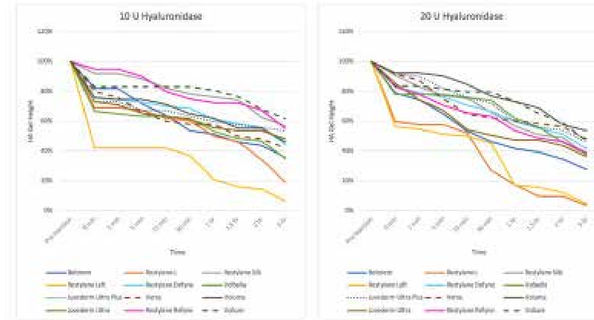

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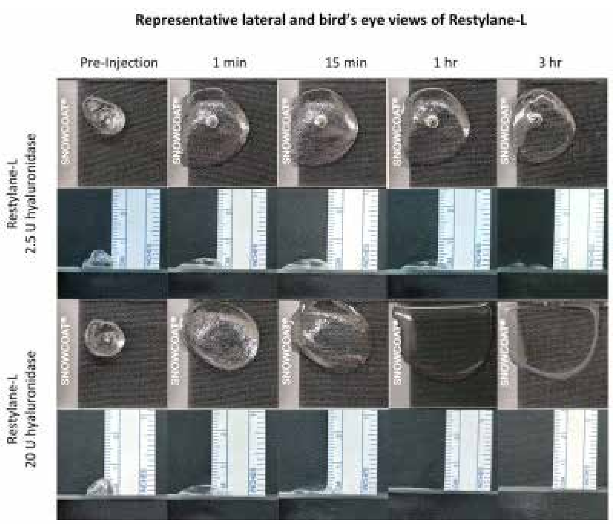

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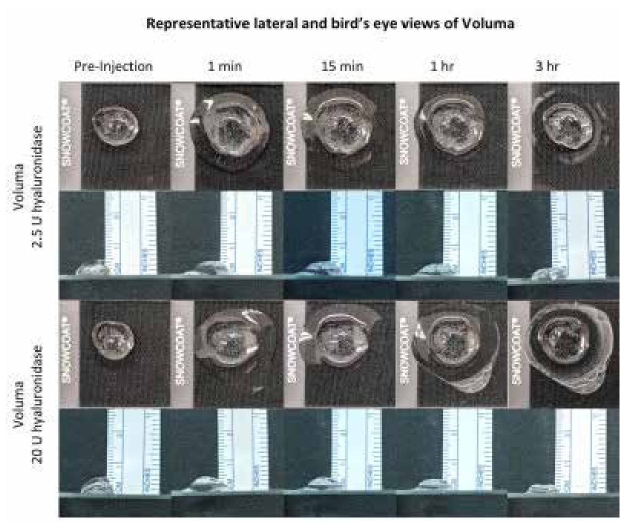

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2 pm

Quantitative Analysis of Preoperative and Postoperative Photographs Posted on Social Media (Instagram) by ASOPRS Members

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Introduction: Social media continues to emerge as a valuable tool in functional and cosmetic plastic surgery. Over two-thirds of adults and 90% of young adults use social media, yielding over 2-billion monthly Facebook users and 800-million monthly Instagram users. As a result, many oculoplastic surgeons have begun to incorporate social media into their practice, serving as a powerful marketing tool and educational resource for patients. Additionally, many surgeons publish pre-operative and post-operative photographs to advertise, educate patients, and establish expectations. However, due to the lack of guidelines and content verification, metrics must be established to validate surgical photography.

The purpose of this study is to investigate and quantitatively analyze pre-operative and post-operative photographs posted on social media (Instagram) by ASOPRS members.

Methods: A search of public Instagram posts was performed over a 4-month period (1/1/2019-4/30/2019). Pre- and post-operative upper and/or lower blepharoplasty photographs posted by ASOPRS members were selected for analysis using a hashtag search ("#oculoplastics") through the Instagram website (https://www.instagram.com). Full-face pose photographs displaying bilateral periocular regions were downloaded for analysis. Profile and posting demographics were collected and image analysis was performed to compare the pre- and post-operative photographs. Quantitative image analysis was performed using Adobe Photoshop CS5.1 and ImageJ software. Image analysis was performed to compare magnification and patient positioning using inter-pupillary distance. Additionally, the periocular region was isolated to compare luminosity (perceived brightness distribution) and RGB color profiles. Finally, image quality was evaluated using a Sobel edge detection algorithm to compare intensity changes in the periocular region.

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Results: The study included 104 posts from 35 ASOPRS members. Operative procedures included upper blepharoplasty alone(34), lower blepharoplasty alone(15), combined upper and lower blepharoplasties(28), and 21 blepharoplasty procedures combined with other eyelid surgeries (i.e. ptosis repair). Only 3 photographs were found to be positioned >10% from the patients' center. Pre- and post-operative magnification differed by >10% in 9 postings. 38/104 demonstrated >10% difference in pre- and post-operative luminosity, with 22 exhibiting increased post-operative luminosity. RGB color profile analysis found 57/104 posts to have >10% difference in at least one color channel and 38/104 with >10% difference in the RGB composite. The mean difference in edge detection analysis was 20.5%, with >10% difference in 64/104 and >25% difference in 25/104.

Conclusions: Social media's role in plastic surgery will continue to grow, providing a powerful communication outlet for surgeons to engage patients. However, due to limited content regulations, the ASOPRS community must create guidelines to ensure the validity and consistency of surgical photographs posted on social media. This study identified quantifiable inconsistencies in luminosity, image color, and image quality among pre- and post-operative surgical photographs posted by members of ASOPRS. These quantitative metrics may serve as the building blocks to create guidelines for standardizing clinical oculoplastic surgery photography.

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2:06 pm

Combination Radiofrequency – Microneedling for Festoons

Sathyadeepak Ramesh[1,2], Allan Wulc[1]
[1]Eye and Facial Plastic Consultants, Philadelphia, Pennsylvania, United States of America, [2]Wills Eye Hospital, Philadelphia, Pennsylvania, United States of America

Introduction: Lower eyelid festoons are common and can be challenging to treat. A combination of intralesional sclerosis, thermocoagulation, and direct excision have been reported with variable effect[1–3]. However, these techniques have a potentially significant side effect profile. Combination radiofrequency therapy with microneedling has the potential to provide aesthetic improvement with minimal risk.

Methods: In this cohort study, 29 patients underwent RF/microneedling from 2015 – 2019 with a standardized technique. Patients were advised to discontinue all topical retinols, quinones, and acids for 1 week prior to and 2 weeks after treatment. Appropriate herpesvirus prophylaxis was given. Treatment consisted of two passes with the device; the first pass consisted of a 1.5µm depth monopolar treatment to stimulate deeper collagen rejuvenation, with a superficial 0.8µm depth bipolar coagulation to address the more aged, superficial layers of tissue. Patients were given 4 treatments, 4 weeks apart. Pre- and post-treatment photographs were graded according to a Likert-type scale (Figure 1) from 0-3, with 0: no festoon, 1: mild festoon (light edema below the zygomatic prominence), 2: moderate festoon (edema at the zygomatic prominence, with shadowing underneath), and 3: severe festoon (edema from the zygomatic prominence extending medially to the tear trough, with a step deformity), in a blinded fashion by 20 oculoplastics specialists. Mean ± standard deviation of festoon grade was calculated and groups were analyzed with a paired t-test.

Results: All patients noted improvement in their festoons subjectively, with good patient satisfaction. There were no complications. No patients requested further treatment for the festoons. Combination RF/microneedling was effective in reducing prominence of festoons (-0.2 ± 0.4, $p<0.05$), with a more profound effect in patients with more prominent festoons initially (Figures 2, 3) (-0.4 ± 0.4, $p<0.01$).

Conclusions: Combination RF/microneedling can be a helpful tool in managing lower eyelid festoons. While treatment does not eradicate the festoon, the severity can be significantly reduced to a lesser grade.

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Figure 1

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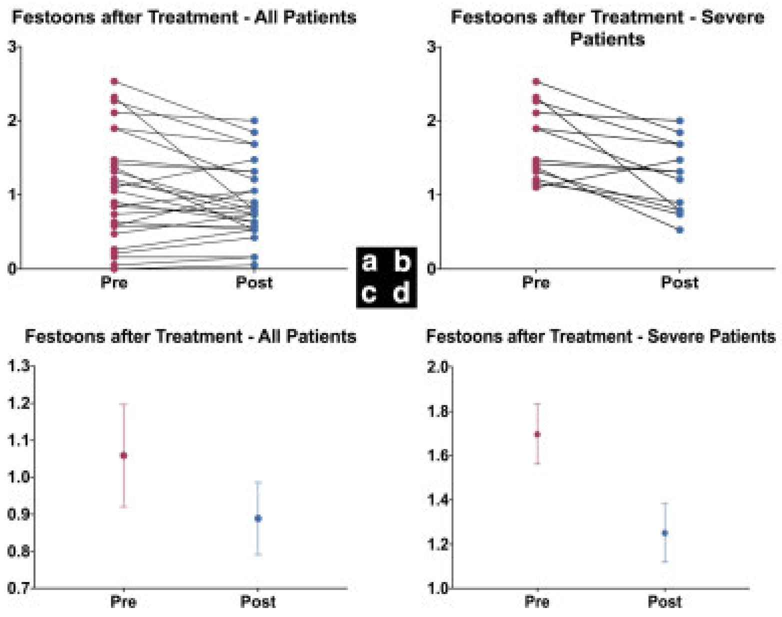
Figure 3



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2:12 pm

Asian Blepharoplasty – Pearls and Pitfalls

Dong Jun Park
John Park MD - Plastic Surgery, Newport Beach, CA, United States of America

3:04 – 4:50 pm

Chair: Wendy Lee, MD

What You Need to Know About the New Toxins....And the Old

Trials, Debates, Personal Experience – How Will They Fit into Your Practice?

3:05 pm	How Does prabotulinumtoxin A Fit in? Brian S. Biesman, MD
3:15 pm	What is Unique about daxibotulinumtoxinA? Steven Fagien, MD
3:25 pm	The Pipeline of Toxins John P. Fezza, MD
3:35 pm	Panel Discussion

Sorting Out the Fillers

What's New on the Horizon, Novel Techniques

3:50 pm	When to Choose What When John J. Martin, MD
4 pm	Experience with HA's that Will Hit the US Soon Femida Kherani, MD, FRCSC
4:10 pm	Novel Filler Techniques Charles Boyd, MD
4:20 pm	Complications of Fillers Julie A. Woodward, MD

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Live Injections with Simultaneous Panel Discussion

4:20 pm	Live Injections John P. Fezza, MD and Charles Boyd, MD

Part 1. Oncology

Moderators: Thomas E. Johnson, MD and Debra J. Shetlar, MD

3:04 pm

Prognostic Factors for Local Recurrence and Disease-specific Survival in Patients with Lacrimal Gland Carcinoma

Joshua Ford[1], Maria L. Rubin[2], Steven Frank[3], Jing Ning[2], Matthew Debnam[4], Diana Bell[5], Christian El-Hadad[6], El-Naggar Adel[5], Renata Ferrarotto[7], Bita Esmaeli[1]

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Introduction: Lacrimal gland carcinoma is a rare but potentially deadly cancer also with high risk of treatment related ocular morbidity. Our aim was to report clinical and pathologic prognostic factors for local recurrence, distant metastasis, and disease specific survival in patients with lacrimal gland carcinoma and compare these outcome measures in patients who had eye-sparing treatments vs. those who had orbital exenteration.

Methods: Retrospective single center cohort. Data collected included age, gender, histology, perineural invasion, TNM criteria (AJCC 8th edition), treatments. Main outcome measures: local recurrence, distant metastasis, and death from disease. All consecutive patients with lacrimal gland carcinoma treated between January 1998 and December 2018 were included.

Results: A total of 55 patients had a median age at diagnosis of 46 years (range: 10-76); 65% were men; the most common race was Caucasian (71%). 43 patients (78%) had adenoid cystic carcinoma. The median maximum size of tumor was 3 cm (range: 1.5-5.1cm). The most common T category at presentation was T2 (31/55). 28 patients (51%) had orbital exenteration, while 26 (47%) had eye-sparing surgery; 1 patient was treated with chemoradiation only. Following surgery, 49 patients (89%) had radiation therapy; 30 of these had concurrent chemotherapy.

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Overall, 10 patients (18%) experienced local recurrence. The median time to local recurrence was 1.28 years (range: 0.05-3.46). There was no statistically significant difference in local recurrence among the AJCC 8th T stage groups. The risk of local recurrence was not significantly different between patients who had exenteration followed by radiation or chemo-RT (3 out of 21 patients) and patients who had eye-sparing surgery followed by radiation or chemo-RT (3 out of 22 patients) (p=0.69). Perineural invasion, however, was significantly associated with local recurrence (p=0.04).

Overall, 11 patients (20%) developed distant metastasis during follow-up. Ten of 43 patients (23%) with adenoid cystic carcinoma developed distant metastasis during follow-up. The median time to distant metastasis was 2.68 years (range: 0.34-9.09). There was no significant difference in distant metastasis between exenterated and eye-sparing patients (p=0.91), or in survival among the AJCC 8th T-stage categories (p=0.13). However, a borderline significance was detected when T1+T2 were compared with T3+T4 groups (p=0.06).

For disease-specific survival (DSS), there was no significant difference between patients who received eye-sparing surgery vs. those who had exenteration (p=0.07). Adenoid cystic carcinoma patients with basaloid/solid histologic type had a significantly worse DSS compared to adenoid cystic carcinoma patients with non-basaloid/solid histology (p<0.01). There was no significant difference in DSS among the AJCC 8th T-stage categories for the subset of patients with adenoid cystic carcinoma (p=0.21).

Conclusions: We found several important associations: 1.) Perineural invasion was significantly associated with local recurrence; 2) Adenoid cystic carcinoma with basaloid/solid histology rendered a worse DSS compared to non-basaloid/solid histology; 3) There was no significant difference in local recurrence, distant metastasis, or DSS between patients who had eye-sparing surgery compared with those who had exenteration 4) Tumors > T3 at presentation had a borderline worse distant metastasis survival compared with less advanced tumors.

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3:10 pm

Development of an Eyelid Sebaceous Cell Carcinoma Cell Culture Line

Andrew Rong[1], Ravi Doddapaneni[2], Sara Wester[1], Chris Alabiad[1], David Tse[1], Daniel Pelaez[2]
[1]Oculofacial Plastic & Reconstructive Surgery, Bascom Palmer Eye Institute, Miami, Florida, United States of America, [2]Dr. Nasser Ibrahim Al-Rashid Orbital Vision Research Center, Bascom Palmer Eye Institute, Miami, Florida, United States of America

Introduction: In the United States, sebaceous carcinoma is the second most common eyelid tumor after basal cell carcinoma. Sebaceous carcinoma is most commonly encountered within the sebaceous glands of the eyelid, which include the glands of Zeiss and meibomian glands. Intra-epithelial or pagetoid spread is seen in 44-80% of cases, and mortality from this disease has been reported as high as 30% in the 1960s, before improving to 6% in the 2000s. However, treatment remains difficult in this neoplasm, with surgical resection as the mainstay of therapy. Medical therapy remains elusive with case series and reports of Mitomycin C, irradiation, or PD-1 inhibitors used in extensive local or metastatic disease. In order to elucidate the molecular drivers of cancer cell proliferation for personalized medicine, we are developing a precision oncology toolbox for this enigmatic eyelid malignancy. Our first step is to develop a tumor cell culture to characterize this tumor's cellular phenotype with genotyping correlation. The ultimate aim is to establish a high throughput pharmacologic screening for candidate drugs.

Methods: Sebaceous cancer tissues were collected from patients under an IRB approved protocol in the University of Miami. Four sebaceous carcinoma samples were collected in total and transported to the laboratory. To obtain single cell suspension, the tissue was dissected, minced, and digested in a collagenase digestion method. The single cell suspension was placed on matrigel pre-coated flasks and non-adherent tissue culture plates containing a well-defined tissue culture media. To characterize and confirm growth of sebaceous carcinoma, the original tissue and cells cultured in vitro were stained for the various immunohistochemistry markers such as p53, EMA, and adipophilin.

Results: Out of the four samples, two samples yielded no viable cell growth and the remaining two samples showed growth both on matrigel adherence as well as non-adherent plates. Sebaceous cancer cells were maintained successfully under optimized culture conditions in vitro. We observed that there was significantly increased growth of sebaceous cells on the adherent flasks compared to suspension. Using the cells serially passaged on adherent flasks, we established sebaceous cell lines from primary tumors. On characterization by immunohistochemistry, we found that both samples stained positively for adipophilin (Fig1a;Fig2a), EMA(Fig1b;Fig2b), p53 (Fig1c;Fig2c). Although one cell culture stained positive for EMA, its corresponding tissue did not (Fig2c).

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Conclusions: We are successful in developing a special tissue culture technique to successfully propagate a pure eyelid sebaceous cell carcinoma cell line. Given the positive staining in immunohistochemistry of the cell culture to p53, EMA, and adiopophilin, these cells are most consistent with that of sebaceous carcinoma derived from our patients.

Figure 1

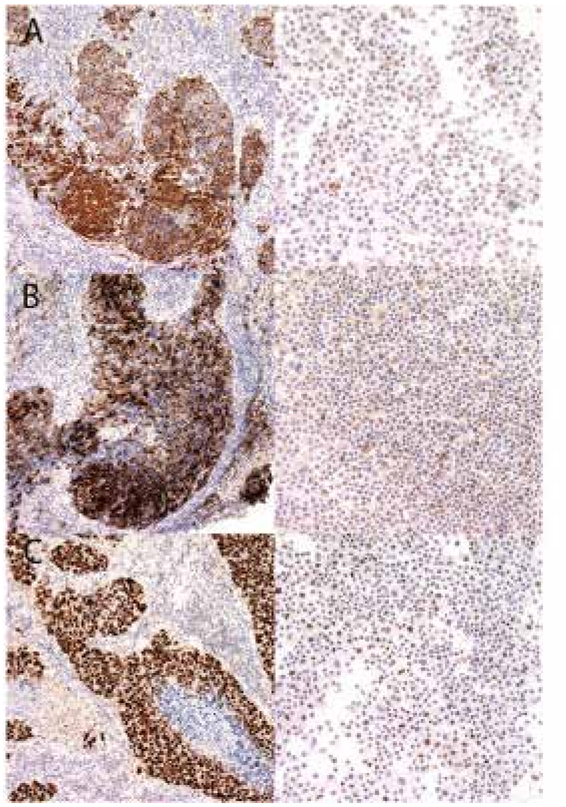
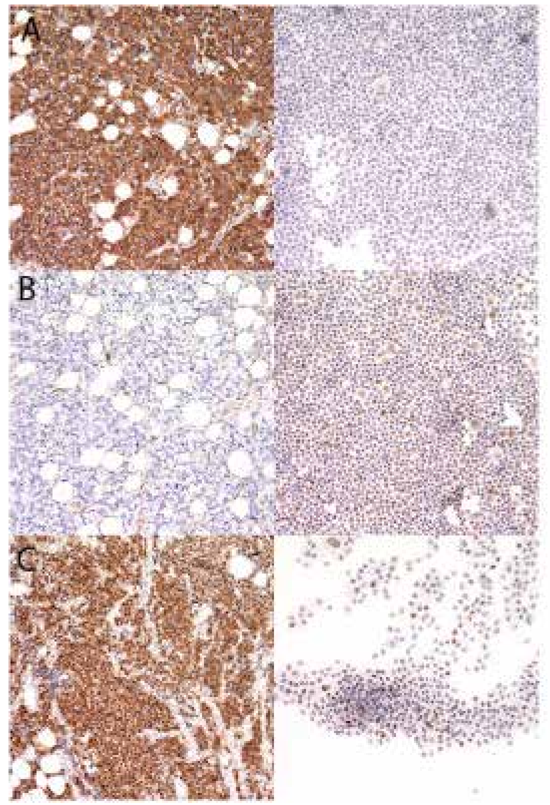


Figure 2



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3:16 pm

Survival after Orbital Exenteration versus Globe-Salvaging Therapy Across Six Different Orbital Malignancies

Emily Charlson, Giancarlo Garcia, Clinton Kolseth, Namju Kim, Benjamin Erickson, Andrea Kossler
Byers Eye Institute, Stanford University, Palo Alto, California, United States of America

Introduction: Orbital malignancy is typically treated with exenteration vs. globe-salvaging therapy (GST). GST typically results in less morbidity and has the potential for significantly improved functional outcomes [1-3]. Survival outcomes of patients treated with GST versus exenteration have not been explored in large patient cohorts. We present a survival analysis of patients with orbital malignancy undergoing exenteration versus GST over a 22-year period, across 6 different orbital cancers including squamous cell carcinoma (SCC), basal cell carcinoma (SCC), adenoid cystic carcinoma (ACC), undifferentiated carcinomas, melanoma, and sarcoma.

Methods: Retrospective, comparative analysis of 6 different orbital malignancies, including primary orbital and those of secondary cutaneous, sinonasal or cerebral origin managed with exenteration versus GST with positive histopathologic margins from a single academic institution between 1997 and 2019. In both groups, patients underwent cancer-specific adjuvant chemotherapy, biologics and radiation as indicated. The Kaplan-Meier method was used to estimate overall survival after surgery, with an event defined as the time from surgery to death. Follow-up time was measured from the day of surgery to the last known status of the subject, and censored at the time of the patient's final follow-up. Statistical analyses were performed with Python using Lifelines and Pandas packages (Python Software Foundation, Wilmington, Delaware).

Results: A total of 165 patients were included, with 93 (56.4%; mean age = 66.7, range 22-92 years) in the GST cohort and 72 (43.6%; mean age = 64, range 22-97 years) in the exenteration cohort. In the GST cohort, 64% had TNM tumor staging of T4, 22% T3, 8% T2 and 6% T1. A total of 14.0% of the GST tumors had nodal spread and none had metastatic spread. In the exenteration cohort, 88.5% of tumors were staged as T4 with 11.5% as T3. A total of 26.9% of the exenterated tumors had nodal spread and none had detected metastatic spread. Median survival was 58.3 months (95% CI 0.36 – 0.62) in the entire GST cohort and 45.6 months (95% CI 0.34 – 0.61) in the exenteration cohort; this difference was not statistically significant (P = 0.12, Log-rank test). Subgroup analyses were largely not significant with the following exceptions: SCC approached (P = 0.06) and undifferentiated carcinoma met statistical significance for (P = 0.02) improved patient survival among those treated with GST.

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Conclusions: Our results show no significant difference in overall survival between patients undergoing exenteration vs GST in a single institution retrospective analysis across the studied orbital malignancies. Subgroup analysis only revealed divergent survival outcomes in the case of undifferentiated carcinomas, with patients statistically fairing better with GST. While this result may reflect lower case severity, these data suggest that GST with adjuvant therapy may be a viable alternative to exenteration for morbidity reduction in appropriately selected patients. Additional studies are necessary to increase the power subgroup analysis of specific malignancies.

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3:22 pm

Adverse Events from High-dose Adjuvant External-beam Radiation Therapy in Orbital Malignancies Managed with Exenteration or Globe-salvaging Therapy

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Introduction: Malignant orbital tumors are often managed surgically; adjuvant external-beam radiation therapy (XRT) can be utilized in conjunction with both exenteration and globe-salvaging therapy (GST) if positive margins are noted at the time of resection, or when perineural invasion (PNI) is present. However, some clinicians are hesitant to provide high dose XRT due to concern for adverse events (AEs); vision-threatening AEs may be of particular concern after GST, with some reported estimates for rates of these events as high as 47% [1-4]. The authors assess AEs from XRT in a large cohort of patients with orbital malignancies at a single institution who underwent either exenteration or GST, with the hypothesis that the incidence of AEs may be less frequent and severe than previously reported estimates.

Methods: Retrospective review of malignant orbital tumors managed by exenteration or GST followed by high-dose XRT (defined as > 40 Gy) delivered directly to the tumor bed at a single academic center. Adjuvant XRT was only performed in cases of positive histopathologic margins after surgery, or when PNI was present. Snellen best-corrected visual acuity (BCVA) measurements were converted to logMAR units for statistical comparison.

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Results: 165 eyes (165 patients) had either positive margins or PNI and received adjuvant XRT, with 72 (43.6%; mean age = 64, range 22-97 years) after exenteration and 93 (56.4%; mean age = 66.7, range 22-92 years) after GST. The majority of orbital malignancies (77.6%, 128/165) were secondary tumors from the skin (67.3%, 111/165) or sinuses (10.3%, 17/165), while 22.4% were primary tumors (37/165). The most common malignancies were squamous (84, 50.9%) and basal (27, 16.3%) cell carcinoma. Mean radiation dose was 58.1±11.9 Gy, and was not statistically significantly different between the exenteration (56.4 ±12.1 Gy) and GST (59.9±10.0 Gy) groups (P = 0.418, independent t-test). Overall documented AE incidence was 12.7% (21/165). 11.1% of patients in the exenteration group had AEs with XRT (8/72). These included periorbital dermatitis, (11.1%, 8/72) sino-orbital fistula (1.4%,1/72), oral mucositis (1.4% 1/72), radiation-induced temporal lobe necrosis (1.4%, 1/72), esophagitis, (1.4% 1/72), and transient contralateral eye pain (1.4%, 1/72). 14.0% of patients in the GST group (13/93) experienced AEs. 14.0% of GST patients had non-vision threatening AEs (13/93). Among these same patients, 12.9% additionally had vision-threatening AEs (12/93). Non-vision threatening AEs included periocular dermatitis (11.8%, 11/93), canalicular stenosis (1.1%, 1/93), rhinitis (1.8%, 1/93), and osteoradionecrosis of the frontal bone 1.8%, 1/93). Ipsilateral vision-threatening AEs were radiation-related severe dry eye (3.2%, 3/93), cataract (2.2%, 2/93), cicatricial ectropion unrelated to surgery (2.2%, 2/93), radiation retinopathy (2.2%, 2/93), and corneal haze not obscuring visual axis (1.1%, 1/93). 1.1% required a medial and 1.1% a total tarsorrhaphy (1/93 for each). In these subjects with vision-threatening AEs, mean logMAR BCVA was not significantly different before and after XRT (0.249 versus 0.293, respectively; P = 0.773, paired samples t-test). No cases of uveitis, optic neuropathy, choroidal or scleral pathology, CSF leak, or infection attributable to XRT were observed. No AEs were noted to the contralateral eye or orbit in the GST group.

Conclusions: In this large-scale analysis, AEs were experienced by 12.7% of patients who received orbital XRT. These results indicate that XRT-associated AEs may be less common and better tolerated than suggested by prior analyses conducted with similar methodology to the study herein [2, 4-6]. As expected, XRT was more common after GST, though interestingly, vision-threatening AEs were infrequent, suggesting that concern for these AEs should not influence decision to pursue XRT after GST.

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3:28 pm

Is Adjuvant Radiotherapy Indicated after Orbital Exenteration for Conjunctival Tumors?

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Introduction: The purpose was to study the need for adjuvant radiotherapy in patients undergoing orbital exenteration for orbital extension of conjunctival tumors.

Methods: This was a retrospective chart review of patients undergoing orbital exenteration for orbital extension of the conjunctival tumors.

Results: Of 46 patients, 42 (91%) had orbital extension of ocular surface squamous neoplasia (OSSN), and 4 (7%) had orbital extension of conjunctival melanoma. The mean age at presentation was 51 years (median, 49 years; range: 7-79 years). There were 35 (76%) males and 11 females (24%). 5 (11%) patients had xeroderma pigmentosa and 1 (2%) had HIV infection. The mean duration of symptoms was 9 months (median, 5 months; range, 2-20 months). The most common symptom was orbital mass (n=40, 87%). The most common morphology of the conjunctival tumor was nodular (n=40, 87%), followed by diffuse (n=6, 13%). The tumor in the orbit extended upto the anterior orbit in 21 (46%) patients, mid-orbit in 22 (48%), and posterior orbit in 3 (7%). All patients underwent partial eyelid-sparing orbital exenteration with transverse blepharorrhaphy. Intraoperative frozen section was performed for margin control. Final histopathology confirmed negative surgical margins in all 46 patients. One (2%) patient with preauricular lymph node metastasis underwent lymph node dissection and radiation to the same region, excluding the orbit. No patient received adjuvant chemotherapy or orbital radiation in this series. At a mean duration of follow-up of 39 months (median, 24 months; range, 13-63 months), none of the patients developed orbital recurrence or metastasis.

Conclusions: Intraoperative frozen section study, followed by histopathology of the fixed sections helps to confirm free surgical margins during orbital exenteration. Adjuvant orbital radiotherapy may not be indicated in patients undergoing orbital exenteration for orbital extension of conjunctival tumors when the surgical margins are negative.

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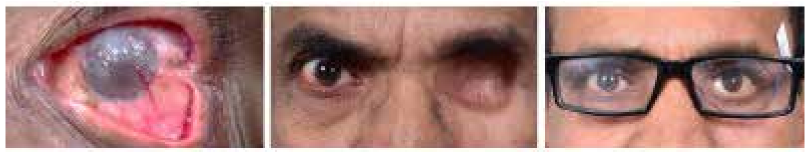
Figure 1: a 55-year-old male with ocular surface squamous neoplasia with orbital extension in the LE (left), following eyelid-sparng orbital exenteration with transverse blepgarorrhaphy (middle) and an orbital exenteration prosthesis (right)



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3:37 pm

Evolving Concepts in the Management of Orbital Metastasis

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Introduction: Study the frequency of various histologies and management of orbital metastasis (OM) at a tertiary cancer center.

Methods: All consecutive patients seen by the senior author in a recent 20-year period with a diagnosis of OM were included. Data retrospectively collected: age, gender, ethnicity, cancer type, presenting signs, imaging findings, treatments, and status at last follow-up.

Results: 99 patients (40 men, 59 women) had a median age of 58.5 years. Median time from cancer diagnosis to OM was 31 months (range=0-304). The top 6 cancer types were: breast carcinoma (n=36); melanoma (n=15); lung carcinoma (n=11); renal cell (n=5); neuroendocrine carcinoma (n=5); adenocarcinoma (n=7):2 from colon, 2 from prostate, 1 from ovaries, 1 from cervix, 1 of unknown primary. 83 patients were diagnosed with OM after the diagnosis of their original cancer and16 patients at the same time as the diagnosis of their original cancer. 23 patients had the orbit as the only metastatic site.

The presenting signs included: orbital congestion (n=60), proptosis (n=49), enophthalmos (n=8). 21 patients had bilateral orbital metastasis. The orbital lesion involved the soft tissue only in 66 patients, the bony walls in 19, and both in 14. 64 patients had involvement of at least one EOM.

31 patients had an orbital biopsy to confirm diagnosis of metastasis. 37 patients underwent a PET-CT: 20 (54%) had hypermetabolic orbital lesions with a median SUV of 8.5.

92 patients were treated with chemotherapy and/or immunotherapy. 65 patients had palliative radiation therapy for a median dose of 30 Gy (range: 8-60 Gy). 60 patients had a combination of systemic drug therapy and radiation: 12 had radiation before drug therapy, 7 had concomitant radiation and drug therapy, 41 had radiation after drug therapy.

17 patients had surgery (other than biopsy): 7 debulking surgery, 9 gross total resection, 1 orbital exenteration. Reliable follow-up data were available for 96 patients and ranged from 1 to 103 months (median 12). At last follow up, 7 patients had complete resolution of the orbital lesion, 14 had partial response, 47 had stable disease, and 28 had progressed. 74 patients died of disease (DOD) at a median of 10 months after diagnosis of orbital metastasis (range: 0-107 months).

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28 of 36 patients with metastatic breast cancer DOD after a median time of 16 months (range 0-107) after the diagnosis of orbital metastasis.

12 of 15 patients with metastatic cutaneous melanoma DOD after a median time of 11 months (range 2-75) after OM diagnosis.

Four out of 5 patients with renal cell carcinoma (RCA) were alive at last contact (Median follow-up time =14 months; range= 13-57 months); 3 were alive with disease, one had no evidence of disease; 1 patient had DOD 6 months after diagnosis of OM.

Conclusions: Breast cancer followed by cutaneous melanoma were the most common sources of OM. Radical surgery or high-dose radiation with their inherent ocular morbidity maybe avoided in patients with OM for whom drug treatment options are available. Patients with RCA metastatic to the orbit had the highest survival chance.

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3:43 pm

Clinical Characteristics and Treatment Outcomes of Diffuse Large B-cell Lymphoma involving the Eye and Ocular Adnexa

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Introduction: In ocular adnexal lymphoma, diffuse large B-cell lymphoma (DLBCL) is a rare disease but has an aggressive clinical course. We performed a study to evaluate the clinical characteristics and treatment outcomes of DLBCL involving the eye and ocular adnexa.

Methods: From 1995 to 2018, the medical records of 38 patients who were diagnosed as DLBCL with ocular or ocular adnexal involvement were reviewed retrospectively. Group 1 comprised of patients with DLBCL involving the ocular adnexa, and group 2 comprised of those with DLBCL involving the eye.

Results: Group 1 comprised 22 patients (57.9%) and group 2 comprised 16 patients (42.1%). The rates of bilaterality (50%) and recurrence or progression (81%) were higher in group 2. The 5-year overall survival rate was 72.7% in group 1 and 24.2% in group 2. The 5-year progression-free survival rate was 56.0% and 8.8%, respectively. Fifty percent of the patients in group 1 had inflammatory signs. Of those, 45% developed rapidly deteriorating visual acuity within, on average, 15 days.

Conclusions: The survival outcomes of patients with DLBCL involving the ocular adnexa were superior to those with DLBCL involving the eye. Ocular adnexal DLBCL can present inflammatory signs mimicking cellulitis or pseudotumor in half of the cases. It often results in rapidly progressive visual loss. In patients whom these tumors are suspected, prompt biopsy and treatment are mandatory to preserve the vision and for better survival outcome.

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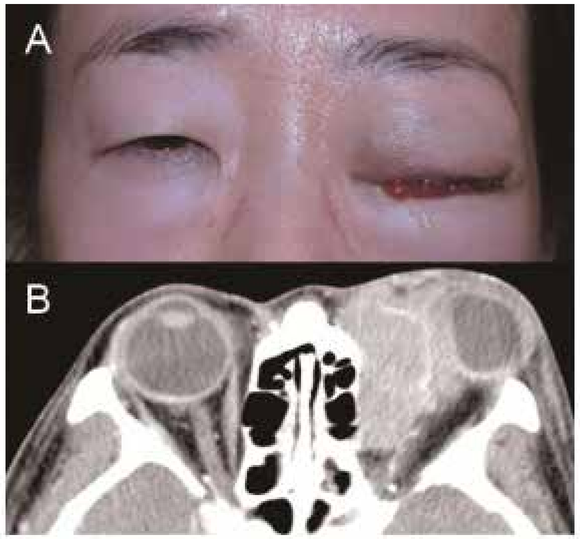
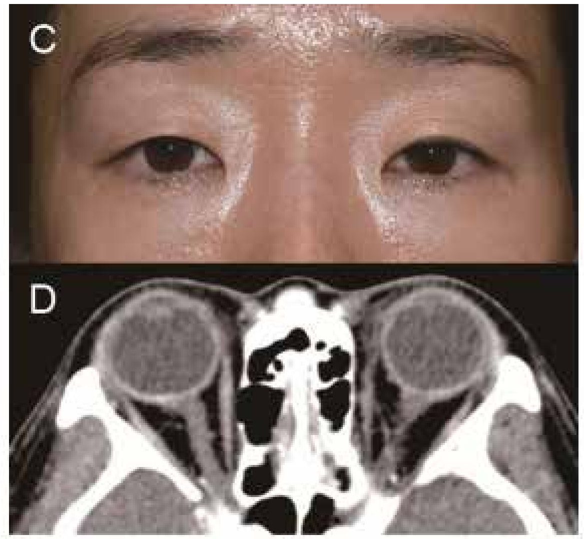
Figure 1



A. A 44-year-old woman showing proptosis, ptosis, swelling, chemosis of left eye. Her visual acuity of left eye was 20/60.

B. Axial CT scan of the orbit demonstrates an enhancing infiltrative mass in medial orbit.

Figure 2



C & D. 3 years after treatment showing complete remission with improvement of left vision to 20/20

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3:49 pm

Vascular Endothelial Growth Factor Receptors in Ocular Cavernous Hemangiomas and Lymphangiomas

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Introduction: Cavernous hemangiomas and lymphangiomas represent benign neoplasms of the orbit. While the pathophysiology is poorly understood, many of these lesions are considered congenital anomalies that can accelerate in growth later in life.[1,2] Treatment can be challenging, especially in large lesions close to the orbital apex. We sought to study the presence of vascular growth factor receptors (VEGF) in ocular cavernous hemangiomas and lymphangiomas to further understand the feasibility of anti-VEGF treatment.

Methods: Single-center study at the Bascom Palmer Eye Institute approved by the Institutional Review Board of patients who underwent surgical excision of orbital cavernous hemangiomas and lymphangiomas from 2000 – 2017. Retrospective chart review was conducted. Additional immunohistochemical staining were performed for VEGF receptor 1 and 2 and CD31.

Results: A total of 15 patients with cavernous hemangiomas. The mean presentation was 49.6 ± 11.7 years of age, the majority were male (53% of patients) and involved the left eye (73%). Intraconal cavernous hemangiomas were seen in 53% of patients. Location of cavernous hemangiomas were 13% on the eyelid and 53% intraconal. No recurrences were noted after surgical incision. Initial immunohistochemical staining showed VEGF1 staining (7/7), VEGF2 staining (7/7) and CD34 staining (5/7).

A total of 10 patients with lymphangiomas were identified. The mean presentation was 26.1 ± 24.8 years of age, the majority female (70% of patients) and involved the left eye (60%). Location of lymphangioma was 50% on the eyelid and 40% intraconal. Two recurrences were noted after surgical incision. Initial immunohistochemical staining showed VEGF1 staining (3/4), VEGF2 staining (4/4) and CD34 staining (1/4).

Conclusions: Cavernous hemangiomas and lymphangiomas show presence of VEGF receptors that may support the adjunct use of anti-VEGF treatment. Additional immunohistochemical analysis and diagnostic testing is currently underway to better characterize the proposed mechanism of these vascular growths.

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1. McNab AA, Tan JS, Xie J, et al. The natural history of orbital cavernous hemangiomas. *Ophthal Plast Reconstr Surg*. 2015;31:89–93.
2. Wiegand S, Eivazi B, Bloch LM, et al. Lymphatic malformations of the orbit. *Clin Exp Otorhinolaryngol*. 2013;6:30–35.

3:55 pm

Mab Science: Frontiers in Targeted Therapies for Periocular Malignancies

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Overview of targeted therapies for advanced periocular malignancies

Vismodegib

Generic name: vismodegib
Brand name: Erivedge (Genentech)
Mechanism: sonic hedgehog inhibitor; binds to and inhibits smoothened, a transmembrane protein involved in Hedgehog signal transduction
Administration: capsule, 150mg once daily
Indications: locally advanced basal cell carcinoma that has recurred following surgery, metastatic basal cell carcinoma, patients not amenable to surgery or radiation
Fda approval: 2012
Cost/access: average wholesale price (AWP) $475 per pill

Side effects: muscle spasms, hair loss, taste changes

Key papers:

1. Sagiv, O, Ding, S, Ferrarotto, R. et al. Impact of Food and Drug Administration Approval of Vismodegib on Prevalence of Orbital Exenteration as a Necessary Surgical Treatment for Locally Advanced Periocular Basal Cell Carcinoma. Ophthalmic Plastic and Reconstructive Surgery, July/Aug 2019, Vol 35, Issue 4, p. 350-353.

Sonidegib

Generic name: sonidegib
Brand name: Odomzo (Novartis)
Mechanism: sonic hedgehog inhibitor; binds to and inhibits smoothened, a transmembrane protein involved in Hedgehog signal transduction
Administration: capsule, 200mg daily
Indications: for patients with locally advanced basal cell carcinoma not amenable to curative surgery or radiotherapy.
Fda approved: 2015
(continued)

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Cost/access: $452 per pill
Side effects: muscle spasms, hair loss, taste changes

Key papers:

1. Migden MR, Guminski A, Gutzmer R, et al. Treatment with two different doses of sonidegib in patients with locally advanced or metastatic basal cell carcinoma (BOLT): a multicentre, randomised, double-blind phase 2 trial. Lancet Oncol 2015;16:716–28.

Cemiplimab

Generic name: Cemiplimab
Brand name: Libtayo (Regeneron Pharmaceuticals)
Mechanism: recombinant IgG4 monoclonal antibody that binds to PD-1 on Tcells and blocks its interaction with PD-L1 and PD-L2, which helps to restore the antitumor T-cell response
Administration: 350mg IV every 3 weeks until disease progression or unacceptable toxicity
Indications: treatment of patients with metastatic cutaneous squamous cell carcinoma or locally advanced cutaneous squamous cell carcinoma who are not candidates for curative surgery or curative radiation.
Fda approved: 2018
Cost: $1650 per infusion
Side effects: immune-mediated adverse reactions, fatigue, rash, diarrhea

Key Paper:

1. Midgen MR, Rischin D, Schmultz CD, et al. PD-1 Blockade with Cemiplimab in Advanced Cutaneous Squamous-Cell Carcinoma. N Engl J Med 2018; 379: 341-51.

Ipilimumab

Generic name: Ipilimumab
Brand name: Yervoy (Bristol-Myers Squibb)
Mechanism: human cytotoxic T-lymphocyte antigen (CTLA-4)-blocking antibody
Administration: 3mg/kg IV every 3 weeks for a total of 4 doses
Indications: treatment of unresectable or metastatic melanoma; adjuvant treatment of patients with cutaneous melanoma with involvement of regional lymph nodes more than 1mm who have undergone complete resection
Fda approved: 2011
Cost: $886 per infusion
Side effects: immune mediated adverse reactions, fatigue, diarrhea, pruritus, rash, and colitis

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Key papers:

1. Sheldon C, Kharlip J, Tamhankar M. Inflammatory Orbitopathy Associated with Ipilimumab. Ophthalmic Plastic and Reconstructive Surgery: May/June 2017-Vol 33, 3S, p S155-S158.

Pembrolizumab

Generic name: pembrolizumab
Brand name: Keytruda (Merck)
Mechanism: binds to the PD-1 receptor, blocking both immune suppressing ligands PD-L1 and PD-L2, from interacting with PD-1 to help restore Tcell response and immune response
Administration:200mg IV every 3 weeks
Indications: treatment of patients with unresectable or metastatic melanoma; for the adjuvant treatment of patients with melanoma with involvement of lymph nodes following complete resection; in combination with platinum and FU for first-line treatment of patients with metastatic or with unresectable recurrent head and neck squamous cell cancer; as a single agent or the first line treatment of patient with metastatic or with unresectable HNSCC whose tumors express PD-L1; recurrent, locally advanced or metastatic merkel cell carcinoma
Fda approved: 2014
Cost/access: $1437 per infusion
Side effects: immune-mediated reactions; fatigue, musculoskeletal pain, decreased appetite, pruritus, diarrhea

Key papers:

1. Kodali S, Tipirneni E, Gibson P, et al. Carboplatin and Pembrolizumab Chemoimmunotherapy Achieves Remission in Recurrent Metastatic Sebaceous Carcinoma. Ophthalmic Plastic and Reconstructive Surgery. Sept/Oct 2018. Vol 34, 5, p e149-151.
2. Cugley D, Roberts-Thomson S, McNab A, et al. Biopsy-proven metastatic merkel cell carcinoma of the orbit. Ophthalmic Plastic and Reconstructive Surgery: May/June 2018. Vol 34, 3, p e86-e88.

Nivolumab

Generic name: Nivolumab
Brand name: Opdivo (Bristol-Myers Squibb)
Mechanism: anti-PD1 monoclonal antibody
Indications: unresectable or metastatic melanoma; adjuvant treatment for patient with melanoma with involvement of lymph nodes or in patients with metastatic disease who have undergone complete resection.
Administration: 240mg infusion every 2 weeks until disease recurrence or unacceptable toxicity for a maximum of 1 year
Fda approved: 2014
(continued)

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Cost/access: $324 per infusion

Side effects: fatigue, diarrhea, rash, pain

Key papers:

1. Ford J, Thuro B, Thakar S, et al. Immune checkpoint inhibitors for treatment of metastatic melanoma of the orbit and ocular adnexa. Ophthalmic Plastic and Reconstructive Surgery: July/Aug 2017, vol 33, 4: pe82-e85.

*Cost of pills/injections are average wholesale price as listed in Micromedex Red Book August 2019

Part 2. Lacrimal

Moderators: Karen Revere, MD and Priya D. Sahu, MD

4:12 pm

Tear Transit Time Evaluation using a Novel Real-time Technique for Dynamic MR Dacryocystography

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Introduction: To explore the utility of a novel real-time dynamic magnetic resonance dacryocystography (MRDCG) technique, and establish a normative database for the transit times through the lacrimal drainage system (LDS).

Methods: There were 4 males and 6 females with mean age of 28 years (range, 15 to 40 years). Dynamic MRDCG demonstrated contrast outflow in all cases with good structural delineation. The mean transit time for contrast to appear in lacrimal sac was 16.5 seconds (9.4-66s; SD, 13), 43.3s for NLD (18.9- 66.1; SD, 25), and 140s for inferior meatus (37.8- 377; SD, 143). Contrast appeared in the inferior meatus in less than 2 minutes in 65% (13/20) systems, and 10% (4/20) required more than 5 minutes. The mean width (in millimeters) of lacrimal sac in its upper, middle and lower segment was 2.4, 2.8 and 2.3 respectively. The mean maximum and minimum diameters of NLD were 2.2 mm and 1.3 mm respectively (least being 0.7mm). No statistical significant difference was noted between the right and left sides in terms of transit time and dimensions of LDS ($p<0.05$).

Results: There were 4 males and 6 females with mean age of 28 years (range, 15 to 40 years). Dynamic MRDCG demonstrated contrast outflow in all cases. The mean transit time for contrast to appear in lacrimal sac was 16.5 seconds (9.4-66s; SD, 13), 43.3s for NLD (18.9- 66.1; SD, 25), and 140s for inferior meatus (37.8- 377; SD, 143). Contrast appeared in the inferior meatus in less than 2 minutes in 65% (13/20) systems, and 10% (4/20) required more than 5 minutes. The mean width (in millimeters) of lacrimal sac in its upper, middle and lower part was 2.4, 2.8 and 2.3 respectively. The mean maximum and minimum diameters of NLD were 2.2 mm and 1.3 mm respectively (least being 0.7mm). No statistical significant difference was noted between the right and left sides in terms of transit time and dimensions of LDS ($p<0.05$).

Conclusions: Dynamic MR-DCG using real time 3DSPGR sequence reliably demonstrates the structural and physiological assessment of LDS, and might be useful for evaluating patients with functional obstruction of LDS.

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Figure 1

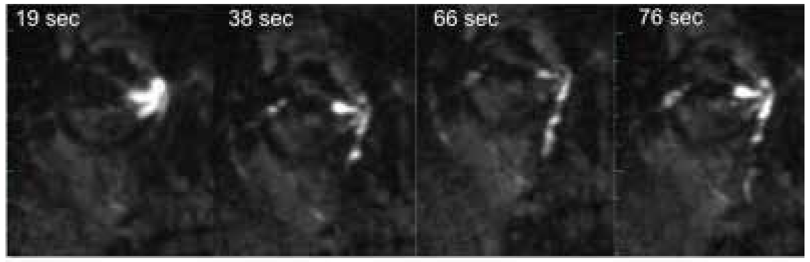
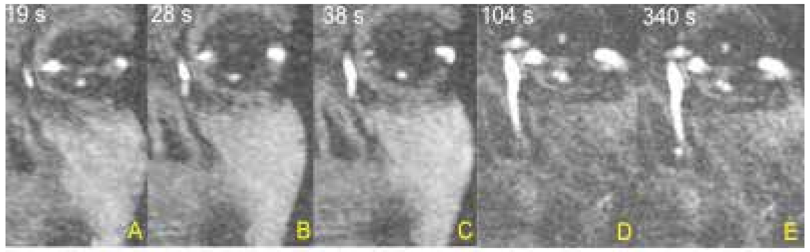


Figure 2



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4:18 pm

Bicanalicular versus Monocanalicular Stents for Nasolacrimal Duct Obstruction: A Comparison of Early Tube Extrusion and Post-Operative Complications

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Introduction: Congenital nasolacrimal duct obstruction (CNLDO) is a common condition with a reported incidence of 20% during the first year of life[1]. The approach to treating CNLDO varies widely between institutions and practitioners. While bicanalicular intubation (BCI) and monocanalicular intubation (MCI) have similar reported rates of success (88.0% and 88.3%) and dislocation (9.8% and 8.5%), we postulate that BCI has a higher rate of dislocation with associated tube related morbidity[2, 3]. This study's aim is to compare early tube extrusion rate and associated morbidity/cost in patients with CNLDO treated with MCI and BCI.

Methods: A retrospective review was conducted on patients from a tertiary pediatric hospital with a diagnosis of CNLDO who underwent nasolacrimal probing and intubation between January 1, 2013 and December 31, 2018. This cohort was then divided into two groups: patients who underwent MCI and BCI. Demographics, date of service, age at time of service, time to extrusion, time to follow up, early tube extrusion, failure, and morbidity (corneal abrasion, irritation/pain/redness, discharge, hospital/ER visits, phone calls, operative tube removal) were recorded. The Chi-squared test and Fisher Exact Test were used to compare categorical variables and a two-sample t test was used to compare numerical variables for each group. Statistical significance was defined as a p-value less than 0.05.

Results: There were 89 patients with 121 eyes diagnosed with CNLDO that underwent probe and intubation with either MCI (48 patients, 72 eyes) or BCI (41 patients, 49 eyes). 43 were male (48.3%) and 46 were female (51.7%) with an age range of 10 months to 13 years. For MCI, the mean age was 2.02 years, standard deviation (SD) 1.12 years. For BCI, mean age was 3.57 years, SD 3.16 years, p=0.0015. 45 eyes experienced early extrusion (24 MCI, 53.3%, 21 BCI, 46.7%) X2=1.132, p=0.2873. When comparing known extrusion date between MCI and BCI, 21/24 eyes and 8/21 eyes were unknown respectively (X2=11.9036, p=0.000552). Tube related symptoms, except punctal discharge and failure rate (2 MCI, 6 BCI), X2=4.232, p=0.0397, were not statistically different between BCI and MCI. There were 5 total phone calls placed (BCI, X2=0.0096) and 6 total ER visits for tube-related dysfunction (BCI X2=0.0036).

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Conclusions: Probing and intubation is a successful treatment for CNLDO regardless of intubation method. Patients with BCI were more likely to experience early extrusion and punctal discharge[1, 2, 3]. BCI resulted with more ER visits and phone calls compared to MCI. While phone calls do not incur a financial cost, they contribute to complexity of care and time expenditure on the part of patients, families, and physicians. As the cost of the average ER visit for outpatient conditions has risen from $1233 in 2008 to $1917 in 2016, an unnecessary ER visit for a benign condition such as early nasolacrimal tube extrusion can present a significant financial burden to the patient's family[4,5].

Figure 1

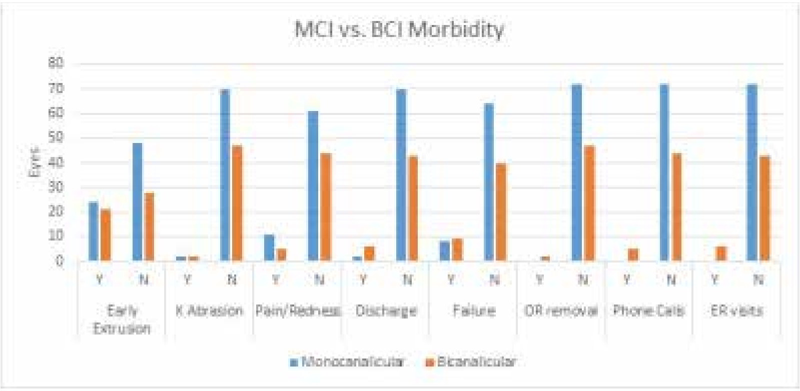
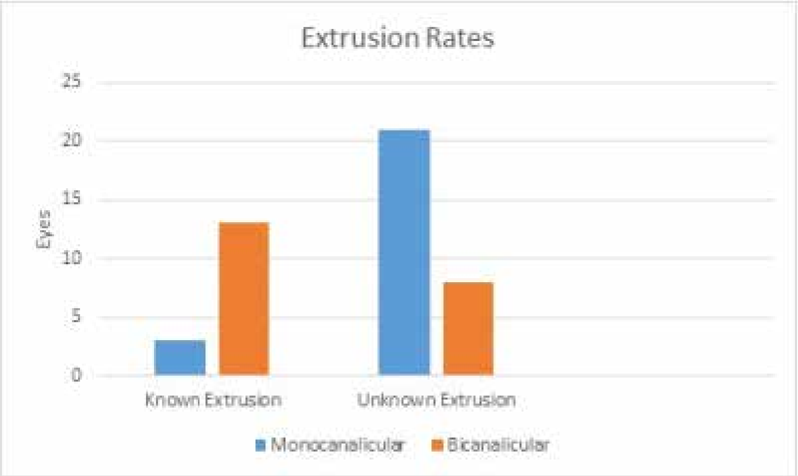


Figure 2



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4:24 pm

Cone Beam CT Dacryocystography in the Evaluation of Lacrimal Outflow Dysfunction

Justin Karlin[1], Hamzah Mustak[2], Adit Gupta[3], Regina Ramos[4], Daniel Rootman[5]
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Introduction: In cases of epiphora where clinical probing and irrigation (PI) results do not correlate with clinical findings, the diagnosis can be challenging, and imaging may be warranted. We set out to determine the utility of cone beam beam computed tomography (CBCT) dacryocystography (DCG) in the assessment of the tearing patient.

Methods: In this retrospective cohort study, adult patients with epiphora, assessed to be due (at least partially) to lacrimal outflow obstruction, were examined with probing and irrigation (PI), as well as CBCTDCG. Data concerning the clinical PI as well as results of the CBCTDCG were reviewed systematically by a single author. Each CBCTDCG was classified as patent, partial or complete nasolacrimal duct obstruction, or canalicular obstruction. Secondary pathology was noted. Patients in whom surgery was performed were classified as anatomic success (patent irrigation), clinical success (resolution of symptoms) and partial clinical success (improvement of symptoms). Concordance between PI and CBCTDCG was assessed by calculating Cohen's kappa (κ).

Results: Forty five patients (63 eyes) met inclusion criteria. Twenty one additional eyes, the unaffected contralateral side, were also analyzed. Overall, there was 66.67% concordance ($\kappa = 0.376$) between PI and CBCTDCG. Discordance was most common ($n = 13$, 15.48%) for cases in which patency or partial nasolacrimal duct obstruction (NLDO) was demonstrated by PI, but CBCTDCG showed complete NLDO or canalicular obstruction. There was no significant difference ($p = 0.877$) between symptom concordance and PI (55.14%) nor CBCTDCG (57.14%). Thirteen patients in this series underwent dacryocystorhinostomy (DCR). Ten patients experienced resolution of tearing after DCR and three patients experienced continued tearing. All three patients who experienced continued tearing after DCR demonstrated discordance between CBCTDCG and PI, where CBCTDCG demonstrated canalicular obstruction but PI did not.

Conclusions: CBCTDCG findings correlate well with PI, however CBCTDCG tends to note functional canalicular obstruction in a greater proportion of cases. Canalicular obstruction noted on CBCTDCG is additionally associated with clinical failure after DCR. CBCTDCG can be a useful tool in discussing outcome with patients in whom PI presents partial obstruction.

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Figure 1

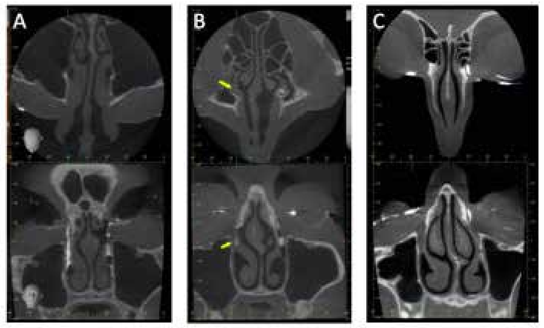

Figure 1. Representative images from CBCT DCG. Each panel demonstrates axial (above) and coronal (below) slices. A. patent right lacrimal excretory system. Left side with patent drainage of contrast material with evidence of previous dacryocystorhinostomy. B. Total nasolacrimal duct obstruction on the right, yellow arrows denote position of nasolacrimal duct. C. Right canalicular obstruction.

Figure 2

		Irrigation				
		Patent	pNLDO	cNLDO	Canalicular	
CBCT DCG	Patent	**46**	4	0	3	*53*
	pNLDO	4	**3**	0	0	*7*
	cNLDO	4	3	**6**	1	*14*
	Canalicular	3	3	3	**1**	*10*
		57	*13*	*9*	*5*	*84*

Table 1. Assessment of lacrimal system outflow by irrigation testing and by CBCT DCG. Cells highlighted in blue show cases where canalicular obstruction was detected either by CBCT DCG or irrigation. Bolded numbers denote concordant cases (n = 56).

Figure 3

Irrigation	Patent	Obstructed	Total
Asymptomatic	**20**	1	21
Symptomatic	37	**26**	63
Total	57	27	84

Table 2a. Irrigation results versus symptoms. Bold numbers represent concordance

Figure 4

CBCT DCG	Patent	Obstructed	Total
Asymptomatic	**19**	2	21
Symptomatic	34	**29**	63
Total	53	31	84

Table 2b. CBCT-DCG results versus symptoms. Bold numbers represent concordance.

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4:30 pm

Punctal Congestion Syndrome: A Drop-related, Reversible, Functional Punctal Stenosis Causing Epiphora in the Setting of Pretarsal Chronic Conjunctivitis

Yandong Bian[1], Stacy Scofield-Kaplan[2], Christine Zemsky[1], Thalmon Campagnoli[1], Larissa Ghadiali[3], Lora Dagi Glass[1], Brigitte Sallee[4], Donald Belsito[5], Bryan Winn[6]

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Introduction: To describe a syndrome of steroid or steroid/antibiotic drops causing reversible epiphora, functional punctal stenosis, and chronic pretarsal conjunctivitis.

Methods: A retrospective case series of patients diagnosed with epiphora, punctal stenosis, and chronic conjunctivitis by a single surgeon. These patients were then included in a prospective study involving non-invasive allergy skin patch testing for several ophthalmic drops, common excipients, and active ingredients.

Results: Thirteen patients received a diagnosis of punctal congestion syndrome (PCS). All had used preserved drops. The average age was 63 (range, 41-93). 69.2% were female. Findings were bilateral in 61.5%. Various antecedent diagnoses resulted in treatment with preserved drops. Patients experienced epiphora for an average of 3.8 months (median, 3 months; range, 1-8 months) prior to presentation. (Table 1) Two patients had undergone punctoplasty which failed to resolve symptoms. 92.3% of patients had been taking tobramycin/dexamethasone drops, loteprednol drops, or a combination of both. (Table 2) All were taken off preserved drops. 69.2% were also treated with a preservative-free loteprednol etabonate 0.5% ophthalmic ointment taper. All patients improved. Partial relief of symptoms was achieved by an average of 1.62 months (median, 2 months; standard deviation, ±0.65 months) and 90% resolution of symptoms by 2.38 months (median, 2 months; standard deviation, ±1.66 months). (Table 1)

Virtually all study patients shared similar historical and clinical characteristics. All patients exhibited intraluminal punctal swelling with concurrent mild to moderate papillofollicular reaction of the pretarsal conjunctiva of the symptomatic eye(s). (Figure 1) All puncta were easily probed with a round tipped 23-gauge cannula and had no associated scarring or fibrous membranes. Canaliculi and nasolacrimal ducts were also patent to irrigation.

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The unifying commonality of each patient's history was the use of preserved steroid or steroid/antibiotic drops with epiphora developing after their discontinuance, prompting re-initiation of therapy. Only after a several week wash-out period did symptoms permanently resolve.

Conclusions: We postulate that the intraluminal punctal swelling and chronic conjunctivitis were secondary to a hypersensitivity to an ingredient in the topical medications which only caused symptoms after the anti-inflammatory effect of the corticosteroid was lifted. The epiphora often led treating physicians to restart the offending drop. While the corticosteroid often reduced tearing, the inflammatory ingredient was also reintroduced, thus repeating the cycle. Only after several weeks without exposure to the causative agent did the symptoms ultimately abate. (Figure 2) Review of the literature indicates several possible causative ingredients including benzalkonium chloride and tyloxapol, a formaldehyde-containing excipient.[1-9](Table 3)

Providers should be aware that patients who use preserved steroid or steroid/antibiotic drops can develop punctal congestion and chronic epiphora. Treatment consists of removal of preserved drops and setting expectations that symptoms may take several weeks to resolve. Non-preserved topical steroids may help alleviate epiphora during this wash-out period. Punctoplasty is contraindicated.

Figure 1

Figure 1. (A) Normal appearance of pretarsal conjunctiva compared to (B) and (C) which demonstrate the typical mild and moderate pretarsal papillofollicular conjunctivitis, respectively, seen in punctal congestion syndrome (PCS). (D) Normal, patent punctum compared to (E) and (F) which show narrow puncta with intralumenal congestion in PCS.

Figure 2

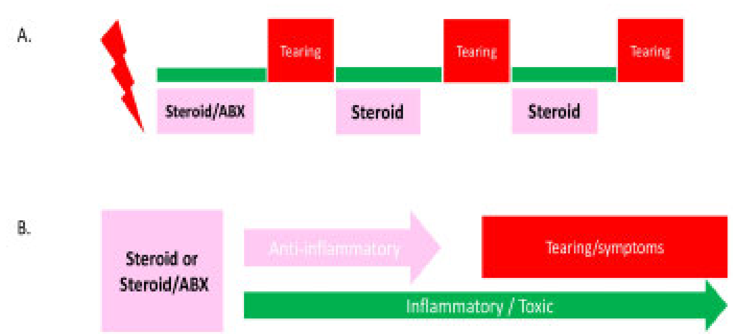

Figure 2. Potential mechanism of punctal congestion syndrome. **(A)** The patient experiences an inciting incident (red lightning bolt), such as an acute conjunctivitis or chalazion removal, that results in inflammation prompting the initiation of a preserved steroid or combination steroid/antibiotic drop (pink box). While the patient is taking the steroid or steroid/antibiotic drops, the symptoms improve; however, once the drop is stopped, the patient starts to tear (red box). The drop is restarted (pink box) and the tearing improves. This cycle continues until the preserved drops are discontinued permanently. **(B)** The ocular inflammatory effect of the drops (green arrow) is mitigated by the anti-inflammatory effect of the steroid (pink arrow). While the patient uses the drops there is minimal tearing and puncta are open. Once the drops are tapered and stopped, the hypersensitivity to an ingredient in the drops (green arrow) is unmasked without the anti-inflammatory effect of the steroid. This results in conjunctival inflammation, intralumenal punctal stenosis, and tearing (red box). As it takes weeks for the conjunctival/punctal inflammation to resolve, the offending drops are often restarted, resetting the cycle and prolonging the course.

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Figure 3

Table 1. Characteristics of patients with punctal congestion syndrome. F=female; M=male; R=right; L=left; B = bilateral; Y = yes; N = no

Patient	Age (y)	Gender	Side	Inciting Event	Duration of Tearing	Conjunctivitis Morphology	Loteprednol ointment	Time to 90% Resolution
1	58	F	L	Blepharitis	4 months	Follicular	Y	2 months
2	51	F	B	Conjunctivitis	5 months	Follicular	Y	4 months
3	61	F	B	Blepharitis/ Dry Eye syndrome	3 months	Papillary	Y	3 months
4	55	F	L	Uveitis	8 months	Follicular	N	1 month
5	93	F	B	Conjunctivitis	4.5 months	Papillary	Y	7 months
6	60	F	L	Chalazion with resection	3 months	Papillary	Y	3 months
7	43	M	B	Conjunctivitis	2 months	Follicular	Y	2 months
8	64	F	B	Allergic Conjunctivitis	1 month	Follicular	N	1 month
9	69	M	B	Conjunctivitis	7 months	Papillary	N	4 months
10	83	F	R	Chalazion with resection	1 month	Follicular	Y	1 month
11	41	M	L	Recurrent herpetic keratitis	1 month	Papillary	Y	2 months
12	79	F	B	Conjunctivitis	7 months	Follicular	N	2 months
13	60	M	B	Conjunctivitis	3 months	Follicular	Y	1 month

Figure 4

Table 2. Ophthalmic drops used by patients prior to presentation

Patient	Tobramycin/ dexamethasone	Loteprednol 0.5%	Loteprednol 0.2%	Other
1	Yes			
2	Yes			Olopatadine/ Ketotifen
3	Yes		Yes	Olopatadine/ Ketotifen/ Cyclosporine ophthalmic emulsion
4	Yes			Prednisolone acetate/ Cyclosporine ophthalmic emulsion
5	Yes			
6		Yes		
7	Yes			
8	Yes		Yes	Ketotifen
9	Yes	Yes		Ketotifen/ artificial tears
10				Prednisolone acetate/ Neomycin/Polymyxin B/Dexamethasone
11		Yes		
12		Yes		
13	Yes	Yes		

Figure 5

Table 3. Benzalkonium chloride (BAC) concentration and tyloxapol presence in common ophthalmic medications

Drop	BAC	Tyloxapol
Tobramycin/dexamethasone	0.01%	Yes
Loteprednol 0.5%	0.01%	Yes
Loteprednol 0.2%	0.01%	Yes
Difluprednate	No	No
Olopatadine	0.01%	No
Prednisolone acetate 1%	0.006%	No
Ketotifen fumarate	0.01%	No
Fluorometholone 0.1%	0.004%	No
Latanoprost	0.02%	No
Travoprost	0.015%	No
Brinzolamide	0.01%	No
Timolol	0.01%	No
Brimonidine tartrate	No	No
Loteprednol ointment	No	No

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4:36 pm

Nose Dive: Whys and Hows of Office Nasal Endoscopy

M. Reza Vagefi
University of California San Francisco, San Francisco, California, United States of America

BREAKOUT #3: PRACTICE MANAGEMENT:
BUSINESS IN OPHTHALMIC PLASTIC SURGERY, AND BEYOND…

3:04 – 4:50 pm

Chair: Gary J. Lelli, MD

3:06 pm **Coding Scenarios, Audits and E/M Updates**

Sue Vicchrilli, AAO Director, Coding and Reimbursement

4 pm **Compensation Structures in Academic Ophthalmology**

Keith D. Carter, MD, FACS
- Discuss models that work
- Discuss key features of a positive reimbursement model and potential pitfalls
- Discuss retention in academic ophthalmology (particularly in plastics, where private practice can run at a lower overhead)

4:06 pm **Compensation Structure in a Group Oculoplastics Practice**

Kenneth V. Cahill, MD and Tamara R. Fountain, MD
- Discuss models that work
- Discuss key features for a positive reimbursement model
- Discuss ownership options (junior associate to partner)
- Discuss considerations related to work/life balance and considerations related to career trajectory

4:18 pm **Running a Solo Oculoplastics Practice**

Stephen R. Klapper, MD, FACS
- Discuss perspective over time (with changes in healthcare, increasing regulations on EMR)
- Discuss positives of running your own practice and difficulties
- Discuss exit strategy for a solo practitioner (i.e. sell the practice, hire a junior associate who takes over, dissolve practice)

Stephen R. Klapper, MD, FACS has been in solo private practice in the Indianapolis area for nearly 20 years. Dr. Klapper will share his perspectives on the advantages of running a small practice, as well as the increasing challenges of remaining independent. Potential keys to success will be reviewed along with long term planning including potential exit strategies.

4:24 pm Ancillary Services and Physician Extenders

Robert G. Fante, MD, FACS

- ASC ownership
- Physician extenders (compensation model, incentives, clinical uses)

4:30 pm Pay Equity in Oculoplastic Surgery

Erin M. Shriver, MD

- Discuss pay gaps, discrimination in pay
- Identify ways to improve transparency and fair balanced pay schemes for all

4:36 pm Private Equity Acquisitions within Ophthalmology

Gary J. Lelli, MD

- Discuss motivation for PE money within the ophthalmic space
- Discuss possible positives of PE entering ophthalmology
- Discuss possible negatives of PE entering ophthalmology
- Discuss future implications for ophthalmic practices

Moderators: Brian Tse, MD and Lilly H. Wagner, MD

7 am

Effects of Upper Eyelid Posterior Ptosis Repair on Lower Eyelid Position

Adriane Schiano, Stacy M. Scofield-Kaplan, Ronald Mancini
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Introduction: It is commonly accepted that after unilateral ptosis repair, the contralateral upper eyelid can assume a lower position due to Hering's law, which states that equal and simultaneous innervation is supplied to synergistic extraocular muscles[1]. In addition to the upper eyelids, the lower eyelids also possess tarsal muscles consisting of sympathetically innervated smooth muscle fibers[2], making it reasonable to believe they may also be affected by changes in the magnitude of sympathetic activation of the upper lids. This study aims to identify any significant post-operative changes in lower eyelid position following upper eyelid posterior ptosis surgery compared to upper lid blepharoplasty surgery due to hypothesized changes in sympathetic activation of the tarsal smooth muscles.

Methods: This was a retrospective chart review of patients seen at a tertiary medical center who underwent upper eyelid surgery performed by a single oculoplastic surgeon. Charts were reviewed to identify patients who underwent posterior ptosis repair and/or upper blepharoplasty in the absence of lower eyelid surgery and had adequate preoperative and postoperative photographs. The preoperative and postoperative external photographs were analyzed using Image J digital photographic analysis with standardization based on the corneal diameter so that measurements could be taken of the upper eyelid and lower eyelid positions via margin to light reflex distances (MRD1 and MRD2 respectively).[3]

Results: There were a total of 21 patients and 36 eyes included in the final analysis: 11 underwent ptosis surgery, while 25 underwent blepharoplasty in the absence of ptosis surgery. The average age was 64 years old (range of 35-84 years). Fifteen were female (71%) and 6 were male (29%). Eighteen patients were Caucasian (85%), 2 were Hispanic (10%), and 1 was African American (5%). In the blepharoplasty group, the 25 included eyes had an average pre-operative MRD1 of 1.67 mm and MRD2 of 5.29 mm. Following surgery, on average the MRD1 increased by 1.76mm and the MRD2 decreased by 0.29 mm (p= 0.0557). In the ptosis repair group, the average pre-operative MRD1 was 1.27 mm and MRD2 was 6.07 mm. Following surgery, on average the MRD1 increased by of 3.10 mm and the MRD2 decreased by 0.81 mm (p=6.38x10-5).

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Conclusions: There was a statistically significant elevation in lower lid position in those who underwent posterior ptosis repair compared to those who underwent upper blepharoplasty surgery. This supports the hypothesis that the sympathetic activation of the lower eyelid is affected by upper eyelid position in a manner similar to Hering's law of the contralateral upper eyelid. When a patient loses sympathetic tone of the eyelid in the setting of Horner's syndrome, there is upper lid ptosis and reverse ptosis of the lower eyelid; operating on the upper lid via posterior ptosis repair to improve upper lid position may decrease the innervation or drive to the lower lid causing elevation of the lower eyelid position similar to the reverse ptosis seen with Horner's syndrome. This phenomenon may prove useful in preoperative patient counseling and surgical planning for subsequent lower eyelid procedures.

Figure 1

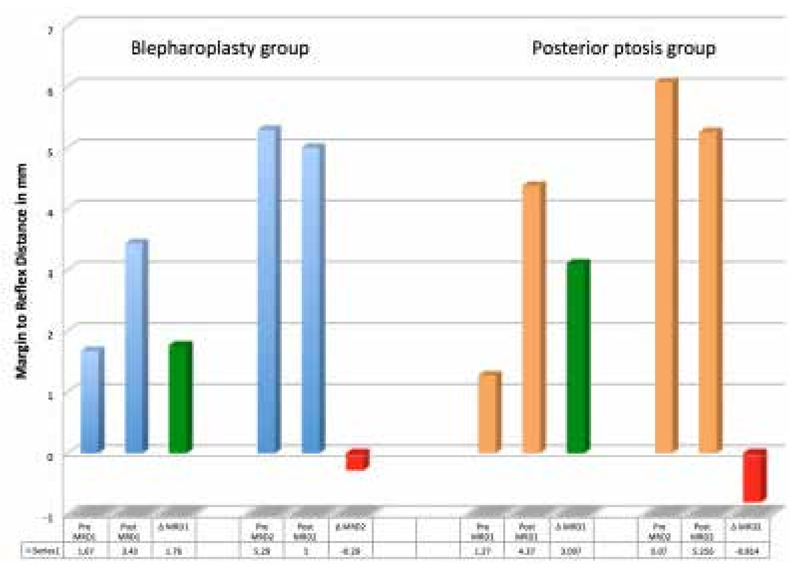


Figure 2

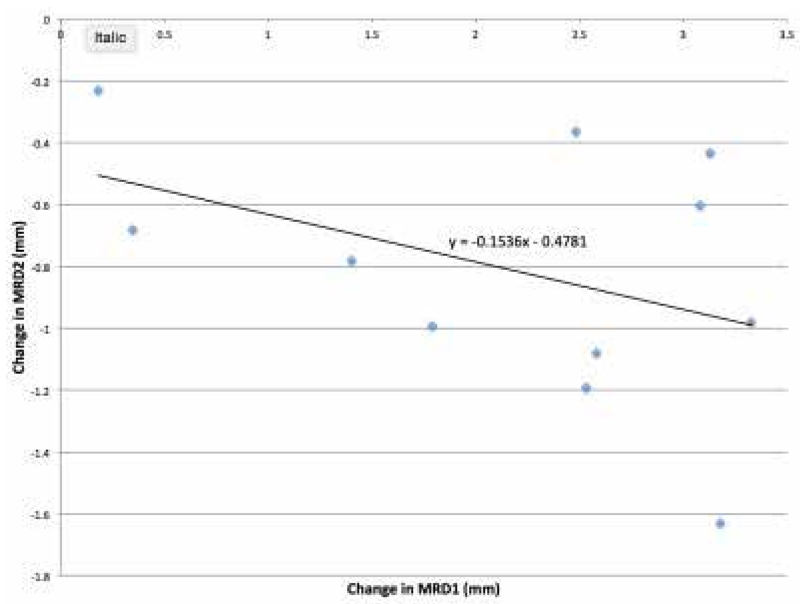
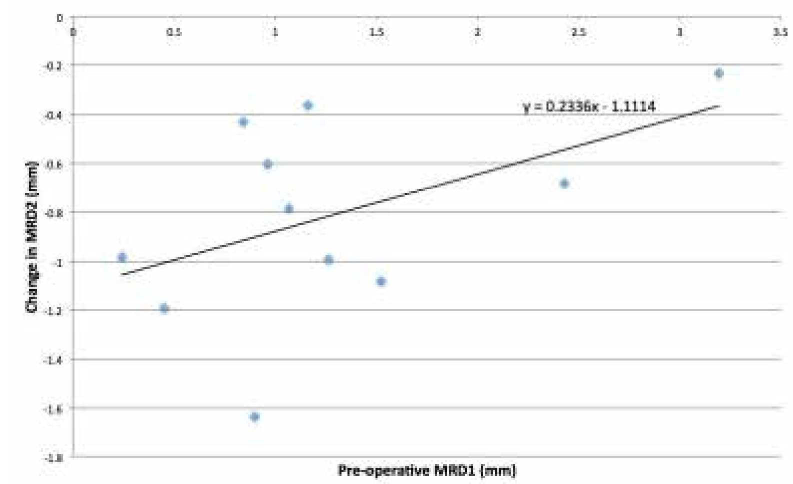


Figure 3



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7:04 am

Pyoderma Gangrenosum Affecting the Eye, Orbit, and Periorbital Soft Tissues: A Case Series

E. Lacey Echalier[1], Lauren C. Mehner[1], Scott E. Mann[2], Phillip M. Radke[3], Christopher C. Lo[4], Raymond I Cho.[5], Russell S. Gonnering[6], Michael E. Migliori[7], Sophie D. Liao[1], Jasmina Bajric[8], Jill Melicher[9,10], Eric M. Hink[1], Sabrina A. Newman[11], Michael J. Hawes[1]
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Introduction: Pyoderma gangrenosum (PG) is a rare ulcerative skin disorder.[1] It is a neutrophilic dermatosis characterized by pathergy or pustules progressing to ulceration, undermined borders, purulence and cribriform scarring in the setting of negative cultures.[2] It is classically associated with inflammatory bowel disease, inflammatory arthritis, and hematologic malignancies.[3-5] PG may be induced by cocaine as well, due to the common adulterant Levimasole.[6]PG typically involves the anterior lower leg or peristomal sites.[4] We present 12 patients with PG affecting the eye, orbit, and periorbital tissues. PG involving orbit/eye has been described prior.[7-9] To the best of our knowledge this is the largest series to date.

Methods: Retrospective review of patients with PG lesions involving the orbit or periorbital tissues. Three cases were identified through the University of Colorado, the others were solicited through the ASOPRS forum. Inclusion criteria was diagnosis of PG and a biopsy supportive of this which was also culture negative. Collected data included photos, demographics, lesion locations, pathergy, associated conditions, treatments and complications (**Figure 1**).

Results: 12 patients met the inclusion criteria. Nine exhibited pathergy (75%). 10 were Caucasian, two were African American. 10 had additional lesions elsewhere (83%). Four had naso-orbital complications including two with sinocutaneous fistulas (**Figure 2**), and three with acquired saddlenose deformity. Two had malignancy. One had Crohn's disease. Five had at least one positive vasculitic serology (Figure 1), while one had anti-RNP antibody. Five reported a history of cocaine use, two were idiopathic, one was untested.

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All patients responded to a steroid, immunosuppression, and/or cytotoxic agent regimen. Ocular complications included ectropion/entropion, eyelid retraction, lagophthalmos, restrictive strabismus, and corneal exposure/ulceration/perforation. Two patients had corneal perforation, one from exposure and the other from sclerokeratitis. One patient had a culture negative lacrimal gland abscess.

Figure 3 shows cases involving predominantly the eyelid, **Figure 4** shows temple/malar ulcerations.

Conclusions: PG involving the eye/orbit is a rare site for an already rare disease. Delayed or misdiagnosis are common for PG,[1] this represents significant risk for patients. Debridement can worsen lesions and delays initiation of immunosuppression. Lesions may extend to deep orbital tissues, sinuses, or lead to sclerokeratitis and perforation.[5,8]

There is a preponderance of cocaine and/or vasculopathic serologies associated with PG in this series. Cocaine/levimasole-induced PG is associated with elevated titers of ANCA, PR3/MPO, antiphospholipid antibodies and ANA.[10,11] This is also consistent with the atypical location on the temple, ear and malar region: numerous reports of cocaine/levimasole-induced PG demonstrate analogous distribution.[6,10-12] Similarly, there are reports of palate/septum perforation.[12,13] The saddlenose deformities seen in our series could represent unrecorded septal perforation.

Early recognition and immune suppression is key to management. Reconstruction may be needed but must be attempted when stable on immunosuppression as recurrence is possible.[5,14] Addiction further complicates reconstruction; one patient had recurrence in a pedicle flap following cocaine relapse. When approaching ulcerative lesions involving the orbit/eyelids, one should be alert to the possibility of PG. Testing for cocaine/levimasole and vasculopathic markers should be considered for patients with face ulcerations, sinonasal abnormalities, absence of classic associations, or history of illicit drug use.

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Figure 1

Age	Gender	Biopsy	Culture	Pathergy	Location	Extraorbital sites	Associations	Complications
47	male	+	-	yes	bilateral malar	back	cocaine, HNE-ANCA	ectropion
55	female	+	-	yes	lacrimal gland, eyelid	legs, saddlenose	Crohn's, pANCA, PR3	
57	female	+	-	yes	bilateral medial canthus	sinuocutaneous fistula, ankle, inguinal crease	distant cocaine	corneal exposure, death
60	male	+	-	unknown	upper eyelid, forehead	none	none	globe perforation
43	male	+	-	yes	left temple, lateral canthus	back, suprapubic	none	exposure, ectropion
28	female	+	-	yes	temple/malar, upper and lower eyelids	C-section scar	RNP antibody	exposure, retraction, lagophthalmos
51	female	+	-	unknown	bilateral medial canthus	sinuocutaneous fistula, saddlenose, arm, thigh	GPA, cANCA, PR3, cocaine	restrictive strabismus, entropion, lagophthalmos
59	male	+	-	yes	upper eyelid	saddlenose, nares, back	GPA, cANCA, PR3, cocaine	exposure, perforation, entropion
74	male	+	-	yes	upper and lower eyelid	ear, foot, ankle	myelodysplasia	exposure
68	male	+	-	unknown	upper and lower eyelid	none	unknown	
44	male	+	-	yes	cheek, temple, scalp, ear	trunk, arms	cANCA, cocaine	flap failure, progression to involve scalp
93	male	+	-	yes	upper eyelid	anterior leg, back	melanoma	

Figure 2

Figure 3

Figure 4

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7:08 am

Consideration of Nasal Contour in Endoscopic Forehead Rejuvenation

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Introduction: Preliminary studies have suggested an improvement in nasal aesthetics following endoscopic forehead lifting.[1,2] In this study we performed a large-scale review of patients who have undergone minimally-invasive surgical forehead elevation to determine clinical and objective nasal contour changes.

Methods: We performed a retrospective review of patients who underwent endoscopic forehead lifting by four surgeons at a single surgery center from 2004 to the present. Institutional Review Board approval was obtained. All patients had subperiosteal blunt release of soft tissues overlying the radix. Patients who received simultaneous periorbital fat transfer, botulinum toxin injection or laser resurfacing were excluded. Pre and post-operative patient photos at average 15-week follow-up were collected. Four independent judges from diverse training backgrounds, including an oculoplastic surgeon, a dermatologist, an aesthetically-trained registered nurse and an office staff member, reviewed patient photos and graded the post-surgical changes in nasal contour using the Global Aesthetic Improvement Scale.

Perioperative patient photographs were standardized in size based on the average human corneal diameter (11.64 mm women and 11.77 mm men)[3] and analyzed using ImageJ software (US National Institutes of Health, Bethesda, MD, U.S.A.).[4] Changes in nasal height (measured from nasal base to the inferior brow hairs) and height-to-base ratio were measured on scaled photos (Figure 1). Results were analyzed using a 2-tailed t-test with p-values < 0.05 considered statistically significant. Measurements were further compared by demographic variables of age (≤ 65, or > 65) and gender.

Results: In total, 326 patients met inclusion criteria. Patients had a mean age 61 (range 28-79). Ninety-two percent were female and 99% were Caucasian. Summative judging results revealed 79.4% of patients with clinical improvement in nasal contour (11.1% very much improved, 25.6% much improved, and 42.6% improved). The graders found 20.1% to have no change and 0.6% to have a post-operative worsening of nasal contour appearance. Those patients with no or minimal improvement tended to have less preoperative brow and forehead descent. Judges with cosmetic training tended to report more favorable post-operative changes.

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Quantitatively there was an average increased nasal height of 2.17 mm ($p < 0.0001$) and increased height-to-base ratio of 0.03 mm ($p < 0.0001$). Figure 1 displays representative patient pre (A) and post-operative (B) photos demonstrating interval increased nasal height (blue line) and height-to-base (green line) ratio, as well clinical nasal aesthetic improvement. Nasal height and height-to-base ratio changes did not significantly differ by age ($p = 0.53$ and 0.30, respectively), or gender ($p = 0.56$ and 0.44, respectively).

Conclusions: There is a noteworthy subjective and quantitative improvement in nasal contour and height following endoscopic forehead lift. In general, our patients displayed a narrowing of the radix and glabella with improved nasal proportion at the nasofrontal angle as the dorsal contour sweeps up into the glabella and forehead. This potential beneficial change in nasal contour is a useful counseling point when offering this surgery to patients, in addition to the anticipated improvement in forehead, eyebrow and eyelid cosmesis.

Figure 1

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7:12 am

Actinomyces and Eikenella Abscess of the Inferior Rectus Muscle with Intracranial Extension

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Introduction: To report a case of an indolent Actinomyces and Eikenella abscess of the inferior rectus muscle with intracranial extension mimicking a meningioma.

Methods: Case report.

Results: A 48-year-old woman presented with 1 week of "fuzzy vision and colors appearing lighter" in the left eye. Her history was notable for a tooth extraction 5 months earlier and sinusitis 4 months earlier. Imaging at the time of the sinusitis revealed a left meningioma involving the left cavernous sinus and extending to the left orbital apex. Her examination at presentation was notable for a trace left relative afferent pupillary defect, mild dyschromatopsia and mild limitation in upgaze without proptosis. On follow-up 3 weeks later her extraocular motility worsened and relative proptosis increased. MRI imaging revealed a left intracranial mass along the cavernous sinus, with a dural tail and encasement of the left carotid artery (Figure 1) with extension into the orbit, consistent with a meningioma. In addition, the left inferior rectus was massively enlarged and contained a cystic structure (Figures 2 and 3). The patient underwent a biopsy using a transconjunctival subperiosteal approach along the orbital floor. Incision of the periosteum below the cyst released thick creamy material that was sent to pathology. Histopathologic examination revealed severe acute inflammation with Actinomyces zonal granulomas. PCR testing confirmed the presence of Actinomyces meyeri, Eikenella corrodens, Actinomyces israelli and Aggregatibacter acinomycetemcomitans. She was treated with high dose Amoxicillin with probenecid with clinical and radiographic improvement.

Conclusions: Actinomyces is a branching filamentous bacterium that lives on mucosal surfaces. Infection results from traumatic implantation of the organism into deeper tissues. Dental procedures and poor dental hygiene are risk factors for infection. Infection produces a slow granulomatous disease that forms masses, sometimes with abscesses. Orbital and intracranial infections are often first diagnosed as malignancies such as meningiomas, or as inflammations such as Tolosa-Hunt syndrome. Treatment is with high dose penicillin.[1]Prognosis is good. Other cases of orbital or cavernous sinus actinomyces have previously been reported.[2,3,4,5,6,7]

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Figure 1

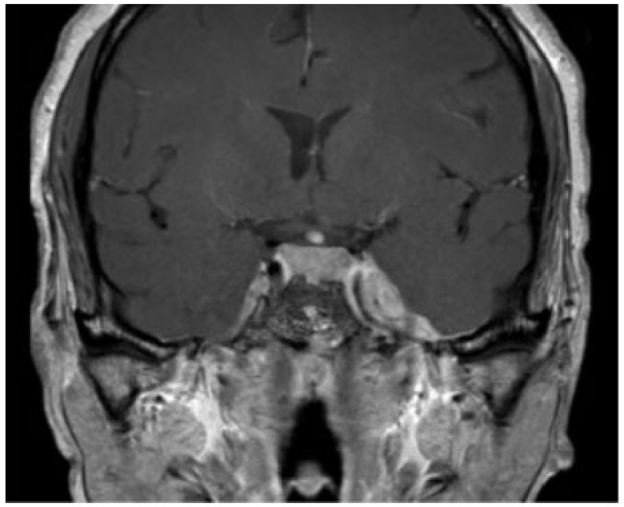


Figure 2

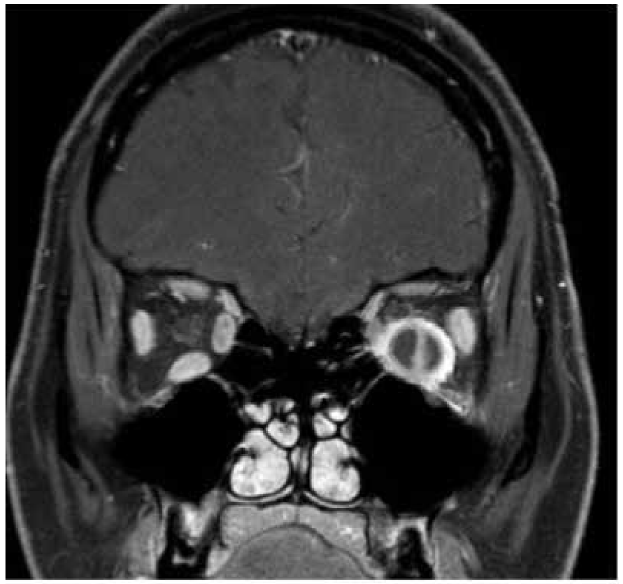


Figure 3

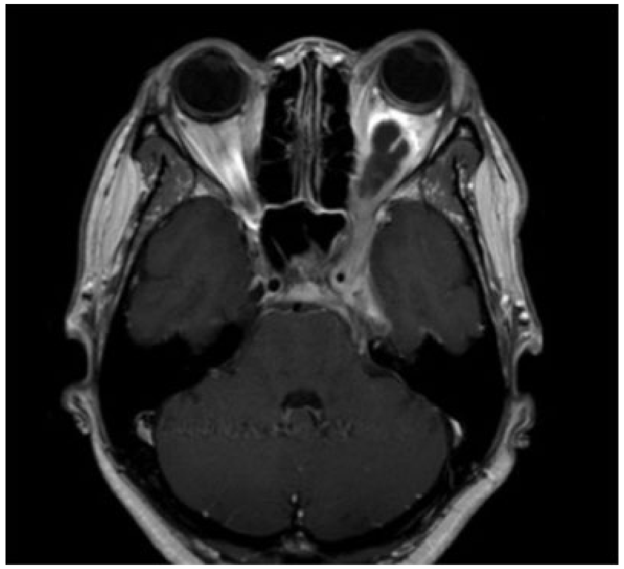


Figure 4

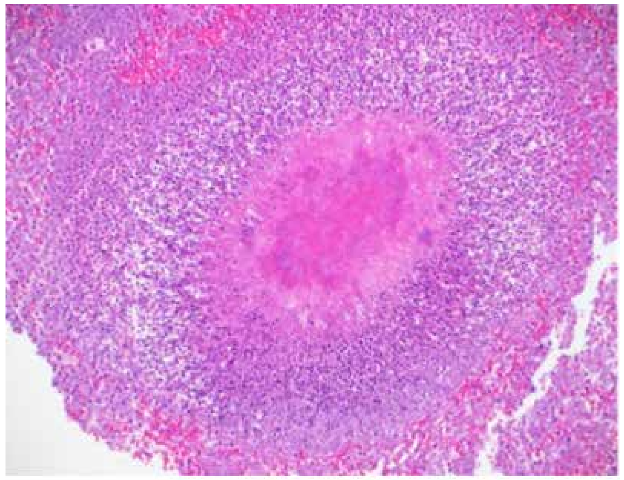
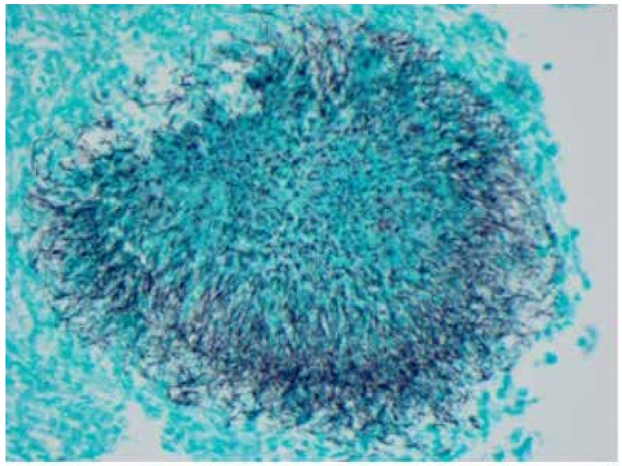


Figure 5



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7:16 am

Orbital Mass and Internal Carotid Artery Occlusion as a Presentation of IgG4-related Disease

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Introduction: IgG4-related disease (IgG4-RD) has a variety of ophthalmic manifestations. We report a case of orbital mass and internal carotid artery (ICA) occlusion due to IgG4-RD.

Methods: Case report.

Results: A 27-year-old male presented with weakness and a 9-month history of progressive right ptosis. He also reported a 4-month history of gradually worsening vision in the right eye, eye pain, decreasing ability to move the right eye, and right eye proptosis. He had no left eye symptoms. He denied fever and had no history of autoimmune or inflammatory disease.

On exam, visual acuity was 20/400 eccentrically with constriction of visual field to a small island of vision inferonasally. He was unable to read color plates due to visual acuity, but noted abnormal color vision in his right eye. Intraocular pressure was within normal limits. The right eye was proptotic with upper lid fullness, ptosis, and mild erythema. Extraocular movements were limited, and the right eye was exotropic and hypotropic. Examination of the left eye was within normal limits. CT, CTA, and MRI showed a right orbital mass involving the superior orbit, superior and lateral recti, and lacrimal gland, with posterior extension through the orbital apex, into the cavernous sinus and Meckel's cave, to the anterior tentorium, with associated occlusion of the right ICA beginning just distal to the bifurcation. He also had a basal ganglia infarction.

Biopsy of the mass revealed a tan heavily collagenized mass consisting of sclerotic fibrous tissue with chronic inflammation with IgG4-positive plasma cells. An extensive infectious and inflammatory workup was positive for elevated ESR only. He was treated with high-dose IV steroids and a slow oral steroid taper. His ICA occlusion was treated with aspirin and a statin. He reported significant subjective improvement in his pain after steroids were started.

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Conclusions: Ophthalmic manifestations of IgG4-RD most commonly involve the lacrimal gland and extraocular muscles, with the defining characteristics of fibrosis and lymphoplasmacytic infiltration with IgG4-positive plasma cells on biopsy.[1,2] Vision loss can develop if the optic nerve is directly involved or if compressive optic neuropathy develops from mass effect.[1,2] To our knowledge, this is the first reported case of ICA occlusion associated with IgG4-RD, likely due to mass effect from extension into the cavernous sinus. Prompt diagnosis and treatment is essential to avoid irreversible damage. There are no long-term studies or randomized controlled trials on treatment of IgG4-RD, but current guidelines recommend steroids as first-line therapy.[3]

Figure 1

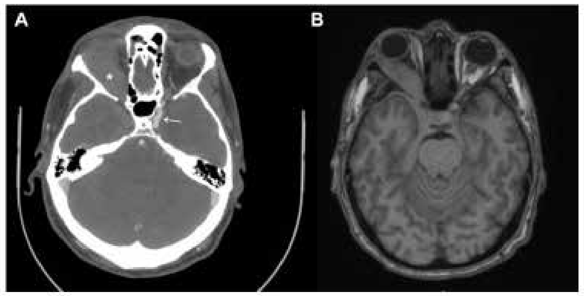

Figure 1. Axial CTA (A) and T1-weighted MRI (B) showing right orbital mass lesion (asterisk) and non-filling right ICA in comparison to normal left ICA (arrow).

Figure 2

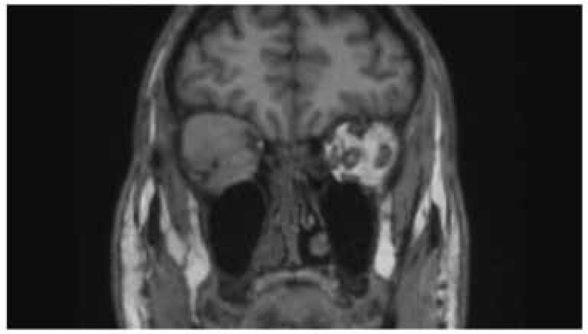

Figure 2. Coronal T1-weighted MRI showing loss of right orbital apex structures due to mass lesion.

Figure 3

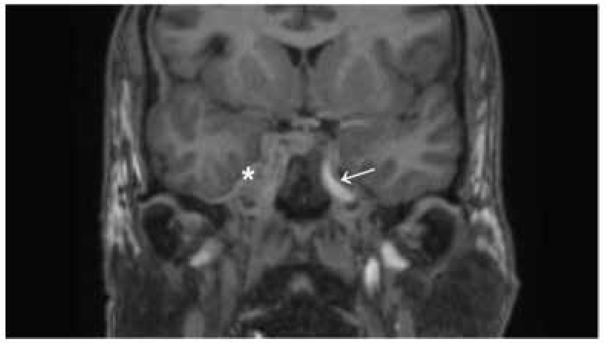

Figure 3. Coronal T1-weighted MRI showing extension of the right orbital mass (asterisk) to the cavernous sinus with non-filling right ICA in comparison to normal left ICA (arrow).

Figure 4

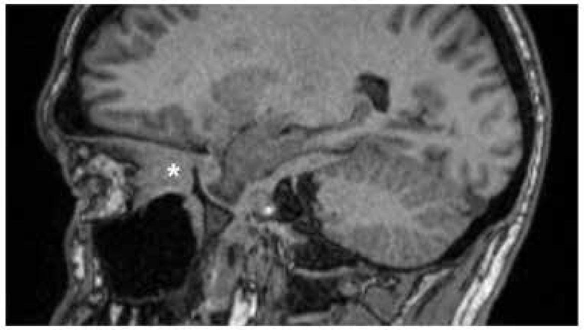

Figure 4. Sagittal T1-weighted MRI showing posterior extent of the right orbital mass lesion (asterisk).

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7:24 am

Adnexal Squamous Cell Carcinoma: Incidence of Eyelid Margin Involvement

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Introduction: Squamous cell carcinoma is the second most common malignancy of the eyelid with an incidence between 0.09 and 2.42 cases per 100,000 individuals.[1,2] Keratin-19, a marker for poor prognosis in squamous cell carcinoma[3] has been uniquely identified within eyelash follicular stem cells.[4] The unique genetic profile of the eyelash follicles may increase the vulnerability for squamous cell cancer deveopment at the eyelid margin. We aimed to perform a large-scale review of facial and periorbital squamous cell carcinoma cases to assess the incidence of eyelid margin involvement.

Methods: We performed a retrospective review of all patients with biopsy-proven squamous cell carcinoma who were evaluated at a single oculoplastic surgery practice from 2007 to the present. The charts were reviewed for anatomic location of the malignancy. Those involving the eyelid were divided into marginal and non-marginal lesions. Statistical analysis was performed using a one proportion z-test.

Results: A total of 76 patients with a diagnosis of biopsy-proven periocular and facial squamous cell carcinoma were identified. Thirty-nine (51.2%) patients had lesions located on the eyelid. Of these, 33 (84.6% $p<0.0001$, 95% CI 69.45-94.13) had lesions located at the margin, six of the 39 lesions were non-marginal. The remaining lesions were present within the brow ($n = 10$, 13.0%), medial canthus ($n = 10$, 13.0%), palpebral conjunctiva ($n = 1$, 1.0%), or orbit ($n = 1$, 1.0%). Six patients (8%) had lesions that involved multiple anatomic subunits.

Conclusions: We present our novel investigation of the incidence of squamous cell carcinoma of the marginal vs. non-marginal eyelid revealing an increased propensity of involvement of the eyelid margin. Future investigations are necessary to further elucidate the vulnerability of the eyelid margin to the development of squamous cell carcinoma in particular in regards to the role of the unique genetic expression profile of eyelash follicular stem cells.

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7:28 am

Evaluation of Electronic Health Record Implementation on an Academic Oculoplastics Practice

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Introduction: The adoption rate of electronic health records (EHRs) has increased tremendously over the last decade[1]. Despite increasing adoption, perceptions of EHRs are negative among ophthalmologists, attributed to concerns about decreased productivity, increased costs, and increased effort required for clinical documentation [1]. In addition, EHR has been cited as a major risk factor for physician burnout[2]. We evaluated the effects of EHR adoption in oculoplastics practice. We found no prior studies examining this transition.

Methods: Data on clinical volume, time in documentation, attending physician time with patients, financial reimbursement, relative value units (RVUs), and patient satisfaction were examined from two academic oculoplastics attendings between April 2018-April 2019, with EPIC Kaleidoscope implementation in September 2018. Reimbursement, RVUs, and patient satisfaction scores were normalized using the April 2018 value as a baseline. Descriptive statistics were used to summarize the data. Quantitative outcomes pre- and post-EPIC implementation were compared using t-tests.

Results: The mean patients seen in a half-day clinic was 31.8 vs 27.7 ($p=0.018$) pre- and post-EPIC implementation, respectively. An average of 10.9 vs. 8.8 ($p<0.001$) patient encounters per hour were completed pre- and post-EPIC. EPIC implementation had no effect on total monthly reimbursement ($p=0.88$) or total monthly RVUs ($p=0.54$). Average reimbursement ($p=0.004$) and RVUs ($p=0.001$) per patient encounter were higher post-EPIC. Mean normalized patient satisfaction scores pre- and post-EPIC were 0.94 and 1.02 ($p=0.08$), respectively. Mean physician time per patient was 6.4 vs. 9.0 minutes ($p<0.001$) pre and post-EPIC implementation, and mean documentation time per patient was 1.7 vs 3.6 minutes ($p<0.001$). Although physician time expenditure per patient increased after EPIC implementation, average patient wait times decreased by 9 minutes ($p=0.03$). No scribes were used in either physician practice.

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Conclusions: In our study, EPIC implementation was associated with decreased patient volume and number of patient encounters per hour. However, there were no significant differences in total reimbursement or RVUs. Although EPIC adoption was associated with increased physician time devoted to patients and greater time expenditure on documentation, patients experienced decreased wait times after EPIC implementation. This suggests that EPIC use streamlined the overall clinic flow without sacrificing physicians' time with the patient. In addition, despite a common concern for an inferior patient experience with use of EHR, patient satisfaction scores via patient surveys demonstrated similar satisfaction pre- and post-EPIC implementation. Strategies employed to optimize the paper-to-EPIC transition and improve the efficiency of clinical workflows includes pre-implementation training for all physicians and staff, development of customization/personalization features and standardized note templates in EPIC, contributions from ophthalmic technicians on recurrent orders, and in-clinic technical support after implementation. Our findings suggest that EHR implementation can be accomplished in an academic oculoplastics setting without negative impact on patient experience or financial considerations.

Figure 1

Table 1. Pre and Post-EHR implementation: Clinical volume, reimbursement, and patient satisfaction

	Pre-EHR	Post-EHR	Difference in means (95% CI)	p-value
Clinical volume				
Mean # of patients seen in a half day clinic	31.8	27.7	-4.1 (-0.7, 7.5)	p=0.018
Mean # patient encounters completed per hour	10.9	8.8	-2.1 (-1.3, -2.8)	p<0.001
Reimbursement and RVUs (monthly mean)				
Monthly reimbursement[a]	0.998	1.008	+0.010 (-0.157, 0.138)	p=0.88
Monthly RVUs[b]	0.929	0.895	-0.034 (-0.086, 0.154)	p= 0.54
Patient satisfaction (monthly mean)				
Mean normalized patient satisfaction scores[c]	0.94	1.02	+0.08 (-0.205, 0.017)	p=0.08

EHR = electronic health record; CI = confidence interval; RVU = relative value unit

[a]Monthly reimbursement was standardized as a ratio of the magnitude of reimbursement from April 2018 which was used as a baseline.

[b]Monthly RVUs were standardized as a ratio of the magnitude of RVUs from April 2018 which was used as a baseline.

[c]Monthly patient satisfaction scores were standardized as a ratio of the magnitude of the mean patient satisfaction scores from April 2018 which was used as a baseline. Patient satisfaction scores were determined by monthly "likelihood to recommend" values.

Figure 2

Table 2. Pre and Post-EHR implementation: Physician time with patients and in documentation

	Pre-EHR (n=115 patient encounters)	Post-EHR (n= 79 patient encounters)	Difference in means (95% CI)	p-value
Physician mean total time spent per patient (minutes)	6.4 (4.1)	9.0 (5.8)	+2.6 (1.1, 4.1)	p<0.001
Documentation mean time per patient (minutes)	1.7 (1.2)	3.6 (2.1)	+1.9 (1.7, 2.7)	p<0.001

EHR = electronic health record; CI = confidence interval

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7:32 am

Ophthalmic Consequences of Ichthyosis and the Role of Systemic Retinoids

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Introduction: Ichthyosis is a congenital dermatologic condition with abnormal keratinization.[1] Autosomal recessive (AR) ichthyosis can manifest with severe dermatologic involvement of the entire body. Among the ophthalmic consequences is exposure keratopathy due to cicatricial ectropion and lagophthalmos. Anterior lamellar shortening from progressive cicatrix may necessitate skin grafting. However, uninvolved skin for grafting is limited and recurrent disease is inevitable, making alternatives to surgery attractive. Herein, we present a series of two Cambodian children with AR ichthyosis treated with full-thickness skin grafting to the eyelids and adjuvant oral retinoic acid.

Methods: We performed a prospective familial case series of two patients with autosomal recessive ichthyosis treated with skin grafting and post-operative systemic retinoid therapy.

Results: The presented are brother and sister, ages 15 and 12 respectively. Each underwent bilateral upper and lower eyelid skin grafting in their early childhood, but manifested recurrent ectropion with ocular exposure. In addition to bilateral upper and lower eyelid ectropion, (Figure 1A), the 15-year-old male demonstrated corneal scarring with secondary strabismus and amblyopia OS, corneal exposure keratopathy was mild OD. The 12-year-old female had a non-resolving corneal ulcer OD and mild exposure OS in the setting of bilateral upper and lower eyelid cicatricial ectropion, (Figure 1B). They underwent bilateral upper and lower eyelid ectropion repair with cicatricial release and supraclavicular skin grafts with temporary tarsorrhaphies for one week. At post-operative week one they were healing well from surgery, (Figure 1C,D), with improved eyelid position. Given the inevitability of recurrent ectropion, treatment with oral retinoic acid was initiated. Careful monitoring of side-effects of oral retinoic acid, with monthly blood tests and patient education was performed. Follow-up at post-operative month one (Figure 1E,F) and two (Figure 1G,H) revealed substantial improvement.

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Conclusions: This familial case series demonstrates the adjunctive utility of systemic retinoids to optimize restitution of normal eyelid anatomy and preservation of the ocular surface in two patients with ichthyosis. While accepted as an important treatment in the armamentarium of dermatologists[2] oral retinoids are less established as a noninvasive tool to address ichthyosis-related eyelid malposition in the ophthalmic literature. The reported use of systemic retinoids in combination with surgical intervention is limited to case reports.[3] Topical therapies[4] are an additional alternative, but require optimal patient compliance and access for success. Oral retinoids may minimize progression and even reverse sequela of this disease, and have proven to be transformative for patients with minimal access to care.

Figure 1

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2. Hernandez-Martin A, Aranegui B, Martin-Santiago AM, Garcia-Doval I. A systematic review of clinical trials of treatments for the congenital ichthyoses, excluding ichthyosis vulgaris. J Am Acad Dermatol 2013; 69(4): 544-549.e8
3. Sigurdsson H, Baldursson TB. Inverting sutures with systemic retinoids and lubrication can correct ectropion in ichthyosis. Ophthalmic Plastic and Reconstructive Surgery 2016; 32(5):e112-e113.
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7:36 am

Prospective Correlation of Risk of Obstructive Sleep Apnea and Severe Clinical Features of Thyroid Eye Disease

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Introduction: Risk of obstructive sleep apnea (OSA) has previously been demonstrated to correlate with the development of thyroid eye disease compressive optic neuropathy in a retrospective study.[1] The purpose of this study is to prospectively evaluate the association of the risk of obstructive sleep apnea (OSA) and severe clinically identifiable features of thyroid eye disease (TED), potentially requiring immunomodulatory intervention or surgery using a validated OSA screening tool.[2]

Methods: An IRB approved, prospective consecutive case series was performed. All new patients in a single practitioner's (MK) academic practice were offered sleep apnea screening with the STOP-Bang survey on initial presentation. These patients were then evaluated in comprehensive fashion using the VISA classification system[3] and treated according to standard of care during their active clinical course. The patients were followed through the course of their active disease and remeasured when in the stable phase. Inclusion criteria were patients with TED who were screened with the STOP-Bang questionnaire[2] to assess risk for OSA at the time of their initial visit. Exclusion criteria were patients treated with surgery or immunomodulatory therapy prior to initial presentation or concurrent, alternate orbital pathology. A multivariable logistic regression analysis was performed to determine the correlation between risk of OSA on presentation and development of the following clinical features: 1) compressive optic neuropathy, 2) strabismus, 3) eyelid retraction, and 4) exophthalmos.

Results: patients met inclusion criteria and were included in the analysis. Of these patients, 27 percent were at high risk of OSA with a positive STOP-Bang score of 3 or higher. When controlling for gender, the severity of strabismus as measured by vertical prism deviation and horizontal prism deviation were significantly associated with risk of OSA (p value 0.023). An elevated STOP-Bang score was also strongly associated with the development of CON during the course of disease, but this did not meet statistical significance (p value 0.11).

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Conclusions: In this prospective analysis, risk of OSA is statistically significantly associated with the severity of strabismus in patients with TED. Furthermore, the risk of OSA is associated with the development of compressive optic neuropathy in patients with TED. Accordingly, OSA may represent another potentially modifiable risk factor in TED, and the STOP-Bang survey may represent a useful screening tool for selecting high risk patients early in their disease course.

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7:40 am

Rates of Contracture and Additional Surgeries Following Enucleation and Evisceration

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Introduction: We aim to characterize rates of contracture and requirement for additional surgery following enucleations and eviscerations.

Methods: This is a single-institution, retrospective chart review of enucleations and eviscerations performed from January 2014 to April 2019 at a Level 1 trauma center. Our review included demographic information, indications for surgery, rates of contracture, and characterization of follow-up procedures. Statistical analysis of continuous variables was performed using Student's t-test and categorical variables using Chi-square and Fischer's exact tests.

Results: There were 161 enucleations and 53 eviscerations pooled from our review. Overall, the most common indications for surgery were trauma, glaucoma, and neoplasms (28.0%, 18.2%, and 16.4%, respectively). Enucleated patients had more neoplasms (benign and malignant) as indications for surgery (21.7% vs. 0.0%, $p < 0.01$) while eviscerated patients had greater corneal indications (22.6% vs. 8.7%, $p = 0.01$). Enucleated patients were younger than eviscerated patients on average (46. 1 vs. 55.1 years, $p = 0.01$). 45.3% of enucleated patients required at least one additional surgery versus 11.1% for eviscerated patients (45.3% vs. 11.3%, $p < 0.01$). Patients with enucleations had a greater number of additional surgeries (1.4 vs. 0.2, $p < 0.01$), time from initial surgery to revision surgery (52.5 months vs. 4.0 months, $p < 0.01$), and were followed for a greater duration of time (72.6 months vs. 12.6 months, $p < 0.01$) than patients who had undergone eviscerations.

29.8% of enucleated patients experienced socket contracture compared to only 3.7% of eviscerated patients ($p < 0.01$). Patients experiencing contracture were younger (37.5 years vs. 51.6 years, $p < 0.01$), more likely to be female (60% vs. 38.4%, $p = 0.01$). Patients with contracted sockets had greater number of additional surgeries (2.7 vs. 0.6, $p < 0.01$), had greater time elapsed between initial surgery to first follow up surgery (70.1 months vs. 31.4 months, $p = 0.04$), and were followed longer post-operatively (96.8 months vs. 45.9 months, $p = 0.01$). Contracture was more associated with congenital conditions including anophthalmia, microphthalmia, vascular malformations, and retinopathy of prematurity ($p < 0.01$).

Compared to non-contracted sockets, contracted sockets underwent a greater percent of general reconstructive procedures (76.2% vs. 21.6%), and specifically, conjunctivoplasty (40.5% vs. 18.9%), fornix reconstruction (42.9% vs. 0.0%), and entropion repair (23.8% vs. 0.0%) ($p < 0.05$ for all).

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Conclusions: This is the first study to examine long-term need for follow-up surgeries and rates of contracture in patients undergoing either enucleation or evisceration. The results reveal enucleated sockets have higher rates of contracture and need for additional surgery compared to eviscerated sockets, as has been previously suggested.[1,2] Risk factors for contracture include younger age and congenital conditions. Additionally, enucleated sockets need for additional surgery was delayed compared to eviscerated sockets. These findings suggest that development of pathology in enucleated sockets is a more gradual process than in eviscerated sockets, requiring greater number of surgeries and long-term follow-up care. Future studies may look to optimize follow up regimens after eye removal surgery to predict contracture early and prevent the need for revision procedures.

Figure 1

Table 1. Descriptive Characteristics of Enucleations and Eviscerations

Surgery	Number	Male (Female)	Average Age	Contracture (%)	Patients with Follow Up Surgeries (% of Total)	Mean Follow Up Surgeries	Mean Follow Up Since Surgery (Months)	Mean Time from Surgery to First Revision (Months)	Mean Follow Up Since Last Surgery
Enucleation	161	91 (70)	46	48 (29.8%)	73 (45.3%)	3.1	72.6	122.5	9.6
Evisceration	53	31 (22)	55	2 (3.7%)	6 (11.1%)	1.3	12.7	35.2	8.6
Total	**214**	**121 (92)**	**50.5**	**50 (23.4%)**	**79 (36.9%)**	**3.0**	**57.8**	**115.5**	**9.3**

Figure 2

Table 2. Most Common Contributing Indications for Patients Undergoing Enucleation and Evisceration

Indication	Enucleation (%) (n = 161 patients)	Evisceration (%) (n = 53 patients)	Total (n = 214)	Statistic	P value
Trauma	48 (29.8%)	12 (22.6%)	60 (28.0%)	1.02	0.31
Glaucoma	30 (18.6%)	9 (17.0%)	39 (18.2%)	-	0.99
Neoplasm*	35 (21.7%)	0 (0.0%)	35 (16.4%)	13.77	< 0.001
Benign	4 (2.5%)	1 (1.9%)	5 (1.4%)	-	0.99
Malignant	30 (18.6%)	0 (0.0%)	30 (1.4%)	-	< 0.001
Retinal Detachment	21 (13.0%)	8 (15.1%)	29 (13.6%)	-	0.82
Endophthalmitis/Inflammation	17 (10.6%)	9 (17.0%)	26 (12.1%)	-	0.23
Corneal Pathology^	14 (8.7%)	12 (22.6%)	26 (12.1%)	7.27	0.01
Congenital Conditions	9 (5.6%)	1 (1.9%)	10 (4.7%)	-	0.46
History of Radiation	8 (5.0%)	0 (0.0%)	8 (3.7%)	-	0.21
Uveitis	6 (3.7%)	0 (0.0%)	6 (2.8%)	-	0.34
Diabetic Retinopathy	3 (1.9%)	2 (3.8%)	5 (2.3%)	-	0.60
Cataract Complications	3 (1.9%)	0 (0.0%)	3 (1.4%)	-	0.99
Burns	2 (1.2%)	2 (3.8%)	4 (1.9%)	-	0.26
Shingles	2 (1.2%)	0 (0.0%)	2 (0.9%)	-	0.99
Sturge-Weber Syndrome	1 (0.6%)	0 (0.0%)	1 (0.5%)	-	0.99
Chicken Pox	1 (0.6%)	0 (0.0%)	1 (0.5%)	-	0.99
Scleritis	0 (0.0%)	1 (1.9%)	1 (0.5%)	-	0.25
Stevens-Johnson Syndrome	0 (0.0%)	1 (1.9%)	1 (0.5%)	-	0.25

Note: Patients with multiple indications for surgery were included in all applicable categories. *Neoplasm is a general category including any type of malignancy. Benign neoplasms include meningioma and neurofibroma, while malignant neoplasms include retinoblastoma, lymphoma, squamous cell carcinoma, melanoma, and optic nerve glioma. ^Corneal pathology includes patients with corneal ulcers, perforations, keratitis, Fuchs dystrophy, and bullous keratopathy. Chi-square tests and Fischer's exact test were performed for categorical variables. Test statistics and p values were reported for t tests and chi-square tests; there are no reported test statistics for Fischer's exact test.

Figure 3

Table 3. Summary of Demographic and Follow Up Timelines of Enucleated and Eviscerated Patients

	Enucleations (n = 161)	Eviscerations (n = 53)	Test Statistic	P value
Age (Years)	46.1	55.1	2.49, *df 102.63	0.01
Sex (Males, Females)	90, 71	31, 22	0.11	0.74
Contracture	48	2	-	< 0.001
Patients with Follow Up Surgeries	73 (45.3%)	6 (11.1%)	-	< 0.001
Follow Up Surgeries (Mean)	1.4	0.2	-4.84, df 178.22	< 0.001
Months from Initial Surgery to Revision Surgery (Mean)	52.5	4.0	-4.47, df 189.99	< 0.001
Months from Initial Surgery to Last Follow Up (Mean)	72.6	12.6	-5.14, df 191.75	< 0.001
Months from Most Recent Surgery to Last Follow Up (Mean)	9.6	8.6	-0.51, df 1	0.61

Note: Student's t-tests were used for continuous variables. Chi-square tests and Fischer's exact test were performed for categorical variables. Test statistics and p values were reported for t tests and chi-square tests; there are no reported test statistics for Fischer's exact test. *Df represents degrees of freedom.

Figure 4

Table 4. Comparison of Enucleated and Eviscerated Patients with Follow Up Surgeries

Indication	Enucleated Patients with Follow Up Surgeries (%) (n = 73 patients)	Eviscerated Patients with Follow Up Surgeries (%) (n = 6 patients)	Total (n = 79)	Percentage of Total Surgical Patients (n = 214)	P Value
Reconstructive Procedure^	39 (53.4%)	1 (1.7%)	40 (50.6%)	18.7%	< 0.001*
Orbital Implant Removal	36 (49.3%)	3 (50.0%)	39 (49.4%)	18.2%	0.01*
Orbital Implant Revision/Re-insertion	33 (45.2%)	4 (66.7.0%)	37 (46.8%)	17.3%	0.04*
Tarsorrhaphy	28 (38.4%)	3 (50.0%)	31 (39.2%)	14.5%	0.04*
Dermal Fat Graft	25 (34.2%)	0 (0.0%)	25 (31.6%)	11.7%	< 0.001*
Conjunctivoplasty/Rearrangement	23 (31.5%)	1 (1.7%)	24 (30.4%)	11.2%	0.01*
Fornix Reconstruction	18 (24.7%)	0 (0.0%)	18 (22.8%)	8.4%	0.01*
Mucous Membrane Graft	13 (17.8%)	0 (0.0%)	13 (16.5%)	6.1%	0.04*
Entropion	9 (12.3%)	1 (1.7%)	10 (12.7%)	4.7%	0.46
Excision of Lesion	9 (12.3%)9	1 (1.7%)	10 (12.7%)	4.7%	0.46
Ptosis Repair	10 (13.7%)	0 (0.0%)	10 (12.7%)	4.7%	0.07
Ectropion	6 (8.2%)	0 (0.0%)	6 (7.6%)	2.8%	0.34
Canthoplasty/Canthal Plication	5 (6.8%)	0 (0.0%)	5 (6.3%)	2.3%	0.336
Blepharoplasty	4 (5.4%)	0 (0.0%)	4 (5.1%)	1.9%	0.57
Orbital Fracture Repair	2 (2.7%)	0 (0.0%)	2 (2.5%)	0.9%	0.99
Retrobulbar Injection	2 (2.7%)	0 (0.0%)	2 (2.5%)	0.9%	0.99
Full Thickness Graft	1 (1.5%)	0 (0.0%)	1 (1.3%)	0.5%	0.99
Amniotic Membrane Graft	1 (1.5%)	0 (0.0%)	1 (1.3%)	0.5%	0.99
Tutoplast Graft	1 (1.5%)	0 (0.0%)	1 (1.3%)	0.5%	0.99
Craniotomy/Cranialization	1 (1.5%)	0 (0.0%)	1 (1.3%)	0.5%	0.99
Resection of Muscle	1 (1.5%)	0 (0.0%)	1 (1.3%)	0.5%	0.99

Note Fischer's exact tests were performed for categorical variables. ^Includes any revision or reconstructive procedure related to the patient's enucleation or evisceration. Patients with multiple surgeries were included in all applicable categories. *Indicates statistically significant values.

Figure 5

Table 5. Comparison of Patients with Contracture After Enucleation or Evisceration

	Contractures (n = 50)	No Contractures (n = 164)	Test Statistic	P value
Age (Years)	37.5	51.6	3.53, *df 78.25	< 0.001
Sex (Males, Females)	20, 30	101, 63	7.27	0.01
Number of Follow Up Surgeries	2.7	0.6	-3.62, df 58.31	< 0.001
Initial Surgery to Revision Surgery (Months)	70.1	31.4	-2.00, df 76.94	0.04
Initial Surgery to Last Follow Up (Months)	96.8	45.9	-2.50, df 78.54	0.01
Most Recent Surgery to Last Follow Up (Months)	8.3	9.7	0.79, df 118.06	0.43
Indication for Surgery				
Trauma	13	47	0.13	0.71
Neoplasm	8	27	-	0.86
Glaucoma	10	29	-	0.68
Retinal Detachment	6	23	-	0.82
Endophthalmitis/Inflammation	4	22	-	0.46
Corneal Pathology	4	22	-	0.46
Congenital Conditions	8	2	-	< 0.001
History of Radiation	2	6	-	0.99
Uveitis	1	5	-	0.99
Diabetic Retinopathy	1	4	-	0.99
Cataract Complications	1	2	-	0.55
Burns	2	2	-	0.23
Shingles	1	1	-	0.41
Sturge-Weber Syndrome	0	1	-	0.99
Chicken Pox	0	1	-	0.99
Scleritis	0	1	-	0.99
Stevens-Johnson Syndrome	1	0	-	0.23
Patients with Follow Up Surgeries	(n = 42)	(n = 87)	62.21	< 0.001
Number of Follow Up Surgeries (Mean)	3.2	2.7	72.40	< 0.001
Months from Initial Surgery to Revision (Mean)	79.2	121.35	135.42	< 0.001
Months from Initial Surgery to Last Follow Up (Mean)	109.6	149.1	123.55	< 0.001
Months from Most Recent Surgery to Last Follow Up (Mean)	8.7	9.3	32.50	0.72
Types of Follow Up Surgery				
Reconstructive Procedure	32	8	-	< 0.001
Orbital Implant Removal	16	23	4.56	0.03
Orbital Implant Revision/Re-insertion	16	21	2.75	0.10
Tarsorrhaphy	21	10	4.25	0.04
Dermal Fat Graft	20	5	10.58	< 0.001
Conjunctivoplasty/Rearrangement	17	7	-	0.05
Fornix Reconstruction	18	0	-	< 0.001
Mucous Membrane Graft	13	0	13.71	< 0.001
Entropion	10	0	10.09	< 0.001
Excision of Lesion	3	7	-	0.18
Ptosis Repair	5	5	-	0.99
Ectropion	2	4	-	0.41

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7:44 am

Tobacco Counseling by Ophthalmologists in the Setting of Thyroid Eye Disease

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Introduction: Tobacco use is known to worsen the severity of ongoing thyroid eye disease and thus presents an acute risk for visual impairment, however, no study has investigated either the rate or efficacy of tobacco counseling by ophthalmologists in the setting of patients with thyroid eye disease.

Methods: We analyzed the electronic medical records of a digital cohort of patients seen by ophthalmologists within the University of Pennsylvania Health System from the beginning of 2012 to the end of 2017 with ICD codes for Graves' Disease, Thyrotoxic Exophthalmos, and/or Thyroid Eye Disease. Tobacco histories were recorded at the first and last ophthalmology office visits, or the most temporally proximal encounter, as packs/day (ppd) and each ophthalmology office visit note was analyzed for tobacco counseling.

Results: 435 patients were included in the analysis, of which 72 (16.6%) were actively smoking at the time of their first encounter. 36 (50.0%) of these patients received at least one form of tobacco counseling by at least one ophthalmologist, and those that did were approximately three times as likely to either quit smoking or reduce their smoking burden (respectively, OR 2.96, 95% CI [0.83, 10.53] and OR 2.98, 95% CI [1.08, 8.23]). 74.5% of ophthalmologists who had an actively smoking patient, and who had also referenced the patient's thyroid eye disease diagnosis in their notes, did not document any tobacco counseling.

Conclusions: This study reveals both the missed opportunities for tobacco counseling as well as its efficacy in the setting of thyroid eye disease.

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Figure 1

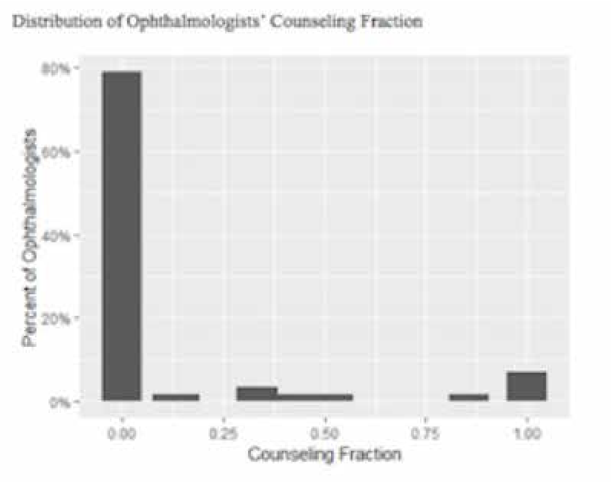


Figure 2

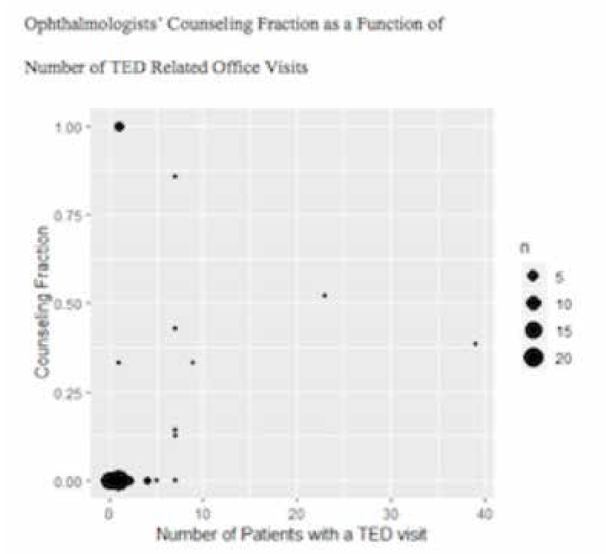


Figure 3

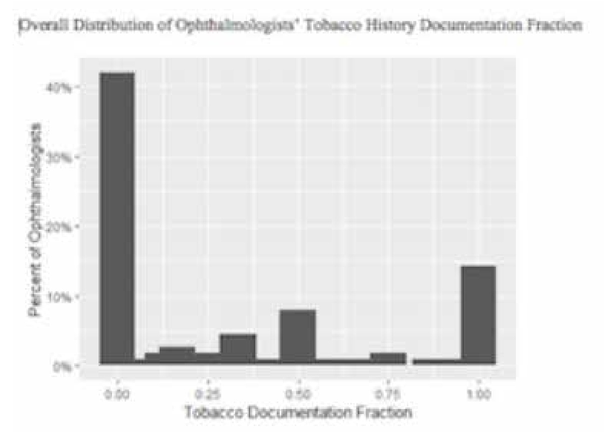
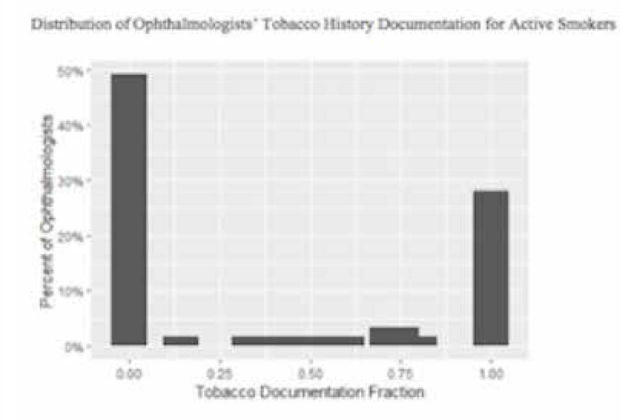


Figure 4



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8:07 am

The ASOPRS 50th Anniversary Book, a New, Useful, and User-friendly Electronic Publication

David Reifler[1,2,3]

[1]Archives Committee and 50th Anniversary Book Committee (Chair), ASOPRS, St. Paul, Minnesota, United States of America, [2]Graduate Education, Michigan State University College of Human Medicine, Grand Rapids, Michigan, United States of America, [3]Emeritus Honorary Staff, Mercy Health St. Mary's Hospital, Grand Rapids, Michigan, United States of America

Introduction: The e-publication platform and content of *The ASOPRS 50th Anniversary Book* historically documents the activities of the Society and its members during the past quarter-century and reflects new technologies of the modern Information Age.

Methods: Drafts of *The ASOPRS 50th Anniversary Book* were reviewed with attention to descriptions of Information Age-technologies used in the development and publication of this e-book, the activities of the Society, and the evolving management of its archives. The appearances of historically meaningful comparisons between older and newer technologies were noted, particularly how they were embraced by the leaders and members of the Society and used to promote the stated mission of ASOPRS, *"... to advance education, research, and the quality of clinical practice in the fields of aesthetic, plastic and reconstructive surgery specializing in the face, orbits, eyelids, and lacrimal system."*

Results: As described in the preface, book-development required reorganization of the Society's physical archives into folders of electronically stored minutes, meeting programs, and correspondences with files formatted as portable document formats (PDFs) and images following Joint Photographic Experts Group standards (JPEGs). Composition of text utilized up-to-date word-processing software (Microsoft Word) and cloud-based file-sharing (Dropbox and Flicker) to store, share, and edit files. Design preparations for electronic publication involved Hypertext Markup Language-conversion (HTML) and uploading to the internet with links to the ASOPRS website. The projected utility and cost-savings of planned electronic publication helped secure funding for the project from the ASOPRS Foundation which also funded PDF-scanning and retroactive publication of a "flip-book" version of the 1994 hardcover ASOPRS 25th Anniversary Book. Like its predecessor, the important roles and many contributions of the Society's members and leaders permeate virtually every section of the chapters and appendices of *The ASOPRS 50th Anniversary Book*. A retrospective analysis of the book's introductory historical overview (Chapter 1: "The Second Quarter-Century") revealed that almost one-fifth of the 12,500-word narrative (2,359 words) describes discarded "quaint" older technologies and/or the introduction and utilization of newer technologies of the Information Age. The following (bulleted) examples of Information Age-technologies included:

- Full-text online publication of the Society's journal, *OPRS*, beginning in 2001;
- Online submission- and review-processes for the Journal and for the Society's meetings;

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- The Oculofacial Plastic Surgery Education Center, a collaborative ASOPRS-AAO project linked to the ASOPRS website;
- Evolution of the Society's email listserv to the latest iteration of the ASOPRS Forum; and
- Continued improvements in the ASOPRS website.

Conclusions: Following the example and organization of the hard-cover ASOPRS 25th anniversary festschrift, *The ASOPRS 50th Anniversary Book* continues an ongoing a process of the documentation of the history of the Society. It highlights the important roles and many contributions of ASOPRS members during this past quarter-century in a format that utilizes newer Information Age-technology that is accessible, useful, and user-friendly.

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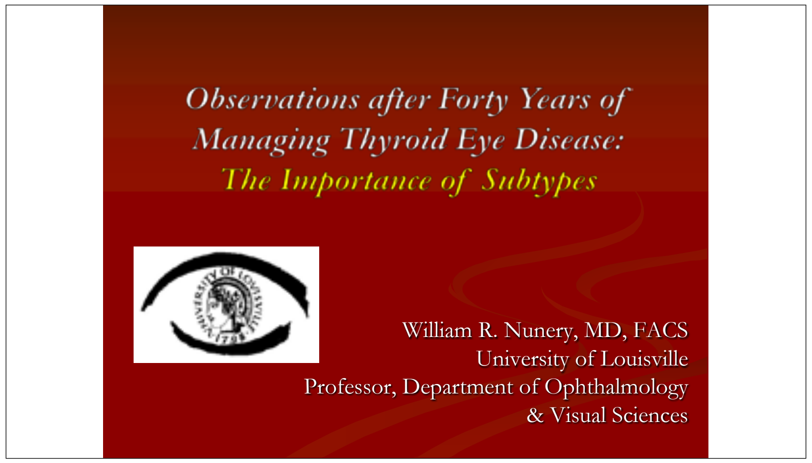
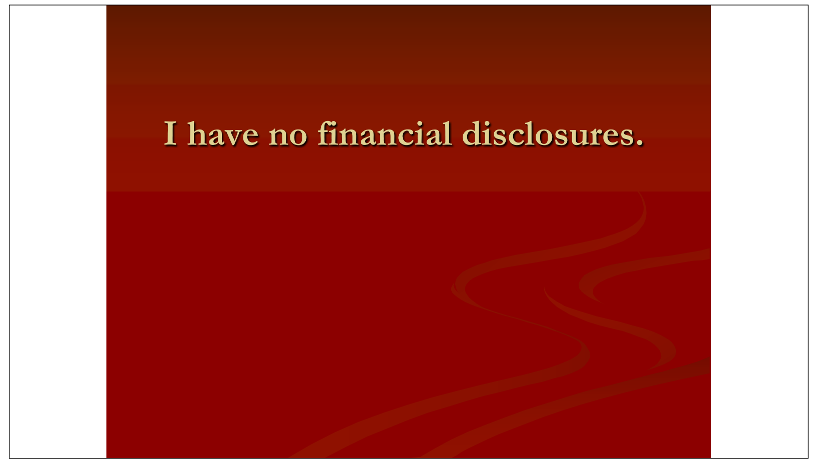
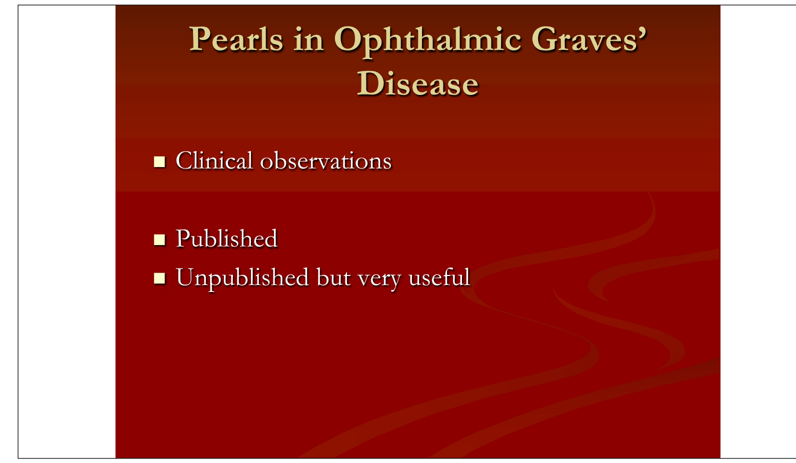
8:20 am

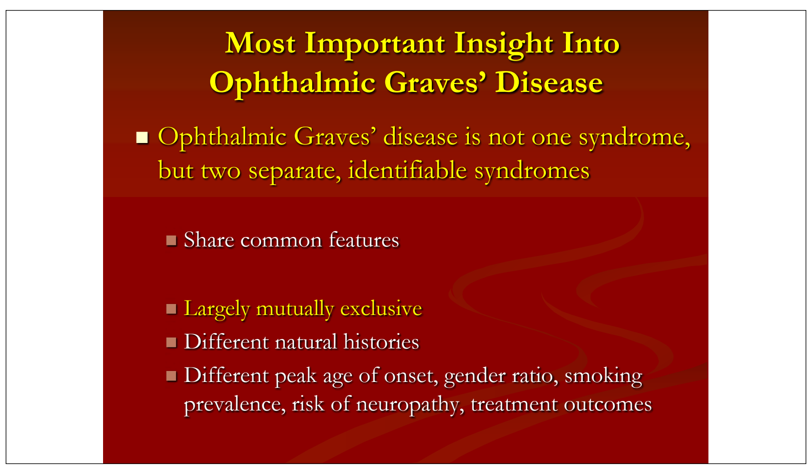
Observations After Forty Years of Managing Thyroid Eye Disease – The Importance of Subtypes

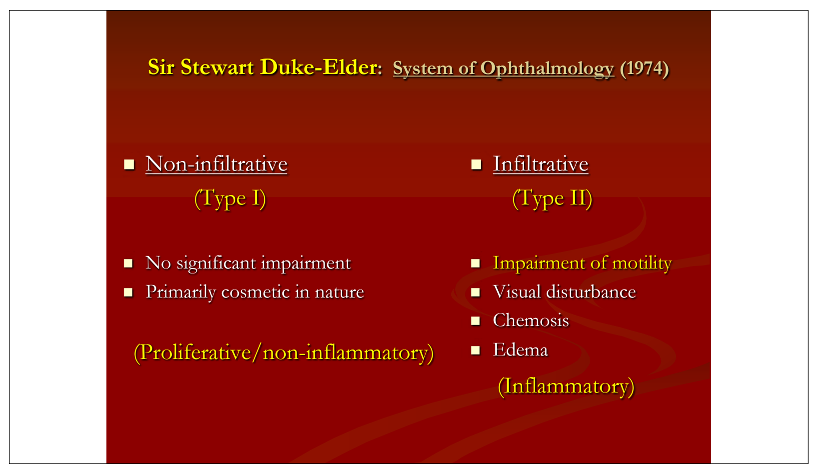
William R. Nunery, MD, FACS

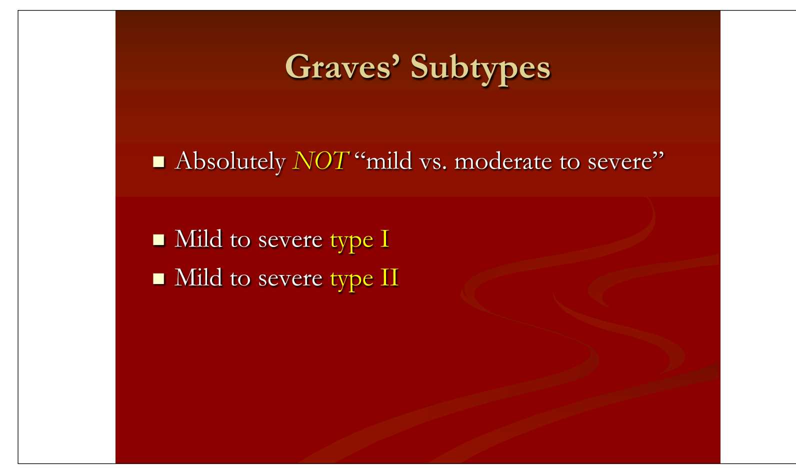


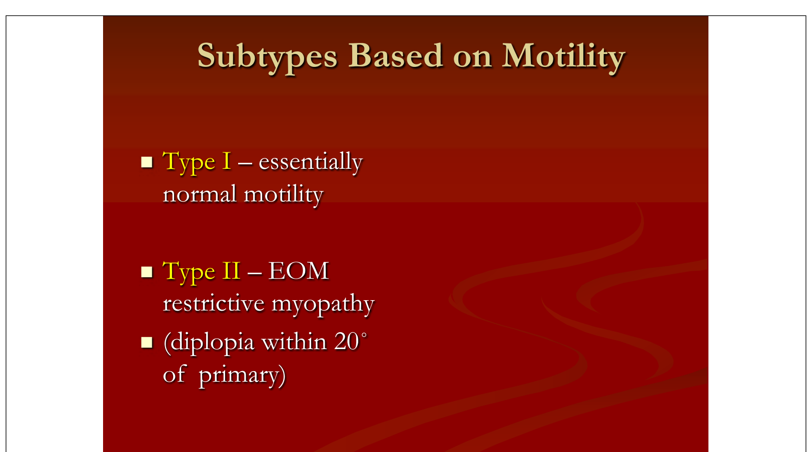


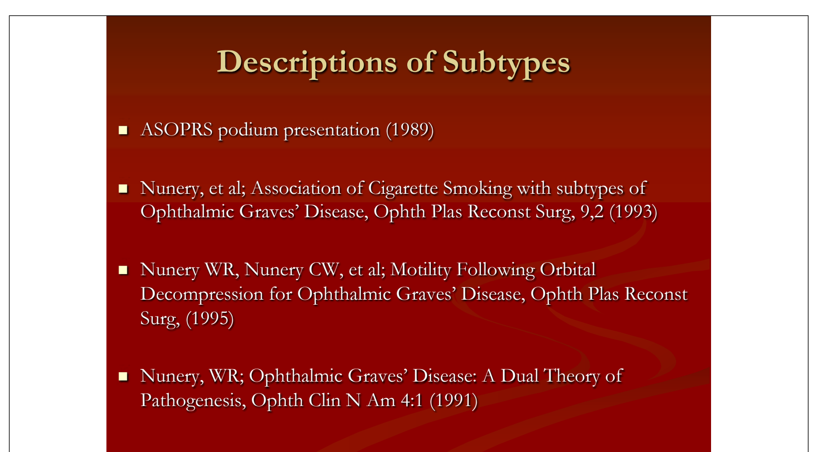


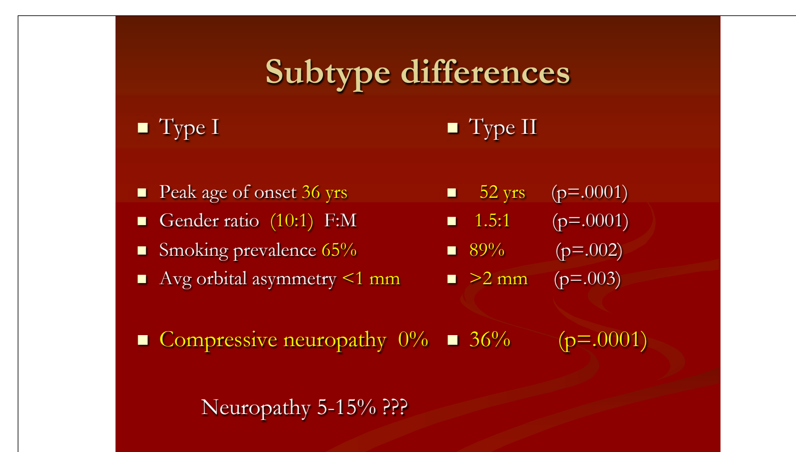












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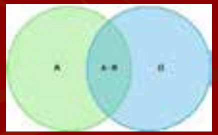
Subtype similarities—Type I vs Type II precursor?

Type I	Type II
Avg hertel 22 mm	23.8 mm
Hertel range 16-34 mm	15-32 mm
Onset age range 10-68 yrs	14-74 yrs
Proptosis, lid retraction, pressure pain in orbit, smoking common to types I and II	May present in non-inflamed plateau

- Too many trees (similarities) to see the forest

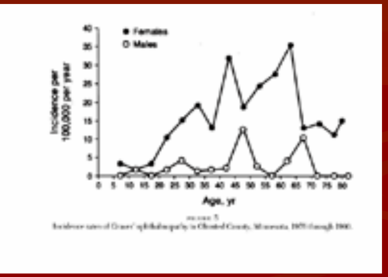
Type I precursor to Type II?

- Minimal evidence of type I progressing to type II
- Minimal evidence of inflammatory phase in type I
- Can Type I be confused w/ Type II?



Confirmation of subtypes in literature?

Incidence of Graves' Ophthalmopathy in Olmsted County, Minnesota (1994)



- Bartley, GB: The Epidemiologic Characteristics and Clinical Course of Ophthalmopathy Associated with Autoimmune Thyroid Disease in Olmsted County, Minnesota, The Am Ophth Soc: vol XCII. 1994

Subtypes in understanding literature and research

Kim HC, Yoon SW, Lew H (2015)

- Fatty volume, but not EOM volume correlate with "mild to moderate" TAO

Strabismus correlates with increased EOM volume, but not increased fatty volume

Br J Radiol. V88 (2015)

"Based on these results, we support the concept that TAO is classified into two distinct types, orbital fat dominant TAO, and EOM dominant TAO"

CT can be suggestive of type, but not diagnostic

- EOM size may be enlarged in type I, but functionally normal

Subtypes in Graves' Disease

- CAS scores correlate W/ EOM size, but not increased fatty volume
- Kvetny J, Puhakka KB, Rohl L: Acta Ophthalmol Scand; 84 (2006)
- Chang TC, Huang KM, et al:Acta Ophthalmol Scand 75 (1997)

Phipps RP, et al (2016) The aryl hydrocarbon receptor and its ligands inhibit myofibroblast formation and activation AmJ Pathol (186) 12, 2016

- T lymph and mast cells—activate orbital fibroblasts to *either* form myofibroblasts or orbital fat cells
- Myofibroblasts induce transforming growth factor B, cytokine which produces fibrosis of EOMs

Mild vs severe disease?

- Hertel of 31, normal motility, spontaneous prolapse
- Hertel 20, mild chemosis, restrictive myopathy , optic neuropathy
- No linear continuum between subtypes

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Failure to recognize and segregate subtypes in Graves' disease

- Misinterpretation of literature

Role of Adiponectin in GO

- Soiberman U, et al: Adiponectin concentration in the orbital fat of patients with Graves' ophthalmopathy. Clin Ophthalmology 2013; 7 :1723-26.

Adiponectin

- Protein produced by adipose tissue
- Role in regulation of immune processes
- Systemic inflammatory processes

Soiberman, et al. (2013)

Prior Studies on "Severe GO Patients":
- 25 x ↑ in adiponectin gene expression

- Examined adiponectin protein concentrations in orbit in Graves' decompression patients
- Concluded "no difference in orbit adiponectin protein levels between GO patients and controls"

Study Sample

- GO population (Soiberman):
  - "No patient had signs or symptoms of active disease as measured by CAS" (all female)
  - Indication: proptosis with orbital fat prolapse and cosmesis"
  - i.e., Type I patients, whereas prior studies on "severe GO patients" were likely on Type II patients

Confusion of Study Results

- Motility following decompression surgery comparing various techniques
- Segregation of types I and II is mandatory to interpret results

Motility Following Decompression

Type I	Type II
essentially zero	61% shift alignment (most commonly toward eso and hypotropia)

- Nunery WR, Nunery CW, et al; Motility Following Orbital Decompression for Ophthalmic Graves' Disease, Ophth Plas Reconst Surg, (1995)

Type I

- Decompression effective and sufficient
- Minimal risk of diplopia

Self Image in Ophthalmic Graves'

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Type I Patients

- No role for steroids or immune suppressors
- No role for radiation
- ?? Role for biologics

Radiotherapy for TED

Gorman CA, Garrity JA, et al. Ophth 108:9 (2001) Radiation not useful in Graves'

- Pt selection: "mild to moderate; symptoms of pain, lacrimation, photohobia, or visual blurring"
- At least 3 of 6:
  - chemosis or lid edema
  - lid lag, lid retraction
  - pt perception of bulging or staring eyes
  - proptosis of 20 mm or more
  - less than 4 mm of asymmetry
  - restriction in EOM motion

- Exclusions:
- asymmetry >4mm
- optic neuropathy

- Over ½ of pts had symptoms longer than 1.3 yrs prior

- Biased against active and inflamed Type II pts

Radiation Effective only in Active, Inflamed Type II pts

- Godfrey K, Kazim M. Ophth Plast Reconstr Surg, 34/45 (2018)
- "Mild or inactive disease will not benefit from rad rx"
- "Only for moderate to severe, active disease"

- Clarification:
- Active, type II pts only

Unpublished Observation #1

- Orbit decompression significantly reduces orbital inflammation in the type II active, acute phase

- Pulsed steroids followed immediately w/ decompression is the best treatment to date for active inflammatory phase of type II

Timoney, et al (Unpublished)

- ↓ CAS w/ steroids & decompression
- 4.67 pre-op to 0.28 post-op

- Kikkawa, et al. Reduction of orbital inflammation following decompression for thyroid-related orbitopathy. Biomed Res Int, 2013.

CAS After Decompression

Pre and Post Acute Type II

CAS after decompression

- Prefer pulsed steroids followed by decompression in acute type II Graves' orbitopathy

Monteiro MLR, et al (2011)

Color Doppler before and after Graves's decompression

Clinics vol 66 no 8

Studied two sub-types: "Lipogenic vs myogenic"

"Congestive phase" of myogenic

slow or reversed SOV flow pre-op

normal SOV flow post decompression

Venous stasis is significant component in orbital congestion in "myogenic" GO

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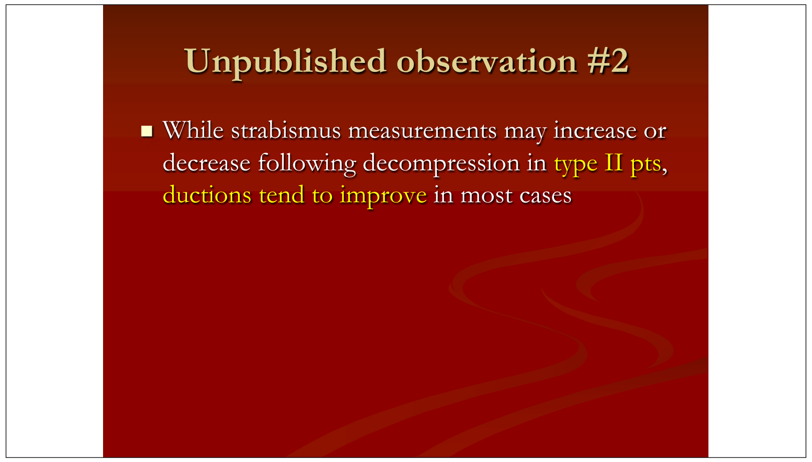

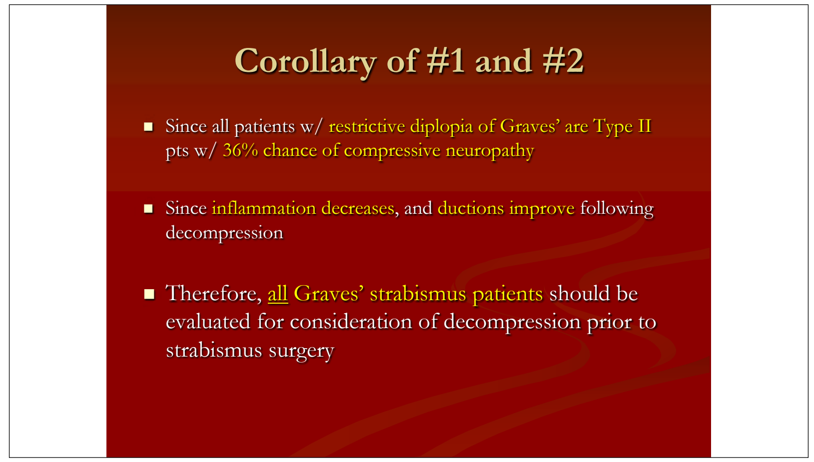

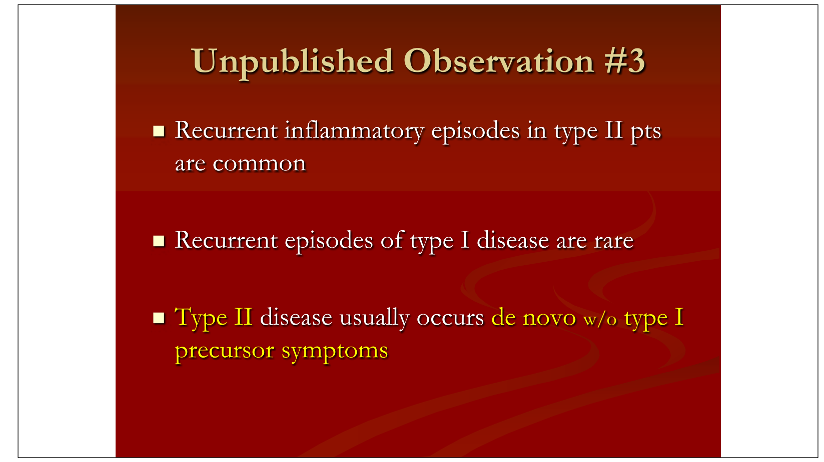

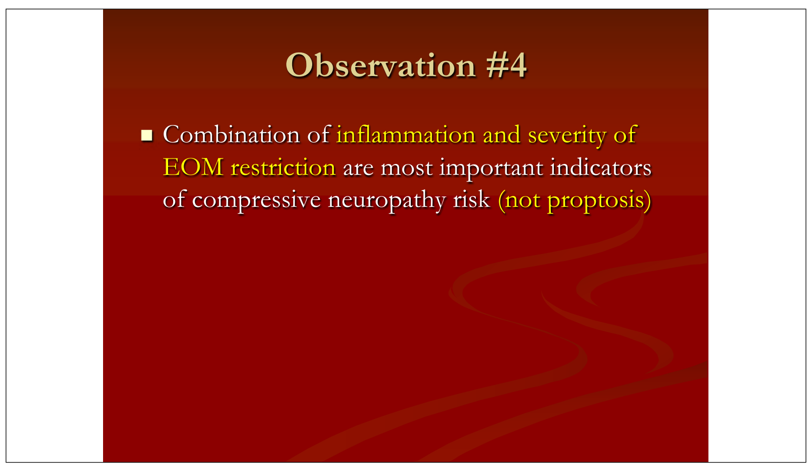

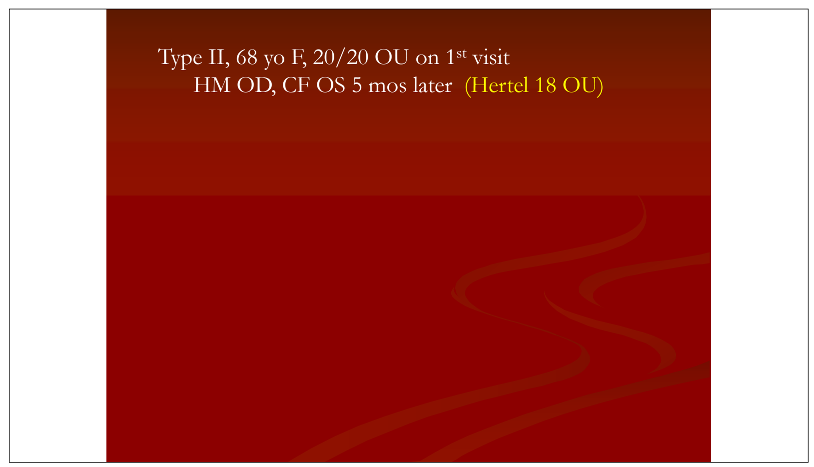

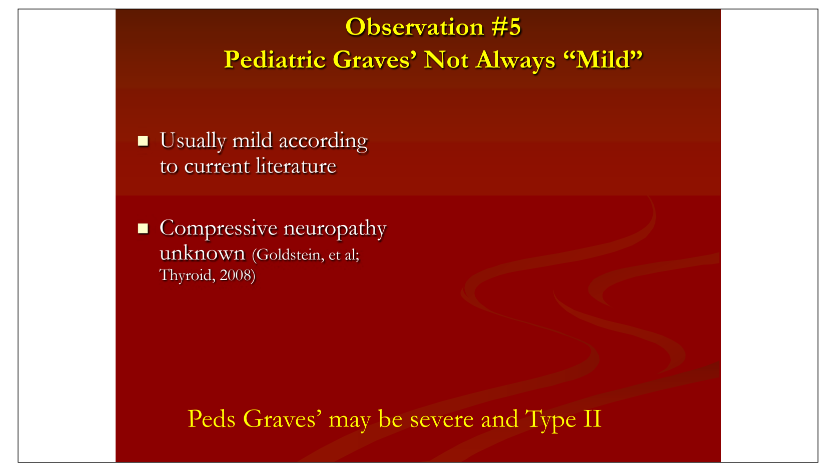

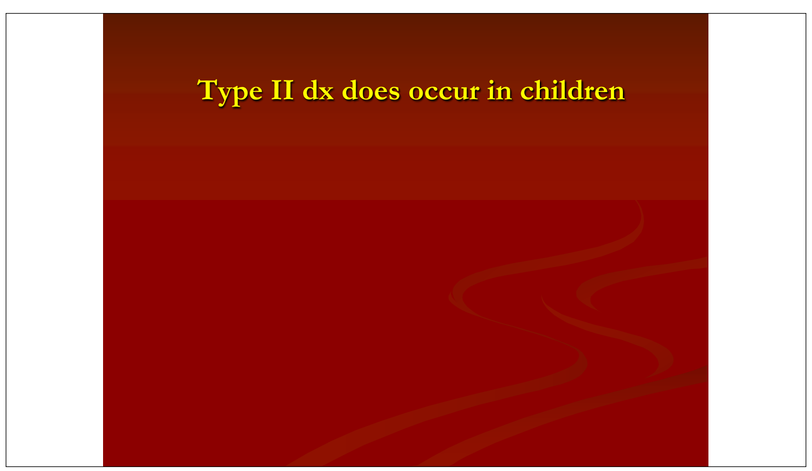

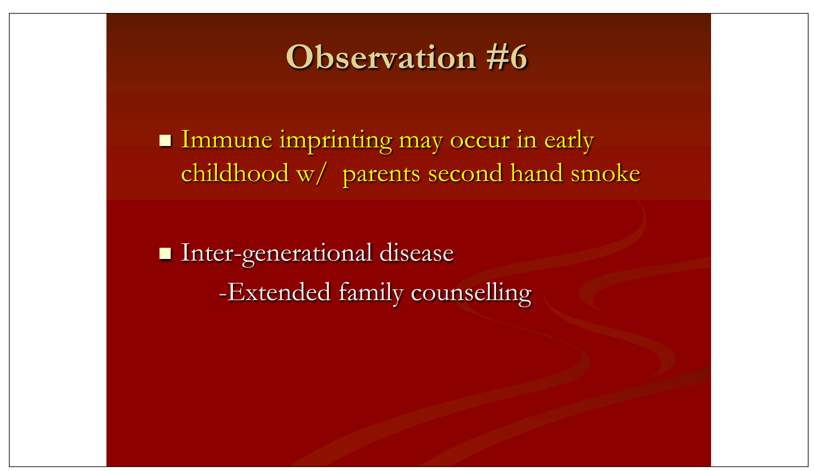

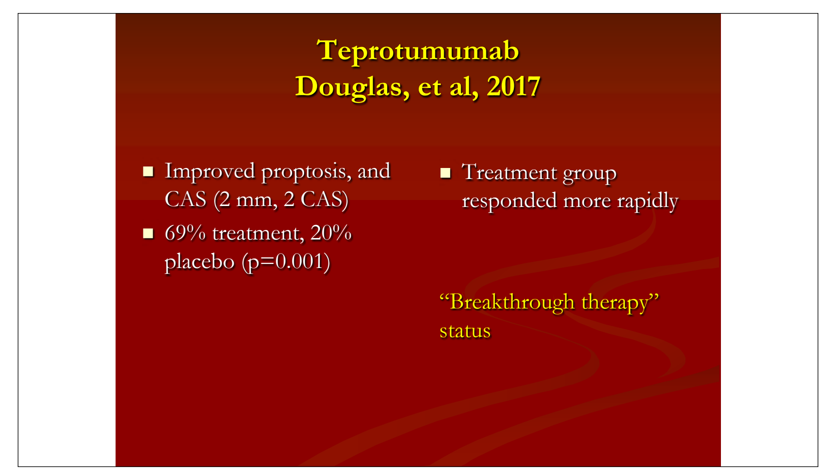

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Teprotumumab Rx vs. Placebo

- Gender (65%F vs 82%)
- Time since thyroid dx (8 mos vs 15 mos)
- Constant diplopia (35% vs 9%)
- No diplopia (10% vs 31%)
- Avg improvement in proptosis (3mm vs 0.5mm)
- Avg CAS improvement (4 vs 2)
- Higher number of type II pts in treatment group than control group

Take-Home Message

- Teprotumumab improves Type II inflammatory Graves' and may be significant step forward in therapy
- Studies needed:
- Type I vs type II response
- Cost/risk benefit of each subtype

Compare teprotumumab vs pulsed steroids and acute decompression in active type II pts

Summary

- Sub-types necessary:
  - Categorize risk profile
  - Determine monitoring level
  - Choose treatment options
  - Interpret literature
  - Inform future research

Thank You

8:44 – 9:38 am

Moderators: Steven M. Couch, MD and Sara Tullis Wester, MD

8:44 am

Early Response of Intravenous Methylprednisolone for Restrictive Myopathy in Thyroid Eye Disease: A Prospective Observational Study

Kyung In Woo[1], Ji Woong Park[1], Jae ho Jang[2], Jung-Hoon Kim[1], Yoon-Duck Kim[1]
[1]Ophthalmology, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea, Republic of, [2]Ophthalmology, Kim Ki-Soo-Soo Eye Clinic, Jeju, Korea, Republic of

Introduction: Restrictive myopathy of extraocular muscle occurs in about half of the thyroid eye disease patients resulting in sometimes severe diplopia. High-dose systemic glucocorticoids are the first line of treatment to control the acute phase inflammation of thyroid eye disease. But, the clinical course of the muscle movement along with immunosuppressive treatment is not well elucidated. We want to evaluate an early response of intravenous methylprednisolone (IVMP) in patients with thyroid eye disease and restrictive myopathy.

Methods: A total of 28 patients who presented with diplopia within 20 degrees within 6 months of presentation from 2015 through 2018 were included. Clinical courses and functional outcomes including deviation angle, limitation of extraocular muscle movement (EOM), HESS score, binocular single vision (BSV) score, and clinical activity score were evaluated.

Results: At 6 months follow-up after IVMP treatment, although clinical activity score improved from 3.3 to 1.7, deviation angle changed from 13.1 to 19.1 prism diopter in average. The deviation angle improved in 10 (36%) patients, maintained in 7 (25%) patients, and worsened in 11 (39%) patients. In the increased deviation angle group, the angle worsened over time, while in the non-increased deviation angle group, it remained stationary throughout the follow-up. No affecting factors for progression of strabismus were identified.

Conclusions: It is the first report showing the effectiveness of IVMP in thyroid eye disease patients with restrictive myopathy, prospectively. Even though IVMP decreased soft tissue inflammation signs, there was a group of patients presenting rapid deterioration in deviation angle.

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Figure 1

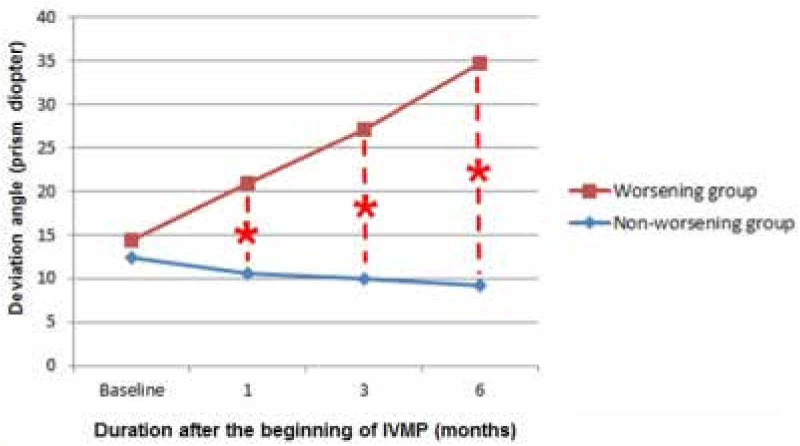

Figure 1. Generalized estimating equation (GEE) analysis of deviation angle with group and time.

* *p-value <0.05*

Figure 2

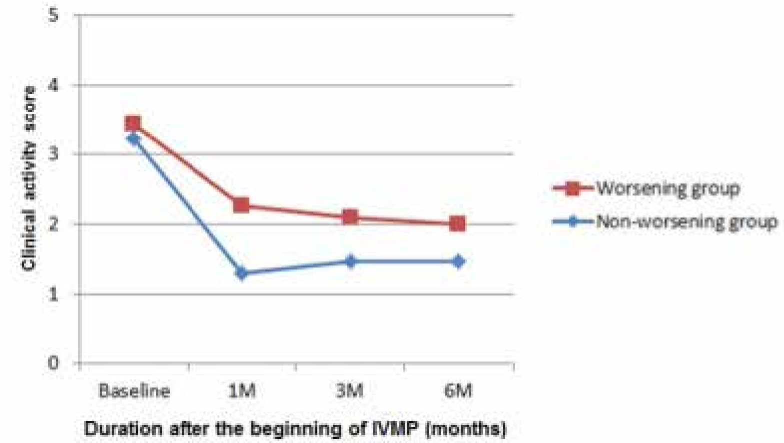

Figure 2. Generalized estimating equation (GEE) analysis of clinical activity score with group and time.

References:

1. JW Kim, YJ Woo, JS Yoon. Is modified clinical activity score an accurate indicator of diplopia progression in Graves' orbitopathy patients?. Endocr J. 2016 Dec 30;63(12):1133-40.
2. TY Lin, Ning Li, MW Yeh, AM Leung, DB Rootman. Prognostic indicators for the development of strabismus among patients with graves' ophthalmopathy. Journal of Clinical & Translational Endocrinology 2017;9:38–40.

8:50 am

“My-TED” Smartphone Application for Thyroid Eye Disease Patients

Andrea Tooley, Michael Kazim
Ophthalmology, Columbia University Medical Center, New York, New York, United States of America

Introduction: In partnership with the International Thyroid Eye Disease Society, a first of its kind smartphone application has been developed for patients with Thyroid Eye Disease (TED) to track and share symptoms with their physicians and assist individualized treatment planning. The introduction of this app to the public at the fall ASORPS meeting will allow physicians to give their patients a new and empowering tool to help manage their TED.

Methods: An iPhone compatible application has been developed for patients with TED and is available for download on the Apple app store. This app serves as a symptom tracker and enables patients to document symptoms and transmit data to their physicians. The core of the app consists of 5 key sections: Symptom Tracker, Care Card, Insights, Education, and Connect. The Symptom Tracker section is patterned after the “VISA” classification and allows patients to document symptoms daily, weekly, or monthly following the ITEDS classifications. The Symptom Tracker also includes a Quality of Life tracker. The “Insights” section provides longitudinally viewed, graphical displays of the symptom data over time. “Care card” encourages patients to track smoking status, medications, sleep, and exercise habits. Patients may use the “Educational” section to read about TED and connect to websites and other educational content. Finally, the “Connect” section allows patients to send data to their physicians for review prior to appointments.

Results: This application will be available for download from the Apple app store in the summer of 2019 and will be available to patients and practitioners. Currently, beta tester patients and ITEDS board members are using the app. This preliminary data from initial users will be presented. De-identified data collected from the application over time will be available for future research of TED. In the future we hope to use artificial intelligence (AI) to program the app as a predictive model of TED activity and disease course.

Conclusions: This is the first smart phone application for patients with TED. The goal of the app is to allow TED patients track changes in symptoms, lifestyle habits, medications, and treatment, methods to improve personalized treatment planning.

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Figure 1

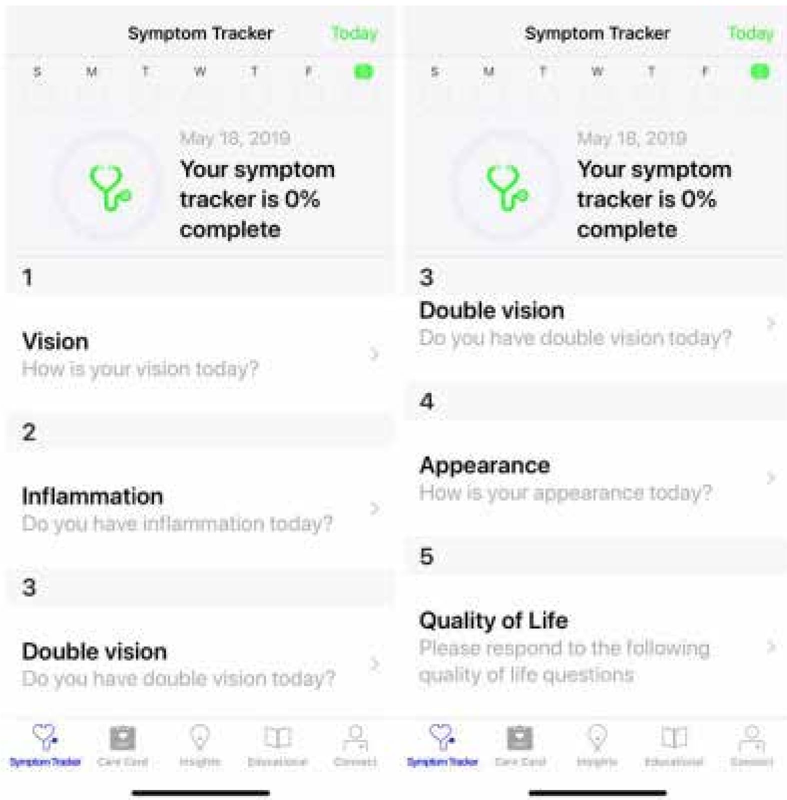
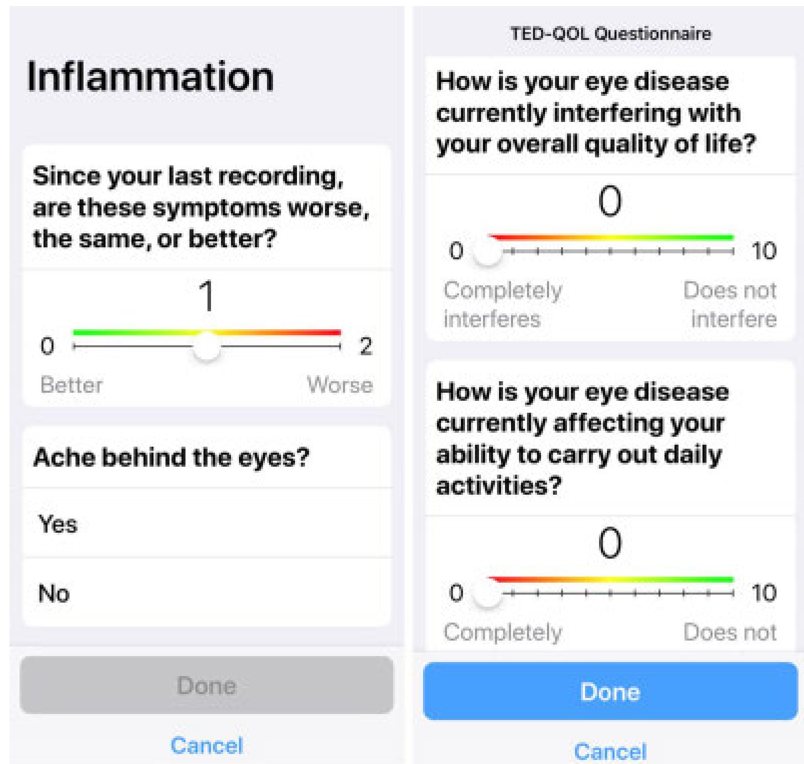


Figure 2



References:

1. Jingting W, Yuanyuan W, Chunlan W, et.al; Smartphone Interventions for Long-Term Health Management of Chronic Diseases: An Integrative Review. Telemedicine and e-Health 2014 20:6, 570-583.

8:56 am

A Deep Learning Framework for Recognizing Thyroid Eye Disease from Facial Photography

Justin Karlin[1], Lisa Gai[2], Kodi Collins[2], Nathan LaPierre[3], Daniel Rootman[4]

[1]Stein and Doheny Eye Institutes – UCLA, Los Angeles, California, United States of America, [2]Computer Science, University of California Los Angeles, Los Angeles, California, United States of America, [3]University of California Los Angeles, Los Angeles, California, United States of America, [4]Orbital and Ophthalmic Plastic Surgery, Stein and Doheny Eye Institutes – UCLA, Los Angeles, California United States of America

Introduction: The identification of facial and periocular signs of thyroid eye disease (TED) is typically performed by trained orbital and thyroid specialists. Delays in referral and management under this system are common, as peripheral or inexperienced providers are less acutely aware of early changes. Deep learning (DL), an implementation of neural networks, is useful in image classification (Gulshan et al) and facial feature recognition, and is well suited to perform screening for TED. We set out to apply DL to the task of recognizing TED from facial color photography.

Methods: Approximately 400 specialist verified photos of patients affected by TED and approximately 10,000 photos of unaffected patients (10k US adult faces, Bainbridge et al) were cropped using facial recognition (Open CV) to isolate the periocular regions in each photograph. Using the ResNet34 architecture and the PyTorch implementation (He et al), a DL model was trained and validated. Class activation maps (i.e. heat maps) were created to identify which portions of the image were most important in making predictions.

Results: The algorithm achieved 99% accuracy in distinguishing TED from “healthy” controls (Figure 1a shows ROC curve and precision-recall curve, Figure 1b shows confusion matrix). When 200 additional images of patients with conditions mimicking thyroid eye disease were interspersed with the “healthy” control images, the model remained 99% accurate in distinguishing TED, but the false positive rate increased. Class activation maps were generated demonstrating that key pixels in classification of TED are those that show stereotyped eyelid and periocular changes (Figure 2).

Conclusions: DL algorithms perform remarkably well in recognizing TED in facial photographs. Platforms such as the one described herein could open the door to using photography as part of public health screening for early TED, and thus could reduce the morbidity of delayed TED diagnosis.

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Figure 1

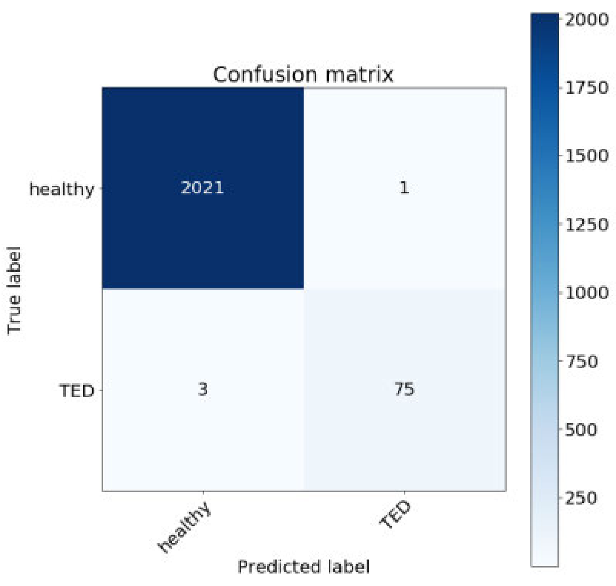


Figure 2

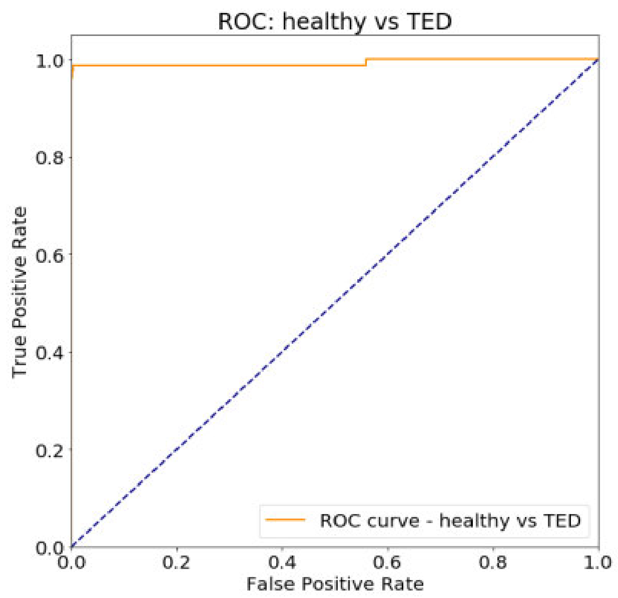


Figure 3

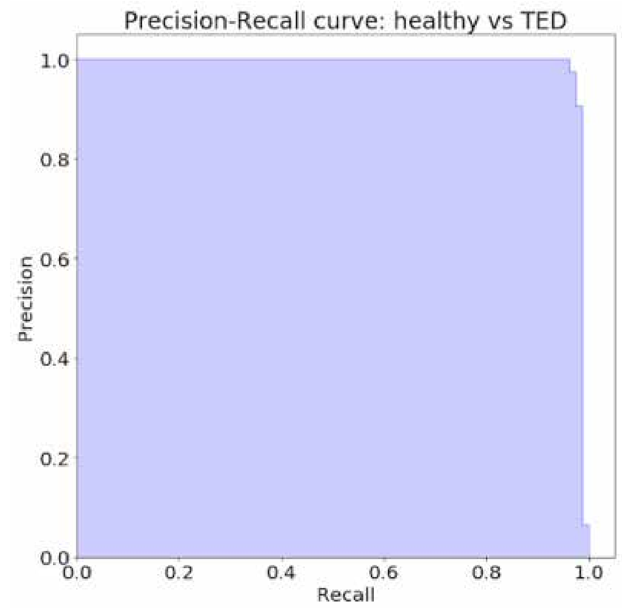


Figure 4

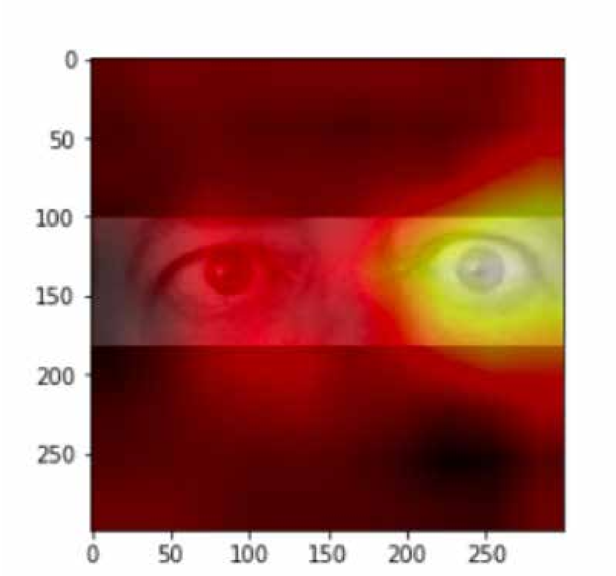
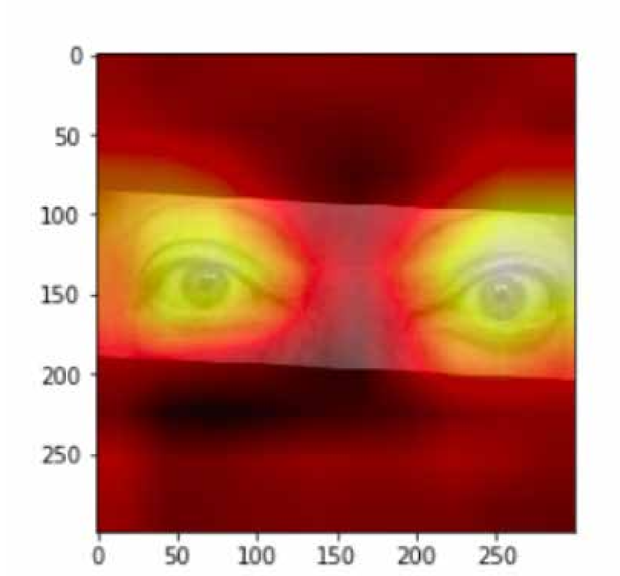


Figure 5



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9:02 am

Algorithmic Analysis of Eyelid Contour Outcomes after Orbital Decompression in Thyroid-Related Orbitopathy

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Introduction: To determine the effect of orbital decompression on eyelid contour in the setting of quiescent thyroid-related orbitopathy (TRO).

Methods: Retrospective interventional case series of all two-wall orbital decompressions performed by two oculoplastic surgeons at a single institution from 2018 to 2019 for reduction of proptosis. Exclusion criteria were patients with history of trauma, tumors, nerve palsy, or previous surgery, and patients undergoing concomitant blepharoplasty. Standardized photographs of patients in primary position were taken before and three months after surgery. The analysis of eyelid contour was completed before any further treatment. If patients had strabismus, only the fixating eye was used to measure eyelid contour. Two-wall decompression was performed via a retro-caruncular and an eyelid crease approach, respectively, leaving the upper and lower eyelid retractors and lateral canthus untouched.

Software developed in MATLAB (Natick, MA) using automation of the upper and lower eyelid contour with iris registration was employed. Primary outcome measurements included quantitative pre and post-operative upper and lower eyelid contour measurements. These were then compared to the same "normal" upper and lower eyelid contour of patients without TRO. A standard deviation (SD) from the mean normal upper and lower eyelid contour (MNU, MNL) was derived (Figure 1), with a larger SD indicating an eyelid contour further from these mean eyelid contours. A positive SD indicates that an eyelid contour is higher than the MNU or lower than the MNL (retraction). Comparisons of the standard deviations from the mean normal eyelid contours pre and post-operatively were performed using paired t-tests.

Results: Table 1, 2

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Seventeen eyes were included. The upper and lower eyelid contours in patients undergoing two-wall decompressions improved significantly after surgery with an average improvement in upper eyelid retraction of 0.71 standard deviations (p=0.023) from the MNU, and an average improvement in lower eyelid retraction of 0.56 standard deviations (p=0.001) from the MNL.

Conclusions: Orbital decompression only (without eyelid surgery) is associated with improvement in eyelid retraction via measurements of upper and lower eyelid contour (1-3). While eyelid position after orbital decompression using MRD1 and MRD2 has been studied before (2), our results differ in that we also found an improvement in upper eyelid contour and we used digital contour analysis to determine outcomes. Standardized photography and quantitative measurement allowed via the automatic digital eyelid contour analyzer provides more accurate and reliable results. Eyelid position should be assessed following decompression surgery prior to considering eyelid surgery, as eyelid position is likely to improve.

Figure 1

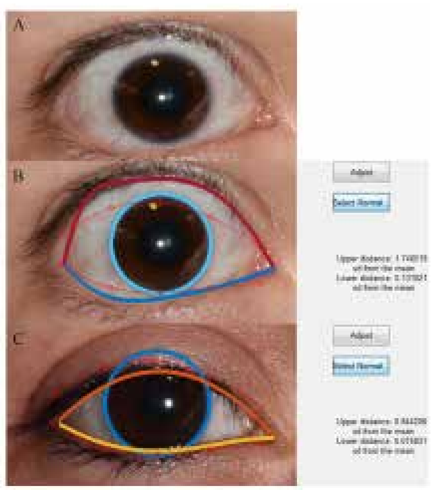

Figure 1. Eyelid contour pre and post-operatively after two-wall decompression.
A. Preoperative image demonstrating both upper and lower eyelid retraction of the right eye.
B. Preoperative image of same patient with eyelid contours (red and blue) representing the upper and lower eyelid outline. Blue circle indicates iris outline. Red line overlay represents standard eyelid contour.
C. Postoperative image of same patient after 3 wall decompression with eyelid contour (orange and yellow) compared to standard eyelid contour (red).

Table 1

Table 1: Demographics: Age, number of eyelids, gender and surgical approach used in patients

	Two-wall decompression (medial/lateral/fat)
No. eyelids	17
Mean age years (SD)	51.6 (16.5)
Female	16

SD = standard deviation

Table 2

Table 2: Pre and postoperative eyelid contours after two-wall decompression

	Preoperative (SD)	Postoperative (SD)	Change in eyelid contour (SD)[a]	P-Value*
UL contour	0.02 (1.4)	-0.69 (0.5)	0.71 (0.7)	**0.023**
LL contour	0.14 (0.2)	-0.42 (0.5)	0.56 (0.6)	**0.001**

SD = standard deviation; UL = upper eyelid; LL = lower eyelid
*Paired Two-sample t test
[a]These SDs indicate the magnitude of improvement in eyelid contour (retraction) postoperatively compared to preoperatively

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9:08 am

Therapeutic Effect of Curcumin, a Plant Polyphenol Extracted from Curcuma longae, in an in vitro Model of Graves' Orbitopathy

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Introduction: Graves' orbitopathy (GO) is pathologic manifestation of Graves' disease, an autoimmune disorder of the thyroid gland. Also known as thyroid eye disease (TED), the presentation of GO includes eye pain, eyelid retraction, edema of periorbital tissues, proptosis and compressive optic neuropathy. There is currently no reliable and specific therapeutic agent for GO. Glucocorticoids have so far been the first-line treatment, but side effects and complications necessitate a search for safer therapeutic alternatives. We examined the therapeutic effect of nontoxic concentrations of curcumin, a plant polyphenol extracted from Curcuma longae in primary cultures of orbital fibroblasts from Graves' orbitopathy (GO). We tested whether curcumin could counter inflammation, oxidative stress, and adipocyte differentiation, the three main pathogenic mechanisms in GO, in orbital fibroblasts taken from patients with GO. We further sought insights into the related mechanisms.

Methods: The effect of curcumin on interleukin(IL)-1β induced proinflammatory cytokine production was determined using quantitative real time PCR (RT-PCR), enzyme-linked immunosorbent assay (ELISA), and western blot analysis. Adipogenic differentiation was identified using Oil-Red O staining, and levels of peroxisome proliferator activator gamma (PPARγ) and CCAAT-enhancer-binding proteins (C/EBP) α/β were determined by western blot analyses. Antioxidant activity was measured using oxidant-sensitive fluorescent probe to detect intracellular reactive oxygen species (ROS) generated in response to hydrogen peroxide (H_2O_2) and cigarette smoke extract (CSE).

Results: Treatment with curcumin resulted in a dose and time-dependent decrease in IL-1β induced synthesis of inflammatory cytokines, including IL-6, IL-8, MCP-1 and ICAM-1 at both mRNA and protein levels. Decrease in lipid droplets and expression of PPARγ and c/EBPα/β were noted in fibroblasts treated with curcumin during adipose differentiation. CSE- or H2O2-induced ROS synthesis was significantly lower in curcumin-treated fibroblasts in comparison to the control. Curcumin significantly suppressed expression of IL-1β induced phosphorylated Erk, Akt, Jnk and NF-κB p65 proteins, and stimulated β-catenin translocation into nucleus during adipogenesis.

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Conclusions: Curcumin had anti-inflammatory, anti-oxidant and anti-adipogenic properties in GO fibroblasts in vitro. Curcumin suppressed the release of pro-inflammatory cytokines and inhibited activation of pro-inflammatory transcription factors. It also suppressed adipocyte differentiation through the PPARγ-C/EBPα pathway as well as β-catenin pathway. The ingredient prevented ROS formation in GO fibroblasts challenged with H_2O_2 and CSE.

In conclusion, curcumin inhibits pro-inflammatory cytokine production, ROS synthesis and adipogenesis in orbital fibroblasts of GO patients in vitro possibly related to multiple pro-inflammatory signaling molecules and β-catenin pathway. The results of the study support potential use of the curcumin in the treatment of GO.

Figure 1

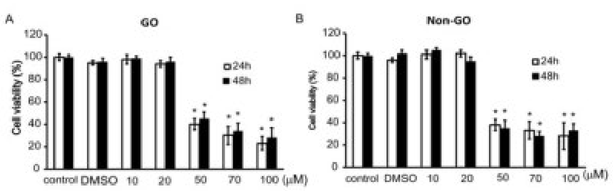

Figure 2

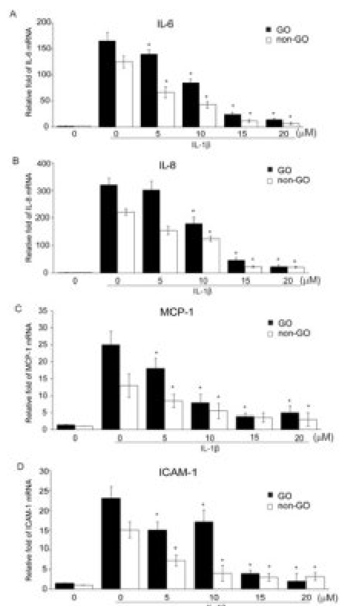

Figure 3

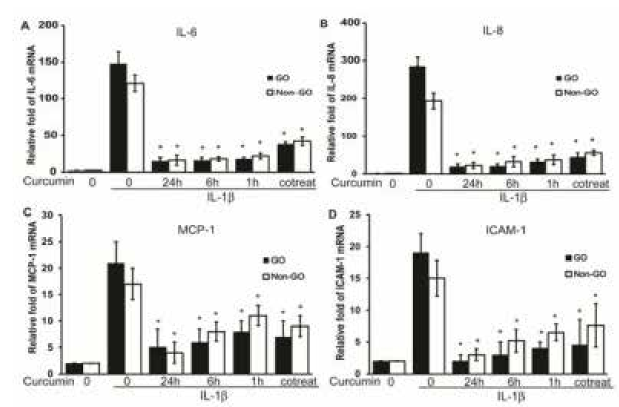

Figure 4

Figure 5

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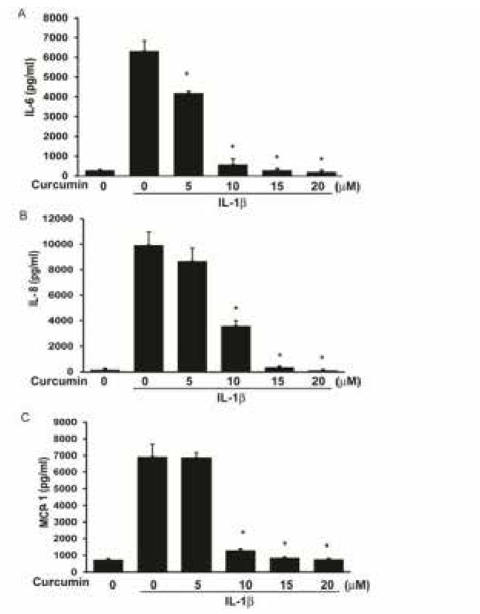

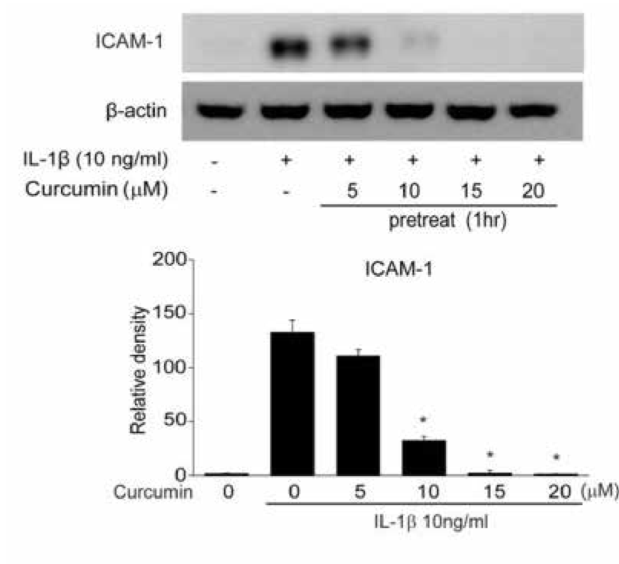

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9:14 am

Teprotumumab Infusions Reduce Proptosis in Thyroid-Eye Disease in a Randomized, Placebo-Controlled, Clinical (OPTIC) Study: Effectiveness on Diplopia and other Secondary Outcomes

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Introduction: Active thyroid eye disease (TED) is an autoimmune disease characterized by orbital pain, redness, and swelling that may progress to clinically significant proptosis and diplopia. The effectiveness of teprotumumab in active TED was previously demonstrated in a double-masked, randomized, placebo-controlled Phase 2 study.[1] Here we report the primary and secondary outcomes from the confirmatory Phase 3 OPTIC study.[2]

Methods: OPTIC (NCT03298867) is a 24-week randomized, double-masked, placebo-controlled, parallel-group, multicenter study in adults with active, moderate-to-severe TED. Patients were treated with teprotumumab or placebo every three weeks for a total of 8 infusions. Key eligibility criteria included onset of TED symptoms within the past 9 months and patients were euthyroid or had only mild hypo- or hyperthyroidism. The primary outcome was the percentage of patients with a reduction in proptosis of ≥2 mm at week 24 in the study eye without similar fellow-eye worsening. Secondary outcomes were overall responder rate (% of patients with ≥2 mm proptosis reduction AND ≥2-point CAS reduction) at week 24, CAS responder rate (% of patients with a CAS value of 0 or 1) at week 24, % of patients with an improved diplopia score at week 24, average proptosis and GO-QoL score change from baseline through week 24, as compared with placebo.

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Results: patients in the teprotumumab group and 42 patients in the placebo group were randomized, with 95% of patients completing the study in both groups. Demographics and baseline characteristics were balanced between groups, including smoking, a known risk factor for TED. Significantly more patients in the teprotumumab group achieved the primary endpoint compared to the placebo group (82.9% vs 9.5%) at week 24 with a treatment difference of 73.5% ($p<0.001$). The response to teprotumumab was early with 23 patients (56.1%) achieving a ≥2 mm reduction at week 6 (after ½ test dose and one full-dose infusion). The average change in proptosis from baseline through week 24 was significantly greater in patients who received teprotumumab than in those receiving placebo (-2.82 vs. -0.54 mm, $p<0.001$). The overall responder rate was significantly higher with teprotumumab (32/41 [78.0%] vs. 3/42 [7.1%], $p<0.001$). A higher percentage of patients achieved a CAS value of 0 or 1 at week 24 with teprotumumab (24/41 [58.5%] vs. 9/42 [21.4%], $p<0.001$). In patients with baseline diplopia, the diplopia responder rate was significantly higher with teprotumumab (19/28 [67.9%] vs. 8/28 [28.6%], $p=0.001$). Improvement in average change from baseline through week 24 in GO-QOL overall score, was significantly greater in patients who received teprotumumab (overall: 13.79 vs. 4.43, $p<0.001$; visual functioning subscale: 12.39 vs. 4.21, $p=0.035$; appearance subscale: 14.43 vs. 4.22, $p=0.001$). No new safety signals were identified versus Phase 2 study.

Conclusions: The results of this phase 3 clinical trial confirm the effectiveness and safety of teprotumumab observed previously in the phase 2 study. Teprotumumab reduces proptosis, diplopia, and the clinical symptoms of inflammation in active, moderate to severe TED patients, while providing a clinically meaningful improvement in quality of life.

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10:08 – 10:44 am

Moderators: Michael T. Yen, MD and Neda Esmaili, MD

10:08 am

Minimally Invasive Corneal Neurotization for Postherpetic Neurotrophic Keratopathy: Initial Experience and Clinical Outcomes

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Introduction: Corneal sensation is integral to the health and structural integrity of the corneal epithelium, but is significantly impaired in neurotrophic keratopathy (NK). The most common etiology of NK is herpes simplex and varicella zoster keratitis, both of which are prone to recurrent episodes and corneal anesthesia-related complications of poor prognosis.[1] Corneal neurotization procedures have been shown to successfully reinnervate devitalized corneas and improve visual prognosis, but their results have not been well studied in postherpetic NK specifically. This study examines the early outcomes of minimally invasive corneal neurotization for postherpetic NK.

Methods: Medical records of patients who underwent corneal neurotization for postherpetic NK by a single experienced oculoplastic surgeon (I.M.L.) from March 2017 to March 2019 were retrospectively reviewed. Stage and etiology of NK as well as comorbidities, prior treatment history, exam findings, neurotization technique, donor nerve site, preoperative and postoperative visual acuity (VA), preoperative and postoperative corneal sensation by cotton wisp or Cochet-Bonnet esthesiometer, and follow-up duration were recorded and evaluated. Differences between preoperative and postoperative values were analyzed by the Wilcoxon signed-rank test.

Results: Of 18 patients who underwent corneal neurotization, three (16.7%) had history of herpes simplex keratitis and/or endotheliitis, and two others (11.1%) had history of herpes zoster ophthalmicus (Table 1). Two of these patients (40.0%) had Mackie[2] stage 1 disease, one (20.0%) had stage 2, and two (40.0%) had stage 3 with impending perforation. Median age at time of neurotization was 78.9 years (interquartile range [IQR]: 63.7-82.9 years), with median follow-up duration of 11.8 months (IQR: 8.1-15.6 months, Table 2). An endoscopic technique[3] was used in three patients (60.0%), and a decellularized nerve allograft[4] was used in two (40.0%). Donor sites included the contralateral supraorbital nerve (n = 2, 40.0%), ipsilateral supraorbital nerve (n = 2, 40.0%), and ipsilateral infraorbital nerve (n = 1, 20.0%). Corneal sensation improved significantly postoperatively ($P = 0.043$), with one patient achieving full sensation by postoperative month 5 (Fig. 1). All patients with a persistent epithelial defect preoperatively showed either complete or nearly complete corneal healing by their last follow-up visit (Table 2). VA also improved postoperatively in all patients ($P = 0.043$). The degree of VA

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improvement was limited by persistent central corneal scarring (n = 1), irregular astigmatism from a new full-thickness corneal graft (n = 1), and prior history of retinal detachment (n = 2).

Conclusions: Corneal neurotization can successfully reinnervate corneas devitalized by herpetic disease and halt the progressive nature of postherpetic NK. If utilized appropriately and early in the disease process, minimally invasive techniques of corneal neurotization may reduce morbidity and maximize visual potential in postherpetic NK.

Figure 1

Table 1: Patient Demographics and Clinical Features

Case	Age (years)	Gender	Comorbidities including relevant ocular history	Laterality of NK	Etiology of NK	Stage of NK* (description of findings)	Prior treatment failure
1	66	F	Atrial fibrillation, hypertension, low-risk glaucoma suspect OU	OS	VZV	Stage 3 (approximately 2.2 mm by 4.7 mm neurotrophic ulcer, with Descemet membrane folds and stromal thinning)	Topical ocular lubrication, valacyclovir, lateral tarsorrhaphy
2	67	M	Hypertension, CAD s/p CABG, peripheral artery disease s/p aortofemoral bypass surgery, OSA on CPAP, GERD, tobacco smoking history	OD	VZV	Stage 1 (diffuse PEEs, anesthetic cornea by testing of corneal sensation with wisp of cotton)	Topical ocular lubrication only
3	58	M	Hypothyroidism, GERD	OD	HSV	Stage 3 (approximately 1.5 mm by 1.8 mm central descemetocele, no overlying epithelium intact, Seidel negative)	Topical ocular lubrication, course of oral corticosteroids, increased dosage of valacyclovir, cyanoacrylate glue with BCL, AMG (2), DCR
4	78	F	CAD, T2DM, hypothyroidism, PXF glaucoma OU s/p SLT OS and s/p trabeculectomy followed by insertion of Ahmed glaucoma implant OD, pseudophakia OU complicated by IOL dislocation OD s/p IOL removal and ACIOL placement OD, macula-involving retinal detachment OD s/p 23g PPV/PFO/FAX/EL/16% C_3F_8 OD complicated by recurrent macula involving retinal detachment s/p 23g PPV/MP/PFO/EL/FAX/14% C_3F_8 OD, prior tobacco smoking history	OD	HSV	Stage 1 (irregular but intact epithelium, no frank epithelial defect, faint anterior stromal scar over central visual axis, decreased corneal sensation by wisp of cotton)	Topical ocular lubrication, oral doxycycline, increased dosage of valacyclovir
5	75	M	CAD s/p cardiac stent placement, T2DM, prior tobacco smoking history, history of congenital cataracts s/p CEIOL OU with ACIOL OD complicated by PBK OD s/p PKP OD, history of PKP graft dehiscence s/p repair, history of PKP graft failure s/p repeat PKP OD, history of chronic angle-closure glaucoma OD s/p insertion of Ahmed glaucoma implant OD, history of retinal detachment OU s/p repair	OD	HSV	Stage 2 (PKP graft with mild diffuse haze, 30% PED, loose epithelium inferiorly)	Topical ocular lubrication, topical ganciclovir, increased dosage of valacyclovir

*Staging of NK was determined by the Mackie classification.[2]

Abbreviations: ACIOL, anterior chamber intraocular lens; AMG, amniotic membrane graft; BCL, bandage contact lens; CABG, coronary artery bypass grafting; CAD, coronary artery disease; CEIOL, cataract extraction and insertion of intraocular lens; CPAP, continuous positive airway pressure; DCR, dacryocystorhinostomy; EL, endolaser; FAX, fluid-air exchange; GERD, gastroesophageal reflux disease; HSV, herpes simplex virus; IOL, intraocular lens; MP, membrane peel; NV, neovascularization; OD, oculus dexter (right eye); OS, oculus sinister (left eye); OSA, obstructive sleep apnea; OU, oculus uterque (both eyes); PBK, pseudophakic bullous keratopathy; PED, persistent epithelial defect; PEE, punctate epithelial erosion; PFO, perfluoro-N-octane; PKP, penetrating keratoplasty; PXF, pseudoexfoliation; PPV, pars plana vitrectomy; s/p, status post; SLT, selective laser trabeculoplasty; T2DM, type 2 diabetes mellitus; VZV, varicella zoster virus.

Figure 2

Table 2: Corneal Neurotization Technique, Postoperative Follow-up, and Early Outcomes

Case	Neurotization technique	Donor nerve	Follow-up interval (months)	Preoperative VA	Postoperative VA	Preoperative corneal sensation*	Postoperative corneal sensation*	Postoperative presence of PED	Postoperative recurrence of HSV/VZV	Subsequent procedure(s)
1	Endoscopic	Contralateral supraorbital nerve	17	CF at face	20/300 PH 20/80†	Absent by wisp of cotton	S – 4.0 cm N – 3.0 cm I – 4.0 cm T – 4.0 cm C – 1.0 cm Mean – 3.2 cm†	None†	None	None
2	Allograft	Contralateral supraorbital nerve, with 1 mm x 7 mm nerve graft coapted in end-to-end fashion	12	20/70	20/30‡	S – 1.0 cm N – 1.0 cm I – 1.5 cm T – 1.0 cm C – 3.0 cm Mean – 1.5 cm	S – 6.0 cm N – 6.0 cm I – 6.0 cm T – 6.0 cm C – 6.0 cm Mean – 6.0 cm‡	None‡	None	None
3	Endoscopic (combined with same-day PKP)	Ipsilateral supraorbital nerve	14	20/80 at 4'	20/400§	S – 0.0 cm N – 0.0 cm I – 0.0 cm T – 0.0 cm C – 0.0 cm Mean – 0.0 cm	S – 3.0 cm N – 2.5 cm I – 2.5 cm T – 3.0 cm C – 1.0 cm Mean – 2.8 cm§	None§	None	CEIOL at postoperative month 12
4	Allograft	Ipsilateral infraorbital nerve, with 1 mm x 5 mm nerve graft coapted in side-to-end fashion	11	20/400 (eccentric)	20/300 (eccentric)**	S – 1.0 cm N – 1.5 cm I – 3.0 cm T – 3.0 cm C – 1.0 cm Mean – 2.3 cm	S – 3.0 cm N – 3.0 cm I – 5.0 cm T – 6.0 cm C – 3.0 cm Mean – 4.0 cm**	None**	None	None
5	Endoscopic	Ipsilateral supraorbital nerve	5	CF at face	CF at 1'††	S – 2.0 cm N – 2.0 cm I – 2.0 cm T – 2.0 cm C – 1.0 cm Mean – 1.8 cm	S – 5.5 cm N – 5.5 cm I – 5.0 cm T – 5.5 cm C – 3.5 cm Mean – 5.1 cm††	Approximately 1.0 mm by 0.8 mm central epithelial defect††	None	None

*Both preoperative and postoperative corneal sensation was measured superiorly (i.e., 12:00 for either right or left eye), nasally (i.e., 3:00 for right eye, 9:00 for left eye), inferiorly (i.e., 6:00 for either right or left eye), temporally (i.e., 9:00 for right eye, 3:00 for left eye), and centrally by Cochet-Bonnet esthesiometry, where 0.0 cm denotes absent corneal sensation and 6.0 cm represents full corneal sensation. In case 1, preoperative corneal sensation was not measured by Cochet-Bonnet esthesiometry but was determined qualitatively by cotton wisp.
†Postoperative VA (with correction), postoperative corneal sensation, and postoperative presence of PED were obtained at postoperative month 17.
‡Postoperative VA (without correction), postoperative corneal sensation, and postoperative presence of PED were obtained at postoperative month 12. In this case, full corneal sensation was achieved by postoperative month 5.
§Postoperative VA (without correction), postoperative corneal sensation, and postoperative presence of PED were obtained at postoperative month 14. In this case, postoperative corneal sensation was obtained peripherally in native host cornea, whereas the central measurement was obtained within the donor graft. The reported mean value was determined by averaging the measurements obtained from native host cornea only.
**Postoperative VA (with correction), postoperative corneal sensation, and postoperative presence of PED were obtained at postoperative month 11.
††Postoperative VA (without correction), postoperative corneal sensation, and postoperative presence of PED were obtained at postoperative month 5.

Abbreviations: C, central cornea; CEIOL, cataract extraction and insertion of intraocular lens; CF, counting fingers; HSV, herpes simplex virus; I, inferior cornea; N, nasal cornea; NI, no improvement; PED, persistent epithelial defect; PH, pinhole; PKP, penetrating keratoplasty; S, superior cornea; T, temporal cornea; VA, visual acuity; VZV, varicella zoster virus.

Figure 3

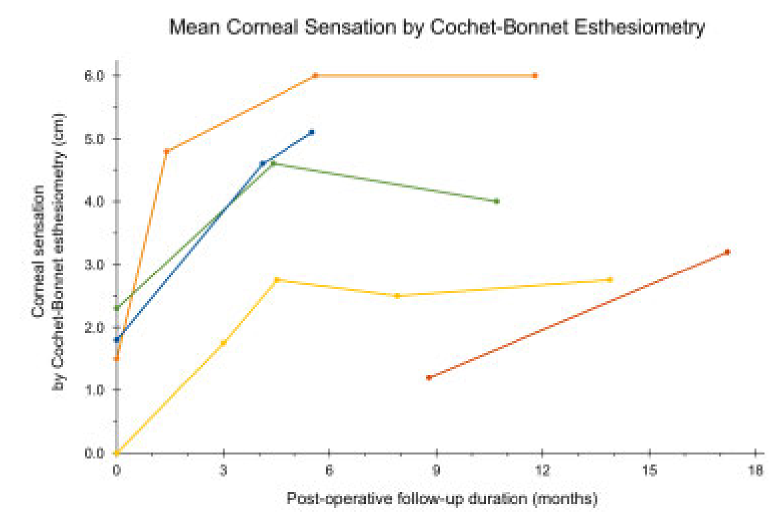

Figure 1: Corneal sensation was measured superiorly (i.e., 12:00 for either right or left eye), nasally (i.e., 3:00 for right eye, 9:00 for left eye), inferiorly (i.e., 6:00 for either right or left eye), temporally (i.e., 9:00 for right eye, 3:00 for left eye), and centrally by Cochet-Bonnet esthesiometry, where 0.0 cm denotes absent corneal sensation and 6.0 cm represents full corneal sensation. Mean values are plotted in the graph. In case 1 (red), preoperative corneal sensation was not measured by Cochet-Bonnet esthesiometry but was determined qualitatively by cotton wisp. In case 2 (orange), full corneal sensation was achieved by postoperative month 5. In case 3 (yellow), postoperative corneal sensation was obtained peripherally in native host cornea, whereas the central measurement was obtained within the donor graft. The reported mean value was determined by averaging the measurements obtained from native host cornea only. Cases 4 and 5 are plotted in green and blue, respectively.

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10:14 am

Intralesional Injection of Bleomycin Combined with Orbital Decompression for Treatment of Cavernous Venous Malformation Located at Orbital Apex

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Introduction: The orbital apex is the very portal between the intracalvarium and orbit, which hosts high density of critical neurovascular structures. The management of cavernous venous malformation (CVM) located at this region is still challenging. The purpose of the present study is to evaluate the safety and efficacy of intralesional injection of bleomycin combined with orbital decompression (IIBCOD) for treatment of apical CVM.

Methods: Design: Open-label, single-center, single-arm treatment trial.

Participants: Patients with apical CVM confirmed by both clinical characteristics and contrast-enhanced magnetic resonance imaging.

Methods: Eligible subjects were performed with IIBCOD surgery by the same surgical team. Evaluation Visits included baseline, 2 to 4 months and 12 months postoperation.

Main Outcome Measures: The efficacy and safety assessments generally include four aspects: tumor response, visual function and optic nerve morphology and function. Tumor response was evaluated by the tumor volume change. The visual function assessment includes the best-corrected visual acuity (BCVA, measured by Snellen chart and transformed into logarithm of the minimum angle of resolution (LogMAR) for analysis) and Humphrey visual field. The optic nerve morphology evaluation includes the thickness of retinal nerve fiber layer thickness (RNFL) and ganglion cell complex (GCC), and optic nerve head (ONH) morphology. The optic nerve function was reflected by pattern VEP and and papillary light reflex.

Results: Between December 2016 and December 2018, 14 subjects were enrolled and 13 of whom completed the study. The mean tumor volumes at baseline, averaged 3rd month and 12th month postsurgery were 2652±3475 mm^3, 762±1166 mm^3 (shrinkage rate, 74.7±13.3%) and 455±678 mm^3 (shrinkage rate, 85.6±12.2%) respectively. All the subjects demonstrated improvement in BCVA (baseline 0.70 ± 0.74 vs. 12th month 0.16±0.30, p=0.0153) and visual field (mean deviation: baseline -16.51±11.66 vs. 12th month -6.97±7.16, p=0.0223). The major restoration of BCVA and visual field happened in the first 3 months after surgery. The thickness of RNFL and GCC were slightly decreased and the amptitude of P100 slightly improved after treatment, however the differences were not statistically significant (RNFL: baseline 91.35±18.50 vs. 12th month 80.89±20.38, p=0.2442; GCC, baseline 80.31±14.23 vs. 12th month 77.84±14.14, p=0.6965; P100, 32×32

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grid, baseline 7.31±4.30 vs. 12th month 9.00±5.92, $p=0.4555$). The ONH morphology of 11 subjects remained unchanged before and after surgery. ONH edema in 2 subjects at baseline faded at visits. There were 9 subjects existing positive RAPD before surgery, 7 of which turned negative at visits. Two subjects remained positive at final evaluation. Complications included 1 enophthalmus and 1 deepening of superior sulcus palpebralis.

Conclusions: IIBCOD surgery is a safe, effective, and less invasive operation, which provides a therapeutic option for CVM located at orbital apex.

Figure 1

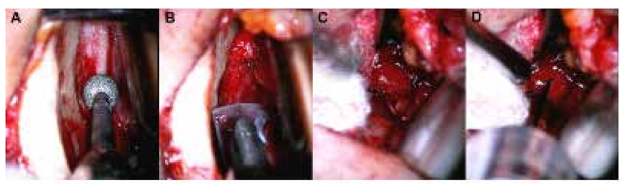


Figure 2

Table 1. Demographics and Clinical Characteristics of Patients

Patient no.	Age (yrs)	Gender	Eye	Signs and Symptoms	Duration of Symptoms (mos)	Best-Corrected Visual Acuity (Snellen)	Relative Afferent Pupillary Defect	Orbital Decompression
1	54	Male	Left	Blurring of vision, Visual field defect	36	20/300	+	Lateral
2	41	Male	Left	Blurring of vision, Visual field defect, proptosis	60	20/30	+	Lateral & Medial
3	51	Male	Left	Discoveried by Physical examination, proptosis	1	20/40	-	Lateral
4	24	Female	Right	Blurring of vision, Visual field defect	1	20/200	+	Medial
5	59	Female	Left	Blurring of vision, Visual field defect, proptosis	48	HM	+	Lateral & Medial
6	56	Female	Left	Discoveried by Physical examination, proptosis	1	20/30	-	Lateral
7	45	Female	Left	Blurring of vision, Visual field defect, proptosis	3	20/100	+	Medial & Inferior
8	60	Female	Right	Discoveried by Physical examination	3	20/30	-	Lateral
9	39	Female	Right	Blurring of vision, Visual field defect	1	20/40	+	Medial & Inferior
10	53	Female	Right	Blurring of vision, Visual field defect	4	20/100	+	Lateral
11	29	Female	Right	Blurring of vision, Visual field defect, proptosis	1	20/20	-	Lateral
12	49	Male	Left	Blurring of vision, Visual field defect	36	CF/10cm	+	Medial
13	44	Female	Right	Proptosis	24	20/20	+	Medial

HM = Hand move, CF = counting fingers, + = positive, - = negative

Figure 3

Table 2. Dynamic change of tumor volume

Time point \ Patient No.		1	2	3	4	5	6	7	8	9	10	11	12	13
Baseline	Volume (mm^3)	1718	1878	1721	1006	13942	1231	2566	1341	2184	910	2023	539	3406
Evaluation visit 1	Volume (mm^3)	567	711	140	277	4440	210	1403	81	517	90	484	169	812
	Shrinkage rate (%)*	**67.0**	**62.2**	**91.9**	**72.5**	**68.2**	**82.9**	**45.4**	**94.0**	**76.3**	**90.1**	**76.1**	**68.6**	**76.2**
Final evaluation visit	Volume (mm^3)	343	618	10	119	2443	101	1107	66	261	31	157	35	621
	Shrinkage rate (%)*	**80.1**	**67.1**	**99.4**	**88.2**	**82.5**	**91.8**	**56.9**	**95.1**	**88.1**	**96.6**	**92.3**	**93.5**	**81.8**
	Shrinkage rate (%)**	**39.5**	**13.1**	**92.8**	**57.1**	**45.0**	**51.9**	**21.1**	**18.6**	**49.6**	**65.8**	**67.6**	**79.3**	**23.6**

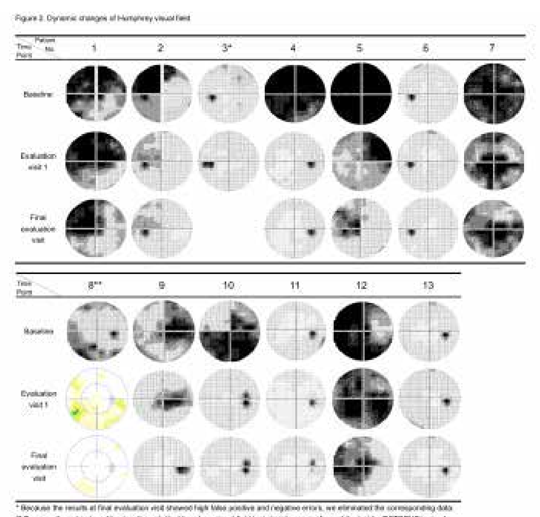
* The tumor volume compared to baseline
** The tumor volume compared to evaluation visit 1

Figure 4

Table3. Dynamic change of BCVA (Snellen charts)

Time point	Patient Number 1	2	3	4	5	6	7	8	9	10	11	12	13
Baseline	20/300	20/30	20/40	20/200	HM	20/30	20/100	20/30	20/40	20/100	20/20	CF/10cm	20/20
Evaluation visit 1	20/70	20/25	20/20	20/20	20/400	20/20	20/50	20/20	20/25	20/20	20/20	20/400	20/20
Final evaluation visit	20/50	20/20	20/20	20/20	20/40	20/20	20/50	20/20	20/20	20/20	20/20	20/200	20/20

Figure 5



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10:20 am

3D Printing for Custom Orbital Prosthesis

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Introduction: Orbital exenteration is the surgical practice of removing the entire orbital contents and is typically performed in patients with locally invasive orbital malignancies. Although this operation is oftentimes life-saving, it has a profound psychological impact on patients, leaving a disfiguring cosmetic defect. Orbital prostheses are created as a means of camouflaging the defect, but are expensive and time consuming to fabricate by even an experienced ocularist. A replacement unit is often needed within 4-5 years due to wear and tear. Due to the cost of a replacement, many patients may forgo wearing a prosthesis and instead elect to wear a patch over the exenteration socket. We have designed a proof-of-concept process to rapidly fabricate a customized orbital prosthetic using 3D printing technology.

Methods:

1. Facial topography mapping and data collection: A digital representation of the orbital defect and contralateral periorbital region is obtained using a handheld, blue-LED 3D scanner. The periorbital skin is scanned over 8 regions using a colorimeter to obtain the corresponding digital skin tone registry.

2. Digital data manipulation: The data is uploaded into Geomagic Studio software for further customization. After defining a line of symmetry, a mirrored topographical mesh of the contralateral periorbital region is blended with the orbital defect scan, thus establishing the anterior and posterior contours for the prosthesis.

3. Following software customization of the socket, a mold is printed using a 3D printer. Based on the colorimeter register, a defined pigment palette is mixed with a biocompatible elastomer in a speed mixer to produce the patient's skin base tone.

4. The elastomer preparation is injection molded into the 3D printed mold and allowed to set. Additional extrinsic shading is colored by hand and eyelashes are affixed with glue. The ocular piece is made separately without using the 3-D printing technique. See Figure 1.

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Results: The entire manufacturing process by adapting these new technologies into the process is 40hr, with a total of 3.5hr of hands-on time by personnel. Three patients underwent this proof-of-concept 3-D printing process for construction of an orbital exenteration prosthesis. No patients suffered prosthetic discomfort, ulceration of the skin, or adverse allergic reaction to the elastomers. All patients achieved satisfactory cosmesis (Figures 2 and 3).

Conclusions: Orbital prosthesis fabrication is a time-intensive process that can only be performed by a limited number of trained prosthetists. Furthermore, access to these specialists may be limited by proximity or by costs. In many cases, the cost of a replacement creates a significant financial burden. Adapting newer technologies such as the 3-D scanning and printing, we are able to provide a high-resolution, anatomical replication of our patients' unique facial topography in a low-cost, rapid access manner. The digitalized data may be stored for future replacements without the need for patient contact. Our aim is to make this technology accessible in underserved countries and to reduce the cost of fabrication of protheses.

Figure 1

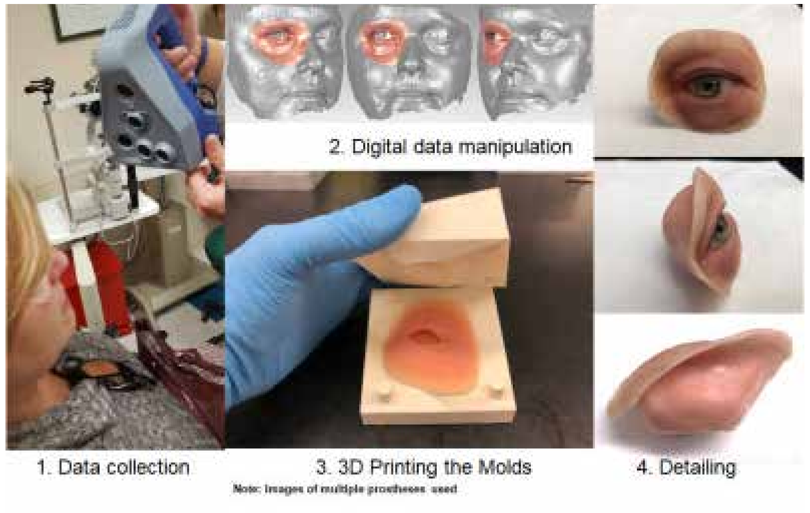

Figure 2

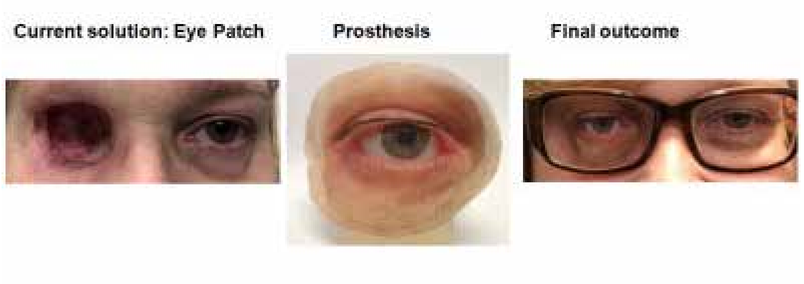

Figure 3

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10:24 am

Semi-automated Fabrication of a Customized Orbital Prosthesis with Three-dimensional Printing Technology

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Introduction: Orbital prostheses are implants made to fill missing tissue sites and cover the defects and are used for the cosmetic and rehabilitation of patients. The traditional manufacturing method of the orbital prosthesis is labor-intensive, time-consuming, and expensive. As three-dimensional (3D) printing technology has advanced, utilization of this technology in the medical field has also widened. We describe how to design a virtual orbital prosthesis and a negative mold using a 3D printer with the patient's facial 3D data and ocular prosthesis data.

Methods: A portable scanner was used to acquire 3D modeling data of the patient's facial surface and ocular prosthesis. The 3D scanning equipment that illuminates the surface light source is portable and can acquire 3D model data directly from any place, with a precision of 0.01 to 0.03 mm which is more accurate than the CT. The outline and skin texture of the orbital prosthesis were designed using computer aided design (CAD) software.

Results: Using a 3D printer, 3D modeling data of the eyelid area and the eye prosthesis were printed, and the pupil center of the defect side is compared with the healthy side to determine the appropriate position for insertion of the ocular prosthesis. We designed two negative molds that can be assembled using the completed virtual orbital prosthesis data, and printed them using 3D printers with biocompatible materials. The negative mold is injected using a syringe containing medical silicone and the orbital prosthesis is completed.

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Conclusions: This paper showed that 3D CAD programs and 3D printing technology can be applied to fabricate orbital prostheses. In the case of the traditional handmade production, the facial frame of the patient may be different depending on the experience and ability of the ocularist. Patients may experience discomfort or skin troubles due to the materials used to create the facial frame, and have to visit the hospital about 3-5 times before making the silicone orbital prosthesis. In addition, high production cost is inevitable due to massive materials used in various steps of making the orbital prosthesis. The skin problem caused by alginate can be avoided by scanning facial shape using a 3D scanner. By using a 3D CAD program and a 3D printer, patients need less hospital visits compared to the conventional process and the manufacturer can reduce the cost of orbital prosthesis. This method reduces the time and skill required to fabricate a quality, custom-made orbital prosthesis while doing no damage to the patient's soft tissues.

Figure 1

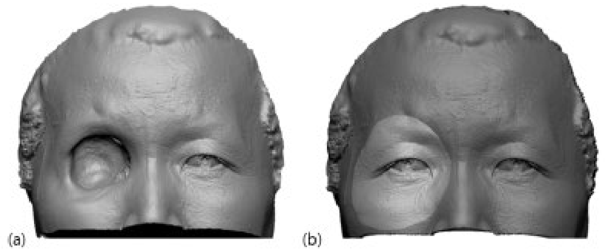

Figure 2

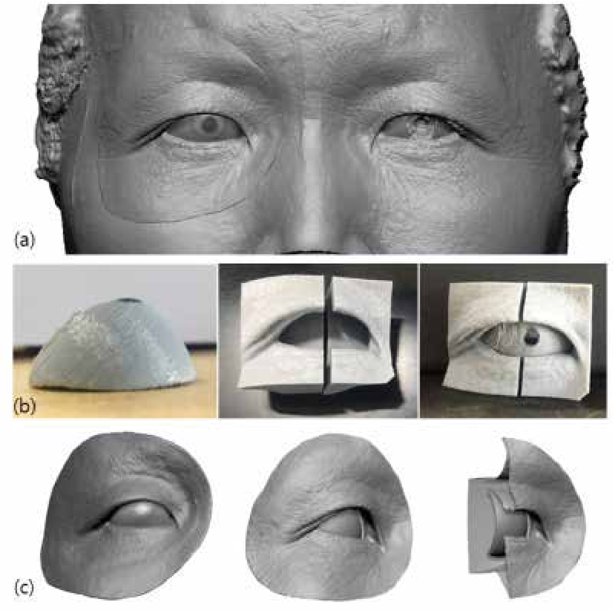

Figure 3

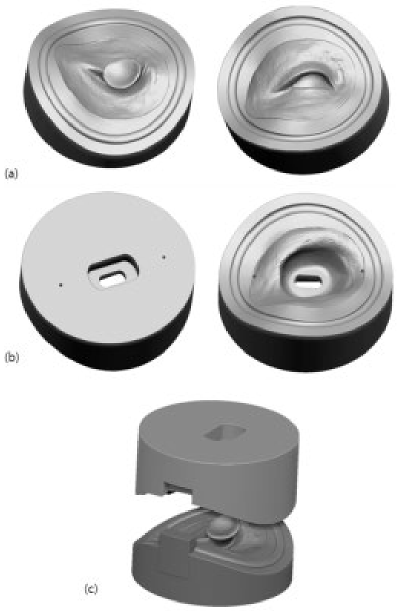

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Figure 4

Figure 5

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10:28 am

Frequency and Fate of Residual Orbital Lesions after Treatment of Orbital Rhabdomyosarcoma

Rachel Sobel[1], Joshua Ford[2], Erin Shriver[3], Gregory Griepentrog[4], Matthew Debnam[5], Bita Esmaeli[6]

[1]Ophthalmology, Vanderbilt University Medical Center, Nashville, Tennessee, United States of America, [2]Plastic Surgery, University of Texas MD Anderson Cancer Center, Houston, Texas, United States of America, [3]Ophthalmology, University of Iowa Hospital and Clinics, Iowa City, Iowa, United States of America, [4]Ophthalmology, Medical College of Wisconsin, Milwaukee, Wisconsin, United States of America, [5]Radiology, University of Texas MD Anderson Cancer Center, Houston, Texas, United States of America, [6]Plastic Surgery, University of Texas MD Anderson Cancer Center, Nashville, Tennessee, United States of America

Introduction: Orbital rhabdomyosarcoma (ORMS) is the most common malignant pediatric orbital tumor. Diagnosis is usually established through debulking surgery, and chemotherapy and radiation are used to achieve local control with eye preservation in the majority of patients. In some cases a residual orbital mass is seen at the end of treatments and this always raises concern for possible active disease and risk of progression. The purpose of this study is to evaluate the frequency and fate of a residual orbital mass after full treatment of ORMS and explore factors that may correlate with progression of the residual orbital lesion.

Methods: A retrospective review of all consecutive patients with ORMS from four academic centers between 1998 and 2018. Outcomes assessed included demographics, histologic subtype of RMS, tumor response at 12 weeks after initiation of chemotherapy and also at the end of all treatments, time to resolution or progression of orbital mass after completion of treatment.

Results: Thirty-seven patients (21 males,16 females) were included. Of note, there were 25 pediatric patients (median age=7 years; range:1 month to 17 yrs), and there were 12 adult patients (median age=29;range:19-66 years). Twenty-two patients had embryonal, 13 had alveolar, and 2 had mixed embryonal/alveolar ORMS. Thirty-four patients had incisional biopsy/debulking surgery; only 3 patients had gross total resection as the initial surgical treatment.

At 12 weeks after chemotherapy, using RECIST criteria, 8 patients had a complete response (CR), 15 had a partial response (PR), 3 were stable, 3 had progression, and no imaging studies were available at this time point for the rest (n=8).

By end of treatments, 21 patients had achieved complete resolution of the orbital mass (CR); 13 patients had a residual ORMS; final imaging was not available for 3 patients.

6 of 13 patients with residual ORMS at the end of treatment eventually achieved CR. 2 had surgery for the residual mass both demonstrating no tumor present. The other 4 resolved without any surgical intervention at a median of 19 months after completion of treatment (range:4 – 48 months).

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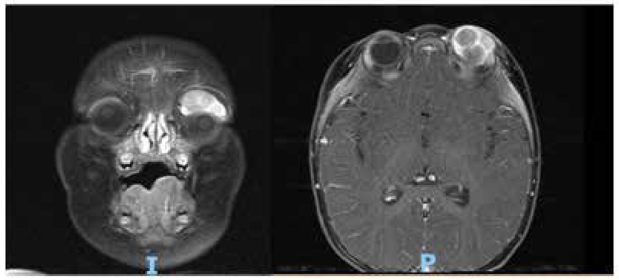
4 of 13 patients with residual ORMS at end of treatments continued to show further resolution of their mass at a median follow up time of 13 months (range: 6 – 78 months) after treatment completion.

3 of 13 patients with residual ORMS at end of treatment had progression of their orbital mass. All three were adult patients with ORMS (age at diagnosis: 27, 28, 29 years); one had an alveolar ORMS and the other two had embryonal ORMS. 2 out of 3 had either progressive disease or partial response at 12 weeks post chemotherapy.

Conclusions: The finding of a residual ORMS immediately after treatment completion is relatively common and was observed in close to 40% of patients. However, only about a quarter of these residual ORMS lesions progress; this was observed only in 3 adult patients with ORMS. In about 75% of cases the residual ORMS was inactive or resolved spontaneously over time, in one case up to 4 years after treatment completion.

Figure 1

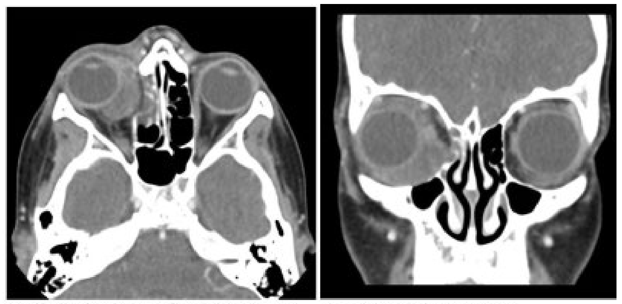


Orbital rhabdomyosarcoma on presentation

Figure 2

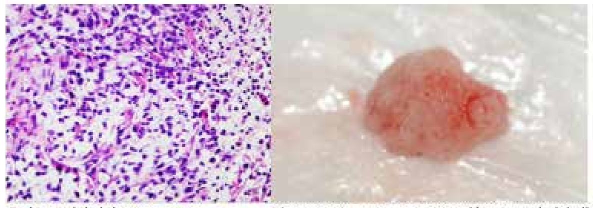
Post treatment residual mass in the left superomedial orbit concerning for recurrence. Excisional biopsy showed fibrous tissue.

Figure 3



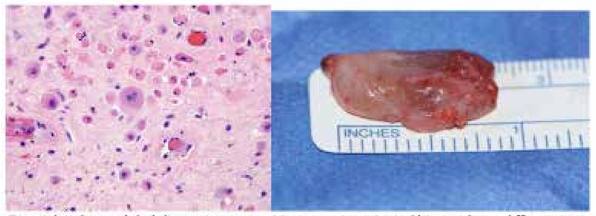
Residual orbital mass after full treatment Questionable bony erosion

Figure 4



Embryonal rhabdomyosarcoma Macroscopic tumor on incisional biopsy with debulking

Figure 5



Treated embryonal rhabdomyosarcoma Macroscopic excisional biopsy shows different texture

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10:48 am

Balancing Life and Medicine

Abraham Verghese, MD

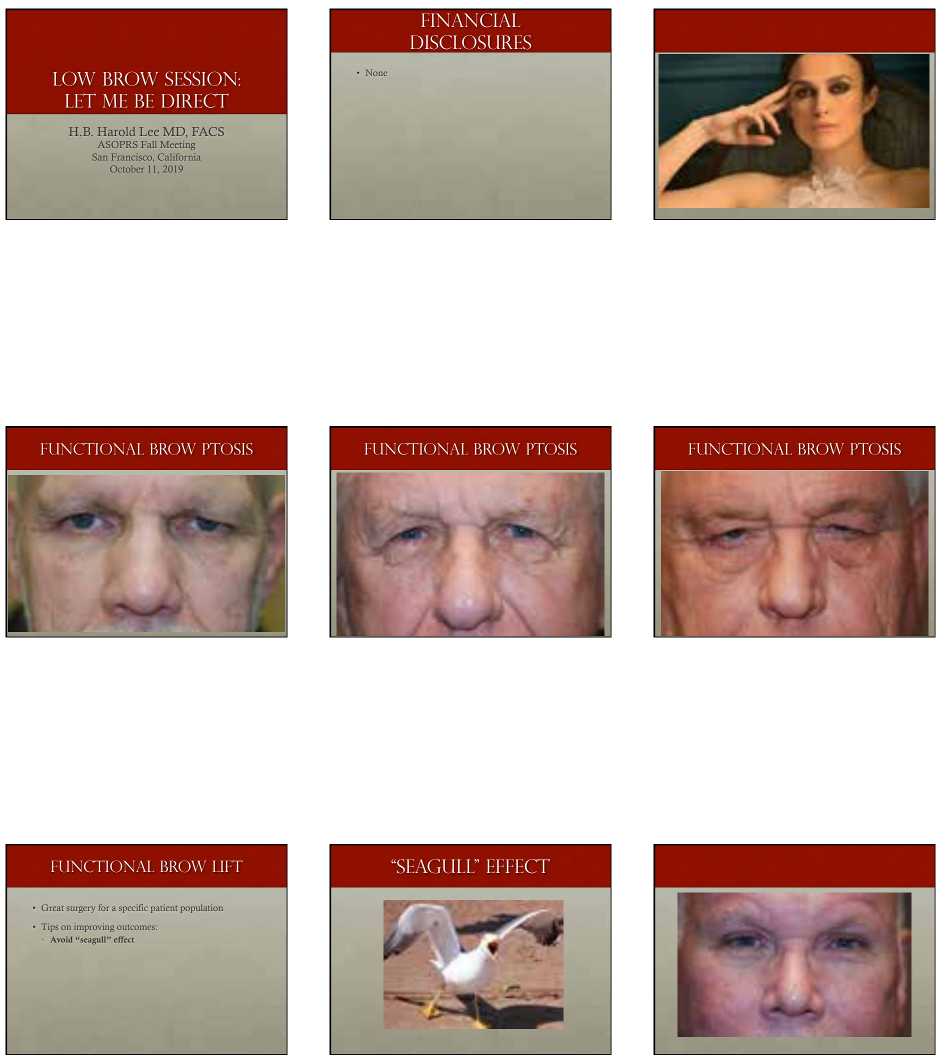
11:22 am – 12 pm

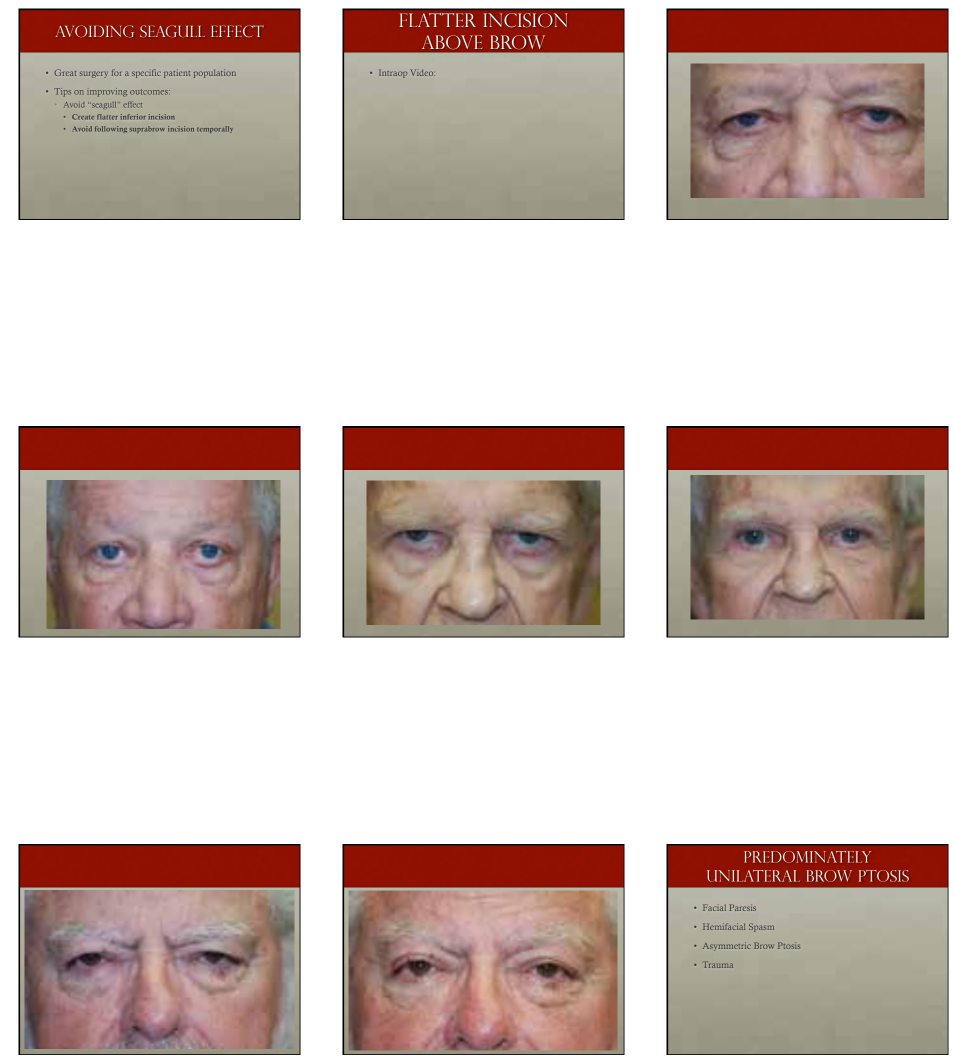
Moderator: Jeremiah P. Tao, MD, FACS

11:22 am

Let Me be Direct

Hui Bae Harold Lee, MD





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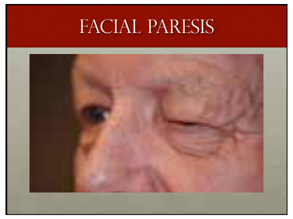
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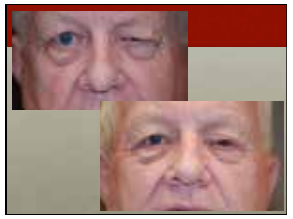
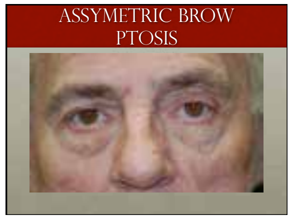
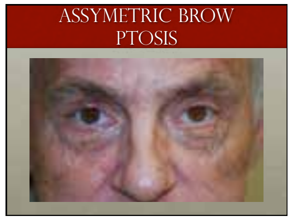
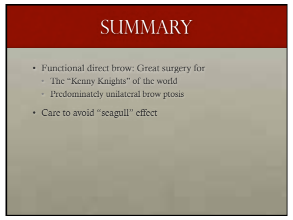



ASSYMETRIC BROW PTOSIS


ASSYMETRIC BROW PTOSIS


SUMMARY
Functional direct brow: Great surgery for
The "Kenny Knights" of the world
Predominately unilateral brow ptosis
Care to avoid "seagull" effect

11:28 am

Scope of Practice: Endo is Your Friendo

Bobby S. Korn, MD, PhD, FACS

11:34 am

Open Up for Heavy Lifting to See Great Results

John A. Long, MD

11:40 am

I Agree with Bobby Until the Endo Time

Guy G. Massry, MD

The surgical success of any aesthetic procedure is to provide consistent, reliable and predictable outcomes with few complications. Selecting a technique which lends to a quick recovery and return to daily activity is also essential. Endoscopic approach brow lifting, with or without the use if the endoscope, meets all these criteria. While there is a learning curve associated with surgery, this is well worth the effort when the profile of the procedure is compared to other contemporary brow lifting options. In my personal experience, most patients require only a temporal lift (approximately 90%), which can be performed with a headlight and a retractor. Adjuncts such as fat grafting, brow fat pad suspension sutures and post-operative neuromodulation are useful. Patients with preoperative brow asymmetry and prominent brow projection (ie positive vector brows) must be cautioned as these cases are less predictable. Finally, controlling post-operative nausea and headache, and special attention to surgical nuances which limit bothersome complication (hair loss, scarring, wound override and motor and sensory deficit) is critical to attaining the high patient satisfaction I have noted with this surgery.

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1 – 2:04 pm

Moderators: Marc Yonkers, MD and Yasmin Shayesteh Chambers, MD

1 pm

Effect of External Eyelid Weighting on Eyelid and Eyebrow Position in Normal and Ptosis Patients

Alexandra Manta[1], Joshua Dan[1], Annie Tran[2], Daniel Rootman[3]

[1]UCLA, Los Angeles, California, United States of America, [2]Los Angeles, California, United States of America, [3]Oculoplastics, UCLA, Los Angeles, California, United States of America

Introduction: Clinically and experimentally, it has been established that eyelid ptosis is associated with an elevated brow position [1] [2] [3] [4]. This relationship is however, somewhat idiosyncratic in that the lower eyelid is not always on the side of the higher brow. Further, both phenylephrine application and ptosis surgery to leads to a variable brow depression response [2] [5]. This investigation aims to characterize the relationship between eyelid position, elevation effort and the eyebrow response in normal individuals.

Methods: In this prospective observational study, healthy candidates >18 years with no prior history of eyelid or orbital disease were recruited. Digital photographs were obtained in primary position with the subject looking directly into the camera. A reference sticker was placed on the malar eminence for internal measurement control. Multiple photographs were taken with successively increasing weights secured to the eyelid margin on one randomly selected side. Weights were applied in 0.2g intervals from 0.2g to 2.4 g. Trials continued until the marginal reflex distance (MRD1) was <0mm or the 2.4g weight was reached. Pupil to brow distance (PTB) was measured digitally as the distance in mm from the center of the pupil to the lower brow margin in the midpupillary line. MRD1 was measured digitally as the distance in mm from the center of the pupil to the upper eyelid margin in the midpupillary line. Primary outcome measure was the difference in PTB between the weighted and unweighted eye for each condition. All measurements were made utilizing ImageJ software. Data was analyzed using linear and piecewise regression models.

Results: Twenty four subjects (11 female) were included in this study. Mean (SD) MRD1 and PTB at baseline was 3.45 (0.82) mm and 13.78 (2.30) mm respectively. In the weighted eye, as weight increased the MRD1 decreased ($r^2=0.12$, $p<0.01$) and the PTB increased ($r^2=0.08$, $p<0.01$) (Figure 1). The correlation between MRD1 and PTB was significant ($r=0.23$, $p<0.01$). In the unweighted eye, as weight increased the MRD1 increased ($r^2=0.07$, $p<0.01$) and the PTB increased ($r^2=0.02$, $p<0.01$) (Figure 2). The correlation between MRD1 and PTB was significant ($r=0.31$, $p<0.01$). At each weight above baseline, MRD1 was significantly lower for the weighted eye ($p<0.01$). For each weight above baseline, PTB was not significantly different between the weighted and unweighted sides ($p>0.05$). At baseline the unweighted PTB was 0.6mm higher ($p<0.05$). The difference between the weighted and unweighted MRD1 increases with weight, while

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the difference in PTB is relatively stable after 0.2g (Figure 3). There was no significant break point in the piecewise regression for any of the models (p>0.05).

Conclusions: Our data indicated that the eyelid response to increasing weight is to linearly reduce MRD1. The opposite eyelid appears to elevate to a lesser extent, also linearly. This may represent a Hering's response. The brow appears to elevate linearly with increasing eyelid weight, on both sides by an approximately equal amount (on average). It is postulated that the increased elevation effort stimulated by increased protraction force (weight), is driving the opposite eyelid and both brows to elevate by a process of yoked innervation between all of these structures. The primary stimulus responsible for initiating this process cannot be determined from the present experiment, as proprioceptive, visual and sensory pathways are all likely activated by the eyelid weighting model.

Figure 1

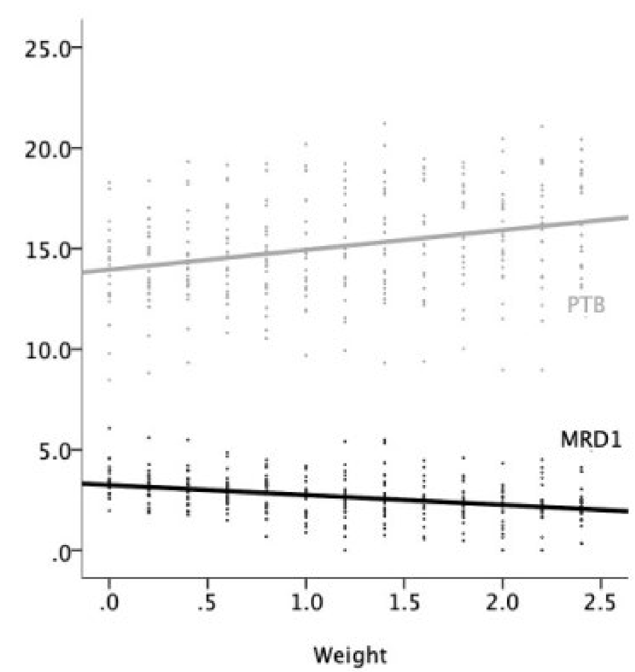


Figure 2

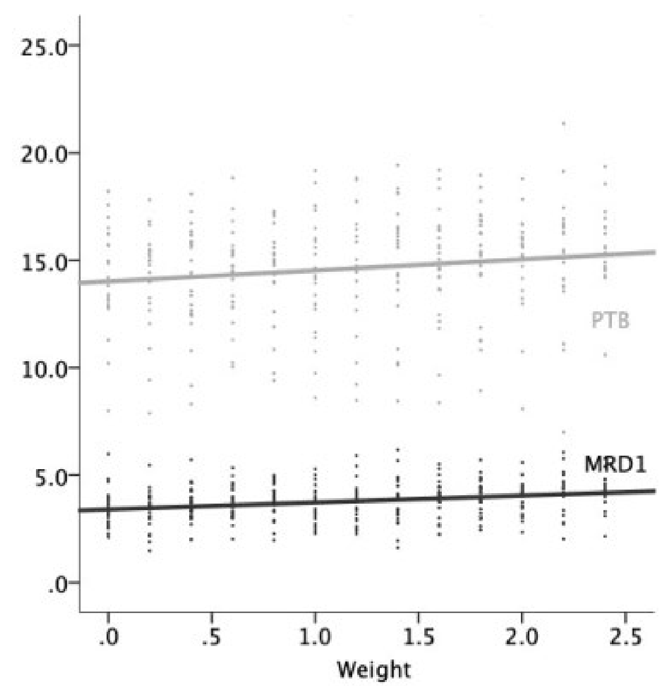
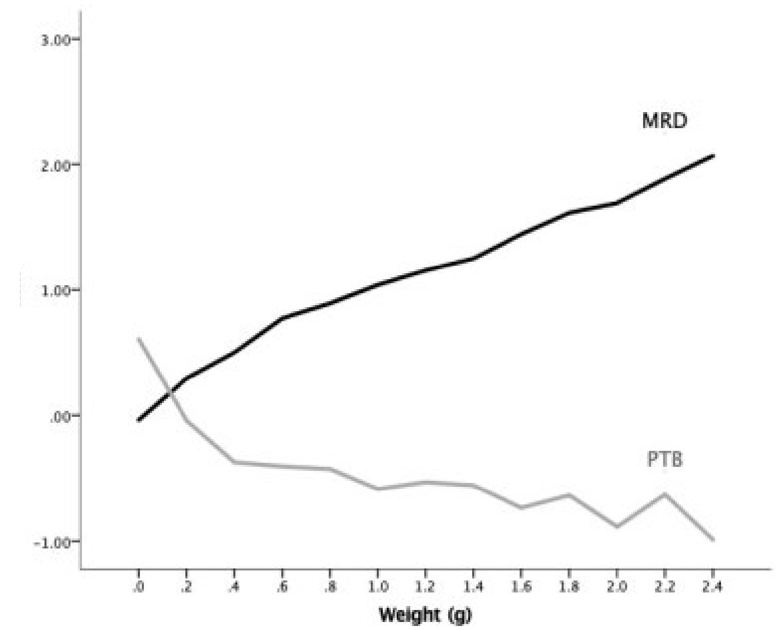


Figure 3



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1:06 pm

Eyelid Contour Outcomes after Ptosis Repair in the Aging Patient: ELA vs MMCR

Rohan Verma[1], Allison Chen[1], Zvi Gur[1], Phuc Nguyen[2], Catherine Liu[1], Bobby Korn[1,3], Don Kikkawa[4,3]
[1]Viterbi Family Department of Ophthalmology, Division of Oculofacial Plastic and Reconstructive Surgery, Shiley Eye Institute, UC San Diego, La Jolla, California, United States of America, [2]Department of Computer Science and Engineering, University of California Irvine, Irvine, California, United States of America, [3]UC San Diego Division of Plastic Surgery, La Jolla, California, United States of America, [4]Division of Oculofacial Plastic and Reconstructive Surgery, Shiley Eye Institute, UC San Diego, Viterbi Family Department of Ophthalmology, San Diego, California, United States of America

Introduction: To quantitatively evaluate eyelid contour outcomes in the elderly versus younger age patients after Müller muscle-conjunctival resection (MMCR) and external levator advancement (ELA).

Methods: Retrospective interventional case series from 2013-2018 at a single institution. ELA and MMCR groups consisted of 40 standardized unilateral palpebral fissures images of patients before and after surgery. Exclusion criteria were patients with history of trauma, tumors, nerve palsy, or previous surgery, and patients undergoing concomitant blepharoplasty. Mean normal upper eyelid contours (MNC) were created by averaging the upper eyelid contours (ULC) of 25 patients with normal eyelid positions (confirmed by two oculoplastic surgeons). Due to demographic eyelid variations, this study only evaluated Caucasian females.

Software developed in MATLAB (Natick, MA) using automation of the ULC with iris registration was employed. Pre and post-operative ELA and MMCR contours were compared to the MNC and standard deviations from the MNC were derived and compared using t-tests. Age groups were defined as younger age (YA, ≤70 years) and advanced age (AA, >70 years).

Results: For ELA, the mean age was 59.9 years (YA group) and 81.3 years (AA group) and they were statistically different. Pre-operative ULC (P=0.48) did not differ between the YA and AA groups. Postoperatively, the YA group had a mean ULC closer to the MNC when compared to the AA group (1.28SD from the MNC vs 2.29SD from the MNC; p=0.003). The improvement in ULC after surgery was also significantly greater in the YA group than in the AA group (2.23SD vs 1.25SD from the MNC, respectively; p=0.017).

For MMCR, the mean age was 63.1 years (YA group) and 74.7 years (AA group) and they were statistically different. Pre-operatively, the AA group had worse pre-operative ULC than the YA group [i.e. an ULC further than the MNC than the YA group] (p=0.01) with no difference between age groups in ULC change after MMCR (P=0.222).

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Conclusions: This study shows that both ELA and MMCR are effective procedures in patients >70 years. However, in the AA group, ELA did show greater variance in ULC from the MNC than the YA group. This indicates that ELA may be less predictable in this age group. Conversely, this discrepancy was not found in the MMCR group. With age, loss of elastic and collagen fibers in the tarsal stroma decreases tarsal rigidity, tensile strength and resiliency, while the levator undergoes thinning and tonal loss [1]. As both of these structures are integral to ELA repair, the eyelid contour outcomes after ELA repair may not be as optimal in advanced age patients, as direct tarsal suturing may be more problematic. Both types of ptosis repairs remain good options in advanced aged patients compared to younger patients, however, ELA shows higher variability with advancing age. While these findings were significant in the demographic studied, further evaluation in broad demographic groups is necessary to generalize our conclusions.

Figure 1

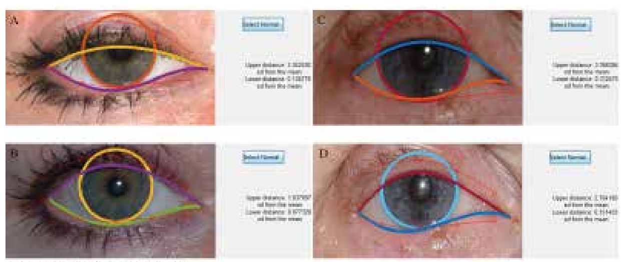

Figure 1. Eyelid contour YA vs AA ELA
A. Preoperative image of YA (53 years old) patient with eyelid contours (yellow and purple) representing the upper and lower eyelid outline. Orange circle indicates iris outline. Red line overlay demonstrates standard eyelid contour.
B. Postoperative image of same patient after ELA with eyelid contour (purple and green) compared to standard eyelid contour (red).
C. Preoperative image of AA (81 years old) patient with eyelid contour (blue and orange) representing the upper and lower eyelid outline. Red circle indicates iris outline. Red line overlay shows standard eyelid contour.
D. Postoperative image of same patient after ELA with eyelid contour (red and blue) compared to standard eyelid contour (red).

Table 1

Table 1: Demographics: age, number of eyelids, and surgical approach

	Group with normal eyelid position	YA ELA	AA ELA	YA MMCR	AA MMCR
No. eyelids	50	20	20	27	13
Mean age, years (SD)	68.8 (9.0)	59.9 (12.9)	81.35 (6.9)	63.1 (7.8)	74.7 (4.7)

SD = standard deviation; YA = younger age (≤70 years); AA = advanced age (>70 years); ELA = external levator advancement; MMCR = Müller muscle-conjunctival resection

Table 2

Table 2: Pre and postoperative upper eyelid contours by age groups among ELA patients

	YA ELA	AA ELA	P-Value
Preoperative (SD)	3.51 (1.6)	3.54 (1.8)	0.476
Postoperative (SD)	1.28 (0.7)	2.29 (1.4)	**0.003**
Change in upper eyelid contour (SD)[a]	2.23 (1.6)	1.25 (1.2)	**0.017**

SD = standard deviation from the mean normal upper eyelid contour; YA = younger age (≤70 years); AA = advanced age (>70 years); ELA = external levator advancement
[a]These SDs indicate the magnitude of improvement in upper eyelid contour postoperatively compared to preoperatively

Table 3

Table 3: Pre and postoperative upper eyelid contours by age groups among MMCR patients

	YA MMCR	AA MMCR	P-Value
Preoperative (SD)	2.65 (1.1)	3.57 (1.3)	**0.011**
Postoperative (SD)	1.10 (0.6)	1.75 (0.6)	**0.001**
Change in upper eyelid contour (SD)[a]	1.55 (1.0)	1.82 (1.1)	0.222

SD = standard deviation from the mean normal upper eyelid contour; YA = younger age (≤70 years); AA = advanced age (>70 years); MMCR = Müller muscle-conjunctival resection
[a]These SDs indicate the magnitude of improvement in upper eyelid contour postoperatively compared to preoperatively

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1:12 pm

Lateral Tarsoconjunctival Flap Lower Eyelid Suspension: A Minimally Invasive Technique for Post-blepharoplasty Retraction

Jordan Conger[1], Seanna Grob[2], Jeremiah Tao[2]
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Introduction: To evaluate the efficacy of a lateral tarsoconjunctival suspension flap (TCSF) for repair of post-blepharoplasty lower eyelid retraction.

Methods: Retrospective chart review of patients who received a TCSF between 2010 and 2018 for correction of cicatricial lower eyelid retraction after lower eyelid blepharoplasty. The post-operative follow-up was a minimum of 3 months. Pre- and post-operative lower eyelid position (MRD2 and photographs), degree of ocular surface disease, and symptoms were recorded. Postoperative complications and/or need for further intervention were also assessed.

Results: eyelids from 30 patients were identified. 20 (67%) of the patients were female. Age ranged from 55-89 (mean 73.2). The most common presenting symptom was foreign body sensation (92% of patients). After retraction repair using the TCSF, ocular surface exposure improved in all cases. Lower eyelid retraction (MRD2) improved in 98% of cases. One patient continued to have retraction and required lateral drill hole canthoplasty 7 months later. Post-operative pyogenic granulomas were noted in 8% (4/48) of eyelids.

Conclusions: The TCSF was effective in improving lower eyelid position and ocular surface exposure in this series of post-blepharoplasty lower eyelid retraction patients.

1:18 pm

Does a Posterior Lamellar Spacer Graft Provide Vertical Lift or Tectonic Support? Ultrasound Evaluation

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Introduction: Posterior lamellar eyelid spacer grafts are rectangular segments of autogenous or alloplastic material that are inserted into the lower eyelid, through a conjunctival approach, typically at the inferior base of the tarsus. They are typically effective in treating cicatricial entropion, when the goal is to lengthen the posterior lamellar in order to unwind the inturned eyelid margin.

In the setting of post-blepharoplasty lower eyelid retraction, the posterior lamella is not typically short, so that lengthening the posterior lamellar alone will not address lower eyelid retraction. Rather, in cases of eyelid retraction, the conceptual goal of a lower eyelid spacer graft is to lengthen the eyelid by stiffening it or providing vertical tectonic support. However, this may not be optimal: we noted that in patients with posterior lamellar grafts, it often seems that the graft is floating in the posterior lamella but not providing tectonic support to the middle lamella of the eyelid.

A retrospective study was designed to analyze the dynamic behavior of posterior lamellar spacer grafts compared to en glove dermal grafts. In particular, we asked the question whether the graft stiffens the eyelid or provides vertical support.

Methods: patients with lower eyelids with posterior lamellar spacer grafts, evaluated by ultrasonography, were identified in the oculoplastic registry. Dynamic ultrasound, in up and down gaze, was analyzed to determine the congruence of movement of the anterior and middle lamella of the eyelid, compared to the posterior lamellar that included the spacer graft.

Results: Dynamic analysis showed failure of concordance of movement of the anterior and middle lamella, compared to posterior lamella. The posterior spacer graft rides with the posterior lamella and lower eyelid retractors and is dissociated from the middle and anterior lamella.

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Conclusions: Posterior lamellar spacer grafts are theoretically designed to address lower eyelid retraction by lengthening or tectonically vertically supporting the eyelid. However, the posterior lamella is not typically short in these patients. Adding a posterior lamellar graft does not directly address the mechanism of retraction, which relates to volume collapse and contraction of the middle lamella of the eyelid. High-resolution ultrasound data from this study suggests that the posterior lamellar spacer grafts move independently of the anterior and middle lamella of the eyelid, making it unlikely that they provide vertical tectonic support. This may suggest that any lengthening of the eyelid is accomplished by recession of the lower eyelid retractors, not by the graft. Volume collapse may play a role in post blepharoplasty lower eyelid retraction, and if a graft is placed, it may be more effective to add volume to the middle lamella rather than length to the posterior lamella.

Figure 1

References:

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2. Taban MR. Lower Eyelid Retraction Surgery Without Internal Spacer Graft. *Aesthet Surg J.* 2017;37(2):133-136.

1:27 pm

Psychosocial and Mental Health Disorders among Patients with Simple Congenital Ptosis

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Introduction: Self-reporting surveys by adults with ptosis have shown higher levels of anxiety, depression, and appearance-related distress and dysfunction compared to populations norms.[1] The purpose of this study was to compare the psychosocial (e.g. social deficits or anxiety, anger issues, poor self-esteem) and mental health findings of children with simple congenital ptosis in a population-based cohort to age- and gender-matched controls.

Methods: The medical records of all children (< 19 years) diagnosed with simple congenital ptosis (N = 81) from January 1, 1965, through December 31, 2004, in a medically-isolated region were retrospectively reviewed for psychosocial and mental health morbidity. The demographics and clinical characteristics of these patients have previously been reported.[2,3,4] One-to-one age- and gender-matched controls without ptosis from the same study population were similarly reviewed.

Results: An adverse psychosocial development was diagnosed in 41 (50.6%) patients with simple congenital ptosis monitored to a mean age of 21.4 years, compared with 26 (32.5%) controls (p=0.02). A mental illness was diagnosed in 31 (38.3%) patients with ptosis compared to 16 (20%) controls (p=0.01). Ptotic children were 2.5 and 2.1 times more likely than controls to develop a mental illness or psychosocial maladjustment, respectively. Patients with ptosis were also significantly more likely to have a greater number of mental health disorders (p=0.02) and a longer duration of psychotropic medication use (p=0.005). Children with greater lid asymmetry at the time of diagnosis did not exhibit increased psychosocial morbidity; when comparing children with unilateral ptosis with 1.5 mm or more asymmetry between the eyelids to those with less than 1.5 mm of asymmetry at presentation, those with less asymmetry had a significantly higher rate of both mental illness and psychosocial burden (p=0.009). Neither having ptosis surgery nor the age at which surgery occurred influenced the rate of mental illness of psychosocial burden. However, of the 18 of 34 total surgical patients for which pre- and post-operative measurements were available, 11 children who did not develop mental or psychosocial illness had a mean fissure increase of 2.3 mm (range, -2 mm to 5 mm) compared to 0.6 mm (range, -1 mm to 3.5 mm) for the 7 children who developed mental or psychosocial illness (p=0.05).

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Conclusions: Children diagnosed with simple congenital ptosis in this population had significantly more psychosocial and mental health morbidity compared to controls. Although having surgery was not associated with an improved mental health profile, postoperative patients who experienced a significant improvement of their ptosis had less psychiatric and psychosocial illness.

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1. Richards H, Jenkinson E, Rumsey N, et al. The psychological well-being and appearance concerns of patients presenting with ptosis. Eye. 2014;28(3):296.
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3. Griepentrog GJ, Diehl N, Mohney BG. Amblyopia in childhood eyelid ptosis. American Journal of Ophthalmology. 2013;155(6):1125-1128. e1121.
4. Griepentrog GJ, Mohney BG. Strabismus in childhood eyelid ptosis. American Journal of Ophthalmology. 2014;158(1):208-210.e201.

1:33 pm

Long-term Results of a No-suspension Frontalis Linkage with Autogenous Fascia for the Management of Myopathic Ptosis

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Introduction: Management of myopathic ptosis with non-suspension frontalis linkage was first described in 1987 by Shorr et al.[1] who successfully employed a monofilament synthetic suture to create a strong bond between the lid and the brow. We report here our experience with the use of autogenous fascia to perform a broad non-suspensory linkage between the lid and frontalis muscle for the management of myopathic ptosis.

Methods: Retrospective analysis of 22 myopathic patients with bilateral ptosis who were operated between 1999 and 2017. The sample consisted of 16 (72.7%) females and 6 (27.2%) males ranging in age from 6 to 81 years (mean 43.22 ± 23.75 SD). All patients had orbicularis weakness and poor or absent Bell's phenomenon due to a variety of conditions including mitochondrial myopathies (n = 10), myasthenia gravis (n = 7), myotonic dystrophy (n=1) and oculopharyngeal dystrophy (n = 1). Surgery consisted of using autogenous fascia slings (Temporalis, n =19 or Lata, n =3) to link the tarsal plate to the frontalis muscle without any degree of intraoperative lid suspension. The surgery is similar to the technique described by Demartelaere et al.,[2] with the crucial difference that the fascia tension is loosely adjusted in order to leave the palpebral fissure closed at the end of the procedure. (Figure 1) Preoperative data included measurements of brow excursion, levator muscle function, margin reflex distance (MRD1), and brow height. During the follow-up period (mean 66.4 months) we recorded the MRD1, brow height, amount of lagophthalmos and presence of superficial keratopathy. All measurements were performed with the Image J software from full face photographs in the primary position of gaze (MRD1 and brow height) and in extreme down and upgaze (brow excursion and Levator function). Paired t-tests were used to analyze changes induced by the surgery in MRD1 and brow height.

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Results: Preoperatively the mean values of MRD1 and brow excursion were -1.0 mm (-1.6/-0.4 95%CI) and 6.3 mm (5.3/7.5 95%CI), respectively. After surgery there were significant changes (p <0.0001) in both MRD1 and brow position. Mean MRD1 increased 2.5 mm (1.9/3.5 95%CI) (Figure 2A) while mean brow height decreased 1.6 mm (-1.0/-2.2 mm 95%CI). With full frontalis contraction, MRD1 reached a mean value of 3.0 mm (2.4/3.5 mm 95%CI). Postoperative lagophthalmos was not detected in 33 (75%) eyes (Figure 2). In the remaining 11 eyes (25%) lagophthalmos ranged from 1.2 to 5.2 mm (mean = 1.7 mm, 0.59/2.72 95%CI). Seven patients (31.81%) had mild inferior superficial keratitis. One patient needed additional surgery to correct a unilateral lid retraction. Overall, 81.81% of the patients were pleased with the procedure.

Conclusions: Myopathic ptosis can be alleviated with a minimal amount of lagophthalmos by just linking the tarsal plate to the frontalis muscle without suspending the lid margin. A broad area of contact between a fascial sling and the frontalis muscle allows an excellent control of the MRD1 with a minimal amount of lagophthalmos.

Figure 1

Figure 1: A) Severe bilateral ptosis in a patient with Kearns-Sayre Syndrome. One day after frontalis linkage. No lid suspension (B) or lagophthalmos (C).

Figure 2

Figure 2: Same patient after 31 months of follow-up. A) With minimal frontalis recruitment MRD 1 OD = 1.0mm and OS = 2.0 mm, B) With maximal frontalis contraction MRD 1 OD = 3.4mm, OS = 4.0mm, C) No lagophthalmos on gentle lid closure

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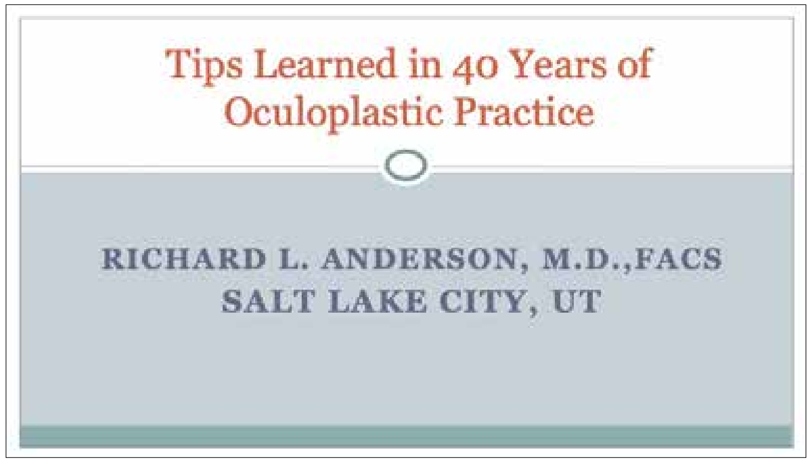
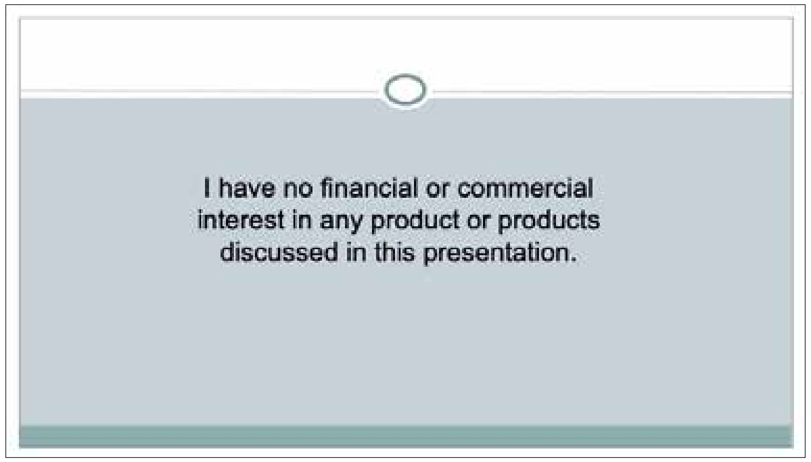
1:39 pm

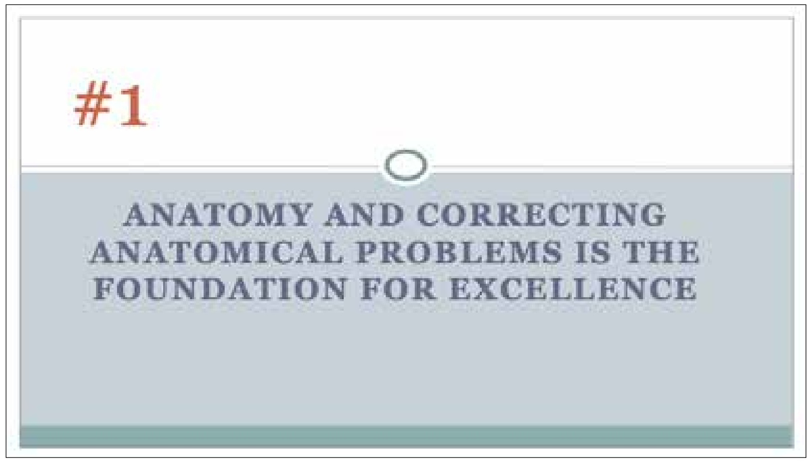
Ten Tips Learned in Over Four Decades of Practice

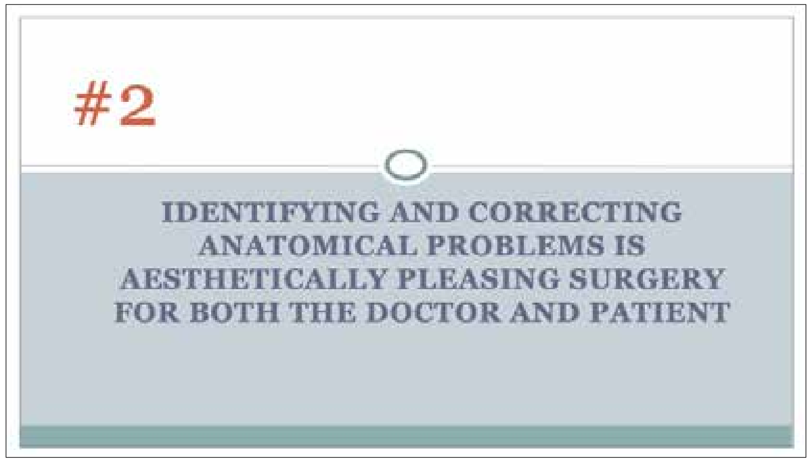
Richard L. Anderson, MD

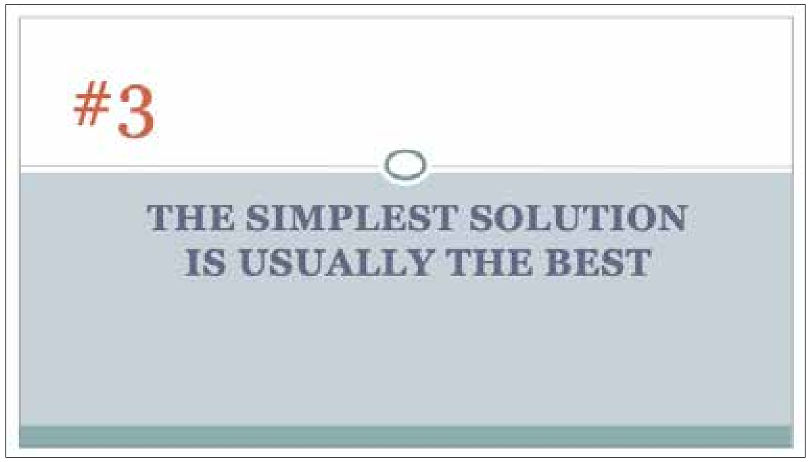
In over 4 decades of Oculoplastic Surgery, I have learned that the simplest anatomically based surgery for a problem is always the best. Complicated procedures have more complications. I will present the 10 best tips including treating the brow, upper eyelid, lateral canthus, lower eyelid and midface as one aesthetic unit for best results in cosmetic surgery.











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#5

EYELID TISSUES MAKE THE BEST EYELIDS

#6

THE EYES AND EYELID APPEARANCE ARE PARAMOUNT FOR A HAPPY PATIENT AND MAKE GOOD RESULTS IN FACIAL SURGERY

#7

MAKE PROCEDURES FIT PROBLEMS
NOT
PROBLEMS FIT PROCEDURES

#8

THE LATERAL CANTHUS IS THE KEYSTONE IN EYELID AESTHETIC SURGERY

#9

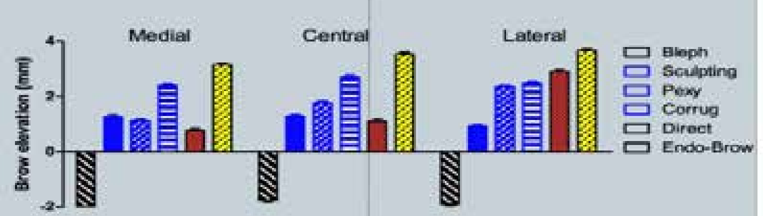
WITHOUT PTOSIS, OCULOPLASTIC SURGERY WOULDN'T EXIST

#10

TREAT BROW, UPPER EYELID, LATERAL CANTHUS, LOWER EYELID AND MIDFACE AS ONE AESTHETIC UNIT VIA A SINGLE UPPER EYELID INCISION SITE IN AESTHETIC EYELID SURGERY

Upper Blepharoplasty

Comparing Effect of Procedures



Treat As One Aesthetic Unit

- Upper lid
- Eyebrow
- Lateral canthus
- Lower lid
- Midface

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Elevating only one area of the periocular unit can make the others look worse

Internal brow lift indicated:

- Patient also needs a blepharoplasty
- Fullness and heaviness in brows
- Appropriate skin removal leaves > 10 mm between lid crease and brow
- Glabellar furrows
- Forehead furrows
- Frontal or glabellar stress or migraine headaches
- Patient refuses endoscopic brow lift, direct brow lift, upper face lift or prefers internal brow lift
- Patient accepts a cosmetic procedure or add on to functional procedure

ADVANTAGES OVER OTHER BROW LIFTS

- Cosmetic incision
- No additional incision
- Saves time
- Saves money
- Minimal morbidity
- High level patient acceptance

PATIENT SELECTION IS PARAMOUNT

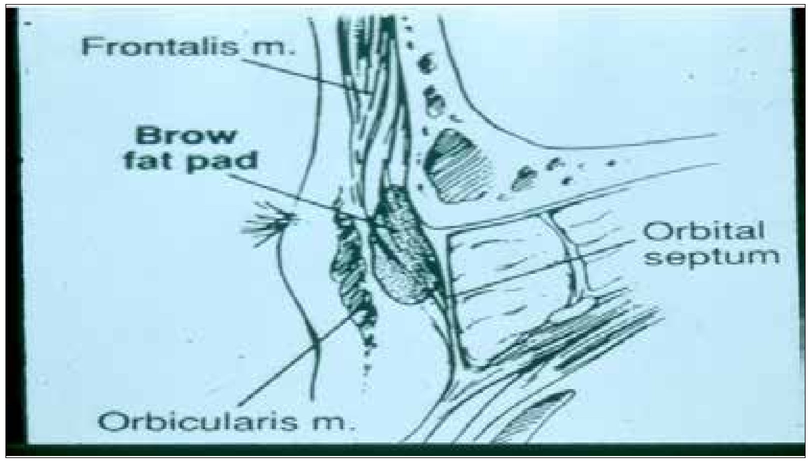
Most patients present to me for eyelid surgery. Excellent cosmetic adjunct to virtually all blepharoplasty patients. The internal brow lift is not an upper face lift.

INTERNAL BROW LIFT TECHNIQUE

- Blepharoplasty with removal of temporal orbicularis
- Identify and open anterior leaf of post galea overlying brow fat pads
- Disinsert leaf of galea inferior to lateral canthal tendon (orbital ligament)
- Sculpt brow fat pad
- Leave posterior leaf of posterior galea and periosteum intact
- Proceed in same plane medial overlying corrugator muscle

CORRUGATOR MUSCLE EXTIRPATION TECHNIQUE

- Anterior leaf of posterior galea plane is opened from lateral to medial superior to orbital rim
- Fascia overlying corrugator is opened
- Corrugator muscle is elevated with forceps and removed preserving supraorbital artery and nerve
- Depressor superciliaris is transected to allow medial brow elevation
- Glabellar folds are bluntly undermined
- Meticulous bipolar cautery is performed



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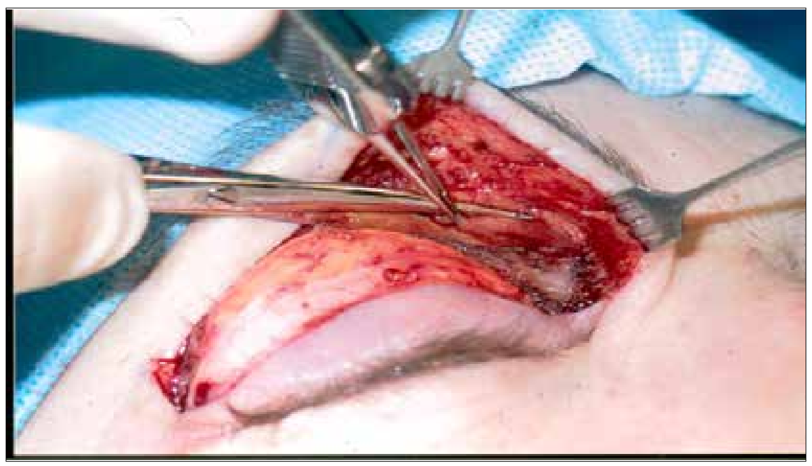

Resuspend brow fat pad to the posterior leaf of the deep galea to enhance elevation

Corrugator and depressor superciliaris extirpation best achieved by internal brow lift approach

- Most direct approach
- Best visualization
- Fast
- Allows bipolar cautery of vessels

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COSMETIC MID-FACELIFT

- Temporal upper blepharoplasty approach
- Undermine supraperiosteal via lateral canthus
- Remove a small amount of orbicularis laterally
- Lateral canthopexy and mid-face fixation with 4-0 or 5-0 polygalactin 910 on P2 needle

The lateral canthus is the Keystone in Eyelid Aesthetics

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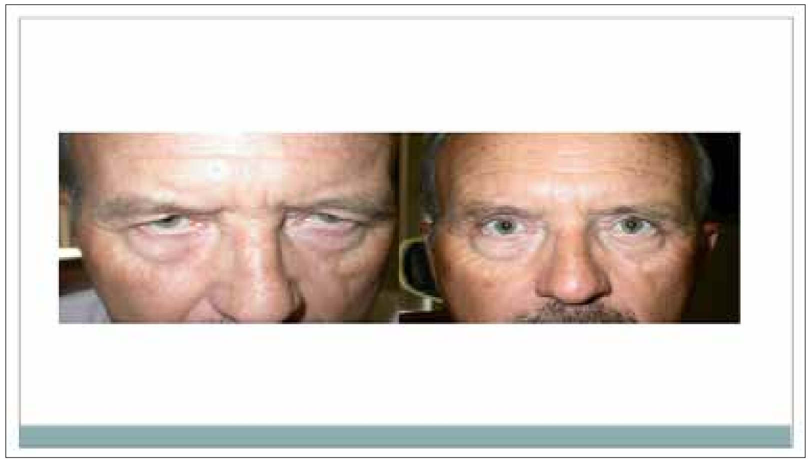

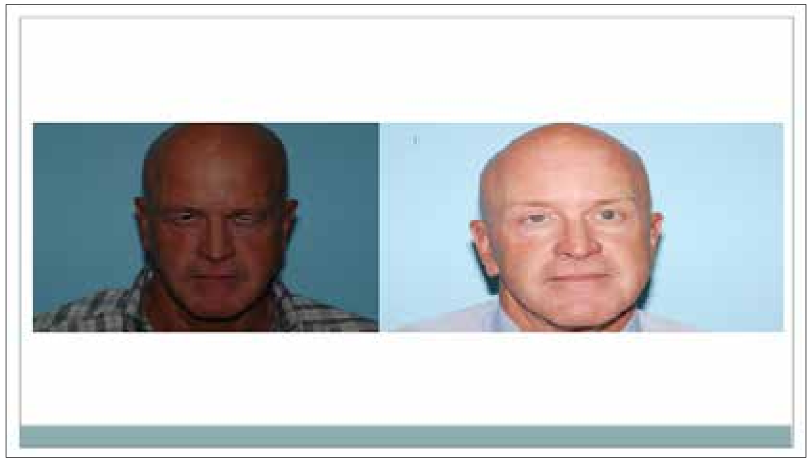

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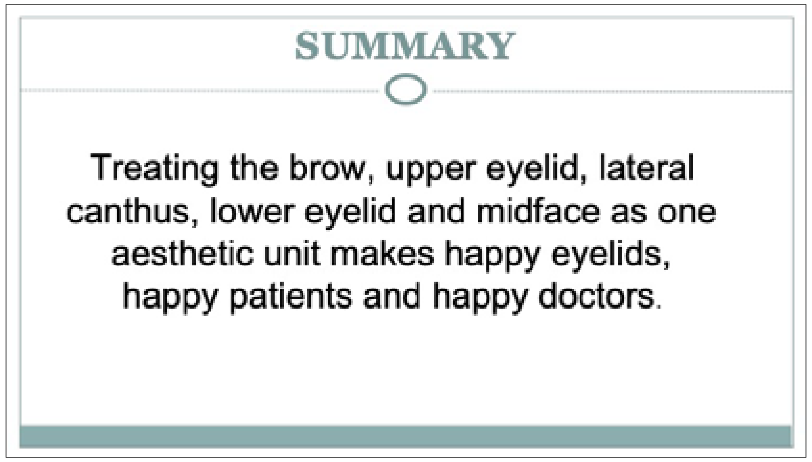
Removal of Eyebrow Fat


SINGLE INCISION REJUVENATION OF THE PERIORBITAL AESTHETIC UNIT


Internal Brow Elevation at Blepharoplasty
Corrugator Superciliaris Muscle Excision for Tension and Migraine Headaches


SUMMARY
Treating the brow, upper eyelid, lateral canthus, lower eyelid and midface as one aesthetic unit makes happy eyelids, happy patients and happy doctors.


RICHARD L. ANDERSON, M.D., F.A.C.S.
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2:06 pm

The Interface Between Dermatologic Surgery and Oculofacial Plastic Surgery

Christopher Zachary, MD

2:36 pm

Shaping Aesthetics: The Form of Beauty

John P. Fezza, MD

Oculofacialplastics is the Fusion of Science and Art
History
Renaissance Artists
Facial Assessment Using ASSESS:
Shape, Symmetry, Side View, Shadows
Facial ogee curves and underlying skeletal buttresses/deep Fat ROOF and SOOF
Additive and Subtractive Techniques to enhance ogee curves
Study of Facial Aging
Relevant Facial Anatomy
Focus on Periorbital Area and Tea Trough
Sequence and method to inject HA filler in tear trough
First treating Tear Trough with deep pre-periosteal SOOF injections of HA filler with needle
Secondly using cannula subcutaneously in the tear trough to smooth and blend

3:32 pm

Insights from Analysis of Medicare Utilization Amongst ASOPRS Members

Allison J. Chen[1], Rohan Verma[1], Catherine Y. Liu[1], Don O. Kikkawa[1,2], Bobby S. Korn[1,2]
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Introduction: Practice patterns, reimbursement, and billing patterns of oculoplastic surgeons vary by geographic region, practice setting, and fellowship training. We sought to evaluate procedure volume and types, and CMS reimbursement for these procedures by geography, private vs academic settings, and solo vs multispecialty groups.

Methods: The 2016 Medicare Provider Utilization Data which contains Healthcare Common Procedure Coding System (HCPCS) claims, were used to assess procedure volume and reimbursement patterns for the most commonly billed procedures by ASOPRS surgeons. Practice setting and type was determined by online searches for each ASOPRS surgeon. Practice and billing patterns, and Medicare reimbursement were analyzed by geography and practice setting. Geographic regions were determined using the eight Bureau of Economic Analysis regions. Wilcoxon rank-sum tests were utilized to compare both Medicare reimbursement and the number of procedures performed in private vs. academic practices and in solo vs. multispecialty groups.

Results: Five hundred thirty-one ASOPRS members were identified in Medicare database. The most commonly billed procedures by ASOPRS surgeons in the United States were blepharoplasty (14,606), chemodenervation of muscles (13,758), external levator advancement (12,264), probing of the nasal-tear duct (12,118), cataract surgery (11,700), and lesion removal (10,572). The distribution of blepharoplasty procedures performed per surgeon are shown in Figure 1. The range of average Medicare allowed amounts for blepharoplasty ranged from $295 to $983 (median: $775) (Figure 2) with the Far West and Mideast having the highest average Medicare allowed amounts (Figure 3A). However, when scaled by median home prices as a surrogate for cost of living, these two regions demonstrated the highest Medicare allowed amount with Oklahoma, Mississippi, and Kansas having the highest reimbursement to cost of living ratio (Figure 3B). The median number of blepharoplasties performed in private vs academic practices were 34 vs 24 ($p<.001$), respectively (Figure 4). There were no differences in number of blepharoplasties performed per surgeon in solo vs. multispecialty groups. Similar assessments were performed for each of the top 10 billed procedures. Eleven percent (60/531) of ASOPRS members
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performed cataract surgery (median: 110); 83% (48/60) of ASOPRS surgeons performing cataract surgery were in the private setting, and they contributed to 79% of all cataract surgeries performed. Eighty-five percent of ASOPRS cataract surgeons were performed in a multispecialty setting, contributing to 91% of cataract surgery performed. The Southeast alone contributed to 46% of all cataract surgeries performed by ASOPRS surgeons.

Conclusions: This study elucidates the most common procedures performed by ASOPRS surgeons and demonstrates the large variation in practice patterns in various geographic regions and practice settings. Practice patterns demonstrated that about one tenth of ASOPRS members perform cataract surgery. Our findings also highlight various underserved geographic regions where there are few/no ASOPRS surgeons and regions that may offer better lifestyle for new graduates.

Figure 1

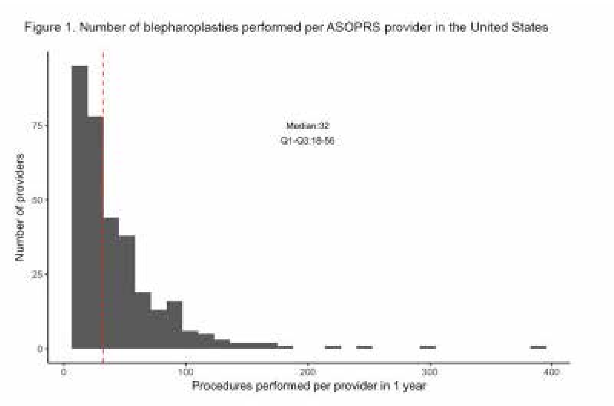


Figure 2

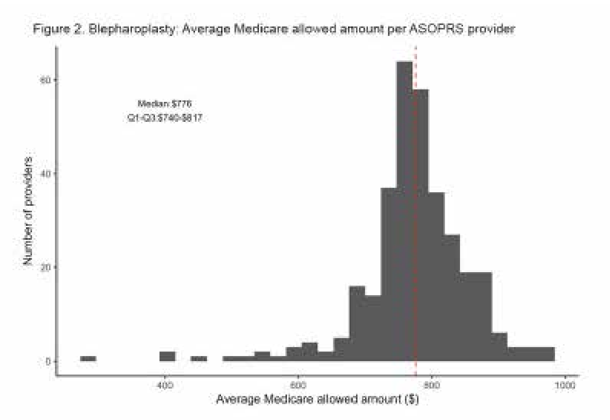


Figure 3

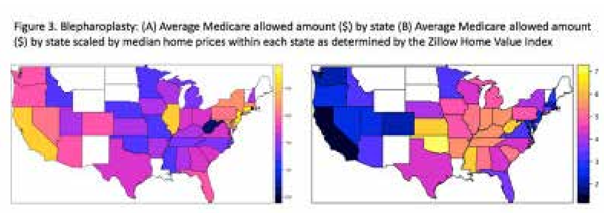
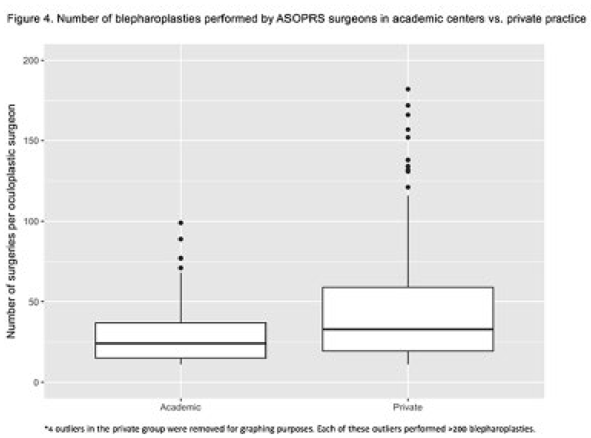


Figure 4



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3:38 pm

ASOPRS in Shanghai – The LA Face Experience

Andrew Harrison[1], Guy Massry[2], Ray Douglas[3], Robert Schwarcz[4], Kylie Azzizadeh[5], Yunjie Liu[6]

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Introduction: Very little information is available regarding international oculoplastic practices. LA Face is a Chinese oculoplastics practice based in Shanghai focusing on cosmetic and reconstructive oculoplastic interventions. There are currently 10 ASOPRS members and 2 ASOPRS fellows who are medically listened in China and involved with the organization. LaFace began operations in November 2016 and has exponentially grown since. This presentation will describe our experience and future endeavors.

Methods: A experiential review emphasizing boundaries to overcome for practice operation; and retrospective review of cases and patient satisfaction data.

Results: With a streamlined process a Chinese medical license can be obtained within 3 months of application and requires significant notarized supportive documentation, yearly physical examination, a Chinese Visa, and an individual designated to coordinating this process. All procedures were performed at Shanghai International Medical Center and examinations were performed with an English translator present. Between November 1, 2016 until present we have performed 159 procedures heavily weighted to anophthalmic socket surgery. These included 114 (71.6%) complex socket cases (all needing multiple procedures), 15 (9.4%) functional eyelid cases, 12 (7.5%) aesthetic eyelid cases, 9 (5.6%) orbital decompressions, and 9 (5.6%) injectable cases. Eight cases (5%) were pediatric in nature (< 18 years old). To date patient satisfaction has been graded by direct questioning with >92% very satisfied. 2 (1%) patients were dissatisfied, much of which was related to language barrier.

Conclusions: International medicine is an exciting growth opportunity for those willing to invest the time. Practice hurdles are large and include include medical licensing, patient communication and expectations, intraoperative communication and instrumentation, and postoperative follow up. Having a dedicated trusted partner who is well acquainted with local laws and regulations is the critical to setting up such a venture. We have all found our practice in China to be an exciting and rewarding adventure. Our surgical success and patient satisfaction will allow us to continue to grow the ASOPRS name across the globe.

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3:44 pm

Intravenous Ketorolac in Orbital Surgery

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Introduction: Given the risks of abuse, surgeons are called upon to use opioid analgesics with decreased frequency. Intravenous ketorolac (IVK) provides excellent analgesia, although some authorities have suggested that it should not be used in orbital surgery, in light of possible bleeding risks. This study was performed to assess the efficacy and safety of IVK in the setting of orbital surgery.

Methods: In this randomized, controlled trial, patients received IVK (n=50) or placebo (n=50) prior to the termination of orbital procedures. Both the surgeon and the patient were blinded as to whether or not the patient received IVK. Postoperative pain was assessed via a 0-10 visual analog scoring system immediately after surgery and on the first post-operative day (POD1). The requirements for opioid analgesics and anti-emetic agents were assessed prior to discharge.

Results: Immediately after surgery, the mean pain scores were 3.1 and 5.5 for patients that did and did not receive IVK, respectively ($p < 0.05$). On POD1, mean pain scores were 1.0 and 2.7 for patients that received and did not receive IVK, respectively ($p < 0.05$). 12% of IVK patients and 22% of controls required antiemetics ($p > 0.05$). 8% of IVK patients and 22% of control patients required opioid analgesics ($p < 0.05$). No patient experienced bleeding complications.

Conclusions: IVK dramatically reduces pain scores and the requirement for opioid analgesics after orbital surgery without increasing the risk of hemorrhagic complications. This medication appears to be a safe adjunct to orbital surgery.

3:48 pm

Does Intraoperative Ketorolac Increase Bleeding in Oculoplastic Surgery?

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Introduction: To evaluate for adverse effects of postoperative bleeding in patients who received intravenous ketorolac during oculoplastic procedures.

Methods: The medical records of 200 consecutive patients older than 18 years of age who underwent lacrimal or orbital surgery performed by a single surgeon under general anesthesia were retrospectively reviewed. Patients were excluded if they had history of a bleeding disorder; any anticoagulant use within one week of surgery; prolonged PT or PTT; or insufficient follow-up. Patients were divided into two groups based upon whether or not they received intravenous ketorolac (30mg) during the procedure. The primary outcome measure was the occurrence of a major postoperative bleeding event (at least one of the following events): (1) bleeding requiring hospitalization or a blood transfusion; (2) bleeding into a critical anatomic site including retrobulbar hemorrhage, compartment syndrome, orbital apex syndrome; (3) uncontrollable nasal bleeding after lacrimal surgery requiring emergent surgical intervention. Secondary outcome measures were the evaluation of post-operative ecchymosis grade (grade 0 : none, 1 : mild, 2 : moderate, 3 : severe) at one week after surgery and the incidence of persistent ecchymosis (beyond 4 weeks).

Results: Out of 200 patients, 89 were excluded due to exclusion criteria. 111 patients were analyzed further, including 31 patients who received intraoperative IV ketorolac and 80 control patients who did not. The demographics between two groups were similar. There were no major postoperative bleeding events and there was no statistically significant difference between the two groups in terms of ecchymosis grade and the incidence of persistent ecchymosis (see table). Comparing the subgroups of lacrimal and orbital cases, there was also no significance difference between these groups.

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variables	Ketorolac	control	p-value
Gender(M:F)	13(41.9%):18(58.1%)	26(32.5%):54(67.5%)	0.35
Age(years)	48.71 ± 17.9	53.81 ± 14.5	0.12
Surgery type (lacrimal : orbital)	7(22.6%):24(77.4%)	25(31.3%):55(68.7%)	0.36
Major bleeding event	0	0	
Ecchymosis grade	0: 29(33.7%)	5(16.1%)	0.08*
	1: 33(38.4%)	13(41.9%)	
	2: 20(23.0%)	11(35.5%)	
	3: 4(4.6%)	2(6.5%)	
Incidence of development of persistent ecchymosis	3(9.7%)	4(5.0%)	0.39**

* Mann Whitney test, ** Fisher exact test

Conclusions: This study suggests that intraoperative ketorolac use does not increase the risk of postoperative hemorrhagic complications in orbital or lacrimal procedures. Our study also show that ketorolac does not lead to worsening or prolonged postoperative ecchymosis. We were unable to find any other similar studies of ketorolac usage in this patient population. Oculoplastic surgeons and anesthesiologists should consider ketorolac if additional non-narcotic analgesia is desired in patients undergoing lacrimal or orbital surgery. This alternative to opioids may assist with pain control and lessen the postoperative narcotic burden.

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3:55 pm

How American Society of Ophthalmic Plastic & Reconstructive Surgery (ASOPRS) Surgeons' Social Media Presence and Demographics Influence Online Reviews and Engagement Across Three Leading Review Websites

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Introduction: To evaluate the influence of American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) surgeons' Instagram, Twitter, and Facebook presence on patient satisfaction scores using leading physician review websites.

Methods: ASOPRS surgeons were identified using the registered ASOPRS member directory (8/1/2018). Surgeon demographics (gender, institution type, website type, practice location and age) and review data were collected from 3 physician rating websites: Healthgrades, Vitals, and Google Business Rating. Using only the first 10 search results from Google.com, we defined social media presence as having at least an Instagram, Twitter, and/or Facebook account. Outcome measures from 1) physician review websites [overall ratings, number of ratings, number of comments, and Healthgrade patient-reported wait times] and 2) surgeon social media presence were collected. Chi-square tests were performed for categorical variables and Mann-Whitney tests for non-normal variables. To examine the relationship between social media presence and overall ratings, univariate linear regression analysis was performed.

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Results: Among the 647 ASOPRS surgeons identified, the presence of Instagram, Twitter, and Facebook were 9.1%, 10.8%, and 47.1%, respectively (**Figure 1**). Further, we investigated factors potentially related to social media presence. Surgeons' affiliated institution type was associated with differences in social media, Instagram, and Facebook presence (all p<0.05); surgeons in private practice had the greatest presence at 75.3%, 81.8%, and 76.3%, respectively (**Figure 1**). Surgeons' practice location was associated with differences in social media and Twitter presence (both p<0.05); surgeons in the south had the greatest social media presence at 34.6% and surgeons in the west had the greatest Twitter presence at 37.1% (**Figure 1**). Surgeons' age was associated with differences in social media and Instagram presence (both p<0.05); surgeons age 40s and 50s had the greatest presence at 58.0% and 59.3%, respectively (**Figure 1**). Surgeons with Instagram presence had a significantly higher overall rating on Vitals (p<0.01)(**Figure 2**). Surgeons with social media, Instagram, Twitter, and Facebook presence had a significantly higher number of ratings and comments (p<0.01)(**Figure 2**). Female surgeon gender was associated with higher Heathgrade ratings (p<0.05), younger surgeon age and shorter wait time were associated with higher Healthgrade and Vitals ratings (p<0.05)(**Figure 3**)(**Figure 4**).

Conclusions: Review of ASOPRS surgeons' social media presence revealed affiliated institution type, practice location, and age demographic differences. Surgeons using Instagram had higher overall satisfaction ratings on V, while surgeons with Instagram, Twitter, and Facebook presence all had more online engagement. Female gender, younger age of surgeons, and shorter wait time are associated with higher ratings. To improve overall patient satisfaction, ASOPRS surgeons should minimize wait times and consider social media, especially Instagram, as a new approach to engaging their patient population.

Figure 1

Figure 1. Social Media Presence vs. Surgeon Demographics

Surgeon Demographics	N	Social Media Presence			Instagram Presence			Twitter Presence			Facebook Presence		
		Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Gender	N=647	N=327 (50.5)	N=320 (49.5)	0.36	N=59 (9.1)	N=588 (90.9)	0.22	N=70 (10.8)	N=577 (89.2)	0.46	N=305 (47.1)	N=342 (52.9)	0.40
Female	135	73 (22.3)	62 (19.4)		16 (27.1)	119 (20.2)		17 (24.3)	118 (20.5)		68 (22.3)	67 (19.6)	
Male	512	254 (77.7)	258 (80.6)		43 (72.9)	469 (79.8)		53 (75.7)	459 (79.5)		237 (77.7)	275 (80.4)	
Institution Type†	N=587	**N=299 (50.9)**	**N=288 (49.1)**	**<0.01**	**N=55 (9.4)**	**N=532 (90.6)**	**<0.05**	N=62 (10.6)	N=525 (89.4)	0.28	**N=278 (47.4)**	**N=309 (52.6)**	**<0.01**
Academic	116	**48 (16.1)**	**68 (23.6)**		**4 (7.3)**	**112 (21.1)**		13 (21.0)	103 (19.6)		**41 (14.7)**	**75 (24.3)**	
Private	408	**225 (75.3)**	**183 (63.5)**		**45 (81.8)**	**363 (68.2)**		46 (74.2)	362 (69.0)		**212 (76.3)**	**196 (63.4)**	
Both	63	**26 (8.7)**	**37 (12.8)**		**6 (10.9)**	**57 (10.7)**		3 (4.8)	60 (11.4)		**25 (9.0)**	**38 (12.3)**	
Website	N=647	N=327 (50.5)	N=320 (49.5)	0.08	N=59 (9.1)	N=588 (90.9)	0.72	N=70 (10.8)	N=577 (89.2)	0.36	N=305 (47.1)	N=342 (52.9)	0.89
None	35	14 (4.3)	21 (6.6)		4 (6.8)	31 (5.3)		2 (2.9)	33 (5.7)		14 (4.6)	21 (6.1)	
Institution	498	250 (76.5)	248 (77.5)		43 (72.9)	455 (77.4)		51 (72.9)	447 (77.5)		233 (76.4)	265 (77.5)	
Personal	109	58 (17.7)	51 (15.9)		12 (20.3)	97 (16.5)		16 (22.9)	93 (16.1)		53 (17.4)	56 (16.4)	
Both	5	5 (1.5)	0 (0)		0 (0)	5 (1.0)		1 (1.4)	4 (1.0)		5 (1.6)	0 (0)	
Practice Location	N=647	**N=327 (50.5)**	**N=320 (49.5)**	**<0.01**	N=59 (9.1)	N=588 (90.9)	0.18	**N=70 (10.8)**	**N=577 (89.2)**	**0.02**	N=305 (47.1)	N=342 (52.9)	0.06
West	177	**91 (27.8)**	**86 (26.9)**		22 (37.3)	155 (26.4)		**26 (37.1)**	**151 (26.2)**		86 (28.2)	91 (26.6)	
Midwest	123	**49 (15.0)**	**74 (23.1)**		5 (8.5)	118 (20.1)		**5 (7.1)**	**118 (20.5)**		47 (15.4)	76 (22.2)	
South	192	**113 (34.6)**	**79 (24.7)**		17 (28.8)	175 (29.8)		**18 (25.7)**	**174 (30.2)**		103 (33.8)	89 (26.0)	
Northeast	155	**74 (22.6)**	**81 (25.3)**		15 (25.4)	140 (23.8)		**21 (30.0)**	**134 (23.2)**		69 (22.6)	86 (25.1)	
Age*	N=569	**N=305 (53.6)**	**N=264 (46.4)**	**0.03**	**N=54 (9.5)**	**N=515 (90.5)**	**<0.01**	N=65 (11.4)	N=504 (88.6)	0.06	N=286 (50.3)	N=283 (49.7)	0.10
<40	65	**30 (9.8)**	**35 (13.3)**		**16 (29.6)**	**186 (36.1)**		7 (10.8)	58 (11.5)		27 (9.4)	38 (13.4)	
40s and 50s	303	**177 (58.0)**	**126 (47.8)**		**32 (59.3)**	**132 (25.6)**		43 (66.2)	258 (51.2)		168 (57.0)	138 (48.8)	
≥60	200	**98 (32.1)**	**104 (39.8)**		**6 (11.1)**	**197 (38.3)**		15 (23.1)	188 (37.3)		96 (33.6)	107 (37.8)	

Practice location information obtained from the American Society of Ophthalmic Plastic and Reconstructive Surgery Directory.
†Some surgeons' institution type could not be identified.
*Some surgeons were not listed on Healthgrade.com and age could not be obtained.
Data presented as N (%); bold values represent statistical significance (p<0.05). Chi-square tests were performed for categorical variables.

Figure 2

Figure 2. Social Media Presence vs. Online Reviews and Engagement

Online Reviews and Engagement	Social Media Presence			Instagram Presence			Twitter Presence			Facebook Presence		
	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Healthgrades	N=306	N=253		N=57	N=526		N=55	N=495		N=295	N=288	
Overall rating	4.19±0.76	4.15±0.86	0.84	4.34±0.59	4.15±0.82	0.20	4.25±0.59	4.15±0.83	0.16	4.19±0.77	4.15±0.84	0.82
# Ratings	22.59±39.52	11.12±18.54	**<0.01**	32.42±45.88	15.75±30.00	**<0.01**	35.18±40.19	15.15±30.28	**<0.01**	23.00±40.43	11.63±18.78	**<0.01**
# Comments	8.32±21.83	3.19±6.41	**<0.01**	17.82±39.39	4.84±11.63	**<0.01**	15.49±30.26	4.87±13.83	**<0.01**	8.50±22.17	3.30±7.48	**<0.01**
Vitals	N=311	N=279		N=53	N=537		N=64	N=526		N=294	N=296	
Overall rating	4.18±0.62	4.12±0.75	0.65	4.40±0.56	4.13±0.69	**<0.01**	4.27±0.67	4.14±0.68	0.09	4.18±0.61	4.13±0.74	0.86
# Ratings	28.50±35.68	16.57±23.84	**<0.01**	38.574±47.31	21.29±26.53	**<0.01**	42.39±47.97	20.48±27.43	**<0.01**	28.85±36.24	16.91±23.41	**<0.01**
# Comments	13.59±28.22	5.09±9.77	**<0.01**	22.68±42.80	8.68±18.16	**<0.01**	24.81±42.48	8.12±17.81	**<0.01**	13.70±28.64	5.22±10.66	**<0.01**
Google	N=253	N=188		N=48	N=273		N=48	N=393		N=241	N=200	
Overall rating	4.49±0.84	4.37±1.03	0.98	4.80±0.58	4.39±0.97	0.20	4.57±0.68	4.42±0.96	0.13	4.49±0.85	4.38±1.02	0.95
# Ratings	8.98±16.43	3.28±4.76	**<0.01**	28.15±26.32	4.95±9.53	**<0.01**	21.48±27.24	4.73±8.59	**<0.01**	8.46±15.64	4.25±8.73	**<0.01**
# Comments	8.08±15.85	2.88±4.26	**<0.01**	17.60±23.89	4.47±8.78	**<0.01**	19.27±25.56	4.21±7.67	**<0.01**	7.63±14.32	3.74±7.95	**<0.01**

Not every registered surgeon was listed on individual review sites.
Data presented as Mean±SD; bold values represent statistical significance (p<0.05). Mann-Whitney tests were performed for non-normal variables.

Figure 3

Figure 3. Healthgrades, Vitals, and Google overall rating univariate linear regression

	Healthgrades overall rating		Vitals overall rating		Google overall rating	
	AD (95% CI)	p-value	AD (95% CI)	p-value	AD (95% CI)	p-value
Gender						
Female	**0**		0		0	
Male	**-0.2 (-0.36, -0.03)**	**<0.05**	0.05 (-0.19, 0.1)	0.54	0.05 (-0.25, 0.35)	0.73
Institution type						
Academic	0		0		0	
Private	-0.04 (-0.22, 0.14)	0.64	-0.06 (-0.22, 0.11)	0.5	-0.09 (-0.43, 0.25)	0.6
Both	-0.08 (-0.34, 0.18)	0.54	-0.03 (-0.26, 0.2)	0.82	0.03 (-0.42, 0.49)	0.89
Website						
None	0.04 (-0.68, 0.76)	0.91	-0.19 (-0.8, 0.43)	0.82	-0.49 (-1.55, 0.57)	0.57
Institution	0.13 (-0.56, 0.81)	0.72	-0.14 (-0.72, 0.45)	0.95	-0.32 (-1.25, 0.61)	0.5
Personal	0.08 (-0.64, 0.81)	0.82	-0.06 (-0.68, 0.56)	0.82	-0.21 (-1.20, 0.78)	0.68
Both	0		0		0	
Practice Location						
West	-0.01 (-0.21, 0.19)	0.93	0.09 (-0.08, 0.27)	0.29	0.23 (-0.1, 0.56)	0.17
Midwest	0		0		0	
South	0.04 (-0.15, 0.23)	0.66	0.1 (-0.07, 0.27)	0.24	0.19 (-0.14, 0.51)	0.26
Northeast	-0.12 (-0.33, 0.09)	0.25	0.08 (-0.01, 0.27)	0.37	0.005 (-0.34, 0.35)	0.98
Age						
<40	**0**		**0**		0	
40s and 50s	**-0.48 (-0.7, -0.26)**	**<0.01**	**-0.22 (-0.44, -0.004)**	**<0.05**	-0.07 (-0.48, 0.34)	0.75
≥60	**-0.7 (-0.92, -0.47)**	**<0.01**	**-0.39 (-0.62, -0.17)**	**<0.01**	**-0.46 (-0.89, -0.04)**	**<0.05**
Instagram Presence						
Yes	0.19 (-0.03, 0.40)	0.09	**0.26 (0.07, 0.45)**	**<0.01**	**0.44 (0.13, 0.74)**	**<0.01**
No	0		**0**		**0**	
Twitter Presence						
Yes	0.2 (-0.008, 0.4)	0.06	0.15 (-0.03, 0.33)	0.09	0.15 (-0.16, 0.46)	0.34
No	0		0		0	
Facebook Presence						
Yes	0.06 (-0.07, 0.19)	0.37	0.08 (-0.04, 0.2)	0.17	0.16 (-0.06, 0.39)	0.15
No	0		0		0	
Healthgrades						
Wait time						
0-10 min	**0**		**0**		0	
10-15 min	**-0.38 (-0.53, -0.23)**	**<0.01**	**-0.20 (-0.35, -0.06)**	**<0.01**	-0.26 (-0.54, 0.02)	0.65
16-30 min	**-0.81 (-0.99, -0.63)**	**<0.01**	**-0.38 (-0.55, -0.2)**	**<0.01**	**-0.34 (-0.68, 0.008)**	**<0.05**
>31 min	**-1.39 (-1.66, -1.11)**	**<0.01**	**-0.69 (-0.95, -0.424)**	**<0.01**	**-0.62 (-1.1, -0.15)**	**<0.01**

CI, confidence interval; AD, absolute difference.

Figure 4

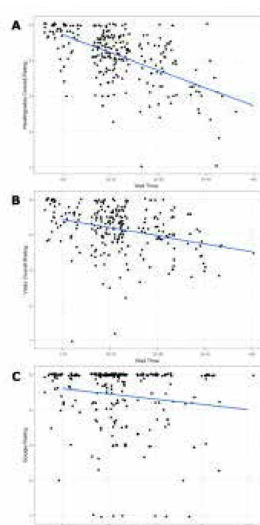

Figure 4. Regression Analysis of Wait Time vs. (A) Healthgrade Overall Rating, (B) Vitals Overall Rating, and (C) Google Overall Rating.

4:01 pm

Deconstructed and Mowed after Reconstruction for Mohs

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4:24 pm

Geographic Income Disparity as a Factor Affecting Non-Attendance in an Urban Oculoplastic Clinic

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Introduction: The purpose of this study is to analyze the association between geographic income disparity and no-show 77 rates of patients visiting an urban university oculoplastic faculty practice to determine if 78 socioeconomic status affects the rate of clinic non-attendance.

Methods: A retrospective chart review of patients visiting the oculoplastic clinic of the 80 University of Maryland from January 1, 2014 to December 31, 2017 was performed. All patients 81 had health insurance. The patients were categorized by the zip code of their residence, and the 82 number of unattended and completed visits per zip code was tabulated. The average household 83 income for each zip code was obtained using publically available census records, and the no84 show rate of patients was correlated with the average income of their residential zip code.

Results: There was a statistically significant difference in average household income per 86 zip code between completed visits ($80,601.98; SD ±35,967, range: $35,965 – $260,081) and 87 unattended visits ($69,506.43; SD±30,722, range: $36,880 – $206,882) ($p=0.02$). Type of 88 insurance (commercial or government-sponsored) was not correlated with missing appointments.

Figure 1. Simple linear regression of ratio of unattended:completed visits compared with average annual household income per zip code. The R2 215 value (0.472) reflects data after the exclusion of 216 one outlier data point highlighted in red. The correlation coefficient of all data points including outlier is R2 217 =0.3446.

Conclusions: The non-attendance rate of this clinic inversely correlated with the average 90 household income of patients' geographic area of residence, independent of the type of health 91 insurance. This result suggests that insured patients living in economically disadvantaged areas 92 are less likely to interact with the health care system, regardless of the type of insurance they 93 possess.

(continued)

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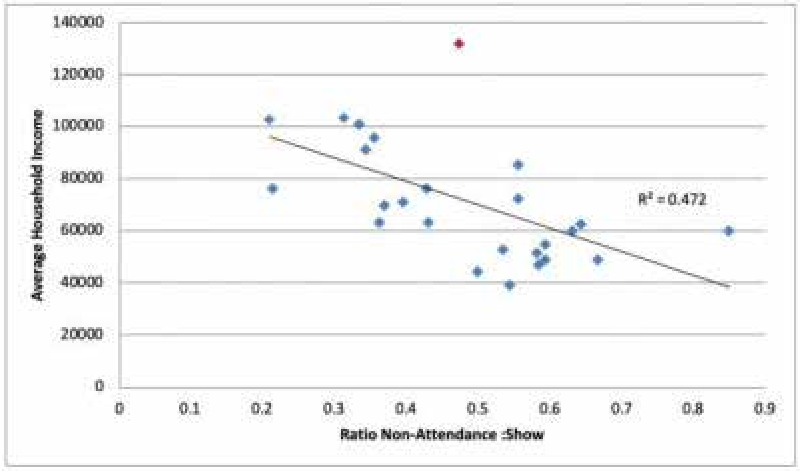
Figure 1



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4:28 pm

Histologic Evaluation of Non-visual Afferent Sensory Upper Eyelid Proprioception

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Introduction: Recent research has suggested a possible role for proprioception in ipsilateral frontalis activation in the setting of ptosis; however, there has not been any robust histologic or anatomic evidence to support this theory. To further elucidate proprioceptive structures in the eyelid, this investigation uses validated histologic techniques to explore the presence of proprioceptive structures or afferent neural networks in the Levator Palpebrae Superioris and Muller's muscle.

Methods: Muller's muscle and LPS samples were evaluated by a laboratory with extensive experience with the histology of extraocular muscle proprioception. Immunofluorescence and confocal laser scanning microscopy was used to analyze the tissue samples.

Results: Thirty-four Muller's muscle samples and ten LPS samples were analyzed. Golgi tendon bodies and muscle spindles were not identified in the Muller's muscle and LPS samples. This result is expected in the Muller's muscle given that these structures are not typically present in smooth muscle, but noteworthy in the skeletal muscle of the LPS. Previously undescribed synaptophysin-positive free nerve terminals within the intermuscular connective tissue of the Muller's muscle were identified.

Conclusions: The nerve terminals identified are anatomically consistent with free nerve endings present in the extraocular muscles that have been implicated in proprioception. These findings advance our current knowledge of the ultrastructure of Muller's muscle and the LPS and suggest a possible mechanism for proprioception in the upper eyelid that may have a role in ipsilateral brow elevation in the setting of ptosis.

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Figure 1

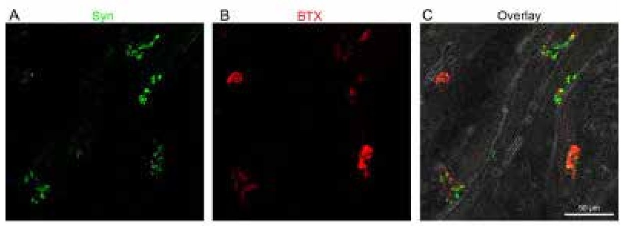


Figure 2

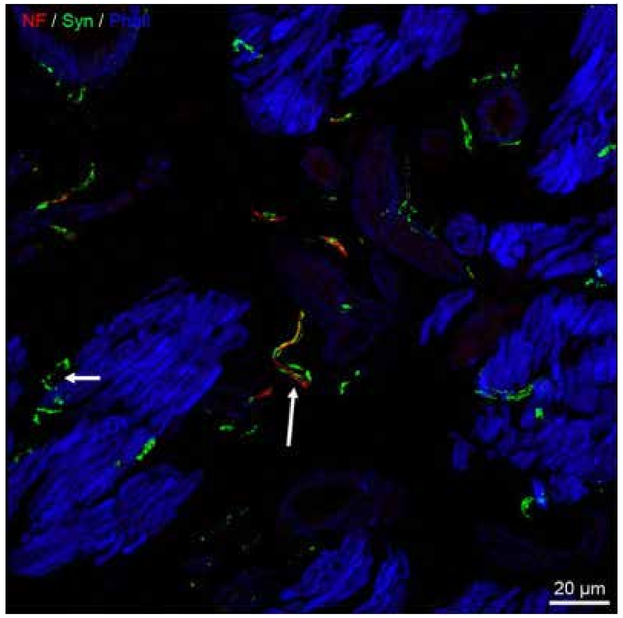


Figure 3

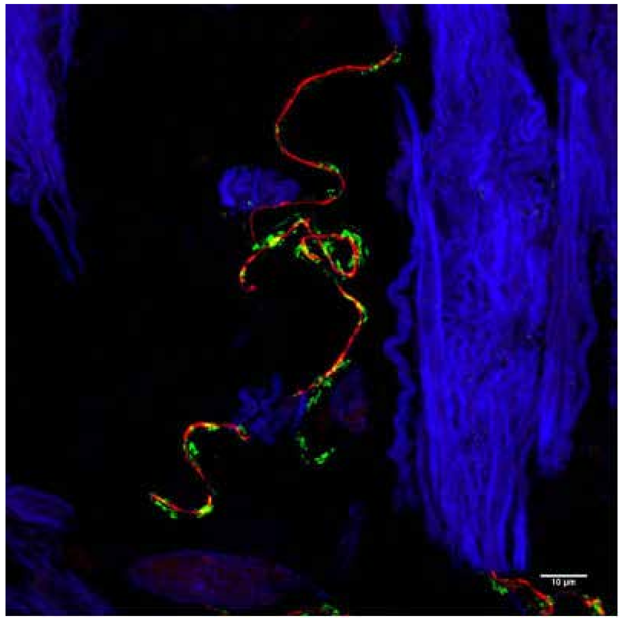
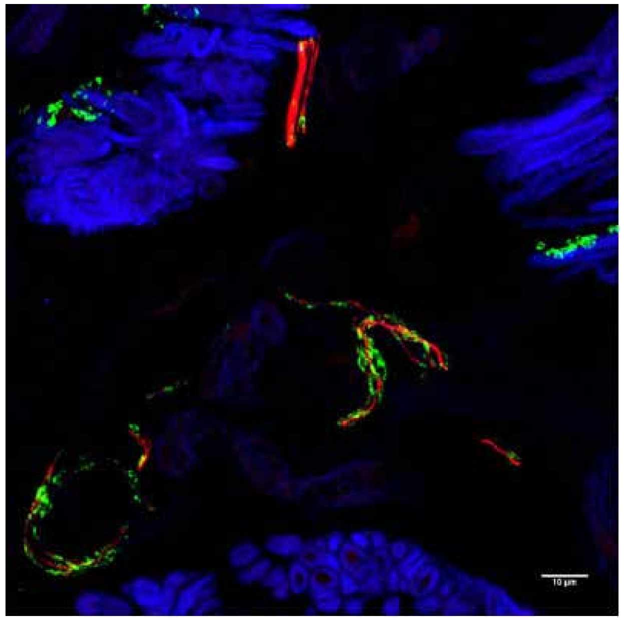


Figure 4



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4:32 pm

A Device and Descriptive System for Quantitative Assessment of Orbital Compliance and Soft Tissue Restriction

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Introduction: There is extensive focus on recapitulating the three dimensional configuration and volume of the bony orbit following trauma, but the most debilitating fracture associated complications often relate to persistent or iatrogenic soft tissue entrapment. While quantitative restriction data theoretically could be represented on a X-Y axis for each cardinal direction of eye movement, forced duction testing as currently practiced results in a binary 'positive' or 'negative' designation, as determined by expert feel. The majority of fractures are also repaired by surgeons without ophthalmic training, not all of whom have equal comfort with globe manipulation by means of precision grasping of the conjunctiva-Tenon's fusion plane adjacent to the limbus. Without experience with these landmarks and method of manipulation, the chance of obtaining clinically useful data is reduced, while the risk of corneal injury and/or conjunctival laceration increases. The authors therefore describe a novel portable device and descriptive system for automated, quantitative assessment of orbital compliance and soft tissue restriction with emphasis on applicability to orbital trauma and fracture management.

Methods: A first generation prototype was created using a load cell cantilevered between a machined handle and an instrument cradle containing forceps to lock the corneoscleral limbus. An inertial monitoring unit (IMU) was added to permit positional sensing. This was tested in a cadaveric orbital fracture model with hanging weights secured to the inferior rectus muscle to provide variable resistance. A second generation prototype was then developed to map orbital soft tissue resistance and range of motion via automated scanning of each clock hour. This consists of stacked piezoelectric motor stages – one rotational and one translational – coupled to a load cell via a 3D printed rail and shuttle system to generate an appropriate vector for reproducible globe manipulation. Ocular surface interface is via vacuum assisted suction, obviating the need for potentially traumatic grasping. Proof of concept testing was also performed in a cadaveric fracture model in which a bare titanium implant was used to simulate iatrogenic entrapment.

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Results: Using the <u>first generation</u> prototype, peak forces measured with application of standardized weight values of 0, 5, 10, 15, and 20 grams in the initial cadaveric fracture model were 8±1.5, 13±2.0, 19±1.8, 23±2.1, and 29±2.0 grams with forced supraduction. IMU data was challenging to integrate in order to provide spatial information. The <u>second generation</u> prototype was created and representative force versus excursion curves were produced with cadaveric simulation of iatrogenic entrapment and after resolution. Simulated <u>360 degree</u> scan acquisition was performed and an accompanying descriptive system for quantitative mapping of orbital soft tissue restriction was developed.

Conclusions: Further refinement is required, including fixation of the system to a stable gantry to ensure further standardization of measurement. While initially a research tool, the authors believe that this novel automated device and the accompanying 360 degree orbital compliance and soft tissue restriction 'heat map' can help to enhance the clinical management of fractures and other restrictive orbital disease once appropriate normative data and predictive algorithms have been integrated, as seen with core ophthalmic technologies such as optical coherence tomography.

1 – A Case of Mistaken Identity: Saksenaea vasiformis in the Orbit Masquerading as Mucor

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Introduction: We describe a rare presentation of invasive fungal sinusitis (IFS) in the orbit caused by Saksenaea vasiformis in an otherwise healthy child.

Methods: Descriptive case report and a literature review using the National Institutes of Health PubMed database.

Results: A previously healthy and immunocompetent 14-yo girl presented with left eyelid swelling and tearing for three weeks (Figure 1). Neuroimaging demonstrated a left orbital mass with adjacent sinus involvement (Figure 2) which prompted sinus biopsy and debridement with initial histopathology showing granulomatous inflammation. Systemic corticosteroid therapy resulted in improvement in proptosis. A secondary pathology review (Figure 3) later revealed invasive fungal elements, prompting readmission for IV amphotericin for presumed Mucor, despite lack of speciation. Repeat endoscopic sinus surgery showed no evidence of necrosis. A comprehensive immunologic work-up was negative. The development of acute renal injury prompted her transfer to our institution with a diagnosis of Mucor.

Her clinical exam was normal with intact vision and full extraocular movements (Figure 1). Repeat neuroimaging (Figure 2) demonstrated stability of the lesion over two weeks, and two retrobulbar injections of amphotericin B were performed.

Additional injections were deferred owing to a stable ophthalmologic exam in the setting of a fully immunocompetent patient. Given the unusual presentation, the diagnosis of Mucor was questioned. The patient was transitioned from IV to oral posaconazole and discharged. Five weeks after initial sinus culture, the specimen grew *Saksenaea vasiformis* complex, a fungus of a different family than Mucor. She remains well at last follow-up 3 months from hospitalization.

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Conclusions: This is a rare case of *Saksenaea vasiformis* in the orbit. There is one prior case reported in a 21-month old child in sub-Saharan Africa[1]. On pathology, it is difficult and sometimes not possible to distinguish from Mucor. Saksenaea typically infects immunocompetent hosts and is generally susceptible to amphotericin B and posaconazole treatment[2]. This case was initially treated and diagnosed as Mucor, which has a high mortality rate and is seen primarily in immunocompromised patients[3]. It is important to differentiate between the terms mucormycosis and the genus Mucor. Mucormycosis refers to the fungal organisms within the order Mucorales, including both Mucor and Saksenaea genera. Given the unusual presentation in this patient, a diligent search for the fungal speciation revealed Saksenaea, despite the prior diagnosis of Mucor. Given the ease of copy forwarding in the electronic health record, physicians should be cautious about documentation when uncertainty of a particular diagnosis exists. Optimal treatment for orbital manifestations of *Saksenaea vasiformis* is yet to be elucidated, however our patient responded well to sinus debridement with amphotericin and posaconazole.

Figure 1

Figure 1. External photographs of patient's full extraocular movements. The patient had no diplopia, lagophthalmos, ptosis, or resistance to retropulsion.

Figure 2

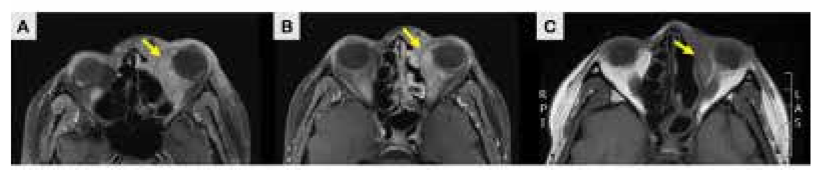

Figure 2. T1 Axial MRI images. A: Initial image on presentation. Arrow shows left medial orbital mass with adjacent sinus involvement. B: Image three days after starting steroids. Arrow shows reduced size of mass. C: Image two weeks after presentation showing further reduction in orbital mass.

Figure 3

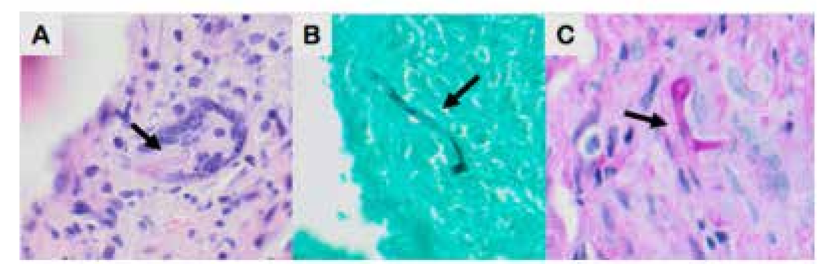

Figure 3A: Arrow shows multinucleated giant cell engulfing fungal hypha (hematoxylin-eosin, 40x). Figure 3B: Arrow shows long non-septate fungal hypha resembling "ribbon" with variable widths with right-angle branching (gomori-methenamine-silver, 40x). Figure 3C: Arrow shows thinner hypha morphology less typical of Mucor (periodic-acid-Schiff, 40x).

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2 – A Novel Approach for Congenital Epiblepharon Management with Minimal Skin Removal. Case Series

Julián Espinosa[1], Wendy W. Lee[2], Osiris Olvera[1], Alba García[1], Franchesca Sánchez[1], Juan Schiappapietra[1], José Luis Tovilla[3]
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Objective: To report on the results of surgical correction procedure for congenital epiblepharon and to describe the technique of minimal skin excision and orbicularis muscle debulking combined with capsulopalpebral fascia – tarsal attachment and skin closure including a tarsal plate “bite”. This procedure combines correction of the 3 physiopathological aspects of epiblepharon and this combination has not been previously described in literature.

Methods: This is a descriptive, case series study. Medical records of consecutive patients who presented with congenital epiblepharon and received surgical intervention in an ophthalmology center in Mexico City between January and May 2019 were evaluated. A combined surgical procedure for the correction of congenital epiblepharon was performed. Inclusion criteria for surgery were patients with symptomatic epiblepharon and/or keratopathy due to cilia eroding the cornea. Under general anesthesia a linear incision was made 1-2 mm below the ciliary line, from the inferior punctum medially to the junction between central third and lateral third of the eyelid laterally; 2-3 mm thick strip of skin was excised below the initial incision. Pretarsal orbicularis muscle strip was conservatively excised. The capsulopalpebral fascia was then attached to the inferior border of the tarsus with 3 interrupted 6-0 polyglactin absorbable sutures. For skin closure interrupted sutures were used along the wound, engaging first the inferior edge of the skin incision, then a non-transfixing “bite” of the tarsus, inferior to the superior edge of the skin incision, and finally the upper edge of the skin incision just below lash line. This rotates the lashes outward. The amount of rotation could be adjusted with the site of tarsal fixation. If more rotation was needed the tarsal “bite” was engaged in a lower portion of the tarsal plate. Postoperative treatment included oral analgesic and antibiotic ointment. Absorbable sutures were left to self-loosen and dropped off. The patients were followed for direct inspection of the wound, the direction of the lashes and the status of the cornea.

Results: 6 eyes of 3 patients were included in the study. Patients ages were between 2 and 4 years old at the moment of surgical intervention. The mean postoperative follow-up period was 6 weeks. Symptoms disappeared in all patients. In all six eyelids the cilia did not touch the cornea, even in the down-gaze. None keratopathy signs were observed in the postoperative period. The cosmetic outcome of the lower lid was satisfactory in all cases. To date, there have been no complications such as wound infection, wound dehiscence, ectropion or lower eyelid retraction.

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Conclusions: The surgical technique described for correction of congenital epiblepharon, with minimal skin and orbicularis removal might reduce the risk of over correction and postoperative ectropion and lower lid retraction, that could occur later in life with facial growth; by combining it with the capsulopalpebral fascia attachment to the tarsus and the lash rotating sutures included in the skin closure, provide an excellent postoperative functional and aesthetic outcome. To our best knowledge, surgical correction of epiblepharon as described above, has not been elucidated in the literature.

Figure 1

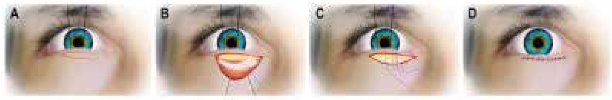

Figure 2

Figure 3

Figure 4

Figure 5

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3 – A Novel Use of Polyetheretherketone Implants for Treatment of Congenital Anophthalmia

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Introduction: Congenital anophthalmia is best approached early and with orbital implants, such as dermis fat grafts, to stimulate orbital growth. Late presentations have been treated with box osteotomies, a large and complex surgery that involves neurosurgery and plastic surgery to cut and move orbital bones, requiring 10-14 days of inpatient post-operative care. We report the first instance of polyetheretherketone (PEEK) implant used in the orbit for treatment of an anophthalmic socket.

Methods: A literature review was performed on PubMed using the following search terms: "polyetheretherketone," "implants", "orbit", and "reconstruction" including the years from 2013 to 2019. There were no language or date restrictions for the search. No reports were excluded.

Results: A 14-year-old male with a history of right anophthalmia with micro-orbit and micro-lids since birth presented for a second opinion regarding orbital expansion after emigrating from the Dominican Republic (Figure 1). After poor bony orbit growth in response to a 5ml spherical hydrogel implant at the age of 10 years, the decision was made to place use a customized PEEK implant to achieve better symmetry. The plastic surgeon and oculoplastic surgeon worked with the implant company, which based the implant on achieving symmetry to the contralateral side. They designed two interlocking, customized PEEK implants on the superior and inferior orbital rim with preplaced drill holes. These were implanted and affixed with titanium screws via a coronal and intraoral approach with stereotactic navigation. To address orbital volume, a dermis fat graft was placed concurrently. He was discharged home on post-operative day 2 and resumed his normal activities within 1 week (Figure 2).

Conclusions: Polyetheretherketone customizable implants are well-known in neurosurgical, dental, and orthopedic literature to be biocompatible, lightweight, and strong.[1] However, there is a relative paucity of material on using PEEK implants in the midface region and what literature does exist focuses exclusively on repair of complex fractures or defects of bone in older patients.[2-3]

To the authors' knowledge, this is the first instance of a PEEK implant being used in treatment of micro-orbit from congenital anophthalmia. Additionally, our patient, at the age of 14 years, is the youngest patient ever to receive a PEEK implant for orbital reconstruction. Customized PEEK implants may be a viable option for difficult orbital reconstruction by providing shorter postoperative recovery times and a more predictable and symmetric outcome than traditional orbital implants.

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Figure 1

Figure 2

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4 – A Rare Case of Atypical Pediatric Ocular Capillary Hemangioma

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Introduction: A rare intrascleral capillary hemangioma should be considered in the differential of a diffuse and enlarging vascular lesion on the ocular surface in children. This lesion may appear to be acquired, with no signs of the hemangioma in the first year of life.

Methods: Prospective case report, and review of literature.

A 7 yo healthy girl presented for an evaluation of a new onset reddish left eye mass (Fig 1) that was increasing in size over several months. The lesion appeared spontaneously with no history of trauma, coagulopathy, or topical medication use. Exam demonstrated a violaceous vascular lesion deep to the conjunctiva, intrascleral, and extending to the inferior limbus. It was non-tender, nonmobile, stable with Valsalva, and did not extend into the retina. Vision was 20/20, and the remainder of her eye exam was normal. There were no oropharyngeal lesions, or other similar skin lesions.

Results: Evaluation of the globe mass included B-scan ultrasound, UBM, anterior segment OCT, and orbital MRI. UBM and ultrasound showed an echogenic component without orbital component. The AS OCT demonstrated vessels within the mass with no defined capsule (Fig 2). The orbital MRI confirmed a lesion isolated to the scleral layers of the globe, with low blood flow. The patient had a partial response to oral propranolol after 4 months of use. Because the lesion vessels began to extend into the corneal endothelium (Fig 3), there was concern for a malignancy such as Kaposi's sarcoma or lymphoma. A biopsy confirmed an atypical ocular capillary hemangioma with corneal involvement. Discontinuation of the propranolol demonstrated slight enlargement a month later, with stability of the lesion 6 months later.

Conclusions: A rare intrascleral capillary hemangioma should be considered in the differential of a diffuse and enlarging vascular lesion on the ocular surface in children. Such lesions may be less amenable to topical or systemic beta-blocker therapy.

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Figure 1

Figure 2

Figure 3

5 – Acute Ophthalmoplegia Following Filler Injections to the Upper Face

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Introduction: Although facial soft tissue fillers are generally low risk, they can in rare cases cause serious complications including ophthalmoplegia.

Methods: 2 case reports, and review of peer-reviewed literature related to orbital complications of facial filler (key search words: filler, hyaluronic acid, diplopia, ophthalmoplegia, nerve palsy, oculomotor palsy, third nerve palsy, myositis, ischemia).

Results: Case 1: A 54-year-old female underwent cosmetic hyaluronic acid filler injections to the temples and periorbital region. After experiencing severe frontal headache and nausea during the malar injections, she was treated immediately with hyaluronidase around the left temple and periorbital region. There was no blanching or bleeding at the injection site. The patient then developed dizziness, binocular diplopia, and vomiting and was subsequently taken to the ER. Ocular exam was unremarkable, except for limited supraduction, -3, of the left eye. MRI/MRA of the brain and orbit were unremarkable. Seventy-two hours after injection the patient she was started on a one week prednisone taper and aspirin to treat empirically for ischemic cranial nerve palsy. The diplopia resolved over the next 8 weeks. Although ischemic third nerve palsy has been reportedly related to cosmetic hyaluronic acid filler injection, this patient's findings were more consistent with an isolated superior rectus palsy due to lack of ptosis.

Case 2: A 37-year-old female frequently attended "filler and botulinum toxin injection parties," and after one event developed acute binocular diplopia after polymethylmethacrylate injection to the nasal bridge and "other" fillers to the periorbital region. She avoided seeking medical attention until 4 months later, when she was noted to have severe limitation of adduction and moderate limitation in supraduction in the left eye, with a large angle left exotropia and left hypotropia, consistent with a partial third nerve palsy. Pupils and the rest of the ocular exam were unremarkable. Specifically, there was no central or branch retinal artery occlusion. There was no improvement of the third nerve palsy at 10 months, and she underwent a strabismus surgery-with partial correction of the motility deficit.

Conclusions: Facial fillers can rarely result in serious or even vision threatening complications. Only a few cases of cranial nerve palsy or ophthalmoplegia have been reported in the literature. We present two cases associated with filler injection to the upper face, one with an isolated superior rectus palsy and the other with a persistent partial third nerve palsy. Individuals who develop ophthalmoplegia related to facial filler may recover function over time as in seen in the majority of cases presented in the literature. However, in some cases the injury may be permanent. Patients need to be aware of this risk prior to injection.

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6 – An Analysis of Pediatric Orbital and Ocular Gunshot Injuries

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Introduction: Ophthalmic injuries secondary to firearms comprise <1% of all pediatric cases of orbital and ocular trauma[1]. Although numerous studies in a pediatric population have examined injuries resulting non-powder (i.e. BB guns, pellet guns) firearms, no such study has examined orbital and ocular injuries resulting from due to gunpowder firearms. We sought to examine the patterns, characteristics, and sequelae of pediatric gunshot injuries to the orbit, ocular adnexa, and eye. We hypothesized that orbital fractures portended poor visual and ocular outcomes.

Methods: We conducted a retrospective chart review of pediatric patients (age < 18 years) treated at a tertiary medical center between 2006 and 2017 who sustained traumatic gunshot injuries caused by firearms to the ocular and/or orbital and adnexal. Injuries due to non-powder firearms were excluded.

Results: Fifteen patients were identified from the 7952 pediatric patients for whom Ophthalmology was consulted during the study period. Individuals were predominantly male (12/15 cases) and ranged in age from 3 to 17 years (M = 13.1 ± 4.6 years). The cause of the injury was accidental in 6/15 cases while 5/15 cases were secondary to assault and 4/15 cases were self-inflicted. Three patients did not survive their injuries. Orbital fractures were observed in 10/15 patients, 50% of which involved both orbits bilaterally. Amongst the 15 orbital fractures, medial wall fractures were most frequently observed in 73.3% of fractures (while roof, floor and lateral wall fractures occurred in in 60%, 53.3%, and 33.3% of orbital fractures). Open globe injuries occurred in 5/15 patients, all of which were unilateral (5/30 eyes); all instances of open globe injuries were associated with orbital fractures. Retained foreign bodies (from bullet shrapnel) were present in 9/30 orbits (4 right orbit, 5 left orbit). In 8 patients for whom visual acuity (VA) could be reliably obtained, last known VA was ≥20/200 in 6 of 16 eyes and in all 6 eyes had associated orbital fractures. There was a statistically significant association (p = .0310) between the presence of an orbital fracture and VA. Four of the 12 patients who survived their injuries required surgical intervention as part of their treatment.

Conclusions: Similar to all-cause reports of ocular trauma, our patients were predominantly male. Unintentional (i.e. accidental) injuries comprised a greater proportion of injuries in pediatric patients (40% of cases) relative to similar gunshot injuries in an adult population over the same study period at this institution (<5% of cases). The presence of orbital fractures in this population was associated with poor visual outcomes and a high likelihood of open globe injury greater than previously reported for other causes of traumatic injuries[2].

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Figure 1

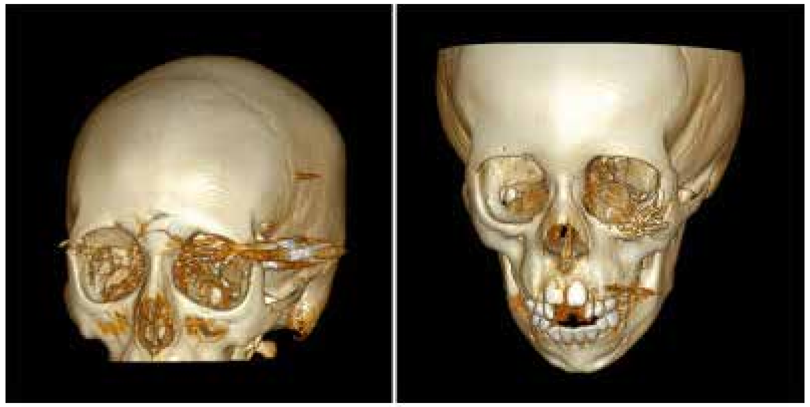


Figure 2

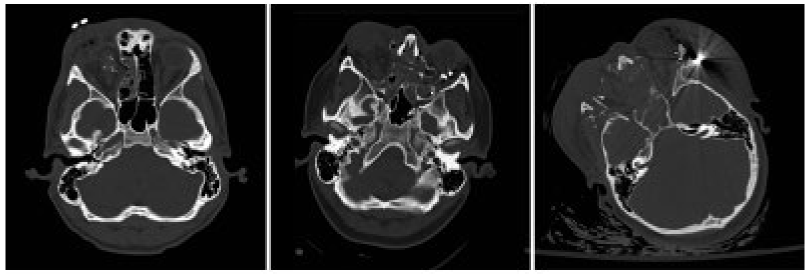
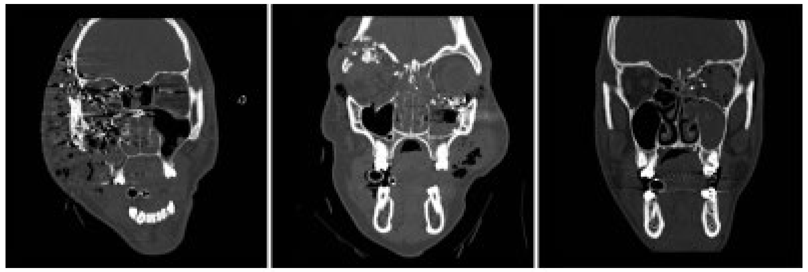


Figure 3



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7 – An Assessment of Radiation Treatment Planning in Thyroid-Eye Disease and Compressive Optic Neuropathy

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Introduction: Donaldson et al., 1973 is the most recent paper on radiotherapy (RT) methodology in thyroid eye disease (TED), and applies little to today's more modern modalities [1]. The objective of this study was to retrospectively review our experience from a radiation planning stand-point for thyroid eye disease and compressive optic neuropathy (TED-CON), to determine if current treatment methods provide adequate dose to target and collateral structures.

Methods: A retrospective review of 52 patients (104 orbits) with bilateral TED-CON and RT (20Gy in 10fx) at our institution from 2008-2016. RT plans were analyzed for target volumes and doses. Visual fields (MD), color plates (CP), and visual acuity (VA) was assessed pre-treatment and 2 months post-RT. A standardized, anatomic contour of the orbit was applied to these retrospective plans to determine dose to the entire space, rather than the self-selected 'target structure' [Figure 1]. Comparisons were made with one-way ANOVA with Tukey HSD post-hoc analysis and an alpha of 0.05.

Results: When compared to the anatomic orbital space, the original contour overlapped by only 68% [Figure 2]. Max and mean dose was 2134cGy and 1910cGy to the anatomic orbital space. Consequently, 39.8% of the orbits had a mean dose <19Gy (<17Gy 16.4%, <18 27.6% <19 37.8%, <20 59.2%, 20-21 35.8%, >21Gy 5%). There was no significant association between improvement in CP (p=0.26), VF (p=0.16), and VA (p=0.78) based on these dose differences. 10 orbits underwent dose recalculation based on a full contour of the anatomic orbital space. They demonstrated a more homogenized mean and max dose of 2002 cGy and 2172 cGy, respectively, with a +7.8% and +3.7% in mean dose to the retina and brain, respectively. When beam placement was retrospectively adjusted to include a space of 0.5cm between the lens and the anterior beam edge, there was a 39.4% and 20.3% decrease in max and mean dose to the lens.

Conclusions: At doses this low, reductions in just 1-2Gy is 10-20% of the prescription dose. Therefore, there appears to be less margin for error in total dose to the orbital space. Plans that received less than 17Gy, however, did not affect outcomes in the follow-up period. While precise contouring of the retro-bulbar space may be of little clinical consequence overall, a >0.5cm space from the lens may continue to reduce/delay cataractogenesis [Figure 3]. More posterior expansion of the apical, superior and inferior regions, which are responsible for the pathogenesis of optic nerve compression, would also improve mean dose to the regions of greatest importance [Figure 4]. This study suggests that prospective studies in RT for TED-CON with lower radiation doses may demonstrate equivalent efficacy to current standards. Use of low dose radiotherapy would allow for re-treatment of recurrent cases with less concern for the potential development of radiation-induced optic neuropathy.

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Figure 1

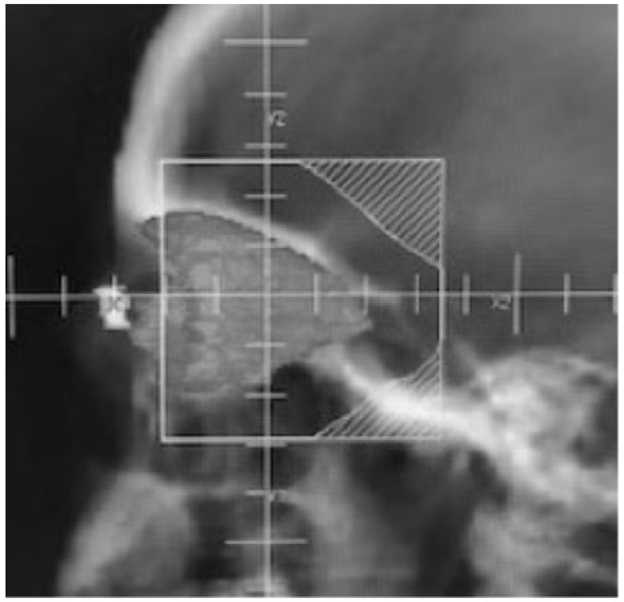


Figure 2

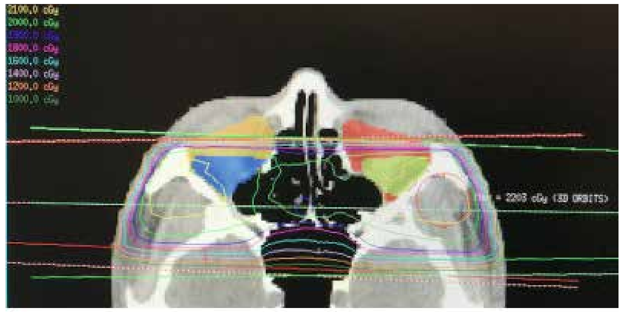
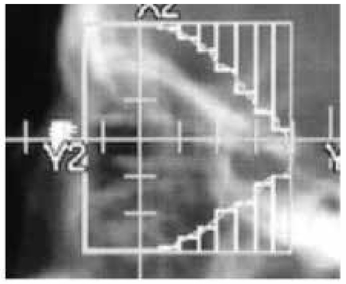
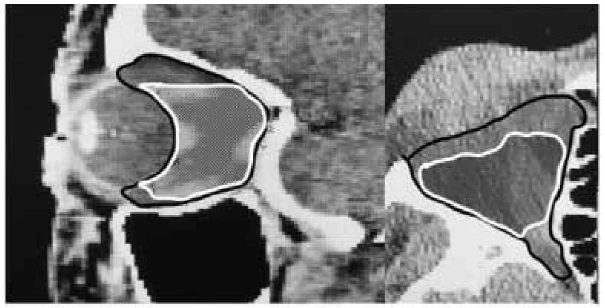


Figure 3



*example of a practitioner anterior beam edge close to the posterior lens border (<0.5cm)

Figure 4



*White = practitioner contour, Black = anatomic contour.

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8 – Analysis of Eyelid Contour using Crowdsourced Data

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Introduction: Eyelid contour is an important surgical outcome that is often challenging to quantify. Manual segmentation by experts is time consuming and inefficient and the signal detection task is challenging for automated systems to date. Crowdsourcing offers the increased efficiency of automated segmentation with the enhanced signal detection capacity of human observers. We aimed to validate the ability of lay people to accurately identify upper eyelid contour.

Methods: Participants were recruited through the Amazon crowdsourcing platform MechanicalTURK. They were tasked to use >10 clicks and denote the eyelid margin on 10 standardized cropped photographs in patients affected by ptosis. The x and y coordinates of each click were recorded and these elements were mapped onto a 1000 x 1000 matrix. Responses were compared between the crowdsourced participants and expert reviewers on the same task (gold standard). The contour was binned into 10 pixel segments in the x axis. The average and standard deviation (SD) was calculated for each box and the y coordinates 1 SD above and below were eliminated. The remaining click points were averaged and compared to the gold standard using the two-sample Kolmogorov-Smirnov test to determine if they fit within the same distribution. Individual polynomials for participant and gold standard responses were also created, without the removal of outliers, and were analyzed to determine the optimal number of participant clicks yielding a good fit with the experts polynomial. All polynomials were inverted in order to facilitate statistical analysis.

Results: Forty responses were crowdsourced for each image. Following the removal of outliers, there was no significant difference in the second degree polynomial created if the mean or median was used; resultantly, the mean was used for subsequent analysis (Figure 1). The polynomial fit to the averaged matrix for participant responses was similar to that representing the experts response ($p=1.000$; Figure 2). While averaged participant responses for those clicking less than the average number of clicks (<13 clicks) varied from the expert polynomial ($p=0.001$), those clicking >13 times did not ($p=0.198$; Figure 3).

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Conclusions: In this study, the polynomials created from averaged crowdsourced data were not statistically significantly different from that measured by oculoplastic surgeons ($p=1.000$) for the whole sample. The same was true for participants utilizing >13 clicks ($p=0.198$). The results of this study suggest that crowdsourced data regarding eyelid contour can, on average, be as accurate as gold standard if >13 clicks are utilized to define the contour. Finally, similar to Malbouisson et al[1] our results suggest that upper eyelid contour can be accurately represented with a simple parabolic line. The responses can be gained in a reasonably short time (<1 hr) for a small price of $0.02 per measurement, or approximately $0.80 per image.

Figure 1

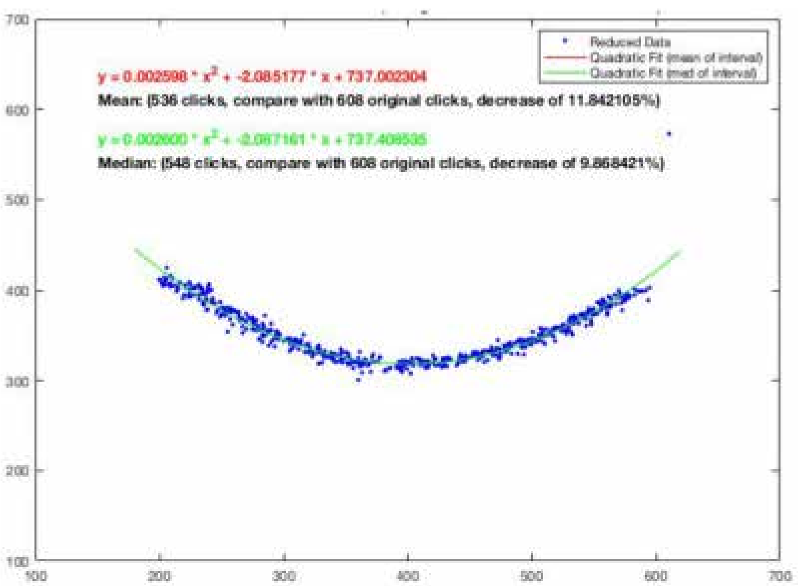
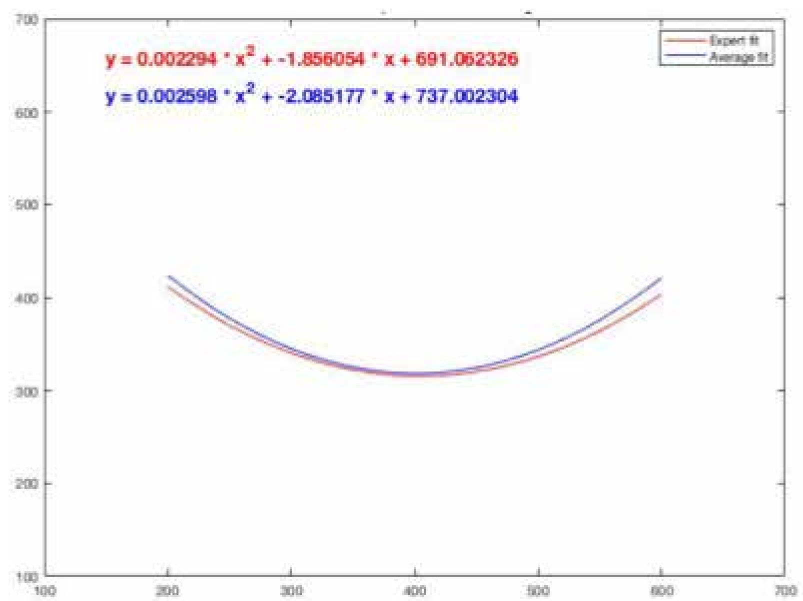


Figure 2



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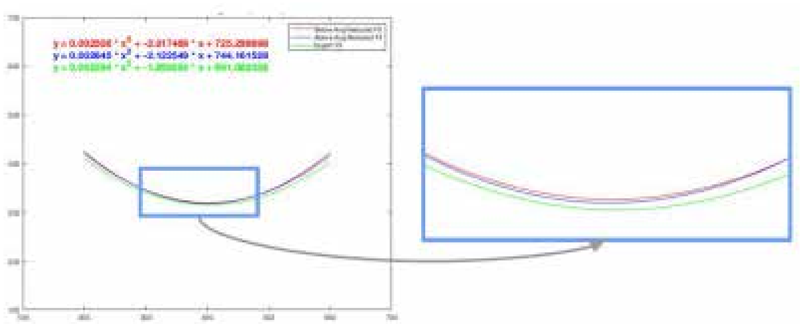

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9 – Animal Model for Hyaluronic Acid Gel Injection for Treatment of Anophthalmos

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Introduction: We used a rabbit model of orbital dysplasia to examine the effect of hyaluronic acid gel (HAG) injections on orbital development.

Methods: Data were collected on the age, health, and quality of 30 immature New Zealand rabbits. Rabbits were randomized into 3 groups of 10 as follows: control, enucleation and enucleation with HAG injection groups. At 1, 3 and 6 months, orbital CT examinations were conducted to assess orbital volume, and eyelid length was measured every month. Measurements were compared bilaterally at six months after which each rabbit was killed. Periosteum and orbital fat tissues were examined using Western blotting to assess BMP-2 expression.

Results: At 6 months, the normal palpebral fissure length was 19.11±0.82 mm, the palpebral fissure length in the ocular enucleation group was reduced to 15.71 ± 0.64 mm, and the palpebral fissure length in the enucleation + HAG injection group was 17.64 ±0.91 mm. The differences in palpebral fissure length between the enucleation and enucleation +HAG groups were significant ($P < 0.01$). The normal orbital volume was 4.94 ±0.26 cm^3, the orbital volume in the enucleation group was 3.18 ±0.14 cm^3, and the orbital volume in the enucleation + HAG injection group was 4.70 ±0.19 cm^3. The differences between the enucleation and enucleation + HAG group were significant ($P < 0.01$). BMP-2 expression in the periosteum and fat significantly increased in the enucleation + HAG injection group.

Conclusions: HAG injection into the muscle cone can effectively stimulate orbital cavity development, promote bone hyperplasia, and has great potential to treat congenital orbital dysplasia.

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10 – Anxiety and Depression After Open Globe Injury

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Introduction: This cross sectional interview-based study aimed to assess the prevalence and severity of anxiety and depression in patients with open globe injury and to identify factors associated with anxiety and depression following open globe injury.

Methods: patients with open globe injury were identified at a tertiary care center between 2008-2019. Prisoners and patients under 18 at the time of recruitment were excluded. 97 patients provided verbal consent to participate in the study, which involved a phone interview and a brief chart review. The interview consisted of a section on sociodemographic data and potential associations followed by the Hospital Anxiety and Depression Scale (HADS), a standardized 14 question survey that has been validated in previous studies as an excellent predictor of anxiety and depression.[1] A score of 8 for anxiety or depression was considered a positive test, and patients with a positive test in either category were advised to seek further evaluation with their primary care doctors. Prevalence of anxiety and depression were calculated and linear regression was used to identify factors associated with anxiety and depression.

Results: The average age was 50.9 ± 19.4 and 75.3% of patients were male. The anxiety score was positive in 40.2% of patients and the depression score was positive in 27.8%. The mean anxiety and depression scores were 6.5 ± 4.8 and 5.4 ± 4.7 respectively. The p value of the linear regressions for anxiety score and depression score were both < 0.0001, with R^2 of 0.441 and 0.474 respectively. Patients who were bothered by the appearance of their injured eye had higher anxiety scores ($p = 0.001$) and depression scores ($p < 0.0001$). Patients without a high school diploma had higher anxiety ($p = 0.047$) and depression scores ($p = 0.002$). Patients with a greater number of ocular and periocular surgeries in the injured eye had lower depression scores ($p = 0.040$). Gender, enucleation status, number of people in support network, use of a prosthetic or scleral shell, final log MAR visual acuity, marital status, employment status, months since the initial injury, and presence of an intraocular foreign body were not significantly associated with anxiety or depression scores.

Conclusions: Open globe injury is associated with a high prevalence of anxiety and depression. Dissatisfaction with the appearance of the injured eye and lack of a high school education were associated with higher anxiety and depression scores, and an increased number of ocular and periocular surgeries in the injured eye was associated with lower depression scores.

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11 – Application of Scleral Lenses in Thyroid Eye Disease: A Retrospective Case Series

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Introduction: Scleral lenses have emerged as a tool in managing exposure keratopathy secondary to lid malposition in complex oculoplastics cases.[1,2] Prosthetic replacement of the ocular surface ecosystem (PROSE) in particular has been shown to result in more rapid and substantial improvement in the visual acuity of post-surgical lagophthalmos and exposure keratopathy patients compared to standard of care treatments.[1] Scleral lens use in thyroid eye disease (TED) patients has been less well described.[3] In the largest case series to date, the authors analyze the clinical characteristics and visual outcomes of TED patients treated with PROSE and conduct a comprehensive literature review on scleral lens use in this patient population.

Methods: Retrospective case series. Three patients (4 eyes) with TED treated with PROSE between December 2014 and November 2018 were identified at a single institution. Data collected included demographics, clinical presentation, management, and best-corrected visual acuity (BCVA) prior to and after PROSE use. A comprehensive PubMed search for all English articles on scleral lenses was also performed. Two prior published cases of scleral lens use in TED were identified.

Results: Three patients (4 eyes) with TED treated with PROSE were included for analysis. Average age was 66.7 (±11.5, range 60-80) and 3 (100%) patients were female. Four (100%) eyes had undergone prior orbital decompression and eyelid retraction repair surgeries. Mean number of failed treatments for exposure keratopathy prior to PROSE was 6.8±1, including both conservative and surgical therapies. Average pre-PROSE corrected visual acuity (VA) converted to logMAR was 0.62±0.58 logMAR (~20/80) and improved to 0.23±0.21 logMAR (~20/30) at initial PROSE fitting. Average VAs at different time points were as follows: 0.28±0.24 logMAR at 3-months, 0.20±0.34 logMAR at 6-months, and 0.07±0.06 logMAR at 12-months. Mean BCVA achieved was 0.14±0.27 logMAR (~20/25). All patients reported improved vision and comfort, and were found to have improvement in ocular surface quality including partial or complete resolution of superficial punctate keratopathy, corneal haze, and/or neovascularization (Figure 1A&B). Demographic and clinical characteristics reported in the authors' case series as well as 2 prior published cases are summarized in Figure 2.

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Conclusions: Application of scleral lenses in TED patients has rarely been reported. In the largest case series to date, the authors demonstrate that PROSE can improve visual acuity, comfort, and ocular surface quality in this patient population. TED patients experienced a 5-line improvement in Snellen VA from approximately 20/80 to 20/30 after PROSE wear. Oculoplastic surgeons may consider using scleral lenses as a viable adjunct therapy for exposure keratopathy in TED patients.

Figure 1

Figure 2

Figure 2. Demographic and clinical characteristics of thyroid eye disease patients treated with scleral lenses

Year - Authors	Patient #	Age (years)/ Sex (M/F)	Prior Orbital Decompression Surgery	Prior Eyelid Surgery	Eye	Significant Exam Findings	Scleral Lens Type	Initial VA	BCVA with Scleral Lens	Patient Reported Improvement in vision/comfort? (Y/N)	Improvement in corneal surface?	Follow-Up (months)
2014 - Harthan JS	1	45 M	N	N	right	proptosis, upper and lower lid retraction, exposure keratopathy	Mini-Scleral Design™	20/30	20/25	Y/Y	Y	3
			N	N	left	proptosis, upper and lower lid retraction, exposure keratopathy	Mini-Scleral Design™	20/50	20/25	Y/Y	Y	5
2018 - Scofield-Kaplan SM et al.	2	59 F	Y	Y	left	ptosis, lagophthalmos, exposure keratopathy	PROSE	20/70	20/25	Y/Y	Y	6
2019 - Gervasio KA et al.	3	60 F	Y	Y	left	lagophthalmos, exposure keratopathy	PROSE	20/50	20/30	Y/Y	Y	11
	4	60 F	Y	Y	right	proptosis, lagophthalmos, exposure keratopathy	PROSE	20/40	20/30	Y/Y	Y	11
			Y	Y	left	proptosis, lagophthalmos, exposure keratopathy	PROSE	20/60	20/30	Y/Y	Y	11
	5	80 F	Y	N	right	exposure keratopathy	PROSE	20/400	20/70	Y/Y	Y	6

BCVA, best-corrected visual acuity; F, female; M, male; N, no; PROSE, prosthetic replacement of the ocular surface ecosystem; VA, visual acuity; Y, yes.

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12 – Assisted Local Anaesthesia for Endoscopic Dacyrocystorhinostomy.

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Introduction: Endoscopic endonasal dacryocystorhinostomy is now a well-established treatment for nasolacrimal duct obstruction[1]. Its performance using local anaesthesia 'assisted' by sedation is acceptable to patients[2,3]. We evaluate the effectiveness of endoscopic endonasal dacryocystorhinostomy using assisted local anaesthesia.

Methods: A retrospective review of consecutive adult patients who had had endoscopic endonasal dacryocystorhinostomy for complete, primary nasolacrimal duct obstruction by the authors J.F. and C.S. using assisted local anaesthesia was performed. Patients had been counselled regarding the risks and benefits of general and local anaesthesia with sedation and had elected to have the latter.

Results: Seventy-seven cases were identified for review. 80.5% were female. Mean patient age was 75.3 years. Complete resolution of epiphora was achieved in 88.2% cases. 89.6% cases underwent postoperative physical examination. Successful surgical creation of a functional ostium as demonstrated by successful lacrimal system irrigation or the spontaneous appearance of fluorescein dye in the nose at nasendoscopy was noted in 97.1%. 65.8% cases had follow-up beyond six months. Repeat endoscopic endonasal dacryocystorhinostomy successfully alleviated epiphora which had recurred over the course of follow up in three cases (3.9%).

Conclusions: When performed using assisted local anaesthesia, endoscopic endonasal dacryocystorhinostomy is effective in the management of nasolacrimal duct obstruction. The success of such surgery is comparable to that of the same procedure when performed under general anaesthesia and indeed to that of external dacyrocystorhinostmy.

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13 – Balanced Horizontal Eyelid Tightening (BHET): Treatment of Irritated, Tearing, and Dry Eyes

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Introduction: To describe a balanced horizontal eyelid tightening (BHET) procedure to treat irritated, tearing, or dry eye symptoms. The BHET uses a minimal invasive subcaruncular approach to repair medial canthal ligament laxity (MCL) in conjunction with a graduated lateral eyelid tightening.

Methods: A retrospective analysis of 164 patients undergoing BHET repair was performed. Presenting complaints included irritated, tearing, or dry feeling eyes. Physical examination demonstrated a characteristic pretarsal blepharo-conjunctivitis, which is usually seen in those patients presenting with moderate to severe horizontal eyelid laxity.

Results: Patient age ranged between 45 and 96 years, with a mean of 71.3 years. Pre-operative upper lid distraction ranged from 3 to 48 mm in the right eye (median 11 mm, Q1 9, Q3 15, IQR 6) and 3 to 43 mm in the left eye (median 11 mm, Q1 8, Q3 15.25, IQR 7.25). Pre-operative lower lid distraction ranged from 8 to 50 mm in the right eye (median 28 mm, Q1 24, Q3 31, IQR 7) and 7 to 52 mm (median 26.5, Q1 24, Q3 30, IQR 6 mm) in the left eye. Pre-operative blepharo-conjunctivitis was noted in 90.8% of patients. Post-operative upper lid distraction ranged from 0 to 45 mm in the right lid (median 4 mm, Q1 3, Q3 6, IQR 3) and 0 to 44 mm in the left lid (median 4 mm, Q1 3, Q3 6, IQR 3). Lower lid distraction ranged from 0 to 33 mm in the right lid (median 7 mm, Q1 3.5, Q3 14, IQR 10.5) and 1 to 34 mm in the left lid (median 7 mm, Q1 3, Q3 14, IQR 11). 97% of patients had post-operative improvement in their lid laxity in at least half of the eyelids operated on as measured by distraction test. The percentage improvement in distraction test values from pre-operation to post-operation was 64.1%, 64.8%, 62.8%, and 64.7% in the right upper lid, left upper lid, right lower lid, and left lower lid respectively. Our two outcomes measured were improvement of blepharo-conjunctivitis per physician's examination at follow-up visit (median follow-up 137.5 days) and improvement or resolution of patient symptoms based on self-report at follow-up visit. Blepharo-conjunctivitis was found to have been improved or resolved in 92% of patients post-operatively. Subjectively, 89.6% of patients felt their symptoms improved or resolved post-operatively.

Conclusions: The lax eyelid is a frequent cause of the irritated, tearing, or dry eye. The BHET technique provides improvement in the lax eyelid pretarsal blepharo-conjunctivitis without causing an eyelid displacement. The BHET technique is an anatomically simple approach to stabilize the eyelid medially done in conjunction with a more familiar lateral eyelid tightening. We believe that eyelid laxity should be added to the differential diagnosis for the painful dry eye patient incompletely responsive to medical treatments.

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14 – Bilateral T-plate Based Suture Fixation to Reduce Large Angle Exotropia in Bilateral Third Nerve Palsy

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Introduction: Bilateral complete third nerve palsy poses a unique therapeutic challenge. Surgical options for correction of strabismus in patients with third nerve palsy include combined resection-recession procedures, superior oblique tendon transfer, and lateral rectus muscle transposition. These techniques have had limited success, often with residual deviation postoperatively or recurrence of ocular deviation over time. The surgical challenge is increased in the patient with bilateral third nerve palsy in which both eyes have abnormal ocular motility. A titanium T-plate based suture fixation technique has been described for reduction of large angle exotropia in unilateral third nerve palsy. The success of this technique has not been described in the case of bilateral third nerve palsy.

Methods: An 18-year-old male with bilateral nuclear third nerve palsies following intracranial hemorrhage from a midbrain vascular malformation presented with bilateral complete ptosis and bilateral deficits of adduction, elevation, and depression of the globes causing marked ocular deviation and visually debilitating diplopia. The patient underwent ocular realignment using the T-plate based suture fixation technique. A titanium T-plate was anchored to medial orbital rim of each orbit with the shaft of the T-plate projecting toward the orbital apex parallel to origin of the medial rectus muscle. A non-absorbable suture was used as as coupling element tethering the medial rectus muscle insertion to the distal aspect of the T-plate shaft. The non-absorbable suture was tightened to achieve the desired amount of tension to counter the force of the antagonist lateral rectus muscle. The Hirschberg light reflex method was used to determine orthophoria intraoperatively.

Results: Postoperatively the patient had marked reduction in ocular deviation, with single vision in primary gaze at distance. The patient continued to experience diplopia at near due to the absence of normal convergence.

Conclusions: A T-plate based suture fixation technique can be used in patients with bilateral third nerve palsy to reduce large angle exotropia and produce single vision at distance in primary gaze.

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Figure 1

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15 – Biofilm Associated Dermatitis

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Introduction: Injectable dermal fillers and facial implants are effective means for achieving lower lid and mid facial augmentation. Both of these techniques have been associated with biofilm formation. Biofilms occur when bacteria coat the implant or injected material and produce a protective sheet, manifesting as an indolent, low-grade infection or inflammation.[1] Multiple biofilm reports with hyaluronic acid fillers have been described.[2] Typically, they are associated with indurated, erythematous nodules at the site of injection that do not respond to conservative or topical treatments.[3] Cultures are negative and pathology is often consistent with a foreign body granuloma.[3] They may respond to chronic antibiotic therapy and sometimes require the removal of the implant.[1] We would like to describes three cases of biofilm-associated dermatitis, which is a previously undescribed sign of biofilm infection.

Methods: A compilation of three cases, all presenting with signs of dermatitis after the use of facial fillers or silicone facial implants. Charts were reviewed and pre-operative and post-operative details described. A systematic PubMed search for dermatitis and associated biofilm was also utilized.

Results: In case 1, a 65-year-old female underwent a modified lower eyelid blepharoplasty with silicone tear trough implant and skin resurfacing with C02 laser. At one week post-operatively, she was noted to have an erythematous rash over the right malar prominence. This were no fevers or chills and the site of the rash was not warm nor fluctuant. She was started on topical antibiotics and warm soaks. One week later, the dermatitis was still present with slight increase of edema (Figure 1). A second round of cephalexin was ineffective and dermatology was consulted. She was placed on a 6 week regiment of Azithromycin for presumed biofilm infection, resulting in marked improvement (Figure 2). By 4 months post-operatively her symptoms had completely resolved (Figure 3).

In case 2, a 33-year-old female presented five days after hyaluronic acid injection to the tear trough region with ill-defined dermatitis, swelling, redness, and pain over both lower eyelids. She was treated with ten days oral prednisone without improvement. Hyaluronidase was injected into both eyelids. Symptoms lessened but the dermatitis persisted. She was placed on four weeks of azithromycin, which completely resolved her symptoms.

Case 3 describes a 65-year-old female who presented with dermatitis, pain and swelling at the sites of injection one week after hyaluronic acid filler to the both melolabial folds. One week of clarithromycin resolved the discomfort and redness but the overlying dermatitis and edema persisted. She was placed on an additional three weeks of clarithromycin, which resolved the remaining symptoms.
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Conclusions: Soft tissue fillers and facial implants are useful modalities in addressing the loss of volume from facial aging. With an increased use of these modalities, there has also been a rise in complications.[2] Dermatitis associated with biofilm formation is a new presentation of a well-established complication. Chronic antibiotic therapy appears to effectively treat this complication without requiring removal of the implant or dissolving the filler.

Figure 1

Figure 2

Figure 3

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16 – Blepharoptosis among Korean Adults: Age-related Prevalence and Threshold Age for Evaluation

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Introduction: To evaluate the prevalence of blepharoptosis among Korean adults and the characteristics of blepharoptosis patients and to determine an appropriate age threshold for recommending blepharoptosis evaluation.

Methods: The Korean National Health and Nutrition Examination Survey (KNHANES-V) was conducted in 2010–2012. We extracted data on 17,878 Korean adults aged more than and equal to 19 years included in KNHANES-V, and determined blepharoptosis prevalence according to age to determine the cutoff age for recommending blepharoptosis evaluation. We also determined the possible association between blepharoptosis and obesity parameters, such as body mass index (BMI) and waist circumference (WC).

Results: There was a strong association between older age and the prevalence of blepharoptosis. The cutoff age for recommending blepharoptosis evaluation was 63 years for males, 70 years for females, and 66 years for all patients. Patients with a high BMI and large WC had a higher prevalence of blepharoptosis in all age groups except for those aged more than 80 years. The association of blepharoptosis with BMI according to age group showed that in the 50–59 and 60–69 years age groups, blepharoptosis prevalence and BMI were higher. However, in the 70–79 and 80–89 years age groups, extremely obese patients (BMI > 30) showed a decreased blepharoptosis prevalence.

Conclusions: Moderate to severe blepharoptosis can result in poor visual function and exacerbate headaches and depression, leading to decreased quality of life. This study proposed an appropriate age threshold for recommendingevaluation of patients with blepharoptosis among the general population of Korea.

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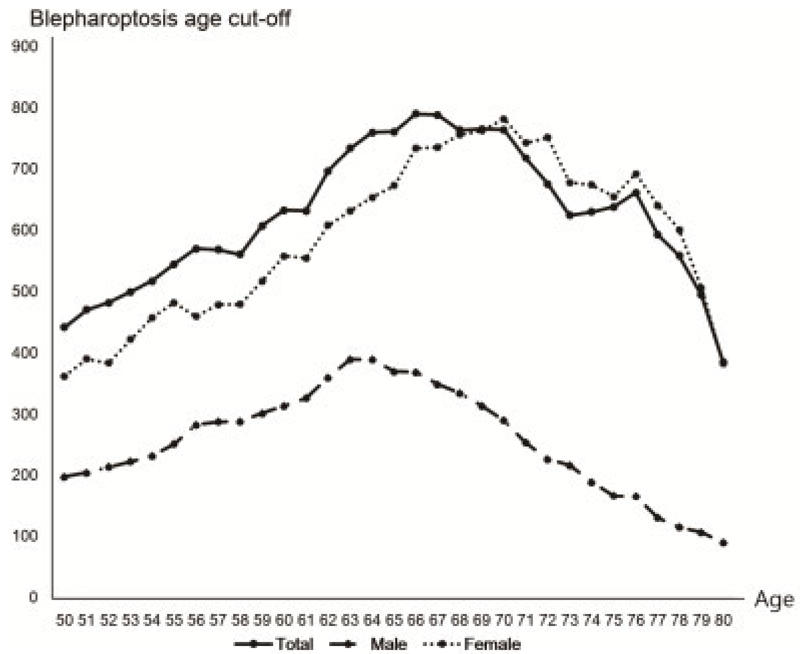
Figure 1



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17 – Calcitonin Gene-Related Peptide in Blind, Painful Eyes

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Introduction: New medications that interfere with calcitonin gene-related peptide (CGRP) have demonstrated tremendous efficacy in the management of migraine headache. Manipulation of this protein may be an effective way to address the pain of blind eyes, and, as such, may represent a strategy to avoid enucleation of these eyes. This study was performed to identify the expression of CGRP in blind, painful eyes, with the intent of delineating a putative role for this new class of medications in the management of these eyes.

Methods: Immunohistochemical staining for CGRP was performed on eyes that were enucleated for pain (n=6) and orbits that were exenterated for painless neoplastic conditions (n=2). Positively-staining cells were counted across five consecutive 40x fields in the choroid, iris, and cornea. Statistical analysis was performed via a dedicated software package.

Results: In the choroid, means of 7 cells/40x field and 0.2 cells/40x field stained positively in painful and painless eyes, respectively ($p<0.05$). In the iris, means of 3 cells/40x field and 0 cells/40x field stained positively in painful and painless eyes, respectively ($p<0.05$). No staining was detected in the cornea.

Conclusions: CGRP is enriched in blind, painful eyes. As such, medications which have been designed to address chronic headaches by selectively manipulating this protein may be useful in the management of chronic eye pain. This treatment strategy may facilitate globe salvage and enable patients to avoid enucleation.

18 – Changes in Lateral Canthal Angle and Inferior Ocular Surface Exposed following Lower Lid Ectropion Repair

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Introduction: Age related changes in the lateral canthal angle have been well documented as a pathogenesis of the aging face.[1] Ectropion repair by lateral tarsal strip provides restoration of tone and position which improve function and recreate youthful appearance. We hypothesized that, following ectropion repair via lateral tarsal strip, the lateral canthal angle (LCA) and inferior ocular surface exposed (IOSE) are reduced, lower eyelid curvature is more gradual, and that MRD-2 is decreased.

Methods: This is a retrospective chart review of patients who underwent lower eyelid ectropion from 2012 to 2018. Pre- and post-operative photographs of 52 patients who underwent lower eyelid ectropion repair were analyzed using Image J software (NIH). Exclusion criteria included any pathology or previous operation involving the eye which affected the lower eyelid or lateral canthal angle. For each case, LCA, IOSE and eyelid curvature was measured. The photos were calibrated based on established measurements of corneal diameter.[2] The LCA was defined as the angle formed by a line drawn between the medial and lateral canthi and a line drawn from the lateral canthus to a point on the lower eyelid margin. The point on the lower eyelid margin was standardized as the intersection of a vertical line drawn from the lateral limbus (Figure 1). The superior half of the LCA was not measured to avoid confounding upper eyelid pathologies or prior operations. For the same reason, IOSE was measured as the area enclosed by a line drawn following the margin of the lower eyelid and connecting the inferior punctum to the lateral canthus. Eyelid curvature was determined by plotting points at the lateral canthus, along the lower eyelid margin at 15-degree intervals, and ending at the lateral punctum.[3-6] A 4th-degree polynomial trendline, following the general structure of $ax^4+bx^3+cx^2+dx+e$, was then generated from these points.[3] Paired 1-tail t-tests were used to compare the LCA and IOSE. Paired 2-tail t-tests were used to compare mean eyelid curvature coefficients and MRD-2.

Results: LCA did not significantly change from preop to postop with equal number of cases having an increase in the LCA as those that had a decrease in the LCA. Change in IOSE following surgery was not statistically significant (Figure 2). Regarding the 4th degree polynomial trendlines generated, factors "d" and "e" changed with statistical significance in both eyes. Factor "b" also changed with statistical significance among the right eyes (Figure 3). These changes can be visualized by the net trendlines generated in Figure 4 and Figure 5.

Conclusions: Contrary to our hypothesis, the LCA did not significantly change from preop to postop. Similarly, IOSE did not decrease with any statistical power. Coefficients in a polynomial equation describe the curvature of the line. The decreased absolute value of coefficients "b" and "d" demonstrate a more gradual postop lower eyelid curvature. The origin of the plane used to plot the scatter

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points and generate the trendlines correlates to the center of the pupil. The y-intercept, factor “e”, is equivalent to the MRD-2. The data indicate a reduced “e” value and therefore reduced MRD-2 in postop measurements.

Figure 1

Figure 2

Right Eye LCA (n=52)

Preop	Postop	p value
29.40±6.715	29.73±5.513	0.381

Right Eye Inferior Ocular Surface Exposed (n=52)

Preop	Postop	p value
34.48±11.75 mm^2	34.44±8.766 mm^2	0.234

Left Eye LCA (n=50)

Preop	Postop	p value
29.13±6.600	28.47±5.269	0.232

Left Eye Inferior Ocular Surface Exposed (n=50)

Preop	Postop	p value
35.14±11.12 mm^2	32.97±8.603 mm^2	0.052

Figure 3

Right Eye Polynomial (n=52)

Coefficient	Preop	Postop	p value
a	6.6434E-05	6.137E-05	0.795
b	-6.753E-04	-2.221E-04	0.023
c	2.542E-02	2.458E-02	0.512
d	0.1120	8.255E-02	0.006
e/MRD-2 (mm)	-6.086	-5.649	0.001

Left Eye Polynomial (n=50)

Coefficient	Preop	Postop	p value
a	8.982E-05	7.622E-05	0.609
b	2.456E-04	-1.216E-04	0.083
c	2.562E-02	2.509E-02	0.664
d	-9.447E-02	-5.833E-02	0.042
e/MRD-2 (mm)	-5.846	-5.380	0.001

Figure 4

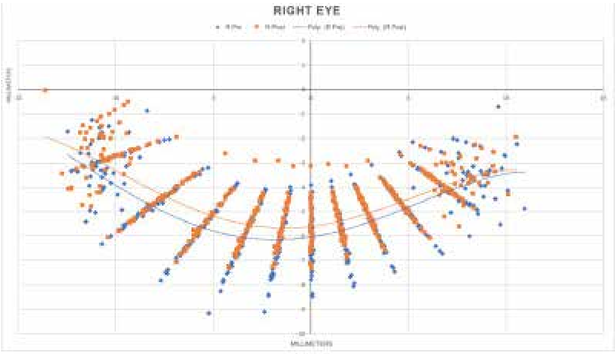
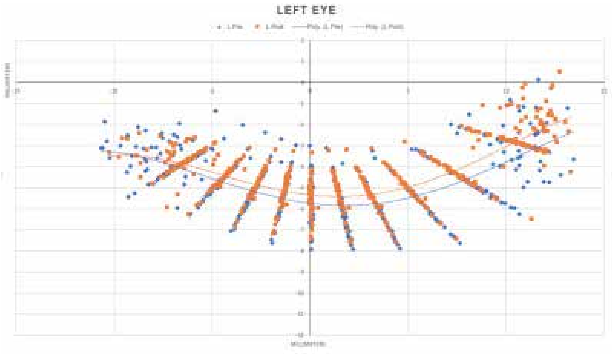


Figure 5



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19 – Characterization of Facial Trauma Associated with Standing Electric Scooter Accidents

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Introduction: To describe the clinical presentation and outcomes of patients with facial trauma associated with the widespread deployment of standing electric scooters (e-scooters). To our knowledge, this is the largest case series to date of patients with facial injuries related to e-scooter use.

Methods: Consecutive retrospective case series based on medical record review of patients presenting with facial injuries associated with standing e-scooter use between June 2018 and May 2019 at two emergency departments associated with an academic medical center in Southern California. Clinical features such as demographic information, type of facial injury, mechanism of injury, and presence of associated co-morbidities (i.e. intracranial hemorrhage, need for intubation, peri-orbital or intraocular injury) were evaluated. Helmet use, rider status, and intoxication, as well as management strategies and outcomes were analyzed.

Results: Thirty patients (23 [77%] male; mean [SD] age, 33.7 [15.3] years) presented with facial injuries associated with e-scooter use during the study period. Of the 30 patients, 29 (97%) were found to have one or more facial fractures. Furthermore, the vast majority of patients (25/30 [83%]) presented with one or more complex facial fractures involving multiple anatomical subunits. Orbital floor fractures (16/30 [53%]) were the most common, followed by lateral orbital rim fractures (15/30 [50%]). ZMC fractures were found in 10 (33%) patients. LeForte fractures (2/30 [7%]) and mandibular fractures (2/30 [7%]) were relatively rare. Nine patients [30%] had fractures involving nasal bones, but none had naso-orbital-ethmoidal (NOE) fractures. Three patients [10%] had lid lacerations, and only one patient [3%] had intraocular sequelae in the form of intra-retinal hemorrhage. One patient [3%] had retrobulbar hemorrhage. No patients had extraocular muscle entrapment or ruptured globe. Of the 30 patients, 23 [77%] were admitted to the hospital due to the severity of their injuries, and only 7 [23%] were discharged home directly from the emergency department. Five [17%] were found to have associated intracranial hemorrhage, and 3 [10%] required emergent airway protection due to impaired neurological status. All 30
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(100%) of patients presenting with facial injuries to the emergency department were not wearing a helmet at the time of the accident, and all were e-scooter riders. Two-thirds (20/30 [67%]) were intoxicated or impaired due to alcohol or drug use. Seven [23%] underwent surgical repair of their facial fractures in the acute inpatient setting.

Conclusions: Facial injuries related to e-scooter use have not been previously well-described. This case series illustrates that facial trauma due to e-scooters most commonly presents with multiple complex facial fractures, with orbital and ZMC fractures being much more common than midface and mandibular fractures. Although intraocular injury was rare, the majority of patients required inpatient admission, and nearly one-fifth were found to have associated intracranial hemorrhage. The potential severity of these complications highlights the importance of ongoing studies of e-scooters in the context of facial trauma. These findings highlight the important role of using protective equipment while riding e-scooters and suggest a role for public policies regulating the use of standing e-scooters.

Figure 1

Figure 2

Figure 2. External photograph of a scooter-rider with facial degloving injury, superior orbital wall fracture, exposed dura and CSF leak

Figure 3

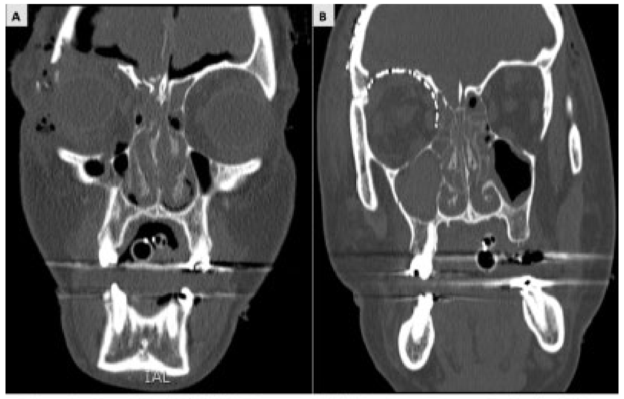

Figure 3. Coronal maxillofacial CT images. A: Initial images on presentation showing right superior orbital wall and supraorbital frontal bone fractures with associated pneumocephalus B: Post-operative changes after repair with metal mesh

Figure 4

Table 1. Distribution of various types of facial fractures among 30 patients presenting with facial trauma due to injuries related to standing e-scooter use.

Number of Facial Fractures	
0	1 (3%)
1	4 (13%)
More than 1	25 (83%)
Bilateral Involvement of Facial Trauma	5 (17%)
Orbital Fractures	
Floor	16 (53%)[a]
Lateral Wall	15 (50%)
Medial Wall	5 (17%)
Roof	6 (20%)
Zygomaticomaxillary complex (ZMC) Fractures	10 (33%)
Maxillary Fractures	10 (33%)
LeForte Type Fractures	2 (7%)
Mandibular Fractures	2 (7%)
Nasal Fractures	9 (30%)
Naso-Orbital-Ethmoidal (NOE) Fractues	0 (0%)

[a]Percentages do not add up to 100 due to most patients presenting with multiple fracture types.

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1. Trivedi TK, Liu C, Antonio ALM, et al. Injuries Associated With Standing Electric Scooter Use. *JAMA Netw Open.* 2019;2(1):e187381.

20 – Clinical Correlation Recommended: Accuracy of Clinician Versus Radiologic Interpretation of the Imaging of Orbital Lesions

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Introduction: Orbital lesions pose a diagnostic challenge as there are a wide variety of processes which present with non-specific orbital signs of globe malposition, reduced ocular motility and optic nerve compromise as well as some presenting as incidental findings. Imaging studies, particularly CT and MRI, are immensely useful in differentiating between these lesions but the accuracy of interpretation may vary amongst physicians/specialties. This study aims to assess the accuracy of radiographic diagnosis between the clinician and radiologist when compared with histopathologic specimens.

Methods: IRB approval was obtained and a retrospective chart review of patients at a tertiary care center who underwent CPT codes related to orbitotomy between 2000-2016 was performed. Charts with preoperative imaging, preoperative clinical assessment, and a histopathologic diagnosis were included. The preoperative assessment of the clinician, who reviewed the imaging, was compared to the impression in the radiology report, and both were compared against the final histopathologic diagnosis. The specific diagnoses were grouped into related classes of pathology (Table 1) for the analysis. A sub-group analysis of radiology reports originating from our academic center and those from outside the institution was also performed.

Results: patients (mean age 46 years, 54.0% female) were reviewed. Of these records, 152 documented the surgeon's clinical impression, the radiology report as well as the histopathology report. The surgeon's preoperative differential diagnosis agreed with the final histopathologic result in 75.0% (114/152) of cases whereas the radiology report was correct in 52.0% (79/152) of cases. When sub-grouped, the radiology reports out of an academic center (n = 83) outperformed outside institutions' reports (n = 69) with respective accuracies of 56.6% and 46.4%. In 49.3% (75/152) of cases the final histopathology correlated with both the clinical impression and radiology report.

Conclusions: The accurate interpretation of orbital imaging is a challenge and histopathologic examination remains the gold standard for diagnosis. While orbital imaging is a valuable diagnostic tool the interpretation of these studies is most accurate when conducted in the context of the patient's medical history, clinical exam, and with the physician most familiar with various orbital lesions.

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Table 1

Diagnosis Group	Number of cases	Percentage
Vasculogenic (cavernous malformation, lymphangioma)	15	9.9%
Lymphoproliferative (lymphoma, lymphoid hyperplasia)	31	20.4%
Lacrimal gland tumor (pleomorphic adenoma, adenoid cystic ca)	4	2.6%
Peripheral nerve sheath tumor (schwannoma, neurofibroma)	5	3.3%
Metastatic (breast, prostate, neuroblastoma)	14	9.2%
Primary malignant (melanoma, rhabdomyosarcoma, Langerhans)	12	7.9%
Inflammatory/Autoimmune (IOIS, Wegener's, rheumatoid, sarcoid)	26	17.1%
Infectious	7	4.6%
Optic nerve/meningeal (meningioma)	3	2.0%
Benign cystic (dermoid cyst, dermolipoma)	26	17.1%
Foreign body/calcification	5	3.3%
Non-specific	1	0.7%
Normal/no pathology	3	2.0%

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21 – Clinical Courses and Treatment Outcomes of Mass-forming Orbital Inflammatory Disease: IgG4-related Orbital disease Versus Idiopathic Orbital inflammation

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Introduction: Idiopathic orbital inflammation (IOI) can be a chronic inflammatory condition of insidious onset and chracterized by focal or diffuse infiltration of orbital soft tissues by chronic inflammatory cells. An IgG4-related orbital disease (IgG4-ROD) was defined as an inflammatory disorder characterized by IgG4-positive lymphoplasmacytic infiltrative lesion. The clinical and histopathological similarities between IOI and IgG4-ROD have made it difficult to establish the treatment strategy and outcomes. We want to compare IgG4-ROD with IOI in clinical course and treatment outcomes.

Methods: Retrospective clinicopathological series of biopsy-proven 47 patients with IgG4-ROD and 30 patients with IOI diagnosed between Jan. 2010 to Oct. 2018. Clinical manifestation, management, outcome, and recurrence were assessed.

Results: patients (16 males and 31 females) with IgG4-ROD and 30 patients (18 males and 12 females) with IOI were evaluated over mean follow-up period of 50.9 / 29.8 months, respectively. After initial treatment, good response was achieved in 60% / 57%. partial response was in 38% / 33% in IgG4-ROD / IOI patients. Recurrence rates were not different in 2 groups (60% / 72%). A group of patients who underwent corticosterod treatment initially (87% / 83% in IgG4-ROD / IOI) showed good response in 51% / 47%, and recurrence in 59.0%/84.6% ($p=0.028$). IOI group treated with corticosteroid initially showed more recurrence.

Conclusions: Patients with mass forming orbital inflammatory disease responded well to initial treatment, but showed significant recurrence in all the patients, which was more significant in IOI than IgG4-ROD. Intensive, multi-modality treatment needs to be administered as an initial treatmemt.

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Figure 1

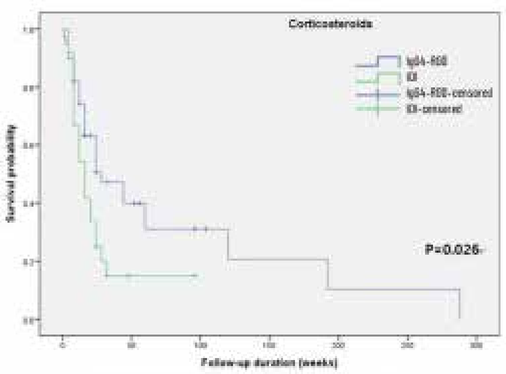

Figure. Kaplan-Meier survival analysis of patients initially treated with corticosteroids

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22 – Clinical Phenotype and Treatment of a Patient with Mosaic Expression of a TWIST2 Mutation

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Introduction: Mutations in the TWIST2 gene are associated with the development of congenital ectodermal dysplasia. Reports of mosaic expression of TWIST2 mutations are extremely rare, with only five confirmed or suspected cases described to date. Although mosaic expression of TWIST2 variants is correlated with a less severe pheonotype than that reported for the typical expression of TWIST2 variants associated with Barber-Say syndrome or ablepharon-macrostomia syndrome, abnormal development of the anterior lamella appears to be a common feature in all cases. Here, we report a unique clinical phenotype of a patient with mosaic expression of a TWIST2 mutation that is typically associated with ablepharon-macrostomia syndrome. We additionally describe the surgical approach employed in the treatment of this patient.

Methods: Clinical and surgical records pertaining to this case were reviewed and utilized in the description of the case. Whole exome sequencing was employed to for molecular diagnosis of the TWIST2 variant. Biopsy specimens of the right upper and lower eyelids were collected during eyelid reconstruction.

Results: A three-year-old female patient presented with multiple colobomas of the upper (more severe) and lower eyelids, a low anterior hairline, folding of the superior helix, a prominent cartilaginous nasal tip, and areas of hyperpigmentation and dermal hypoplasia over the axilla and back. Notably, the patient did not have features of macrostomia. Whole exome sequencing revealed a pathogenic heterozygous *de novo* mutation in the TWIST2 gene (c.223G>A; p.Glu75Lys) associated with ablepharon-macrostomia syndrome. Sequencing additionally revealed a lower peak intensity of the A allele than would be expected with heterozygosity suggestive of mosaic expression of TWIST2 mutation. Evidence of mosaic expression was further supported by the pattern of skin hyperpigmentation over the eyelids appearing to follow the lines of Blaschko. Initial surgical intervention employed pentagonal wedge resections of the upper and lower right eyelid to reapproximate the lid margin. Additional wedge resection of the upper lid margin was performed to create a more curvilinear lid margin.

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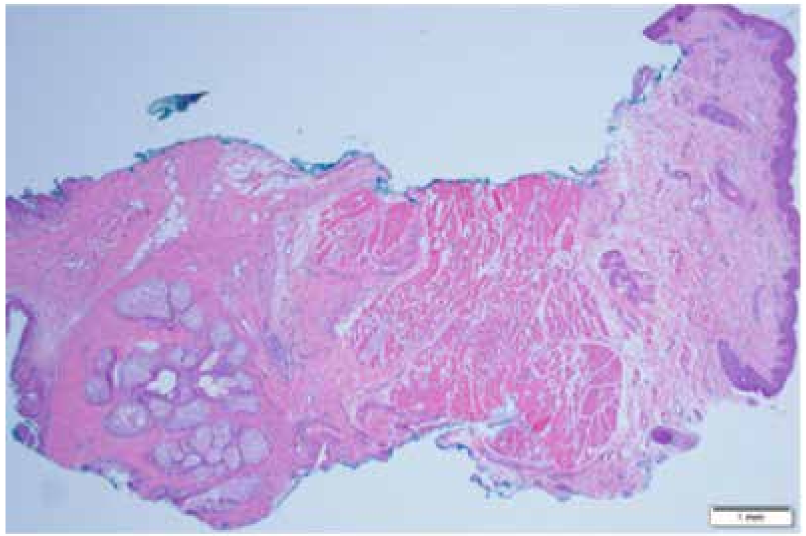
Conclusions: The underdevelopment of the anterior lamella is a shared feature of the mosaic expression of TWIST2 mutations. Although the c.223G>A variant is typically associated with ablepharon-macrostomia syndrome, features macrostomia and sparse hair development were absent with mosaic expression. The phenotype of the present case is similar to prior reports of TWIST2 mutations associated with mosaic expression of both Barber-Say and Ablepharon-macrostomia syndrome. Further genotype-phenotype correlations of the mosaic expression of TWIST2 variants will be necessary for delineating if the resulting phenotype represents a distinct phenotype from Barber-Say syndrome and ablepharon-macrostomia syndrome. Surgical treatment of the patient required multiple surgeries to address the eyelid colobomas. The vertical banding of the upper lid did not appear amenable to surgical treatment; future treatment with fluoruracil has been considered.

Figure 1

Figure 2

Figure 3



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23 – Clinical Presentation and Radiographic Criteria of Subperiosteal Abscess as Compared to Subperiosteal Masqueraders

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Introduction: Collections in the subperiosteal potential space of the orbit are most commonly due to purulent abscesses. However, material of other etiologies can collect in this space, and can be difficult to distinguish from abscesses both clinically and radiographically.[1,2] Here, we compare cases of subperiosteal abscess to other subperiosteal processes mimicking abscess in an effort to distinguish clinical and radiographic features.

Methods: A retrospective review of cases of subperiosteal processes that underwent surgical intervention from April 2015 to September 2018 was performed. Six cases which were presumed to be infectious but found to be different intraoperatively and on pathology were identified along with six cases of confirmed subperiosteal abscess. The medical history, clinical course, and radiographic features on CT orbital imaging of each case were reviewed and compared.

Results: All cases identified had rapid onset of symptoms with orbital signs on examination. The mean age of patients in the masquerader group was 73 ± 7 years while the mean age of the subperiosteal abscess group was 39 ± 18 years ($p = 0.005$). Infectious signs of fever and leukocytosis were absent in the masquerader group and variably present in the abscess group (Table 1). Pre-operative CT scan of the orbits was performed in all cases (Figure 1). Common radiographic findings in both groups included adjacent sinusitis, often with a bony dehiscence, as well as preseptal swelling and a rim-enhancing convex mass along the orbital wall. All cases were started on IV antibiotics for presumed infectious process. Biopsy and drainage was necessary in all cases due to pain, optic neuropathy, or worsening despite antibiotics. Of the masqueraders, the final diagnosis was hematoma in three cases, mucocele in one, metastatic endometrial cancer in one, and naso-mucosal melanoma in one. The radiodensity in Hounsfield units of the lesions, adjacent sinus disease, and other processes such as metastases helped distinguish the various lesions (Table 2). Within the masquerader group, metastatic carcinoma had the highest radiodensity (135 HU), the mucocele had the lowest radiodensity (30 HU), mucosal melanoma was 68 HU, and the hematomas ranged from 49 to 86 HU. The average radiodensity of the subperiosteal abscesses was 38 ± 5 HU, and the average radiodensity of the masqueraders as a group was 71 ± 5 HU ($p = 0.065$). The mean absolute difference between radiodensities of subperiosteal lesions and adjacent sinus lesions was 32 ± 34 HU in the masquerader group and 9 ± 7 HU in the abscess group ($p = 0.168$).

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Conclusions: Most cases of a convex-shaped mass adjacent to the paranasal sinuses with rapidly developing orbital signs are orbital abscesses secondary to sinusitis. Although surgery is ultimately needed in almost all cases due to pain, progression, or need for tissue, a consistent pre- and post-operative diagnosis is useful for patient counseling and tissue processing. Radiographic features, particularly radiodensity, may help distinguish abscess from other lesions.

Table 1

Table 1. Initial clinical presentation, exam findings and management of various subperiosteal processes.

			Clinical Presentation					Exam					Management	
	Age	Post-operative Diagnosis	Pain	Nausea/ Vomiting	Diplopia	Fever	Leukocytosis	APD	Proptosis	EOM Restriction	Dyschromatopsia	Elevated IOP	IV Antibiotics	Days to OR
Case #1	71	Hematoma	+	+	+	-	-	-	+	+	+	-	+	0
Case #2	70	Metastasis	+	-	+	-	-	-	+	+	-	-	+	1
Case #3	80	Hematoma	+	-	-	-	-	-	-	+	-	-	+	1
Case #4	79	Mucocele	+	+	+	-	-	+	+	+	+	+	+	0
Case #5	71	Hematoma	+	-	-	-	-	-	+	+	-	-	+	1
Case #6	54	Melanoma	+	-	-	-	-	-	+	+	-	-	+	2
Case #7	32	Abscess	+	+	-	-	-	-	+	+	-	+	+	0
Case #8	25	Abscess	+	-	+	-	-	-	-	-	-	-	+	1
Case #9	65	Abscess	+	-	+	+	-	-	-	+	+	-	+	1
Case #10	28	Abscess	+	-	+	-	+	-	-	+	-	-	+	1
Case #11	[illegible]	Abscess	+	+	+	-	-	-	+	+	-	-	+	0
Case #12	21	Abscess	+	-	-	+	+	+	+	+	-	+	+	5

Table 2

Table 2. Radiodensities in Hounsfield units (HU) of subperiosteal processes and adjacent sinus lesions.

	Post-operative Diagnosis	Subperiosteal Lesion Radiodensity (HU)	Sinus Lesion Radiodensity (HU)
Case #1	Hematoma	49	41
Case #2	Metastasis	135	45
Case #3	Hematoma	50	20
Case #4	Mucocele	40	38
Case #5	Hematoma	86	33
Case #6	Melanoma	68	60
Case #7	Abscess	30	35
Case #8	Abscess	37	31
Case #9	Abscess	46	56
Case #10	Abscess	36	37
Case #11	Abscess	36	48
Case #12	Abscess	39	18

Figure 1

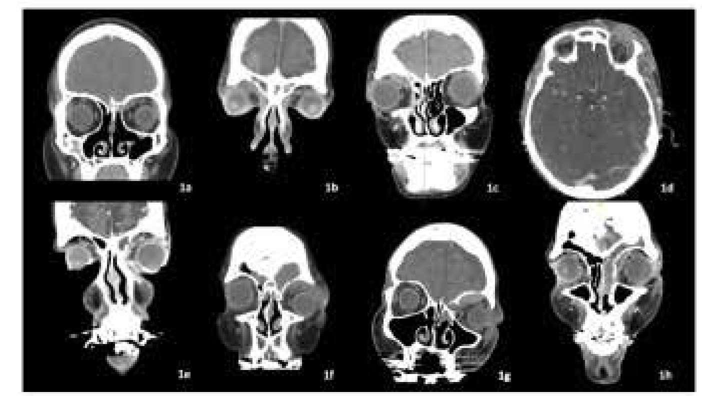

Figure 1. Representative images demonstrating the radiographic features of cases of subperiosteal abscess and subperiosteal masquerade on CT. 1a: Case #8: Abscess. 1b: Case #11: Abscess. 1c: Case #1: Hematoma. 1d: Case #2: Metastatic endometrial cancer. 1e: Case #3: Hematoma. 1f: Case #4: Mucocele. 1g: Case #5: Hematoma. 1h: Case #6: Mucosal melanoma.

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24 – Withdrawn

25 – Collateral Damage: Heat Transfer as a Possible Mechanism of Optic Nerve Injury During Oculoplastic Intervention

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Introduction: The purpose of our study was to evaluate thermal injury as a possible mechanism of bone or optic nerve damage during oculoplastic intervention by measuring temperature changes directly invoked by oculoplastic drills.

Methods: We compared the ultrasonic dissector (ultrasound power 50%, suction 50%, irrigation 15 mL/min) against a surgical drill with manual irrigation (75,000 rpms). Three sites commonly drilled during oculoplastic procedures were tested: greater wing of the sphenoid, posterior medial wall, and lateral orbital floor. On a non-embalmed thawed cadaver, we drilled at these sites in both an exenterated and non-exenterated orbit. The temperature probe was placed adjacent to the drill site and at the optic canal, with the distance to the probe measured. The initial temperature followed by three sequential temperatures in 10 second intervals were recorded. A t-test was conducted to compare the mean temperature change from baseline to 30 seconds between the traditional drill and Sonopet in both the exenterated and non-exenterated orbit at the drill site and optic canal. Statistical analysis was performed using Stata Version 15.0.

Results: The differences between the final 30-second and baseline initial temperatures can be found in Figure 1. The Sonopet had minimal temperature changes (<1°C) at the optic canal but had temperature increases greater than 9°C at sites adjacent to the drill, with the exception of one site. The traditional drill had up to 2.7°C increases at the optic canal but less change locally at the drill site (2.1°C - 9.8°C), when compared to the Sonopet. The presence of tissue (exenterated vs. non-exenterated) had a variable effect. The mean ± standard deviations (SD) can be seen in the table below. A statistically significant difference was observed at the drill site of the exenterated orbit, p = 0.005. The remaining three differences follow trends but were not statistically significant.

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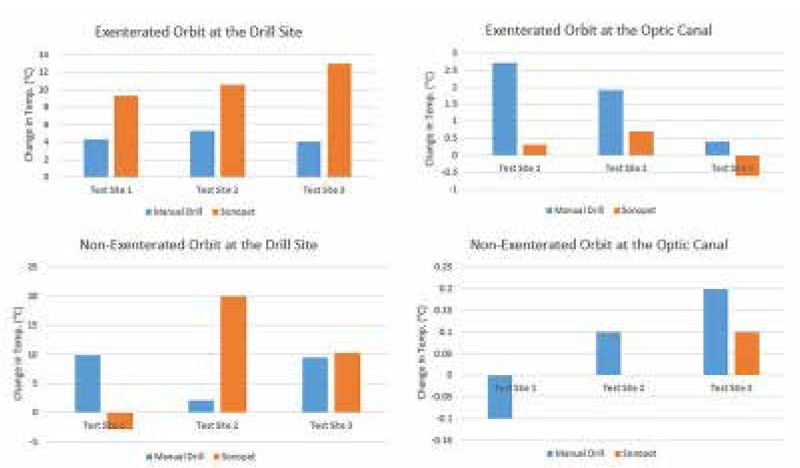
The mean ± standard deviations (SD) for temperature changes at the drill site and optic canal for both the manual drill and Sonopet.

	Condition	Manual Drill Mean ± SD (°C)	Sonopet Mean ± SD (°C)
Drill Site	Exenterated	4.57 ± 0.64	10.97 ± 1.88
	Non-Exenterated	7.13 ± 4.36	9.17 ± 11.44
Optic Canal	Exenterated	1.67 ± 1.17	0.13 ± 0.67
	Non-Exenterated	0.07 ± 0.15	0.03 ± 0.06

Conclusions: Several authors have postulated thermal injury to the optic nerve as a cause of vision loss during orbital surgery,[1,2] but little is known about the heat transfer of commonly used drills. Based on our study, the Sonopet created greater temperature increases at the local drill site, but the traditional drill had greater temperature increases at the optic canal. These results emphasize the importance of understanding heat transfer during oculoplastic intervention and may impact drill choice during different types of procedures.

Figure 1



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26 – Comparing Manual and Auto-Segmentation Techniques for Determining Three-Dimensional Orbital Cavernous Hemangioma Volume on Magnetic Resonance Images

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Introduction: Accurately determining orbital tumor volume is important for therapeutic planning, monitoring disease progression, and assessing tumor response to therapy. Various segmentation techniques exist for estimating three-dimensional tumor volume based on two-dimensional images. The purpose of this study was to compare manual and auto segmentation techniques of MRI scans of orbital cavernous hemangiomas.

Methods: Fourteen patients with orbital cavernous hemangiomas were included in the study. Pre-treatment T2-weighted MR images were analyzed by two observers using a manual segmentation method (ellipsoid), an auto segmentation method (GrowCut**,** 3D slicer, www.slicer.org), and a parameter-dependent segmentation method (*k*-means clustering, ImageJ). For the ellipsoid method, maximal cross-sectional measurements in transverse (TV), antero-posterior (AP) and cranio-caudal (CC) planes were obtained, multiplied and divided by two ((TV x AP x CC) / 2) (Figure 1A – 1B). For the GrowCut method, observers assigned seed pixels to the foreground, i.e., tumor, and background, i.e., non-tumor (Figure 2A). The segmentation then compared characteristics of seed pixels to neighboring pixels and assigned them to tumor or non-tumor (Figure 2B – 2D). For *k*-means clustering, observers selected a region of interest that included both orbits, and selected the number clusters (Figure 3A). The segmentation then partitioned voxels until each cluster contained voxels that were similar in signal intensity and location and dissimilar to voxels in other clusters (Figure 3B – 3E). The primary outcome of this study was inter-observer reliability, represented as concordance correlation coefficients (CCC). CCC value of 1 indicated perfect correlation, with values closer to 0 indicating worse correlation.

Results: Using the ellipsoid method, the average tumor volumes calculated by the two observers were 1.68ml (SD 1.45) and 1.48ml (SD 1.19) (Figure 4). Using the GrowCut method, the average tumor volumes calculated by the two observers were 3.00ml (SD 2.46) and 6.34ml (SD 3.78). Using *k*-means clustering segmentation, the average tumor volumes calculated by the two observers were 2.31ml (SD 1.83) and 2.12ml (SD 1.87). The CCC for the ellipsoid, GrowCut, and *k*-means clustering methods were: **0.92** (95% CI 0.83 – 0.99), **0.12** (95% CI -0.21 – 0.44), and **0.95** (95% CI 0.90 – 0.99), respectively.

Conclusions: In comparing inter-observer reliability, *k*-means clustering performed the best, next Ellipsoid, followed by GrowCut, for determining orbital cavernous hemangioma tumor volumes. This study demonstrates that image segmentation software can be used to monitor three-dimensional tumor volumes in a reproducible manner among multiple observers. Such measurements may aid clinicians in better following tumor progression and response to therapeutic intervention over time.
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Figure 1

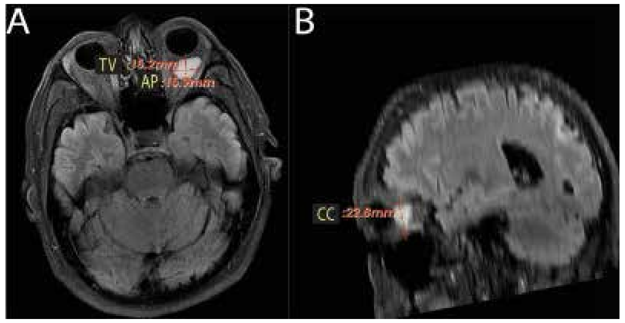

Figure 2

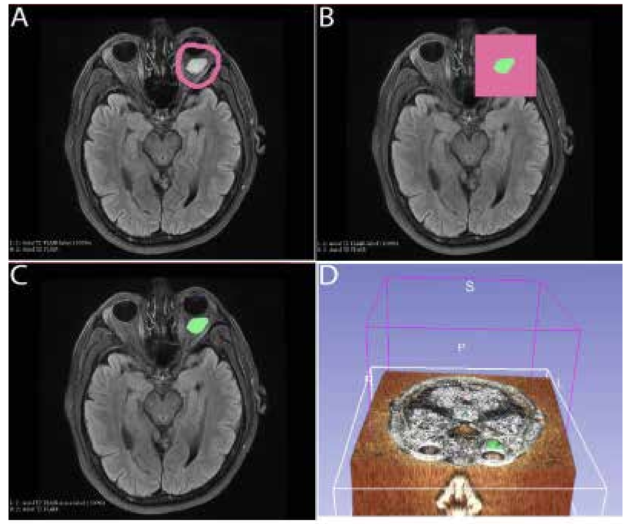

Figure 3

Figure 4

Patient	Ellipsoid (mL)		Difference (%)*	GrowCut (mL)		Difference (%)*	k-means (mL)		Difference (%)*
	Observer 1	Observer 2		Observer 1	Observer 2		Observer 1	Observer 2	
1	3.02	1.81	50	2.83	3.49	21	4.47	5.07	13
2	0.26	0.57	75	0.28	9.32	188	4.34	5.42	22
3	2.89	2.79	3.4	6.88	11.01	46	4.14	3.10	29
4	0.39	0.51	26	2.7	3.82	34	0.50	0.51	1.1
5	1.49	1.66	11	5.56	1.95	96	2.30	1.81	26
6	3.99	2.52	45	6.86	7.63	11	3.10	2.55	22
7	1.78	1.45	20	2.34	12.81	138	2.25	1.84	19
8	0.59	0.61	4.8	0.69	6.22	160	0.68	0.59	15
9	0.81	0.78	3.2	0.9	8.6	162	1.20	1.00	18
10	1.14	1.14	0.0	2.43	7.57	103	1.66	1.55	6.8
11	0.30	0.12	19	0.23	1	125	0.10	0.04	52
12	0.36	0.47	34	0.66	1.72	45	0.26	0.14	56
13	2.13	1.71	22	2.88	2.91	1.0	1.27	0.93	31
14	4.55	4.56	0.2	6.46	8.77	30	5.91	5.04	16
Mean (SD)	**1.65 (1.45)**	**1.48 (1.19)**		**3.00 (2.46)**	**6.34 (3.78)**		**2.51 (1.85)**	**2.12 (1.87)**	
CCC (CI)	**0.92 (0.83 – 0.99)**			**0.12 (-0.21 – 0.44)**			**0.95 (0.90 – 0.99)**		

*Difference was calculated as the absolute difference between measurements made by the two observers divided by the average of measurements made by the two observers per patient.

Figure 5

FIGURE LEGENDS

Figure 1. The ellipsoid method. (A) Transverse (TV) and antero-posterior (AP) cross-sectional measurements are obtained in axial images, while (B) cranio-caudal measurements are obtained in sagittal images. The tumor volume is calculated by the following formula: (TV x AP x CC) / 2

Figure 2. The GrowCut method. (A) Seed pixels are placed on axial images to designate foreground, i.e., tumor (*green*), and background, i.e., non-tumor (*magenta*). (B) Using competitive region growing, the segmentation then iteratively compares seed pixel characteristics to neighboring pixels and assigns pixels to tumor or non-tumor. (C, D) The tumor and non-tumor pixels are split, allowing only the tumor-containing pixels to be highlighted (*green*), which is used to build a 3D reconstruction of the tumor and compute the tumor volume.

Figure 3. *K*-means clustering. (A) To apply *k*-means clustering segmentation, an ROI (*rectangular yellow outline*) is selected that includes both orbits on the slice containing the largest cross-sectional area of the tumor. This ROI is extended orthogonally to the remaining tumor-containing slices. (B, C) The observer then specifies the number of clusters ("4" in this case) and allows the algorithm to cluster the images. (D, E) Using the clustered images, a second ROI (*polygonal yellow outline*) is placed around the tumor, which is used to generate a histogram to identify the exact number of voxels for the cluster containing the tumor ("0" in this case). The total number of voxels from the tumor-containing clusters is multiplied by voxel size to produce tumor volume per slice: (voxel size) × (no. of tumor voxels in slice) = tumor volume in slice. For the example in this figure, voxel size = 0.91mm^3; therefore 0.91mm^3 × 1041 = 947.31mm^3 = 0.94731ml. After all tumor-containing slices are analyzed, tumor volumes from individual slices are summed to produce total tumor volume.

Figure 4. Tumor volume measurements and concordance correlation coefficients per method.

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27 – Comparison of Orbital Volume in Young Versus Senescent Human Skulls

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Introduction: This study compares the orbital volumes in young skulls to those of older skulls to elucidate aging-associated changes to the anatomic dimensions of the orbit.

Methods: One hundred Caucasian male skulls were studied. There were fifty young skulls (age range, 19-33 years) and fifty senescent skulls (age range, 79-96 years). Volcanic sand was used to fill each orbit in an identical fashion and weighed as a proxy for volume. Digital calipers were used to perform linear measurements of the orbit. The relationship between orbit measures and skull size was assessed using Pearson's correlations and 95% confidence intervals, and statistical models to compare age groups adjusted for skull size.

Results: The volume of the orbits ($p<0.001$), the horizontal diameter of the orbit ($p=0.015$), and the orbital depth ($p<0.001$) were significantly larger in the senescent group of skulls after adjusting for skull surface area. No significant differences were found in the vertical diameters of the orbit between the two groups.

Conclusions: Increases in the depth and horizontal dimensions of the orbit lead to increasing orbital volume with increasing age. These changes in size and shape of the orbit with age may contribute to phenotypic changes of aging and may affect disease processes and management.

Figure 1

Table 1. A summary of age group, cranial measures and orbit measures is shown below.

	Total (N=100)	
Factor	**n**	**Statistics (mm)**
Young/old	100	
. Young skull		50(50.0)
. Old skull		50(50.0)
C1 Max cranial Length (mm)	100	188.6±7.3
C3 Greatest head width (mm)	100	154.2±7.3
Weight	100	37.8±4.2
Vertical (mm)	100	35.1±2.3
Horizontal (mm)	100	35.3±1.7
Depth (mm)	100	38.8±3.6
Skull Surface area (cm²)	100	914.1±60.3

Statistics presented as Mean ± SD or N (column %).

Figure 2

Table 2. Models comparing age groups adjusting for skull surface area (cm^2) are shown below.

Factor	**Young Mean (95% CI) (mm)**	**Old Mean (95% CI) (mm)**	***P*-value**
Weight	36.09(35.04, 37.14)	39.59(38.54, 40.64)	***<0.001***
Vertical	34.92(34.28, 35.55)	35.19(34.56, 35.85)	0.55
Horizontal	34.87(34.40, 35.34)	35.71(35.23, 36.18)	***0.015***
Depth	37.63(36.66, 38.61)	40.06(39.09, 41.04)	***<0.001***

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28 – Composite Orbital Mantle Cell and Marginal Zone Lymphoma in Patient with Monoclonal Gammopathy of Undetermined Significance

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Introduction: We describe a unique case of composite mantle cell and marginal zone lymphoma of the lacrimal gland, which is to our knowledge, the first reported case of these distinct lymphoma subtypes biopsied in one orbital lesion.

Methods: A retrospective chart review of a patient with a composite lymphoproliferative (CL) lesion of the lacrimal gland was performed to determine the clinical and histologic features unique to this unusual case.

Results: A 77-year-old man with a history of monoclonal gammopathy of undetermined significance (MGUS) was found to have an incidental right orbital tumor on MRI after workup for a hypertensive crisis in his local emergency room. MRI brain findings were significant for a 1.2 x 2.5 cm T1/T2 isointense enhancing soft tissue prominence involving the right lacrimal gland, with no associated bone destruction, and mild left lacrimal gland enlargement. Of note, the patient had a positive routine PET scan a year prior with uptake in the right orbit. Further investigation of past medical health also revealed a biopsy performed four months prior during routine colonoscopy positive for lymphoid infiltrate in colonic mucosa, indeterminate for malignant cells.

Exam showed a visual acuity of 20/30 right, 20/20 left and no afferent pupillary defect. HRR color plates were 3.5/6 OU, Hertel exophthalmometry measured 19 mm right and 18 mm left. Ocular motility was full. There was a palpable soft nodule of the right upper lid laterally consistent with an enlarged lacrimal gland.

Surgical biopsy was pursued and the pathology showed two distinct lymphoid populations: one consistent with mantel cell lymphoma (MCL) (phenotype: CD5-, CD23-, Cyclin D1+, SO11+, CD43(dim)+, P53-) and the second consistent with marginal zone lymphoma (MZL) (phenotype: CD5+, CD23-, Cyclin D1-, SOX11-, P53+ in 20%). These lesions were found to be separate neoplasms with separate geographic locations and unique morphologic and immunophenotypic features.

Due to presumed bilateral orbital and possible colonic mucosal involvement, treatment with rituximab was initiated. Following this course, the patient will undergo repeat peripheral blood flow cytometry and orbital MRI imaging to evaluate treatment response.

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Conclusions: Lymphoproliferative lesions of the orbit comprise a spectrum of disease that ranges from reactive benign hyperplasia to malignant lymphoma. Masses can arise primarily from the ocular adnexa or secondarily with metastatic lymphoma. The vast majority of primary orbital lymphomas are of B-cell origin including low-grade malignant extranodal marginal zone or mucosa-associated lymphoid tissue (ENZL or MALT), diffuse large B-cell, follicular, and mantle cell . Secondary cases arising from systemic disease are caused by intermediate or high-grade follicular lymphomas.[1,2]

To the best of the authors' knowledge, this represents the first report of composite orbital MCL and MZL.[3,4] Due to the rarity and possible aggressive nature of CL, patients should be monitored closely.

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29 – Congenital Orbital Fibrosis: A Complete Case Series

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Introduction: We present three cases of Congenital Orbital Fibrosis (COF), and a review of the current literature.

Methods: The clinical presentation, radiological findings, biopsy results, and genetic findings are summarized. A review of the current literature is presented, including clinical pearls to distinguish this rare entity from extraocular muscle dysinnervation syndromes.

Results: All patients initially presented for assessment of strabismus, and two were labeled with a diagnosis of Duane's Syndrome. Imaging in all cases revealed ill-defined orbital fibrosis in all cases with involvement of varying numbers of extraocular muscles. Histopathology demonstrated an increase in collagen deposits in the interstitium of all muscle fibers biopsied as well as generalized, hypocellular fibrous tissue. Management included amblyopia treatment and clinical observation with a follow-up period of 3-5 years.

Conclusions: Congenital orbital fibrosis is a non-familial, nonprogressive, unilateral condition characterized by a diffusely infiltrating orbital mass with secondary involvement of extraocular muscles resulting in variable symptomatology due to the cicatricial process. We present the largest case series of COF with complete workup and histopathological correlate. The findings in our cohort are consistent with the current body of literature, which is reviewed.

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30 – Conjunctival Sparing Ptosis Correction by White-line Advancement Technique

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Introduction: There are many variations in performing ptosis surgery. Posterior approach (transconjunctival) ptosis surgery has been first described by Blaskovich in 1923.[1] Since then there has been multiple modification of the procedure. Most techniques include resection of the conjunctiva, muller muscle and possibly part of the superior edge of the tarsal plate. The technique has evolved to become less traumatic to the conjunctiva, muller muscle and tarsal plate with excellent, reproducible and long lasting results. "White line" advancement technique is a procedure that spares the conjunctiva, muller muscle and tarsal plate. We hereby describe our technique of whiteline advancement posterior ptosis surgery.

Methods: Retrospective study, chart review of 48 patients from January 2014 to January 2019 who presented with ptosis and underwent surgical correction with white line advancement technique under local or general anaesthesia. All types of ptosis that were included has good levator function (>12mm).Success rate was defined as maintaining good, symmetrical eyelid position with inter-eyelid height asymmetry of ≤1 mm, and satisfactory eyelid contour3 months postoperatively. The analysis was based on number of patients not eyelid.

Results: Total number of patient was 48, with 71 eyelids (23 bilateral). Female were more than males, 27 and 21 respectively. Average age was 47-year-old with range of 19 to 81. Eighty five percent of patients were having acquired aponeurotic blepharoptosis. Also, other types were included: acquired mechanical, anophthalmic socket, congenital ptosis. Congenital ptosis was defined based on patient history and all of them had good levator function (>12mm). The percentage of patient who had previous eyelid surgery was 14.5%, majority of whom (71%) has previous blepharoptosis correction procedure. Concomitant other procedures included: blepharoplasty, brow ptosis repair, entropion repair and mass excision in 29.16% cases. Mild post-operative complications occurred in 14 patients, which are wound infection (1) suture granuloma (1), over correction (2), lagophthalmos (1), peaking (1) and hematoma (3). All resolved without the need for further surgical intervention. Seven patients had early recurrence and 3 has late recurrence of ptosis. The success rate was 80% with average follow up period 37.7 weeks (approximately 9 months) and range from 12 – 144 weeks. Further analysis for failure cases was done: one of the patient was having mechanical ptosis due to neurofibromatosis type1 and has recurrence because of eyelid plexiform neurofibroma, two of the patients were having congenital ptosis with good levator function. Average of recurrence time 19.3 weeks post-operative. Four patient had revision blepharoptosis correction with white line advancement technique and one has external approach levator resection technique. All of the five patients has good results.

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Conclusions: The surgical method of white line advancement technique was described in details. The success rate of the procedure was approximately 80% in our data. This procedure is a promising technique in cosmetic and functional blepharoptosis correction.
The post-operative complications were mild and manageable. The advantage of this procedure is to preserve the anatomy of the conjunctiva which has potential benefit in maintaining healthy ocular surface. The postoperative eyelid edema and hematoma is minimal and the patient can resume work 2-3 days after the surgery compared to the external approach. In our hands the operating time is less than other types of ptosis surgeries. This technique can easily be used in patients who require deep sedation or general anaesthesia. Furthermore, only one suture is needed to close the skin wound. We find the skin crease incision is an excellent modification of the technique to reduce rate of postoperative infection and granuloma formation that we experienced in all of our first three cases.
With good levator function of 12 mm and better, a positive phenylephrine test is not needed to decide about the type of the surgery preoperatively. Further comparison study between different approaches is needed to prove the superiority of this procedure.

Figure 1

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31 – Corneal Neurotization in the Treatment of Neurotrophic Keratopathy: A Review of Clinical Outcomes

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Introduction: Corneal neurotization (CN) is a novel approach in the treatment of neurotrophic keratopathy (NK) that restores sensation to the cornea and supplies trophic factors necessary for epithelial healing and maintenance.[1,2,3] No prior studies have attempted to report a comprehensive analysis of its clinical outcomes. This study aims to provide a systematic review of the clinical outcomes of published CN procedures for NK.

Methods: All patients who had CN at the study institution were included. Authors searched PubMed, Medline, EBSCOhost, Google Scholar, ASOPRS, and AAO Annual meetings' abstract databases published between Dec 2008 and Feb 2019 with the terms "corneal neurotization," "corneal neurotisation," "corneal reinnervation," and "neurotrophic keratopathy."

Results: A total of 49 eyes that underwent CN were identified. Final logMAR best corrected visual acuity (BCVA) improved to 0.84 (SD=0.66) from 1.22 (SD=0.72) with a mean improvement of 0.34 (SD=0.55;$p=0.003$). Corneal sensation measured using Cochet-Bonnet esthesiometer improved from 1.4 mm (SD=4.5) to 41.9 mm (SD=17.6) with a mean filament length change of 40.4 mm (SD=18.0;$p<0.001$). The median time to maximal sensation return was 6 months (IQR 6-10). The strongest predictor of final BCVA was the baseline BCVA ($p=0.008$). The most common reported limitation to visual recovery was corneal scarring (36.7%). Corneal sensation returned sooner in end-to-end coaptation than direct transfer technique ($p=0.03$).

Conclusions: CN significantly improves visual acuity and corneal sensation in patients with NK. CN should be considered in patients with neurotrophic keratopathy not responsive to medical treatment.

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Table 1

Table 1. Summary of reported corneal neurotization cases in the treatment of neurotrophic keratopathy.

	Sample Size (N)	Percent (%)	Mean	Standard Deviation	p-value [illegible]
Total number of patients	[illegible]				
Age (years)	35		40.45	21.98	
Children	19				
Visual Acuity					
Visual Acuity at baseline (logMAR)	40		1.222	0.722	
			20/333		
Visual Acuity after surgery (logMAR)	43		0.839	0.862	
Visual Acuity after surgery (Snellen equivalent)			20/138		
Change in visual acuity (logMAR)	41		0.383	0.632	<0.0001
Esthesiometry					
Cochet-Bonnet esthesiometer readings at baseline (mm)	38		1.436	4.584	
Cochet-Bonnet esthesiometer readings after surgery (mm)	37		41.892	17.923	
Change in esthesiometer readings (mm)	37		40.397	18.033	<0.0001
Improved sensation to cotton wisp, tissue paper, Schirmer	15				
Time to corneal sensation return (months)			Median	Interquartile range	
Graft materials					
Sural nerve	27	56.1			
Direct transfer	13	26.5			
Cadaveric nerve allograft	8	16.3			
Greater auricular nerve	1	2.0			
Grafting techniques					
End-to-end	21	42.9			
Direct transfer	11	22.5			
End-to-side	4	8.2			
Direct transfer - endoscopic	1	2.0			
Coaptation/Not specified	11	27.5			
Double barrel	1	2.0			
Branch of trigeminal nerve used					
Supratrochlear nerve	20	40.8			
Supraorbital nerve	14	28.6			
Supratrochlear and supraorbital nerve	10	20.4			
Infraorbital nerve	3	6.1			
Greater auricular nerve	2	4.1			
Laterality of grafts					
Contralateral	32	65.3			
Ipsilateral	17	34.7			
Causes of trigeminal nerve injury					
Congenital/Developmental/Trauma/Tumor resection related	10	23.8			
Acoustic neuroma/Schwannoma	15	35.7			
Herpes zoster infection	6	14.3			
Skull base fracture	4	9.5			
Ciliary nerve damage	2	4.8			
Posterior fossa meningioma	3	7.1			
Cerebellar hypoplasia	2	4.8			
Congenital including Goldenhar syndrome	1	2.4			
Microvascular/compression insults	1	2.4			
Limitations to visual acuity gain					
Dense corneal scar	18	36.7			
Posterior segment etiologies	2	4.1			
Amblyopia	2	4.1			
Not reported	24	49.0			
None	3	6.2			
In vivo confocal microscopy	8	16.3			

Figure 1

Figure 1. Flowchart of reported surgical techniques.

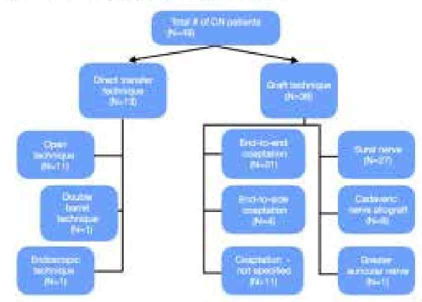


Figure 2

Figure 2. Boxplot of the visual acuity before and after corneal neurotization.

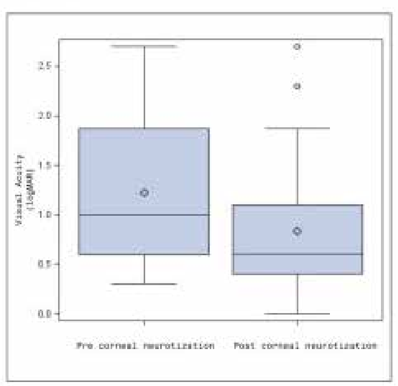
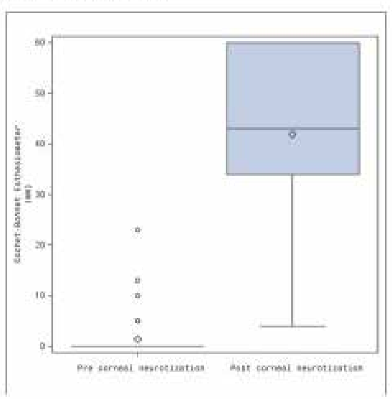


Figure 3

Figure 3. Boxplot of the Cochet-Bonnet esthesiometer readings before and after corneal neurotization.



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32 – Critical Involvement of the Eyelid Due to Erdheim-Chester Disease: 12 years of Follow-up

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Introduction: Erdheim-Chester disease (ECD) is a rare and aggressive form of non-Langerhans cell histiocytosis related to *BRAF*^{V600E} mutations in most cases. The most prevalent clinical features include bone and visceral involvement, but periocular lesions may also be present. The aim of this study was to report a long-term follow-up of a patient with multiple manifestations of ECD, including eyelid involvement and corneal injury.

Methods: This is a case report.

Results: A 65-year-old White woman presented with multiple nodular yellow plaques at pre-septal and pre-tarsal skin. In subsequent years, she developed a range of systemic symptoms (including diabetes insipidus and vein thrombosis) and skin lesions increased dramatically. A yellow mass appeared at the corneal limbus and histopathologic examination of eyelid lesions revealed a foamy histiocytic infiltrate with multiple Touton giant cells. Immunohistochemical staining was positive for CD68. The diagnosis of ECD was confirmed and multidisciplinary treatment included the use of steroids, interferon, and cladribine. The facial lesions regressed significantly, and the corneal mass completely disappeared after drug therapy. Eyelid lesions required a challenging surgical excision with a very satisfactory result.

Conclusions: Although xanthelasma may occur in ECD, it is a rather rare manifestation. The aggressiveness of the eyelid involvement in the present case and the extreme rarity of the corneal lesion (which has only one previous report in the literature) are remarkable. In addition, long-term follow-up and successful outcomes make this report important for further studies and advances in ECD management.

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Figure 1

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Figure 3

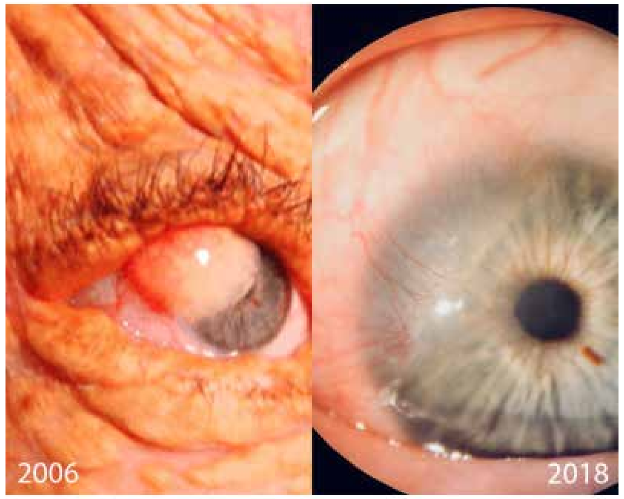


Figure 4

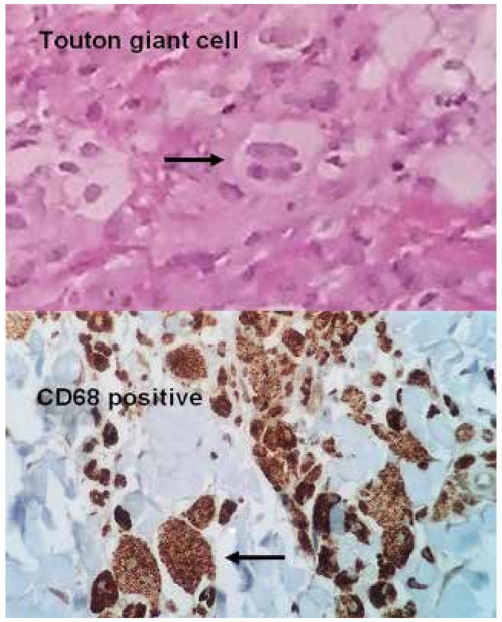
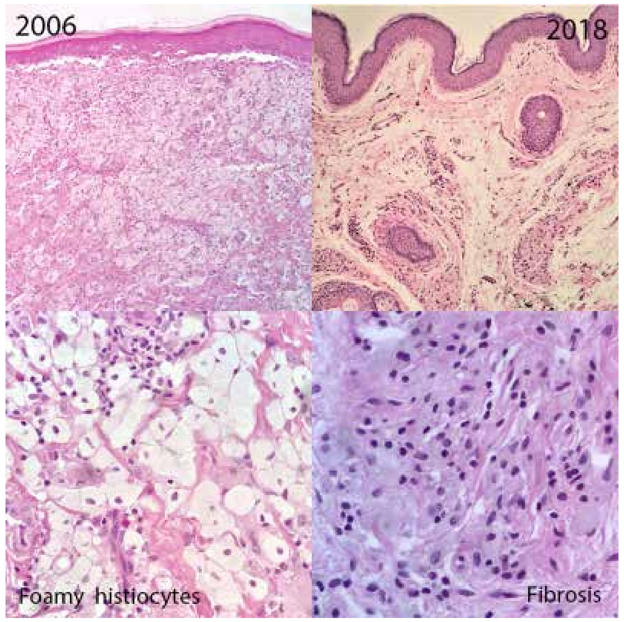


Figure 5



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33 – Cross Sectional Study of Tear Trough Depth and Quality Across Age Groups

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Introduction: The tear trough is the hollow region below the lower eyelid bounded by the anterior lacrimal crest medially, the inferior orbital rim inferiorly, the infraorbital fat pad protuberance superiorly,[1]and the medial pupillary line laterally.[2]It has been termed a tear trough “deformity”, characterized as an infraorbital hollowing/darkening and it is often the subject of aesthetic concern.[3]The purpose of this study is to determine the relationship of the depth and quality of the tear trough with age.

Methods: In 108 participants (age groups 10-89), tear trough depth and characteristics were determined using the tear trough rating scale (TTRS)[1]. This method included an assessment of: tear trough depth (measured using a caliper by two independent evaluators), trough pigmentation, nasal fat pad prolapse, and lower eyelid rhytidosis.These parameters were obtained for both the left and right eyes and compared with collected participant demographics including age, smoking status, gender, race, height, and weight. Correlations between demographics and depth were determined using Pearson’s r, while correlations between demographics and pigmentation, fat pad prolapse and rhytidosis used Spearman’s rho.

Results: Age is significantly associated with total TTRS score in both right and left eyes ($p = 0.001$, $p=0.001$), but there is no significant difference in the association between tear trough depth with age ($p=.156$, $p=.240$) or pigmentation with age ($p=.984$, $p=.956$). There is a significant difference in the association between tear trough fat pad prolapse with age ($p<.001$, $p<.001$) as well as rhytids with age ($p<.001$, $p<.001$). The only significant association with tear trough depth was weight ($p=.009$, $p=.002$).

Conclusions: Historically, tear trough depth has been felt to be associated with aging change. This study suggests that, although aesthetically unappealing, increased tear trough depth is not associated with age. Rather, rhytidosis and fat pad prolapse maintain this association with age. Understanding this information may offer benefit in educating and treating the aesthetic patient who has concerns regarding the appearance of their tear trough.

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34 – Dermal Matrix Sandwich Graft for Lower Eyelid Reconstruction

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Introduction: Porcine acellular dermal matrix has been used as a posterior lamellar spacer graft to repair eyelid retraction and canthal deformities. We report our experience using this material as a graft, sandwiched between skin and conjunctival flaps for lower eyelid reconstruction following Mohs surgery.

Methods: A retrospective chart review of patients undergoing lower eyelid reconstruction with a dermal matrix sandwich graft between 2013 – 2018.

Procedure: An advancement conjunctival flap is developed from tissue inferior to the Mohs defect. The dermal matrix graft is placed anterior to the conjunctival flap, sutured to the tarsus at the wound edges. A skin flap is used to cover the anterior surface of the graft. The two flaps are secured to the superior edge of the graft.

Results: The dermal matrix sandwich graft was performed in 13 cases (12 patients) during the study. Average horizontal marginal defect width was 11.7mm (range: 6-16mm). Mean width of the implanted dermal matrix was 7.7mm (range: 5-9mm). Rhomboid skin flaps were performed in 12 cases and an advancement flap in one case. There were no instances of infection or graft failure. The reconstructed lid had an excellent marginal contour in 11 cases, while 2 had minimal irregularities. Mild thickness and/or erythema of the skin flap were present in 4 of 5 patients followed less than 3 months. These findings were absent at final exam of the 8 patients with longer follow-up. All patients had excellent thickness of the reconstructed margin. One patient required cauterization of overgrown marginal conjunctiva after surgery. Two patients experienced symptomatic trichiasis arising from the lid adjacent to the defect, requiring electrolysis (n=1) and epilation (n=1).

Conclusions: The dermal matrix sandwich graft is an effective method of repairing marginal defects when there is sufficient remaining conjunctiva and skin to develop the necessary flaps. While resolution of edema and erythema may take several months, an excellent final result is achieved in the majority of cases. Complications are mild and relatively uncommon. This one-staged, tissue sparing technique preserves the capability of performing future Hughes or semicircular flaps, should the need arise.

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35 – Development of an Orbital Cellulitis Clinical Pathway: A Multidisciplinary Approach

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Introduction: Preseptal/orbital cellulitis frequently presents to pediatric emergency and primary providers, with potentially vision or life-threatening complications. A high degree of variability exists in management, due to paucity of scientific evidence, lack of consensus, and differences in individual physician and surgeon practices, across and within institutions. We sought to develop a management pathway for preseptal/orbital cellulitis at a tertiary children's hospital and primary care network, to standardize practice, maximize outcomes, and document the consensus building process required for pathway development.

Methods: With institutional support from our Pathways Program, we formed a multidisciplinary committee at Children's Hospital of Philadelphia (CHOP) with representation from ophthalmology, oculoplastics, otorhinolaryngology, pediatric hospitalists, outpatient pediatrics, emergency medicine, infectious disease, neuroradiology, antimicrobial stewardship, pharmacology, and health care analytics. Over regular, full committee and subspecialty meetings, all aspects of preseptal/orbital cellulitis evaluation and management were sequentially reviewed. Consensus was built through review and debate of the literature and expert opinion. The completed pathway was reviewed by stakeholder divisions and hospital leadership, and then posted in a web-accessible format for clinician point of care use, with electronic order sets. After education and implementation, care will be monitored for patients meeting the cohort definition and periodically evaluated through pathway and antibiotic compliance, readmissions, length of stay, imaging and lab testing utilization, ICU care escalation, and clinical outcomes like vision loss, prolonged ocular motility abnormalities, and mortality.

Results: The pathway development team identified key areas of variability in practice and ultimately provided standardized recommendations for evaluation and treatment of patient. Key discussion points included standardizing non-ophthalmologist exams to identify "orbital signs" and navigate differential diagnosis; use of imaging studies, subspecialty consultations, and laboratory testing; empiric antibiotic regimens; need for direct attending-level discussions between surgeons; observation on oral antibiotics before discharge; and use of adjuvant therapies, like systemic steroids, oxymetazoline, and nasal saline rinses.

Conclusions: Our development of an orbital cellulitis clinical pathway provides clinical management guidance to reduce variability in practice both at CHOP and at other institutions, as the pathway is freely available on the internet (https://www.chop.edu/clinical-pathway/preseptal-or-orbital-cellulitis-clinical-pathway), and is a procedural model of interdisciplinary clinical pathway development. Continued measurement of clinical management and outcomes will help close the gap between evidence and real time clinical care.

36 – Diagnosis and Management of Acute Thrombosis in Venous Dominant Orbital Venolymphatic Malformations

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Introduction: To report the characteristic clinical and imaging findings in a series of patients with thrombosed orbital venolymphatic malformations.

Methods: Patients affected by acute thrombosis of an orbital venolymphatic malformation (VLM) were reviewed. Clinical findings including symptoms and signs of presentation, characteristic imaging features and clinical course are presented.

Results: Ten patients were identified, 6 male and 4 female. The mean age at presentation was 56 years. All patients presented with acute pain or pressure sensation, with the most common additional presenting symptoms being proptosis (6/10) and diplopia (5/10). Three patients reported cessation of sildenafil use within weeks prior to the initiation of symptoms and another reported the use of hormones for fertility treatments. On clinical examination, the most common findings were axial proptosis (6/10) of on average 3 mm, restriction of extraocular motility (4/10), and inflammatory signs (6/10) such as eyelid swelling or conjunctival injection. CT imaging typically demonstrated a non-specific orbital mass. (Figure 1) Nine patients underwent MR imaging which revealed a soft tissue mass with peripheral rim enhancement and a central, typically T2 hypointense, core (Figure 2). In five cases, the lesion was configured in a tear drop shape with the tip directed to the apex of the orbit (examples Figure 1), including one case where this was noted bilaterally. Seven out of ten patients were observed and had improvement in symptoms and signs without surgical intervention. Two patients underwent surgical intervention for intractable pain and another underwent exploration, but the lesion had already resolved.

Conclusions: Patients with thrombosis of a VLM often present with acute pain, proptosis, and diplopia. Characteristic MRI findings of a peripherally rim enhancing mass with a T2 hypointense core can be noted. Careful observation is a reasonable management option for cases without visual compromise or intractable pain.

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Figure 1

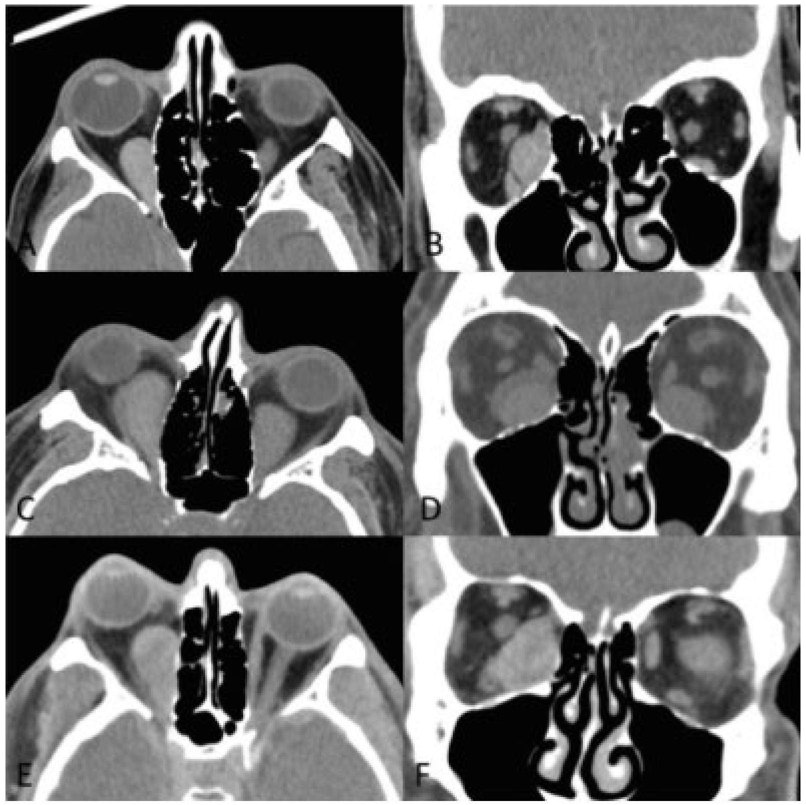
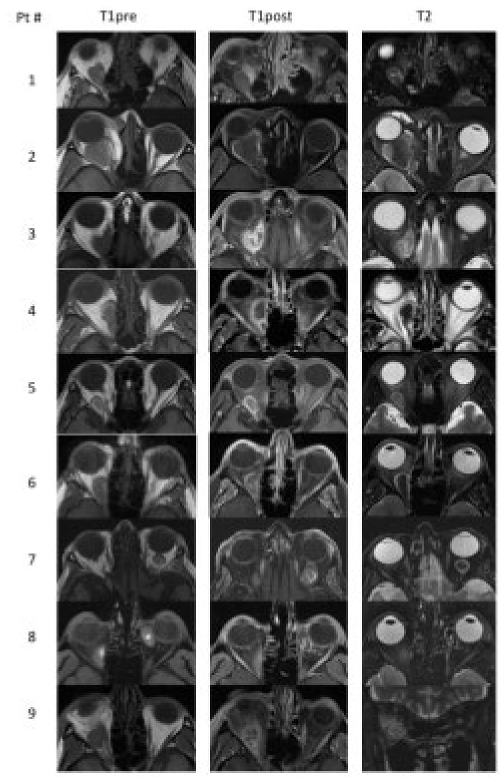


Figure 2



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37 – Eccrine porocarcinoma: A Rare Tumor of the Eyelid and a Novel Histopathological Finding

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Introduction: *Introduction:* Sweat gland tumors of the eyelid are exceedingly rare. Eccrine porocarcinoma (EPC) of the eyelid is a subtype that with less than ten documented cases in the literature (1-8). EPC carries a roughly 20% recurrence rate and a roughly 20% chance of metastasis. Additionally, there is a 67% mortality rate in patients with lymph node metastasis (9). Histopathologically, nests of atypical poromatous basaloid cells and the presence of duct-like lumina characterize this tumor (10). Herein, we present a case of an eyelid eccrine porocarcinoma with a histopathological finding not previously reported.

Methods: Retrospective case report.

Results: A 73-year-old male presented with a rapidly enlarging multi-lobulated left upper eyelid mass interfering with his visual axis obstruction and wit spontaneous bleeding (Figure 1). Histopathology of incisional biopsy showed nests of atypical cells with associated duct-like structures (Figure 2), consistent with a malignant adnexal tumor of sweat gland origin. Numerous loose tumor cells were also identified in the tear film adjacent to the lesion. (Figure 3). Wide local excision with frozen section confirmation of tumor free margins was performed. The eyelid was reconstructed immediately post excision.

Conclusions: Eccrine porocarcinomas are rare on the eyelid. This case demonstrated loose tumor cells in the tear film adjacent to the lesion. To our knowledge, this finding has not been previously described.

Figure 1

Figure 2

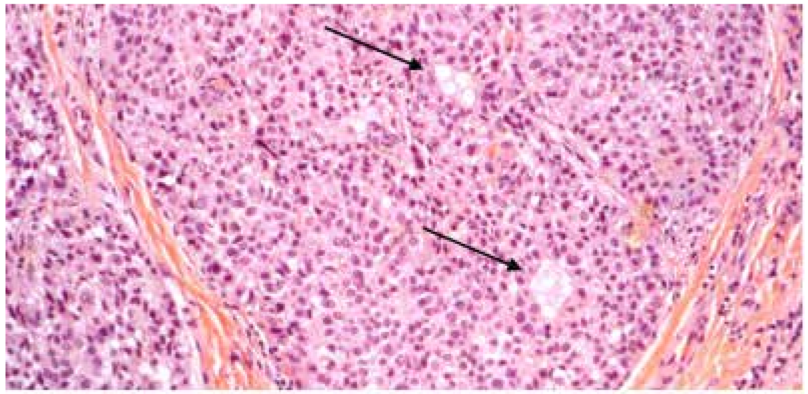
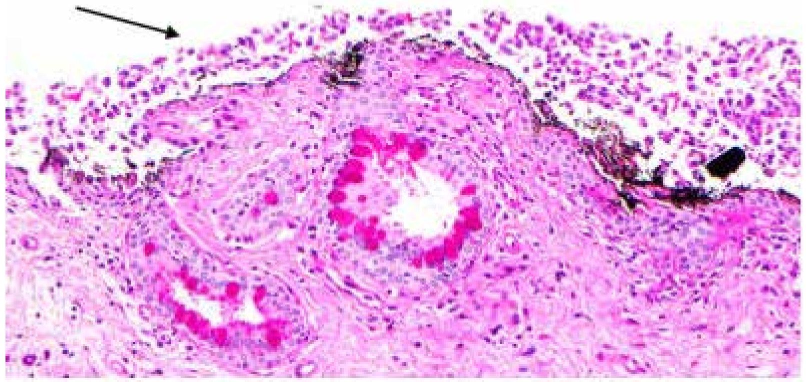


Figure 3



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38 – Effect of Oxymetazoline on Leicester Peripheral Field Test and Marginal Reflex Distance in Blepharoptosis: Results of a Phase 3 Randomized, Double-masked, Placebo-controlled Study

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Introduction: The standard treatment of acquired blepharoptosis is surgery, which includes risks such as infection, bleeding, scarring, asymmetry, and lagophthalmos. This has led to an unmet need for an effective, nonsurgical treatment option for blepharoptosis with minimal adverse effects. RVL-1201 (oxymetazoline hydrochloride ophthalmic solution, 0.1%) is a direct-acting α2-adrenergic agent that, when administered topically to the eye, is thought to stimulate the α2 receptors in Müller's muscle, causing it to contract.[1] This study examined the efficacy of RVL-1201 in the treatment of acquired blepharoptosis.

Methods: In this phase 3, randomized, placebo-controlled study, patients were randomized 2:1 to receive 1 drop RVL-1201 or placebo in each eye once daily in the morning. The primary efficacy endpoint was mean change from baseline (CFB) in number of points seen in the Leicester Peripheral Field Test (LPFT) at day 1 hour 6 and day 14 hour 2 visits; secondary efficacy endpoints included CFB in marginal reflex distance (MRD) at days 1, 14, and 42. LPFT was performed at baseline, day 1 hour 6, and day 14 hour 2. MRD was measured via photograph at baseline; day 1 and day 14 at 5 minutes, 15 minutes, 2 hours, and 6 hours after drop instillation; and end-of-study (day 42 at 15 minutes after instillation). Safety assessments included adverse event (AE) monitoring and reporting.

Results: At baseline, the mean LPFT points seen ± standard deviation (SD) for patients receiving RVL-1201 (n = 109) was 17.6 ± 4.92 vs 17.6 ± 5.48 for placebo group (n = 55). At hour 6 on day 1, the mean CFB in LPFT points seen ± SD was 6.3 ± 6.72 vs 2.1 ± 4.28 for RVL-1201 and placebo, respectively; at hour 2 on day 14, the mean CFB in LPFT points seen ± SD was 7.7 ± 6.41 vs 2.4 ± 5.26 for RVL-1201 and placebo, respectively (P <0.0001 for both timepoints). At baseline, the mean ± SD mm MRD for patients receiving RVL-1201 was 1.04 ± 0.74 mm vs 1.07 ± 0.70 mm for patients receiving placebo. At 5 minutes after instillation on day 1, the MRD mean CFB ± SD was 0.59 ± 0.72 mm for RVL-1201 vs 0.20 ± 0.57 mm for placebo (P = 0.0007); at the end-of-study visit, the MRD mean CFB ± SD for RVL-1201 and placebo was 1.04 ± 0.91 mm vs 0.47 ± 0.93 mm, respectively (P = 0.0003). The majority of AEs were mild to moderate; there were no severe AEs reported. The most commone AEs were conjunctival hyperemia and punctate keratitis, reported by 6 (5.5%) vs 1 (1.8%) and 4 (3.7%) vs 1 (1.8%) of patients receiving RVL-1201 and placebo, respectively.

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Conclusions: Treatment of blepharoptosis with RVL-1201 showed a significant improvement in LPFT points seen and a rapid and sustained improvement in MRD vs placebo with a favorable AE profile. The results indicate that RVL-1201 may be an effective nonsurgical treatment option for patients with blepharoptosis.

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39 – Evaluating Accuracy of Orbital Tumor Volume Measurements and Changes Over Time Using 3D Printed Orbital Models and MRI

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Introduction: This study uses 3-dimensional (3D) printed orbital models and tumor models of known volume to evaluate the accuracy of various imaging techniques to detect orbital tumor volume and change over time.

Methods: A 3-D printed orbital "phantom" was modeled from a normal anatomic CT orbit scan. A water-based starch modeled "tumors" in three common shapes of orbital masses: spherical, ovoid, or diffuse. Tumor volume was measured by water displacement in a graduated cylinder. In order to test the accuracy and threshold of measurable volume change on MRI, each tumor was 1 ml of base volume and additional clay was added in 0.1 ml increments to represent 10%, 20%, 30% and 40% change in volume. The 3-D orbit was scanned with base volume tumors of each shape (1.0 mL) and then again with each volume addition (1.1 mL, 1.2 mL, 1.3 mL, and 1.4 mL).

Two independent observers each obtained planar volume measurements on imaging software Vital, using the largest dimensions in 3 axes, and 3-D volume measurements using semi-automated and manual segmentation Vital and TeraRecon software. Correlation coefficients were calculated for each data set comparing measurements to the true volumes. A student T-test,Cohen's kappa test for inter-rater and intra-rater reliability, and the intra-class co-efficient (ICC) also evaluated the data set.

Results: The ICC for semi-automated segmentation on Vital was 0.7389 for spherical tumors ($p=0.0016$), 0.9082 for ovoid tumors ($p<0.00001$) and 0.7145 for diffuse tumors ($p = 0.0004$) which demonstrates a strong positive linear relationship between true volume and semi-automated volumes.

The correlation coefficients for manual segmentation on TeraRecon were $R=0.8808$ for spherical tumors ($p<0.0001$), $R=0.9372$ for ovoid tumors ($p<0.0001$) and $R=0.3563$ for diffuse tumors ($p=0.0533$) which demonstrates excellent relationship between true volume and manually segmented volumes for spherical and ovoid tumors, but poor correlation for diffuse tumors.

Manual planar volumes demonstrated excellent inter-reader correlation (ICC=0.814). Semi-automated volumetric software Vital demonstrated good intra-reader correlation (ICC=0.5792) and excellent inter-reader correlation (ICC=0.8986). Manual volumetric software TeraRecon demonstrated fair intra-rater correlation (ICC=0.4670) and fair inter-rater correlation (ICC=0.5792).

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Conclusions: MRI is the study of choice for orbital tumor soft tissue characterization and disease progression. Reliably detecting volumetric change on MRI over time may alter treatment and/or time to intervention. Validation of orbital tumor measurement techniques on MRI against a true volume has not been demonstrated in the literature.

Our study demonstrates semi-automated volumetric measurements on Vital best correlate to true volumes and yield excellent inter-rater correlation. While planar measurements typical for radiologists have excellent inter-rater correlation, planar volumes are not reflective of true volume for any tumor shape. Manual segmentation volumetric measurements on TeraRecon correlated well for spherical and ovoid tumors, but diffuse tumors were not able to be accurately measured. Manual segmentation on TeraRecon was also the most time consuming.

Our study demonstrates the value of semi-automated volumetric measurements of true tumor volume and the reliability of these measurements across readers and according to tumor shape. Accurate and reliable assessment of incremental change in volume can aid clinical therapeutic decision-making.

Figure 1

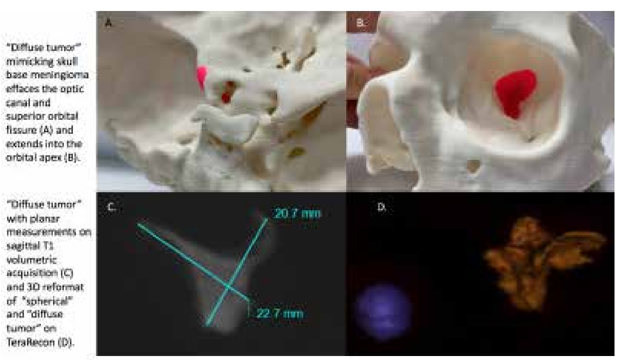


Figure 2

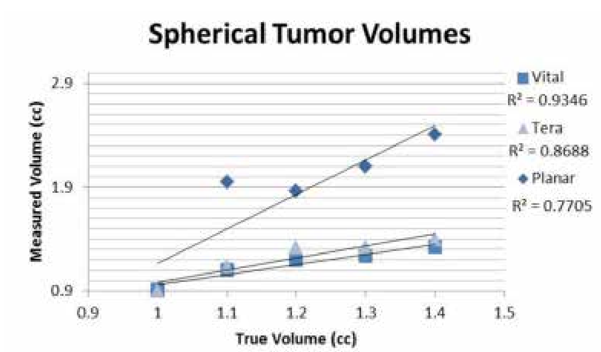


Figure 3

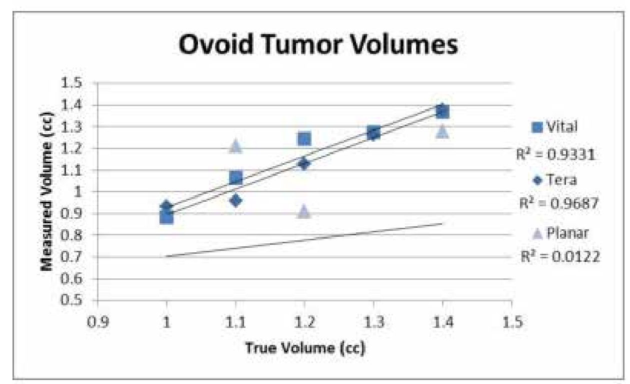
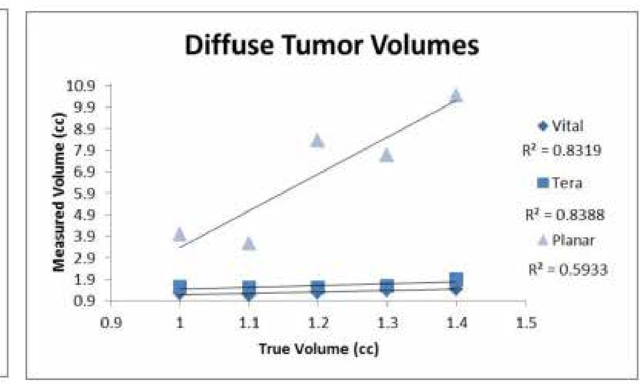


Figure 4



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40 – External Carotid Artery Supply to the Ophthalmic Artery

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Introduction: One of the most feared complications of facial cosmetic filler placement is sudden Ischemic blindness during injection (1). Although rare, the consequence of irreversible blindness is a devastating complication. Current prevention and management strategies are based on the etiologic theory that a column of filler is injected retrograde into the arterial system in the external carotid artery (ECA) circulation, filling the artery back to the branch point of the ophthalmic artery and subsequent embolism from this position (2).

There are a number of observational and theoretic factors making this hypothesis unlikely to represent the pathology. There is observational data to suggest this hypothesis may not be representative of etiology. Despite broad facial geographic diversity in risk sites, the instantaneous onset of ischemia suggests the emboli follow the free flow of blood (179cm/s for 2 cm = 0.01 sec).

This hypothesis contends that in some individuals, ECA circulation flows towards the ophthalmic artery. Angiographic evidence from pediatric populations suggests this is plausible (2). A similar flow pattern has not be described in adults. This study is intended to describe ECA to ophthalmic artery flow in an adult population.

Methods: In this cross-sectional observational study, 200 consecutive conventional angiograms were reviewed for CCA and/or selective ECA sequencing. These cases were then assessed by study authors for direct ECA to ophthalmic artery flow. This was defined as evidence of choroidal blush before filling of the circle of Willis on selective ECA angiogram. Patient and vascular flow characteristics are described.

Results: Five cases of ophthalmic artery flow from the ECA were identified. Age range was 24 to 69 years and 4/5 were female. In each case some form of ipsilateral carotid occlusive disease was noted. This was due to atherosclerotic disease in 3, trauma in 1 and iatrogenic balloon in 1. The occlusion was complete in 3/5 cases, 50% in 1/5 and temporary in 1/5 cases. The collaterals were from the facial collaterals in 2 case and the frontal branch of superficial temporal, posterior ethmoidal and internal maxillary in one each.

Conclusions: Ophthalmic artery supply from the superficial branches of the ECA can occur in adults. This flow can be visualized in temporary and partial carotid occlusion, and as in pediatric populations (4), may be dynamic based on hemodynamic changes. Although some estimates suggest up to 10% of the adult population may have asymptomatic carotid stenosis, we cannot be certain how much this population overlaps with the ischemic filler complication population. Further study regarding the incidence, conditions and dynamics of these patterns would assist in understanding pathophysiology and risk in filler related ocular ischemic disease.

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41 – External vs Buried Vertical Mattress Technique for Full-Thickness Eyelid Margin Defects

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Introduction: Full-thickness, margin-involving eyelid wounds are often repaired with a vertical mattress suture in either an externalized[1]or buried[2] fashion; it is unclear which method provides superior long-term results.

Methods: We performed a retrospective chart review using CPT codes 67971 and 67966 to identify all patients in our electronic medical records (EMR) who underwent full thickness eyelid margin repair from January 2014 to September 2018. For all patients, data was collected within three broad categories: demographics, operative data, and post-operative data. Demographics included patient age, gender, date of service, and diagnosis. Operative data included external or buried knot, type of suture (e.g., permanent or absorbable), upper or lower eyelid, wound size, need for regional flap, and origin of eyelid defect (e.g., neoplasm excision, trauma, floppy eyelid syndrome, etc.). Post-operative data included suture removal date and days sutures were in place if a permanent external suture was used, occurrence of dehiscence, days from surgery to dehiscence, occurrence of corneal abrasion, presence of eyelid notch greater than weeks post operatively, and need for wound revision. Primary outcome measures were (1) wound dehiscence, (2) need for revision, and (3) presence of eyelid margin notch. Patients were excluded from the study if there was lack of operative data, a tarsoconjunctival flap was used, or the patient had less than three weeks follow up. All procedures were performed by one of five surgeons within our practice. A two-tailed Student’s t test was used to evaluate results between groups.

Results: A total of 192 eyelids were included in the study. An external vertical mattress suture was placed in 86 eyelids; a buried vertical mattress suture was placed in 106 eyelids. Wound dehiscence occurred in 7 eyelids (6.6%) with a buried vertical mattress suture while no dehiscence occurred in the external vertical mattress group ($p < 0.05$). Of the eyelids that dehisced, the mean number of days to dehiscence was 11.4 (range 9-15). Three eyelids (2.8%) with a buried vertical mattress suture required wound revision. One eyelid (0.9%) with a buried vertical mattress suture had a notch postoperatively. There was no need for a wound revision and no occurrence of postoperative notch in the external vertical mattress group. Neither rate of wound revision or occurrence of a postoperative notch reached statistical significance.

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Conclusions: In this case series, the external vertical mattress suture had a statistically lower dehiscence rate compared to the buried vertical mattress suture. The clinician should be aware that wound dehiscence often occurs between the first and second postoperative week.

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42 – Eyelid Coloboma and Orbital Choristoma associated with Klippel-Trenaunay Syndrome

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Introduction: This case report describes the clinical presentation and management of a 29 year-old female with history of Klippel-Trenaunay syndrome associated with complex unilateral ocular adnexal deformity including upper eyelid coloboma, lagophthalmos, and superonasal orbital mass (Figure 1A).

Methods: Retrospective chart review and review of the literature.

Results: The Patient had a prior diagnosis of Klippel-Trenaunay Syndrome with phenotype including vascular malformation of the left lower extremity with associated lymphedema, Chiari malformation, and multiple intracranial aneurysms. She had not had any prior ophthalmic reconstructive procedures due to concern of hemorrhagic complications. On MRI, the orbital mass appeared multilobulated and poorly defined, with minimal contrast enhancement (Figure 2). The patient was symptomatic with ocular discomfort, tearing, and distress due to cosmetic deformity and desired surgical reconstruction. The superior forniceal aspect of the mass was debulked and the fornix was reconstructed with conjunctival rearrangement. No significant intraoperative bleeding was encountered. The colobomatous upper lid defect was excised and a standard full-thickness lid repair was performed. The patient followed a routine post-operative course with excellent healing of the eyelid and fornix, improvement of upper lid contour and resolution of lagophthalmos (Figure 1B). Pathology from the superior fornix mass showed benign fibrovascular and adipose tissue as well as lacrimal gland tissue consistent with lipomatous choristoma (Figure 3).

Conclusions: Klippel-Trenaunay Syndrome is a phakomatosis that classically presents with the triad of capillary malformations (such as port-wine stain), venous malformations, and segmental bony or soft-tissue hypertrophy. Possible ocular manifestations include congenital glaucoma[1], oculodermal melanocytosis with increased risk for choroidal melanoma[2], choroidal hemangioma[3], persistent fetal vasculature[4] and optic nerve glioma.[5] To our knowledge, this is the first case report of eyelid coloboma and anterior orbital choristoma associated with Klippel-Trenaunay Syndrome. Importantly, the orbital mass could be safely debulked without hemorrhagic complications, allowing for simultaneous repair of the eyelid coloboma and significant improvement of the patient's symptoms.

Figure 1: External photograph before surgery (A1, eye open and A2, attempted closure) and on post-operative day 10 after repair of coloboma and debulking of fornix mass (B1 and B2).

Figure 2: MRI orbits T1 with gadolinium (A) and IDEAL sequence outflow phase (B) showing non-enhancing multilobulated left orbital mass.

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Figure 3: Gross appearance of orbital mass prolapsing into the superior fornix (A) and corresponding histo-pathologic photograph showing benign fibrovascular and adipose tissue as well as scarce lacrimal gland tissue consistent with lipomatous choristoma without evidence of vascular malformation (B).

Figure 1

Figure 2

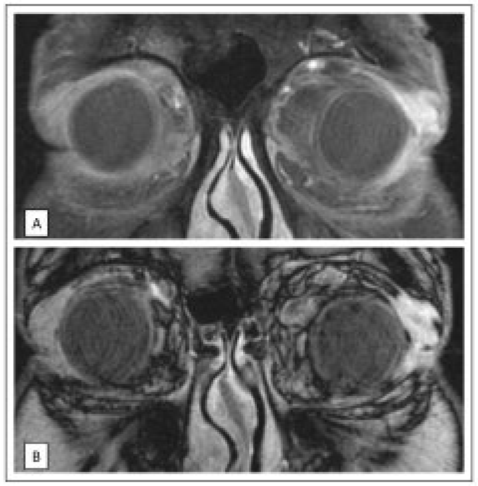

Figure 3

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43 – Eyelid Contour Outcomes of single suture MMCR versus traditional MMCR: Which is Better?

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Introduction: To quantitatively evaluate and compare the eyelid contour after single suture Mueller muscle conjunctival resection (ssMMCR) and traditional MMCR (tMMCR).

Methods: Retrospective interventional case series of Caucasian female patients who underwent either ssMMCR (n=27) or tMMCR (n=27) at a single institution. Exclusion criteria were patients with history of trauma, tumors, nerve palsy, or previous surgery, and patients undergoing concomitant blepharoplasty. Single suture MMCR was performed as previously described (1). We quantitatively examined upper eyelid contour to compare the outcomes between the two techniques.

Upper eyelid contour (ULC) was quantitatively measured pre and post-operatively using software developed in Matlab (MathWorks, Natick, MA). This allows for automation of the upper and lower eyelid contour using iris registration with an optional manual override. Pre and post-operative ssMMCR and tMMCR images were compared to a previously developed Caucasian female standard. A standard deviation (SD) from the mean normal upper eyelid contour (MNC) was derived, with a larger SD indicating an eyelid contour further from the MNC. T-tests were used to compare the SD from the MNC between the ssMMCR and tMMCR groups.

Results: Table 1, 2

The ssMMCR and tMMCR groups did not differ by age (ssMMCR 66.2 years vs. tMMCR 65.0 years; p=0.327) or preoperative ULC (ssMMCR 2.72 SD vs tMMCR 2.54 SD from the MNC; p=0.289). Postoperative ULC did not differ between the two groups (ssMMCR 0.90 SD vs tMMCR 1.00 SD from the MNC; p=0.254). The difference between pre and post-operative ULC was also similar, suggesting that overall lift along the horizontal length of the eyelid is similar between both methods (ssMMCR 1.82 SD vs tMMCR 1.54 SD from the MNC; p=0.174). One patient with tMMCR (3.7%) required further surgical revision whereas none in the ssMMCR group did.

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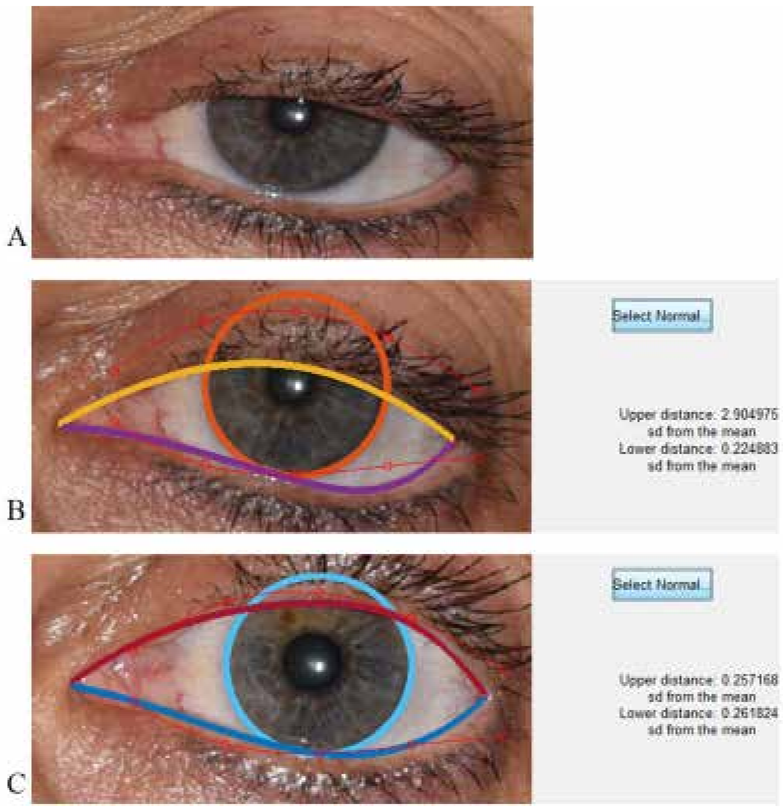
Conclusions: Single suture MMCR is an efficient and effective method for ptosis repair. Using a digital eyelid contouring algorithm, ssMMCR results in equivalent outcomes compared to traditional MMCR. Although expenditure was not an outcome measure in this study, ssMMCR is likely less costly due to faster operating time. While these findings were significant in the demographic studied, further evaluation in broad demographic groups is necessary to generalize our conclusions.

Figure 1. Eyelid contour single suture MMCR



A. Preoperative image showing ptosis of the left eye.
B. Preoperative image of same patient with eyelid contour (yellow and purple) representing upper and lower eyelid outline. Orange circle indicates iris outline. Red line overlay shows standard eyelid contour.
C. Postoperative image of same patient after ssMMCR with eyelid contour (red and blue) compared to standard eyelid contour (red).

Table 1

Table 1: Demographics: Age, number of eyelids, and surgical approach used in patients

	Standard	ssMMCR	tMMCR
No. eyelids	50	27	27
Mean age years (SD)	68.8 (9.0)	66.2 (10.4)	65.0 (9.5)

One-way ANOVA: $F(2,78) = 0.622$, $p = 0.539$
SD = standard deviation; ssMMCR= single suture Mueller muscle conjunctival resection; tMMCR = traditional MMCR

Table 2

Table 2: Pre and postoperative upper eyelid contours by surgical approach groups

	ssMMCR	tMMCR	P-Value*
Preoperative (SD)	2.72 (1.3)	2.54 (1.0)	0.289
Postoperative (SD)	0.90 (0.5)	1.00 (0.5)	0.254
Change in upper eyelid contour (SD)[a]	1.82 (1.1)	1.54 (0.9)	0.174

SD = standard deviation; ssMMCR= single suture Mueller muscle conjunctival resection; tMMCR = traditional MMCR
*Two-sample t test
[a]These SDs indicate the magnitude of improvement in upper eyelid contour postoperatively compared to preoperatively

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44 – Eyelid Margin Repair without Marginal Sutures: Outcomes Using a Novel Technique

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Introduction: Full thickness upper and/or lower eyelid defects requiring reconstruction can result from trauma or various eyelid lesions including neoplastic conditions. These defects are usually repaired by approximating the eyelid margin via marginal sutures. This method can leave suture tails and knots causing corneal abrasions or ocular irritation. Long term complications include eyelid notching, eyelid malposition, and injury to the globe. We describe and evaluate the outcomes of a novel technique of eyelid margin repair without the use of marginal sutures.

Methods: The tarsus is initially approximated by placing two 7-0 polyglactin sutures in a horizontal fashion. The first is placed 1 mm superior to the upper eyelid margin or 1 mm inferior to the lower eyelid margin. Care is taken to ensure that the suture is passed as posteriorly as possible without violating the palpebral conjunctiva. Next, a 6-0 plain gut suture is passed at the lash line, directly perpendicular to the eyelid, through the anterior lamella extending to the most posterior portion of the tarsus. It is passed through the exact structures on the opposite side of the incision. Once this is tied in a standard surgical knot, the suture is used to close the skin in a running fashion.

A retrospective chart review was performed of all cases of full thickness eyelid defects that underwent primary eyelid margin repair without the use of marginal sutures. Demographic information such as age at procedure and sex were collected. Clinical data including indication for repair, size of tissue resection and complications such as lid notching, and post-operative keratopathy and ectropion/entropion were recorded. Descriptive statistics were performed with means for continuous data and frequencies for categorical data.

Results: Thirty-one total cases were identified from March 2013 to May 2019. One case was excluded in the post-operative analysis as the patient has not had a follow up visit yet. The indication for the majority of cases was eyelid lesion (26/31, 83.87%), but others included floppy eyelid (4/31, 12.9%), trauma (1/31, 3.22%) and trichiasis (1/31, 3.22%). Mean age was 59.58 years (range 22 to 88 years) and 54.84% were female. Mean duration of follow up was 14.8 weeks (range 4 days to 42 months). Mean size of resection was 5.77 mm (range 2 mm to 12 mm). Lid notching or scarring were noted in 3 (10%) of 30 patients. Resection size was 6 mm in all 3 of these cases and indications included floppy eyelid (1 patient) and eyelid lesion (2 patients). One (3.33%) of 30 patients had post-operative keratopathy. There were no cases of eyelid retraction, entropion, or ectropion.

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Conclusions: This novel technique of eyelid margin repair without marginal sutures for full thickness eyelid defects has some benefits compared to the classic technique requiring sutures at the margins. Most notably, there is no need to remove sutures or place sutures at the margin which could cause corneal damage. Furthermore, there were comparable rates of eyelid notching, scarring, post-operative keratopathy, and eyelid malposition.

45 – Eyeliner Tattoo Pigment in the Submental Lymph Nodes Simulating Metastatic Malignant Melanoma

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Introduction: We present a case of pigmented submental lymphadenopathy over 20 years after cosmetic eyelid tattoo mimicking metastatic melanoma. The importance of histological confirmation with immunohistochemistry and preoperative recording of any decorative tattoos is the eyelid and adnexal region is emphasized.

Methods: Case report.

Results: A 61-year-old Caucasian female with history of basal cell carcinoma presented for blepharoplasty, temple lift, and upper and lower rhytidectomy. She had a distant history of decorative upper and lower eyelid eyeliner tattoo. During her lower rhytidectomy, a small strip of platysma was excised exposing a pocket of subplatysmal fat. While liposuction was carried out in this plane, two firm dark black pigmented lymph nodes, measuring 0.7 x 0.5 x 0.3 cm and 1.9 x 0.4 x 0.3 cm, were encountered in the submental region and were biopsied.

The histology revealed reactive lymph nodes with black exogenous granular pigment. There was no atypical melanocytic proliferation and MART-1 immunohistochemistry was negative. She did not have any other tattoos on her face or body and systemic work up was otherwise normal.

Conclusions: Pigmented lymphadenopathy can be a harbinger of metastatic melanoma. With increasing popularity of aesthetic tattooing of the eyelids, brows, and face, exogenous pigmentation should be an additional diagnosis on the differential. Despite classic teaching describing the path of lymphatic drainage from the eyelids to the pre-auricular and sub-mandibular lymph nodes, drainage can also occur to the submental region.

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Figure 1

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46 – Frequency of Pathologic Diagnosis Revision based on Molecular Genetic Testing of Primary Orbital Liposarcomas: Addition of Two Case Reports and Systematic Literature Review

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Introduction: Liposarcoma is the most common soft-tissue sarcoma in adults.[1] It has been reported rarely in the orbit where the myxoid subtype occurs most frequently.[1] Less common subtypes include atypical lipomatous tumor/well-differentiated liposarcoma (ATL/WDL) and dedifferentiated liposarcoma (DDL). Molecular genetic testing for *MDM2* gene amplification has emerged as a tool for distinguishing ATL/WDL and DDL from histologically similar lesions.[2] The purpose of this study was to report two primary orbital liposarcoma cases in which *MDM2* detection aided in diagnosis, and to conduct a systematic review of orbital ATL/WDL and DDL with a focus on pathologic diagnosis revision based on ancillary testing.

Methods: Two case reports are described and a systematic PubMed search for articles on primary orbital ATL/WDL and DDL was performed, followed by a citation search (Figure 1&2). Thirty cases were identified. Data collected included demographics, clinical presentation, management, and pathologic diagnosis.

Results: In case 1, a 26-year-old female with treated bilateral germline retinoblastoma and post-radiation osteosarcoma status-post right orbital exenteration, underwent open diagnostic biopsy of a left intraconal orbital mass on screening MRI (Figure 3A&B). Initial histopathologic diagnosis was myxoid liposarcoma. Subsequent fluorescence in situ hybridization (FISH) studies demonstrated *MDM2* and *DDIT3* co-amplification resulting in diagnosis revision to ATL/WDL (Figure 3C&D). In case 2, a 28-year-old female presented with proptosis and motility restriction 2-months after undergoing an orbitotomy for a left intraconal orbital mass diagnosed as solitary fibrous tumor (Figure 4A&B). Additional FISH studies revealed *MDM2* amplification causing diagnosis revision to DDL (Figure 4D). She underwent eyelid-sparing exenteration (Figure 4C) and radiation, but developed lung metastases 18-months later treated with surgical excision and neo-adjuvant chemotherapy.

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Median age for 30 published orbital liposarcoma cases was 35.5 years (range 22-69) and male to female ratio was 1:1 (Figure 5). Pathologic diagnosis was ATL/WDL in 22 (73%) cases, DDL in 6 (20%), and mixed in 2 (7%). Immunohistochemistry (IHC) and/or FISH studies were performed for *MDM2* in 7 (23%) cases (5 ATL/WDLs and 2 DDLs). Ancillary testing led to pathologic diagnosis revision in 4 (57%) tumors, 3 (43%) of which had diagnostic delay for 3.3 years on average (±5, range 0.17-9). Considering all cases reviewed, pathologic diagnosis revision occurred in 13 (43%) tumors, with average diagnostic delay of 2.6 years (±3.2, range 0.17-9). Common alternate diagnoses were spindle cell lipoma (n=3) and neurofibroma (n=3).

Conclusions: Two primary orbital liposarcomas are reported, including the first documentation of *MDM2* and *DDIT3* co-amplification in orbital ATL/WDL. Of 7 orbital ATL/WDL and DDL cases in which IHC and/or FISH studies were performed, 57% had an initial pathologic diagnosis revised based on ancillary testing, with diagnostic delay occurring in 43% of these cases for approximately 3.3 years. *MDM2* testing often results in pathologic diagnosis revision in orbital liposarcoma cases and can improve diagnostic accuracy of the ATL/WDL and DDL subtypes.

Figure 1

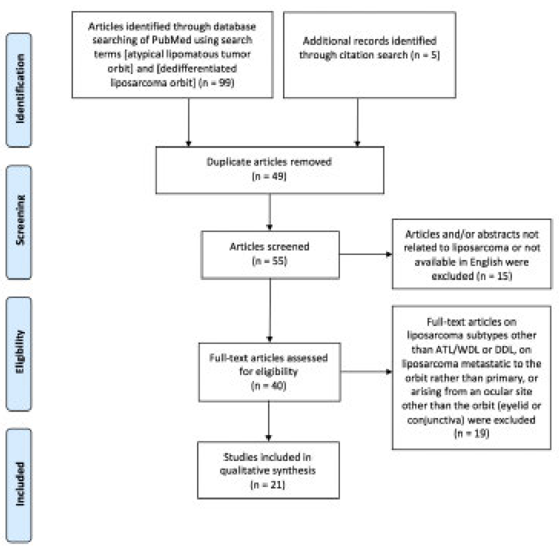

Figure 1. Flow chart of the systematic review process for selection of articles to be included in qualitative analysis of all cases of primary orbital atypical lipomatous tumor/well-differentiated liposarcoma (ATL/WDL) and dedifferentiated liposarcoma (DDL).

Figure 2

Figure 2. References cited from systematic review

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Figure 3

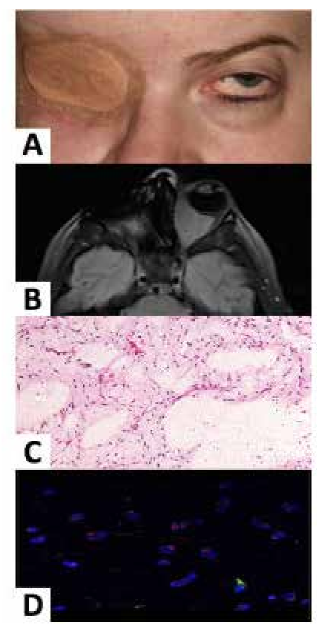

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Figure 4

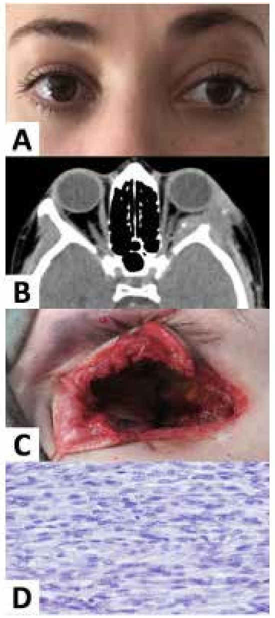

Figure 5

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47 – Henoch-Schönlein Purpura associated with Diffuse Large B-cell Lymphoma of the Orbit

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Introduction: The association between Henoch-Schölein purpura and malignancy remains unclear and in need of further investigation. We describe the first case of diffuse large B-cell lymphoma of the orbit associated with Henoch-Schönlein purpura.

Methods: Case report and review of the literature.

Results: An 84-year-old man presented with double vision for one week. Visual acuity was 20/30 OD and 20/25 OS. There was no relative afferent pupillary defect. Intraocular pressures and confrontational visual fields were also normal. He had -3 limitation in upgaze and -1 in abduction on the right. He had 2 mm of relative ptosis with an S-shaped deformity of the eyelid and 5 mm of relative proptosis with hypoglobus on the right. MRI of the orbits showed a right lacrimal gland mass measuring 2.9 x 2.1 x 1.6 cm compressing the right supralateral globe, lateral rectus and optic nerve. (Figure 1) Head CT from one-month prior showed no abnormalities.

The patient underwent anterior orbitotomy with biopsy. Immediately following the procedure, new petechiae were noted on his legs and he developed acute respiratory distress. The patient was intubated and transferred to the ICU, having developed flash pulmonary edema. His creatinine from five days prior was 1.4 and rose to 3.36. Orbital biopsy results were consistent with diffuse large B-cell lymphoma and positive for CD20, BCL2, BCL6, MUM1/IRF4+. (Figure 2, A-F) Skin biopsy of the petechial rash demonstrated leukocytoclastic vasculitis. (Figure 3, A and B) Renal biopsy results showed diffuse endocapillary glomerulonephritis with IgA-dominant deposits, suggesting Henoch-Schönlein purpura (HSP) nephritis. (Figure 4, A and B) The patient was treated with intravenous methylprednisolone followed by rituximab, cyclophosphamide, etoposide, vincristine, and prednisone (R-CEOP). He ultimately received six cycles of R-CEOP and has remained without recurrence for 7 years.

The association between HSP and malignancy remains unclear due to the limited number of available cases. There have been ten previous case reports of patients with HSP and lymphoma.[1-10](Table 1) HSP appears more commonly associated with non-Hodgkin lymphomas compared to Hodgkin lymphomas.[11]The patient presented here is older than previously reported cases of HSP and lymphoma (mean 54.6, median 62, range 8 – 72).[1-10]As in our patient, most cases of HSP and lymphoma have been reported in male patients (75% male vs 25% female).[1-10]In terms of duration between lymphoma diagnosis and onset of HSP, the timing appears to be quite variable. Our patient was managed with systemic chemotherapy achieving complete remission of DLBCL and HSP. There is similar evidence that successful treatment of the coexisting malignancy can result in resolution of the HSP.[5,6,9,10]
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Conclusions: This is the first reported case of Henoch-Schönlein purpura associated with orbital lymphoma. We report this case to alert clinicians that Henoch-Schönlein purpura can complicate cases of orbital diffuse large B-cell lymphoma resulting in life-threatening fluid shifts and organ dysfunction.

Figure 1

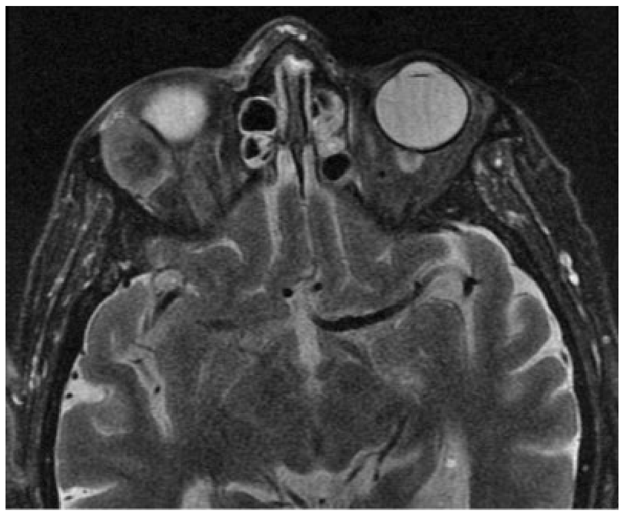

Figure 1. T2-weighted MRI of the orbits demonstrating right lacrimal gland mass with indentation of the globe.

Figure 2

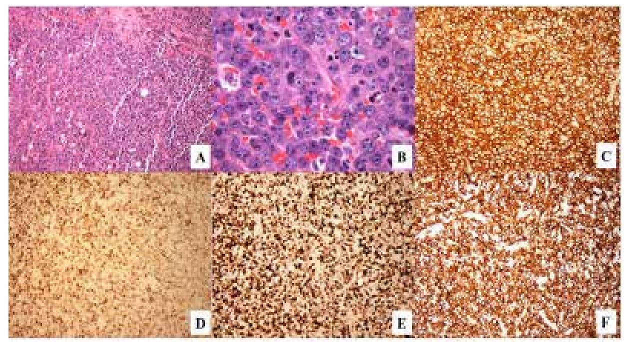

Figure 2. Right orbital biopsy results demonstrating neoplastic lymphocytes infiltrating the lacrimal gland (A). The cells were large and exhibited centroblast-like morphology with focal plasmacytoid differentiation (B). Lymphoma cells expressed CD20 (C), BCL6 (D), MUM1/IRF4 (E), and BCL2 (F).

Figure 3

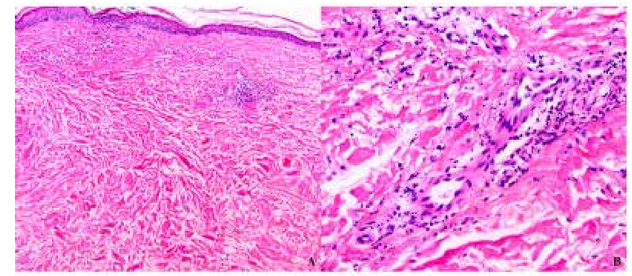

Figure 3. H&E stained section of skin biopsy showing acute vasculitis with neutrophilic infiltration and neutrophilic debris at 100x magnification (A) and 400x magnification (B).

Figure 4

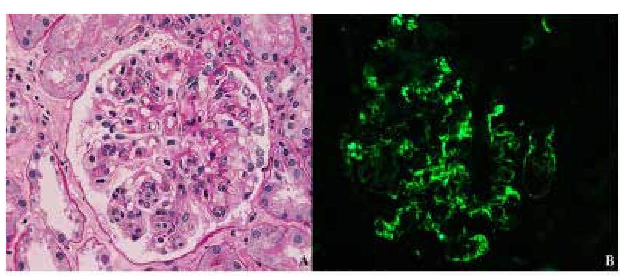

Figure 4. Renal biopsy results (A) PAS stained section revealing diffuse endocapillary proliferative glomerulonephritis. (B) Immunofluorescence stained section showing segmental to global mesangial and capillary wall staining for IgA.

Figure 5

Table 1

Reported Cases of Henoch-Schönlein Purpura Associated with Lymphoma

Author	Year	Type of Lymphoma	Age	Sex	Time between HSP and lymphoma diagnosis	Biopsy results
Kesseler and Slater[3]	1986	Hodgkin (Lymphocyte depleted)	72	M	4 weeks	Skin (leukocytoclastic vasculitis)
Kesseler and Slater[3]	1986	Hodgkin (Mixed cellularity)	61	M	Concurrent	Skin (leukocytoclastic vasculitis)
Vesole[4]	1987	Non-Hodgkin (DLBCL)	63	M	30 years	Not done
Ng et al[5]	1988	Hodgkin (Nodular sclerosis)	39	M	Concurrent	Skin (leukocytoclastic vasculitis)
Blanco et al[6]	1999	Hodgkin (Mixed cellularity)	29	M	Concurrent	Renal (IgA deposits); Skin (leukocytoclastic vasculitis without deposits)
Pertuiset et al[2]	2000	Non-Hodgkin (DLBCL)	68	M	4 months	Renal (IgA deposits)
Day et al[7]	2001	Non-Hodgkin (High grade, Null cell)	66	M	Concurrent	Renal (IgA deposits); Skin (leukocytoclastic vasculitis)
Fox et al[8]	2007	Non-Hodgkin (Follicular)	57	F	9 years; Concurrent with relapse	Skin (leukocytoclastic vasculitis with IgA deposits)
Mitsui et al[1]	2009	B-cell Lymphoma	70	M	Unknown; HSP after malignancy diagnosis	Skin (leukocytoclastic vasculitis)
Mitsui et al[1]	2009	Malignant Lymphoma	65	F	Unknown; HSP after malignancy diagnosis	Skin (leukocytoclastic vasculitis)
Hou et al[9]	2011	Non-Hodgkin (DLBCL)	8	F	Concurrent	Skin (leukocytoclastic vasculitis with IgA, IgM, C3 deposits)
Soerjadi et al[10]	2012	Non-Hodgkin (Angioimmunoblastic T-cell lymphoma)	57	M	Concurrent	Renal (IgA deposits); Skin (leukocytoclastic vasculitis)

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48 – Horizontal Restrictive Strabismus: A Challenging Complication of Jones tubes

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Introduction: Although uncommon, significant horizontal restrictive strabismus can occur as a late-onset complication years later following both standard/StopLoss Jones tube placement, and after tube revisions. Multiple surgeries may be required to release medial orbital/conjunctival contraction, with sometimes only partial resolution achieved.

Methods: Case report series, and review of peer-reviewed literature.

3 cases from multiple institutions presented:

1. 44 yo F s/p Jones tube placed 3 yrs prior, presented with gradual horizontal diplopia. Exam showed abduction restriction (Fig 1), and medial conjunctival symblepharon in the area of the tube. Lysis of symblepharon, conjunctival flap, and repositioning of the tube resulted in complete resolution.
2. 66 yo F s/p fenestrated Jones tube placement OS. Repeated downward tube migrations required surgical revision followed by eventual tube removal 4 months later. Horizontal diplopia was attributed to restriction from medial canthal/nasal conjunctival contraction. Underwent surgical lysis of adhesion with some improvement of diplopia, with current single vision in primary gaze and residual abduction deficit.
3. 56 yo Fs/p CDCR OD 10 years ago, with revision using a StopLoss Jones tube 6 years prior to presentation. At presentation, she had restrictive strabismus with severe abduction limitation (Fig 2) and a medial orbital lobular cyst along the tract of the tube. Removal of orbital cyst did not improve the strabismus and therefore additional release of fibrosis, rectus muscle recession, and abduction stay sutures were performed in conjunction with a physical adhesion barrier.

Results: Follow-up ranged 8 months-6 years. All patients had resolution of epiphora, and 1 had mild residual diplopia in abduction only.

Conclusions: Even with the many ancillary options available to minimize recurrent fibrosis (ie. topical mitomycin C, amniotic membrane transplantation, conjunctival autograft, physical adhesion barrier, and abduction stay sutures), restrictive diplopia secondary to Jones tube revisions proved difficult to treat. Grafts placed to cover the medial defect following symblepharolysis appeared to have a significant risk of contraction, and thus recurrence of dysmotility.

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Restriction of the medial rectus muscle, orbital septae, and nasal conjunctiva can all lead to restrictive strabismus following Jones tube surgery. This may occur after the initial surgery, in which the angle and posterior position of the bypass tract can traumatize/drag the medial orbital tissue, causing fibrosis. Late onset diplopia, even many years later appears to be more common than after primary CDCR, and is often a result of multiple surgical revisions of the tube, which may increase the risk of contraction of the medial conjunctival tissues.

Although complete resolution is possible, some residual restriction and/or recurrent contraction (typically within the first year) can occur. Multiple revisions are not uncommon, and collaboration with a strabismus surgeon or anterior segment surgeon may be helpful to achieve long lasting improvement. Patients undergoing Jones tube surgery should be made aware of this potential complication.

Figure 1

Figure 2

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49 – Idiopathic Dacryoadenitis Treated with Intralesional Rituximab – 6 Year Follow-up

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Introduction: Idiopathic orbital inflammation (IOI) is a benign, non-infectious process without a known cause. When this disease affects the lacrimal gland, it is referred to as idiopathic dacryoadenitis (ID). Symptoms include pain, swelling and tenderness of the inflamed lacrimal gland. Conventional treatment is with high-dose corticosteroids. Recurrence rates are reported at 33%. Rituximab has shown promise as a second-line agent in the treatment of IOI. Here we report our experience in treating ID with intralesional rituximab as a first-line agent.

Methods: Retrospective study of 17 patients treated with rituximab for ID between 10/2012-12/2018. All patients had extensive workup to rule out other diagnoses, including blood work, radiography, and biopsy. Patients were given a 1ml intralesional dose of rituximab (50 mg/1mL) transconjunctivally into the palpebral lobe of the lacrimal gland. Patients were followed for at least 6 months with serial exams and MRI imaging. Exclusion criteria included: age < 6 months. The modified Werner classification for the grading of orbital inflammation was used to measure disease activity before and after treatment. Pre- and post-treatment values were compared with a paired t-test.

Results: A summary of patient data is illustrated in Table 1. Seven males and ten females had a mean age of 44 years (range 29-57). Average duration of disease before treatment was 1.1 weeks (range 0-3). All patients achieved resolution within 4 weeks of treatment. The mean orbital inflammation score declined steeply after treatment (9.47 to 0, $p<0.005$). Two patients relapsed at months 5 and 8. Both responded to repeat injection without further relapses. Mean follow-up was 27.5 months (range 6-55). No patients experienced side effects of rituximab.

Conclusions: Intralesional rituximab appears to be a well-tolerated and effective treatment option for ID. The authors believe this to be the first cohort treated with intralesional rituximab used for this diagnosis. Clinicians may wish to consider its use as a first-line agent rather than corticosteroids given the high relapse rate and side effect profile of steroids. Future larger studies are needed to compare the 2 treatment strategies in an attempt to elucidate superiority.

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Figure 1

Age	Sex	Duration of Disease (weeks)	Modified Werner Grading of Orbital Inflammation	Modified Werner Grading of Orbital Inflammation (Post-Treatment)	Results	Relapse, if so duration after Rx (months)	F/u (months)
52	M	2	11	0	Resolution	No	55
42	M	1	12	0	Resolution	No	40
33	F	0	6	0	Resolution	No	35
57	F	0	10	0	Resolution	No	31
48	M	3	7	0	Resolution	No	46
44	F	2	11	0	Resolution	Yes, 8	31
52	F	1	9	0	Resolution	No	42
29	M	3	10	0	Resolution	No	40
44	M	1	11	0	Resolution	No	51
34	F	0	7	0	Resolution	No	18
51	F	1	10	0	Resolution	No	16
44	M	1	9	0	Resolution	No	14
40	F	0	8	0	Resolution	Yes, 5	14
39	F	0	12	0	Resolution	No	11
50	F	1	11	0	Resolution	No	9
43	M	1	9	0	Resolution	No	9
47	F	3	8	0	Resolution	No	6

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50 – Impact of Thyroid Eye Disease on Patient Quality of Life as Perceived by US Ophthalmologists

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Introduction: Many European studies have shown the severe impact of thyroid eye disease (TED) on patient quality of life (QOL).[1-3] The purpose of this study was to evaluate how TED impacts patient QOL in the United States (US).

Methods: Ophthalmologists practicing in the US identified patients within their practice who had active TED. They then filled out an online survey (2018) regarding their patients' clinical information, including anxiety, depression, and perceived QOL. Responses were made on a 7-point Likert scale (1 = no impact, 7 = extreme impact). Differences between groups were compared using Fisher's exact tests for categorical parameters and unpaired t-tests for continuous parameters. Statistical significance was defined as $p<0.05$.

Results: One hundred and eight ophthalmologists reported data on 432 patients (average age of 52.1 years). Anxiety and/or depression were reported in 172 patients (39.8%), as compared to 18.3% of the general US adult population in 2016 ($p<0.001$),[4] and was not significantly different between patients who had moderate TED (40.3%) and patients who had severe TED (37.1%, $p=0.676$). The average for "overall QOL" impact was 4.1 ± 1.6. Further, 60.8% of patients with moderate TED and 91.9% of patients with severe TED had a QOL impact ≥ 4 ($p<0.001$). TED-associated eye pain and visual disturbances (diplopia, color vision changes, blurred vision, vision loss) were 1.5-3.0 times more prevalent in patients with a QOL impact ≥ 4 (all $p<0.001$). The higher QOL impact group also had a higher rate of topical (1.4-fold, $p=0.005$), oral (1.4-fold, $p=0.020$), and intravenous (9.0-fold, $p<0.001$) steroid use.

Conclusions: TED has a negative impact on QOL in US patients suffering from moderate and severe TED. Pain and visual disturbances may be key contributors to diminished QOL. Further, our results corroborate previous studies that demonstrated anxiety and depression were more prevalent in patients with TED.[5,6] In addition to improving clinical outcomes, it is important for clinicians to also focus on the psychosocial well-being of these patients.

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51 – In vivo Morphology of Common Canalicular Opening: An Anatomical Update

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Introduction: Presence and characteristics of mucosal folds located around the canalicular/lacrimal sac junction has not been studied in detail in vivo. The purpose of this study was to investigate the anatomy of the common canalicular opening (CCO) into the lacrimal sac under direct in-vivo endoscopic visualization, and specifically addressing the presence and characteristics of folds over CCO.

Methods: Prospective observational case series included all patients undergoing endoscopic dacryocystorhinostomy with their CCO evaluated directly after marsupialization of lacrimal sac. Assessed parameters include size of CCO, its distance from the fundus of the sac (measured with the tip of ball probe=1.2mm), presence of any folds over CCO, extent of folds (1/2/3/4 quadrant of CCO), their location, and if overhanging over the opening.

Results: Thirty-six lacrimal systems of 32 patients (7 males, 27 females) undergoing endoscopic dacryocystorhinostomy were studied over a period of 4 months.Overall, 12.5% (4/32) had visible mucosal folds, out of which three were overhanging the CCO. The orientation of folds was superior 180 degrees in two, inferior 180 degrees in one and posterior 270 degrees in one.The remaining had no mucosal folds over CCO. The mean distance between CCO and fundus of sac was 3.2 mm ranging from 1.2 to 4.8mm.

Conclusions: The prevalence of mucosal folds over CCO is less common than previously reported based on cadaveric studies.These observations might play a role in performing lacrimal surgeries.

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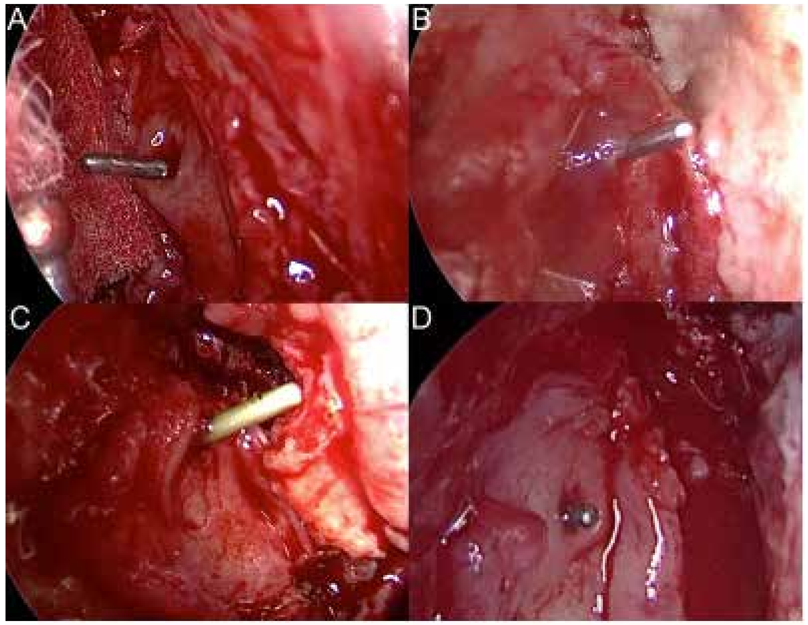
Figure 1



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52 – Incidental Ocular Findings in Children Presenting to Oculoplastic Surgeons

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Introduction: Early diagnosis of risk factors for amblyopia is important for normal visual development. Young children presenting with oculoplastics problems offer an opportunity to identify amblyopia risk factors that may otherwise go undetected. We sought to determine the prevalence and characteristics of incidental pathologic ocular findings in children who present with an orbital or oculoplastics concern.

Methods: Retrospective cohort study of children under age 8 years evaluated in an oculoplastics clinic of Children's Hospital of Philadelphia from May 2009-August 2013. All children had a complete ophthalmologic examination by a pediatric oculoplastic specialist. A subgroup of children were also examined by a pediatric ophthalmologist or pediatric neuro-ophthalmologist. The primary outcome was the presence of one or more ocular findings classified as intraocular abnormality, eye movement abnormality, or visually significant refractive error. Eyelid, orbital, and ocular surface findings, including conjunctival and corneal findings, were considered part of and not incidental to the oculoplastics exam, and therefore did not contribute to the primary outcome.

Results: 3,787 children under age 8 years met inclusion criteria. Presenting complaints included tearing (33%), ptosis (26%), hemangioma (7%), other eyelid abnormality (28%), trauma (7%), orbital lesion (7%), an/microphthalmia (3%), and craniofacial (13%). Overall, 737 children (19.5%) had an incidental potentially visually significant ocular finding. These included high refractive error (10.2%), astigmatism being most prevalent (8.8%); strabismus (8.9%); motility abnormality (5.7%); nystagmus (2.3%); anterior intraocular (iris, lens) abnormality (2.7%); posterior segment (retinal or optic nerve) abnormality (3.9%). 1,055 (28%) children also had a pediatric/neuro-ophthalmologist exam, of whom 28.4% had an abnormality based upon oculoplastics exam, and 36.5% had an abnormality based upon non-oculoplastics exam.

Conclusions: One fifth of children in the amblyopic age range presenting with oculoplastics-related issues had additional, potentially visually significant, ocular abnormalities. This prevalence may be an underestimate, as more findings were found upon pediatric or pediatric neuro-ophthalmologists' examination (37% vs 28%) in a subset of children seen by both types of specialists. Young children presenting for oculoplastics concerns should receive a complete ophthalmological examination with referral to a pediatric ophthalmologist if necessary.

53 – Indirect Corneal Neurotization: Surgical Technique and Outcomes at a Single Institution

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Introduction: Neurotrophic keratitis is a condition caused by the impairment of the fifth cranial nerve and the resulting absent corneal sensation can eventually lead to corneal perforation. The role of an oculoplastic surgeon for these cases has mainly been alleviating the exposure component with procedures such as a gold weight implantation, and/or lower lid retraction repair. These have limited success and patients often end up with permanent tarsorrhaphies, which can still be inadequate in preventing the cornea from decompensation.

Corneal neurotization is a novel technique that can be performed by direct transfer of the contralateral supratrochlear or supraorbital nerves around the anesthetic limbus, or indirectly suturing a sural nerve from the intact supratrochlear or supraorbital nerve to the anesthetic limbus. (1) Newer techniques utilizing endoscopic methods and allografts have also been reported. (2,3) This is a small case series of our experience with the indirect corneal neurotization.

Methods: This was a retrospective case series at a single institution from January 1, 2018 to April 30, 2019. Demographic information and complete medical and surgical history were collected. Descriptive statistics were utilized.

Surgical method: The same 3 surgeons performed the procedures using identical methodology, with the plastic surgeon (PT) harvesting the sural nerve, the oculoplastic surgeon (HJK) performing the end-to-side coaptation of the harvested sural nerve to the contralateral supraorbital or supratrochlear nerve with subsequent tunneling of the sural nerve to the affected anesthetic eye via the superior fornix, and the cornea specialist (SB) securing the sural nerve subconjunctivally around the limbus. (Figure 1)

Results: A total of 4 patients (3 female and 1 male) with a mean age of 53.8 +/- 19.8 years underwent corneal neurotization. Underlying causes for the neurotrophic corneas are listed on Table 1. No intraoperative or postoperative complications were noted. The follow-up ranged from 1 to 15 months.

Every patient has shown improvement in corneal sensation starting in the periphery and progressing centrally. Following neurotization surgery, one patient has been able to undergo a penetrating keratoplasty with significant improvement in vision (Figure 2) and the one patient has been able to undergo necessary strabismus surgery. One patient's central corneal scar has decreased as the sensation improved with significant improvement in vision.

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Conclusions: Neurotrophic keratitis can be a devastating condition with limited treatment options. For the first time, a surgical intervention is available that allows patients to regain their sensation with potential for visual improvement. There is still a significant amount of information to be learned and long-term follow up is needed. Nonetheless, it is a groundbreaking opportunity for patients that lacked any other treatment options.

Figure 1

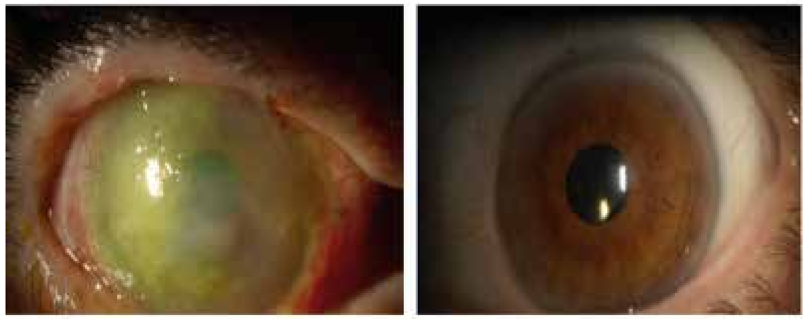
Table 1

Table 1: Summary of clinical findings

Patient #	Age	Gender	Etiology for corneal anesthesia	Duration of corneal anesthesia	Best corrected preop visual acuity	Corneal findings	Duration of follow up	Other eye surgeries post neurotization	Visual acuity at the last follow up
1	61	F	Orbital sebaceous carcinoma s/p surgery +XRT	1-2y	20/50	Filaments, NV, PEK	15	Strabismus surgery	20/200
2	77	F	Herpes zoster	3y	Hand motion	NV, diffuse scar	11	PKP	20/50
3	31	F	Brain tumor resection	4y	20/150	Dense scar, NV	6	None	20/40
4	46	M	Brain tumor resection	6y	Hand motion	NV	1	None	Tarsorrhaphy

F=female; M=male; y=years; NV=neovascularization; PEK=punctate epithelial keratopathy

Figure 2



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54 – Inflammatory Myofibroblastic Orbital Tumor in an 8-Month Old

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Introduction: We present an 8 month old with an orbital mass consistent with an inflammatory myofibroblastic tumor and discuss the pathology findings and treatment recommendations. This is the youngest patient reported, to our knowledge.

Methods: Case report

Results: An 8-month old female presented with a 2-month history of left proptosis. Visual acuity was fix and follow OU. Intraocular pressures were normal. Pupils reacted briskly to light OD but were sluggish OS. External examination revealed proptosis OS. Motility testing demonstrated a left exotropia and hypotropia, and left supraduction and adduction deficits. Slit lamp examination was within normal limits. Dilated fundus examination demonstrated left optic disc elevation with tortuous blood vessels. MRI imaging revealed an extraconal left superomedial orbital mass with globe displacement and proptosis (Figures 1-2). The patient underwent a left anterior orbitotomy with excisional biopsy. The mass measured 3.4 x 2.6 x 2.0 cm and was composed of an infiltrative proliferation of bland spindle cells in a variably myxoid background with associated perivascular lymphoplasmacytic infiltration (Figure 3). Immunohistochemistry was positive for ALK-1 (Figure 4), CD34, and beta-catenin and demonstrated focal positivity for S100. The tumor was negative for SMA, desmin, myogenin, MyoD1, ROS-1 and MUC4. FISH analysis revealed abnormal ALK signaling. Findings are consistent with an inflammatory myofibroblastic tumor.

Conclusions: Inflammatory myofibroblastic tumor (IMT) is a proliferation of spindle cells with a surrounding fibro-inflammatory process that typically occurs in the lung of children or young adults[1,2]. Although rare, IMT can present in the orbit. Age of presentation in the literature ranges from 5 to 76 years of age and tumor sizes vary from 1.0 to 2.5 cm[2]. Common presentations include proptosis, ptosis and painless loss of vision[2]. Treatment consists of orbitotomy for incisional biopsy and partial debulking plus systemic steroids[2]. Tumors with an ALK gene rearrangement on chromosome 2p23 are associated with a higher rate of tumor recurrence and aggressive clinical behavior[3]. This case report demonstrates one of the largest primary orbital IMT in one of the youngest reported patients. Given the tumor's penchant for aggressive growth and recurrence, we propose orbitotomy with complete excision as the standard of care for this tumor type. Prompt diagnosis and treatment of this tumor is essential for visual preservation.

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Figure 1

Figure 2

Figure 3

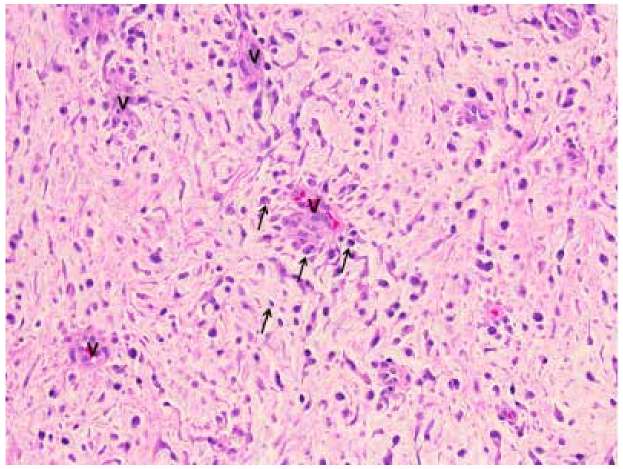
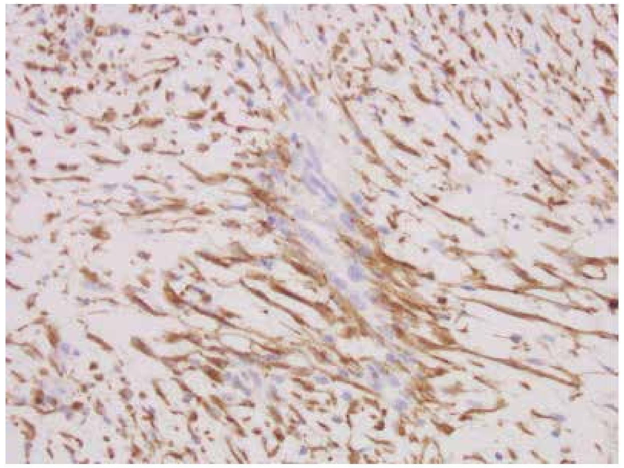


Figure 4



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55 – Intralesional Bleomycin for the Management of Orbital Lymphangioma

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Introduction: The purpose of this study is to evaluate the efficacy of intralesional bleomycin injection in the management of lymphangiomas of the orbit.

Methods: Retrospective review of 30 patients with orbital lymphangiomas. Patients were diagnosed on the basis of clinical examination and relevant imaging CT scan or MRI. Reconstituted bleomycin 0.5-7 ml (1 IU/ ml) was injected in the lesion as seen on imaging. Ten patients underwent surgical intervention followed by injection bleomycin for the residual tumor. The injection was repeated after 6-12 weeks when needed.

Results: The mean age of the patients was 17.8 ± 15 (range, 1-61) years. All patients had unilateral lesion. Lymphangioma was microcystic in 15 (50%), macrocystic in 11 (36.4%), and mixed in 4 (13.3%). The tumor was extraconal in 5 (16.6%), intraconal in 5 (16.6%), diffuse in 17 (56.6%) and predominantly preseptal in 3 (10%) patients. The mean proptosis was 4.7±3.2 mm and mean amount of ptosis was 1.42±2.1 mm. Other features included color vision abnormality in 8 (26.7%), diplopia in 6 (20%), RAPD in 8 (26.7%) and limitation of ocular movements in 20 (66.7%). The mean dose of bleomycin was 2.5±1.5 (range 0.5-7) U. The mean number of injections was 1.6±0.85 (range 1-4). All cases showed >50% reduction in size with marked clinical and radiological improvement. The mean proptosis reduced to 2.1 ± 2.2 mm and amount of ptosis improved to 0.9 ± 1.82mm. 18 (60%) of the patients had no limitation of ocular movements and diplopia persisted in only 2 (6.7%) patients. No systemic or ophthalmic side effects were noted in the follow up period of 15.45 ± 14.3 (range 1-59) months.

Conclusions: Intralesional bleomycin injections seems safe and effective in the management of orbital lymphangioma with good functional and cosmetic improvement.

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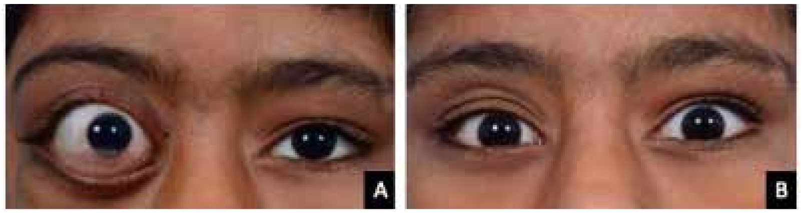
Figure 1. 10 year old male with Right orbital lymphangioma, A. Preoperative photograph showing proptosis and conjunctival chemosis. B. 6 months after intralesional injection of Bleomycin, there was complete resolution of proptosis



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56 – Intralesional Interferon Injections for Neoadjuvant Treatment of Basal Cell Carcinoma and Squamous Cell Carcinoma of the Eyelid and Anterior Orbit

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Introduction: The purpose of this study is to demonstrate the reduction of tumor burden induced by intralesional injections of interferon alpha-2B (IFN) prior to resection in patients with periocular basal cell carcinoma (BCCA) and squamous cell carcinoma (SCCA).

Methods: A case series of adult patients presenting with periocular invasive SCCA or BCCA who underwent chemoreduction with interferon injections prior to Mohs micrographic surgery is reviewed.

Results: Three adult patients received intralesional interferon for treatment of periocular BCCA or SCCA. All three patients had tumor involvement of the medial canthus. Two of these patients had orbital extension of the tumor confirmed with MRI but declined exenteration. The third patient had extensive eyelid/medial canthal involvement and had already undergone exenteration on the contralateral side by another provider. All patients were treated with 1.5 million units of Interferon alpha-2b three times a week for three weeks.[1] Each patient had mild post-injection malaise for about one day. No serious local or systemic complications from the injections were noted. A month after cessation of the injections, there was clinical evidence of tumor regression for all patients, ranging from 25-60% which was confirmed in one patient on MRI. All patients subsequently underwent Mohs micrographic surgery resection. The patient with SCCA had postoperative radiation and is disease-free at 14 years. There has been no disease recurrence in the patients with BCCA with of follow up ranging from 1 to 16 years.

Patients with orbital involvement of BCCA and SCCA typically receive an exenteration.[2] Interferons control cell growth by increasing the number of CD4+ T cells infiltrating the dermis and inducing apoptosis via CD95 receptor and CD95 ligand (CD95L) interaction. CD95L is expressed on activated T cells, BCCA cells and SCCA cells.[3] Therefore, interferon can function by suppressing growth and inducing apoptosis in tumor cells of BCCA and SCCA. This is particularly important in patients who are not amenable to adequate surgical excision or when residual visual function would be severely compromised.[4]

Conclusions: Neoadjuvant interferon for chemoreduction of periocular BCCA or SCCA can decrease the tumor burden which may limit the extent of surgical resection.

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57 – Intraorbital Graphite Foreign Body with a Delayed Presentation of Optic Neuropathy

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Introduction: Traumatic penetrating injuries to the orbit from pencils, while uncommon, have a plethora of presentations, both acute and delayed. With the majority of incidents occurring in the pediatric population where obtaining a detailed history is difficult, the ability to effectively evaluate and diagnose these injuries is cumbersome, yet important.

Methods: We report a patient, who presented with symptoms including optic neuropathy, blepharoptosis, and strabismus approximately 10 months after an orbital injury with pencil graphite.

Results: A 6 year-old male presented with progressive upper lid ptosis, vision loss, and ophthalmoplegia in the right eye over the course of 3 months, corroborated by family photographs. The parents denied any recent history of trauma, amblyopia, or strabismus surgery, and the child was otherwise healthy. Exam upon presentation was notable for decreased vision in the right eye (J5 on the Jaeger near card), and a sluggish pupil with 2+ afferent pupillary defect (APD), although color plates were full. He had significant right extraocular movement (EOM) deficits in elevation, adduction, and infraduction. In primary gaze, the right eye was deviated down and out, suggestive of a CN III palsy. He had right upper eyelid ptosis with a well-healed scar over the medial aspect of the eyelid. The anterior segment slit lamp exam was unremarkable, and dilated fundus exam notable for edema of the right optic nerve.

On further inquiry, parents recall child was in a “tussle” with his older sister about 10 months ago, and he was hit in the right upper eyelid with a pencil. He presented to an outside urgent care facility, where the right medial upper eyelid laceration was repaired and the patient was discharged without a formal eye exam or imaging. Per family, he recovered well and did not have any issues with his eye.

A CT scan of the orbits was notable for 3.1 by 1.0 cm lobulated soft tissue lesion with 0.5cm of calcified enhancement along the superior and medial aspect of the posterior right orbit, with focal erosion and adjacent osseous sclerosis of the posterior medial orbital wall. The posterior portions of the superior oblique, superior rectus, and medial rectus muscles, as well as the right optic nerve, were difficult to distinguish from the lesion. MRI scan showed that the lesion surrounded the superior oblique and medial rectus muscles, and partially involved the superior rectus muscle. The lesion caused both lateral deviation of the globe and the optic nerve.

He was started on ampicillin/sulbactam, and was taken to the operating room for exploration of the right orbit via a transcaruncular approach. Purulence was noted and sent to microbiology, which grew Staphylococcus aureus resistant to penicillin. A 0.6x0.3x0.2 cm piece of pencil graphite was identified carefully extruded.

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Eighteen days after discharge, the patient's VA had improved to 20/80 with persistent APD and optic nerve pallor. The patient had 35 prism diopters (PD) of exotropia and 2 PD of hypotropia of the right eye in primary gaze. He began patch therapy for the residual amblyopia. Seven weeks after discharge, the patient's vision improved to 20/40 with persistent APD, and color plates full. He had 12 PD exotropia and 2 PD hypotropia of the right eye in primary gaze.

Conclusions: Penetrating orbital trauma from pencils are a rare occurrence, but most commonly occur in pediatric and male populations.[1] Often times these injuries can present well after the inciting trauma, from weeks to months to even decades after the injury.[2,3] In pediatric patients, obtaining a detailed history overviewing their symptoms is often difficult, leading to a delay in both etiology and diagnosis when the presentation isn't clinically obvious.[1] Graphite pencils are composed of a graphite core with a wax and clay coating, all encased in a wood barrel.[1] The clay and wax coating leads to a delayed breakdown of the graphite material, thus delaying the T-cell- and macrophage-mediated granulomatous reactions that take place.[5]

In our patient, the specific etiology of the patient's subsequent optic neuropathy is unclear, but likely compressive in nature. Given the location of the foreign body, the resulting granulomatous inflammation also likely compressed the superior division of the oculomotor nerve, leading to the ptosis and elevation deficit. In reviewing this patient's case and other cases like it, we are reminded that the clinical history is paramount, especially in pediatric populations – corroboration from parents or other guardians may be necessary to help ascertain the etiology of the patient's injury.

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Figure 1

Pre-operative External Photograph

Figure 2

External Photograph 7 Weeks post-op

Figure 3

A-C) CT of patient's head and orbits, with the presence of an enhancing lesion in the posterior superomedial right orbit. D) MRI showing a foreign body with lateral displacement of the right optic nerve and medial rectus.

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58 – Involvement of ER Stress in the Pathogenesis of Graves' Orbitopahthy

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Introduction: Orbital inflammation and differentiation of orbital fibroblasts into mature adipocytes has been shown in the progression of Graves' orbitopathy (GO). The endoplasmic reticulum (ER) is the site of biosynthesis for all secreted and membrane proteins. The accumulation of unfolded proteins in the ER leads to a condition known as ER stress. Failure of the ER's adaptive capacity results in abnormal activation of the unfolded protein response. In this study, we found that ER stress–associated gene signatures were highly expressed under inflammatory and adipogenic stimuli in GO orbital fibroblasts, and blocking each may suppress the progression of the disease.

Methods: Orbital connective tissues obtained from decompression surgery or upper lid blepharoplasty from individuals with GO and healthy control subjects, respectively. ER stress–associated gene mRNAs were measured with real-time PCR with orbital tissue samples. ER stress-related proteins were measured during 10 days of adipocyte differentiation using Western blotting. We suppressed ER stress pathway by treating siRNA for BiP, which is the first to accept the unfolded protein response. Cells were transfected with anti-BiP siRNA for before stimulation with IL-1β. Inflammatory cytokine expression was measured by Western blotting and ELISAs. Adipocyte differentiation and lipid accumulation were also measured with anti-BiP transfected cells.

Results: ER stress–associated gene mRNAs, BiP, PERK, IRE1, ATF6, ATF4, CHOP, were more expressed in GO orbital tissue than controls. ER stress-related proteins, BiP, PERK, IRE1, ATF6 were induced during the first 3 to 6 days of adipocyte differentiation and then decreased. Transfection of GO orbital fibroblasts with anti-BiP siRNA decreased IL-1β-induced expression of IL-6, IL-8, and ICAM-1. IL-1β-induced adipocyte differentiation of GO orbital fibroblasts was also suppressed with anti-BiP siRNA transfection.

Conclusions: ER-stress was elevated in orbital tissue of GO individuals and silencing BiP, the first to accept the unfolded protein response, led to decreased inflammation and adipogenesis in primary cultures of orbital fibroblasts derived from GO individuals. Thus, the modulation of ER stress might have therapeutic potential in the suppression of pathogenesis of GO.

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Figure 1

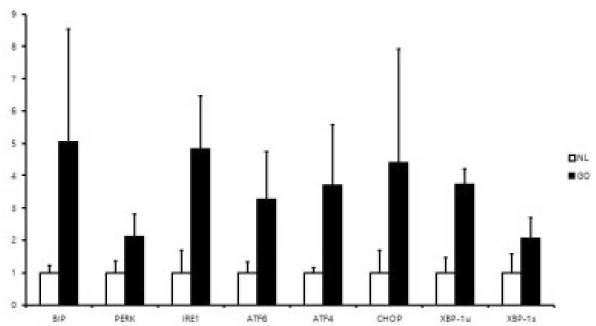


Figure 2

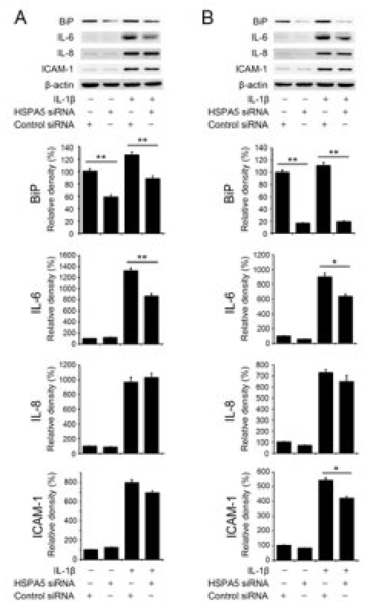


Figure 3

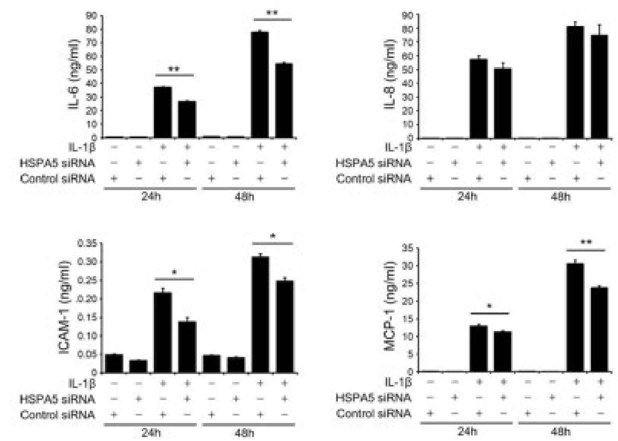
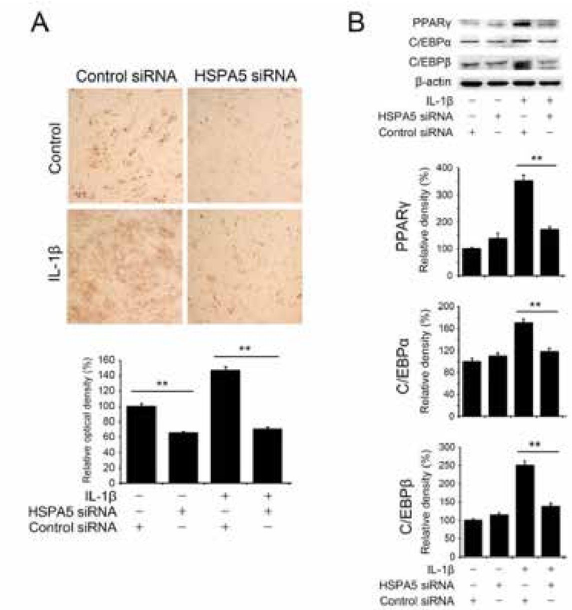


Figure 4



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59 – Lacrimal Gland Size is Associated with Fat Volume Expansion in Thyroid Eye Disease and Compressive Optic Neuropathy

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Introduction: The aim of the study is to evaluate lacrimal gland (LG) volume in thyroid eye disease (TED) with compressive optic neuropathy (CON) and its association with clinical symptoms and retro-bulbar volumes.

Methods: CT scans for TED-CON (54 patients, 104 orbits) were volumetrically analyzed with 3-D contouring methods (Pinnacle Systems v.2-10) for lacrimal gland volume (LG), muscle volume (MV), fat volume (FV), orbital volume (OV), and associated normalization ratios (i.e. LG/OV, MV/OV, FV/OV). Clinical findings for the TED cohort were recorded from the last clinical visit prior to CT. Comparisons were made by two-sample t-test and when appropriate, one-way ANOVA with Tukey HSD post-hoc analysis. Clinical measures were compared by Pearsons Correlation for color plates, proptosis, extra-ocular movements, visual acuity, visual field, margin to reflex distance, diplopia, and retro-bulbar ache. The association between LG size and orbital volumes was additionally compared by linear regression analysis.

Results: There was no significant difference in LG volume by gender or laterality in TED-CON patients ($p=0.478$, $p=0.364$). There was a significant difference in LG volume between TED-CON patients (mean: $0.94 cm^3$) and normal controls (mean: $0.64 cm^3$, 70 patients 140 orbits), $p<.00001$. LG volume was associated with MRD ($p=0.017$), retro-bulbar ache ($p=0.015$), and diplopia ($p=0.011$). LGs demonstrated a weak negative correlation with MV/OV (-0.36) and a moderate positive association with FV/OV ($r=0.51$) [Figure 1]. On linear regression FV/OV was significantly predictive of LG size as demonstrated by the following equation ($p=<0.02$): $LG/OV = -0.39 +.016(FV/OV)$.

Conclusions: TED-CON is a challenging clinical presentation. A better understanding of LG volume in the diseased state may prevent patients from undergoing unnecessary biopsy for other etiologies. Our results for LG volumes in normal orbits were consistent with those found by Bingham et al. for normal controls [1]. This supports the accuracy of a three-dimensional contouring methodology. Retro-bulbar ache, MRD, and diplopia, while possibly associated, provide little diagnostic advantage to more generalized clinical signs of disease burden. They do, however, provide adjunct evidence of lacrimal gland involvement in worsening clinical symptoms. Interestingly, while some patients appear fat predominant vs. muscle predominant in TED, few molecular studies have elucidated cytokinetic or antibody receptor targets specific to orbital fat over extra-ocular muscles [2]. It appears however, that LG volumes are specifically associated with orbital fat expansion. This supports the plausibility of unique antibody targets that are shared between orbital fat and the lacrimal gland.

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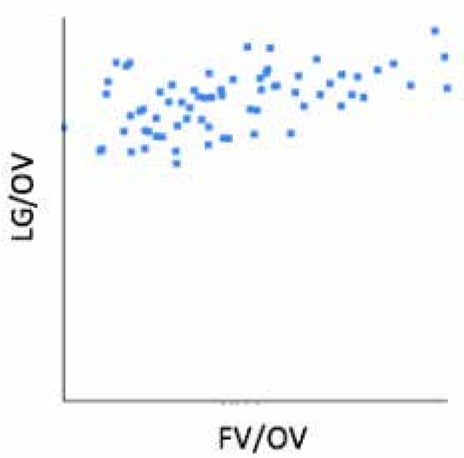
Figure 1

Figure 1: Pearsons Correlation (r=+0.51, p= <0.001)



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60 – Lagophthalmos after Congenital Ptosis Surgery in Patients with Poor Levator Function: Comparison between Maximal Levator Resection and Frontalis Sling Operation

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Introduction: Maximal levator resection (MLR) is an effective procedure for congenital ptosis with poor levator function, and the surgical outcomes are as good as those of frontalis sling operation with autogenous fascia lata (AFL). It also provides improved cosmesis and no brow scars. We performed a study to measure lagophthalmos after MLR or frontalis sling operation in patients with congenital ptosis with poor levator function.

Methods: Patients with preoperative levator function ≤ 4mm who had undergone MLR or frontalis sling operation were collected between Feb. 2017 and Aug. 2018 and a total of 119 patients with 152 eyelids were included. Sixty-eight patients with 71 eyelids underwent MLR and 51 patients with 81 eyelids underwent frontalis sling operation using AFL (18 patients with 35 eyelids) or preserved fascia lata (PFL; 33 patients with 46 eyelids). Preoperative levator function, marginal reflex distance-1 (MRD1) and postoperative MRD1, lagophthalmos, grade of superficial punctate keratopathy (SPK) were measured. The degree of lagophthalmos was measured using photographic analysis.

Results: Patients underwent MLR or frontalis sling operation on average 81.2 months ago. MLR and frontalis sling operation using AFL carried similar risk of lagophthalmos (MLR 1.9 ± 1.4 mm, AFL 1.9 ± 1.7 mm) and postoperative MRD1 (MLR 2.8 ± 0.8 mm, AFL 3.0 ± 0.7 mm). But frontalis sling operation using PFL carried less risk of lagophthalmos (0.6 ± 1.0 mm) and lower postoperative MRD1 (2.2 ± 1.0 mm). MLR group caused significantly more SPKs than PFL group, but there was no statistical difference between MLR and AFL group.

Conclusions: Maximal levator resection can provide similar surgical outcomes to frontalis sling operation using AFL including postoperative lid height and lagophthalmos for the congenital ptosis patients with poor levator function.

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61 – Magnetic Resonance Imaging Characteristics of Solitary Fibrous Tumor of the Orbit Compared to Orbital Cavernous Hemangioma

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Introduction: Solitary fibrous tumor of the orbit (SFT) is a rare clinical entity with malignant potential that shares radiographic and clinical characteristics with the more common benign cavernous hemangioma (CH) of the orbit. Differentiating between SFT and CH has important clinical consequences, yet, the radiographic characteristics of orbital SFT are not well delineated given its rarity. We aim to characterize radiographic characteristics of biopsy-proven solitary fibrous tumor of the orbit and highlight differences from cavernous hemangiomas.

Methods: Institutional review approval was obtained, a retrospective chart review was performed, and cases of solitary fibrous tumor and cavernous hemangioma with pathologic confirmation were identified. All magnetic resonance imaging (MRI) was analyzed by a single blinded neuro-radiologist for tumor characteristics. Demographic data such as age at diagnosis and sex, and clinical data were collected. Comparative statistics were with student's t-test for continuous variables and Chi Square for categorical variables.

Results: Seven cases of SFT and 9 cases of CH were identified. Five cases of SFT and 7 cases of CH had MRI available for review. Average age at diagnosis was 37.7 years (range 16-58) for SFT, and 48 years (range 39-64) for CH, ($p=0.15$). Fifty-seven percent of SFT were female compared to 67% of CH ($p=0.7$).

All tumors were hyperintense on T2-weighted imaging. All tumors (CH and SFT) were isointense to muscle on T1-weighted imaging with 100% of CH showing a homogenous pattern vs. 60% of SFT ($p=0.07$). All tumors enhanced with gadolinium with 100% of CH showing a heterogeneous pattern vs. 60% of SFT ($p=0.07$). SFT was more likely to demonstrate flow voids (80% vs. 57%, $p=0.41$). A vascular pedicle was identified in 71.4% (5/7) of CH vs. 60% (3/5) of SFT ($p=0.68$).

All tumors demonstrated increased signal on diffusion weighted imaging (DWI), however the average apparent diffusion coefficient (ADC) was significantly lower in SFT (1.001×10^{-3} mm^2/s vs. 1.307×10^{-3} mm^2/s in CH, ($p=0.04$).

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Conclusions: In the current study, orbital SFT is likely to demonstrate T2 hyperintensity, T1 homogenous isointensity, and heterogenous enhancement demonstrating flow voids with administration of contrast. Orbital SFT also demonstrates high DWI signal confirmed on ADC maps to represent abnormal restricted diffusion, with average ADC significantly lower than in CH. This is consistent with prior studies demonstrating lower average ADC values in malignant tumors[1]. Use of average ADC may play an important role in distinguishing between CH and SFT.

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62 – Measurement of Orbicularis Oculi Muscle Strength following Upper Eyelid Blepharoplasty

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Introduction: Conventional upper blepharoplasty can involve removal of skin, orbicularis oculi muscle and, sometimes portions of the periorbital fat[1]. The orbicularis functions as the main protractor of the eye and any injury to it may lead to lagophthalmos and dry eye symptoms[2]. Fagien[3] and Rohrich[1], have previously advocated muscle sparing blepharoplasty for physiologic and aesthetic reasons. In this study, we objectively measured the force generated by the orbicularis muscle in controls and those who had upper blepharoplasty.

Methods: The device (Orbiculometer) was constructed by attaching paired specula (Cook's) to two aluminum cylinders at right angles. An electronic force sensor was mounted at the base of the independently adjustable cylinders (figure 1). The force sensor was attached to a microprocessor using a non-inverting amplifier. The reliability of the orbiculometer was tested using known weights corresponding to 1/3, 2/3 and the maximum capacity of the sensor. The second stage involved testing orbicularis strength in females who had undergone skin only and orbicularis involving upper eyelid blepharoplasty. Patients with a history of previous eyelid surgery, ophthalmic surgery, dry eye disease or use of eye drops for symptoms were excluded from the study.

Age matched controls were recruited from the cataract clinic and included only patients with no previous medical or ophthalmic history. The device was introduced into the left palpebral aperture of participants and was set to maintain an intrapalpebral distance of 5 mm. Participants were then asked to close their eyes so that the eyelids would engage the specula. At this point, the force sensor was set to 0. Participants were then asked to squeeze their eyes with full force for a period of 3 seconds. This was repeated 5 times for each participant. A two tailed independent t test was used for statistical analysis.

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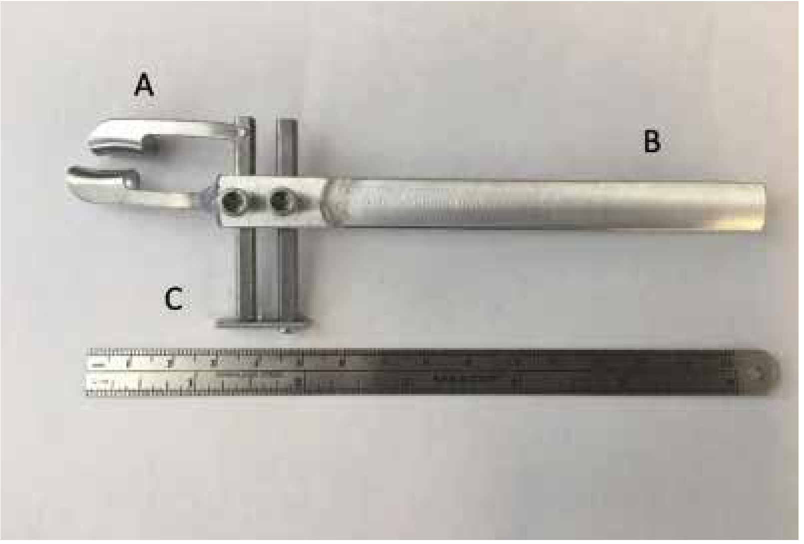
Results: In the first stage, the force sensor was found to have an accuracy of 98.7% in the measurement of known weights. Twenty controls were included while ten patients who had skin only and ten patients who had lateral orbicularis plus medial fat removal were also included. The mean (SD) age of controls was 58 (7.1) while that of patients undergoing skin only blepharoplasty was 61 (5.8). The mean (SD) age of patients undergoing blepharoplasty with removal of lateral orbicularis and medial fat was 67 (7.8) ($p = 0.56$). Mean (SD) follow up of patients who had undergone skin only blepharoplasty was 3 months (1.1), while that for orbicularis involving blepharoplasty was also 3 months (0.9). The mean (SD) force generated by controls was 2.37 N (0.07), while that for skin only blepharoplasty patients was 2.18 N (0.11) and orbicularis involving blepharoplasty patients was 1.91 (0.14). Within participants, the SD for 3 measurements was 0.6 N. The difference between controls and skin only blepharoplasty was significant ($p < 0.01$, Cohen's d = 2.12), this was also the case for blepharoplasty that included orbicularis removal ($p < 0.01$, Cohen's d = 2.63). The difference between skin only blepharoplasty and orbicularis involving blepharoplasty was also significant ($p < 0.01$, Cohen's d = 2.21).

Conclusions: Upper eyelid blepharoplasty decreases the strength of the orbicularis, with the greatest impact following concurrent removal of orbicularis muscle and medial fat.

Figure 1



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63 – Meningiomas Involving the Orbit

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Introduction: Multidisciplinary skull base teams have been assembled at many different institutions in order to co-manage patients with orbital involving meningiomas. These tumors can be challenging to manage and complete resection can be nearly impossible without significant complications due to the location of the tumor to vital orbital and intracranial structures. We report our experience and outcomes of a series of patients with orbital involving meningiomas.

Methods: A retrospective review of 20 patients with meningiomas with orbital involvement who underwent multidisciplinary evaluation by ophthalmology, oculoplastic surgery, head and neck surgery, and neurosurgery at Kaiser Permanente Orange County Anaheim Medical Center between 2007 and 2018. Presenting symptoms and signs, radiographic images, indications for surgery, surgical intervention and reconstruction, histopathological findings, post-operative examinations and complications were reviewed and analyzed. A review of the literature from Pubmed on meningiomas involving the orbit was completed.

Results: Twenty patients with meningiomas involving the orbit were identified. The most common presenting symptoms were blurry vision (60%) and headache (55%). Visual acuity or loss of peripheral vision were indications for surgery in all patients who underwent surgical intervention (85%). All patients underwent optic nerve decompression during surgery and the majority of patients had partial or subtotal resection of their tumor (16/17). Ten patients required orbital reconstruction after tumor resection and seven patients received post-operative radiation. The majority of patients had improvement (26%), stable (32%), or minimal change (20%) in the visual acuity. Two patients had significant visual decline after surgery (12%) both of which had WHO grade 2 meningiomas. The most common post-operative complications were cranial nerve palsy (20%), ptosis (25%), and cerebral spinal fluid leak (10%). The mean follow up time was 60.5 months (5 years).

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Conclusions: Meningiomas involving the orbit can be challenging to manage and complete resection is extremely difficult with close approximation to many vital orbital and intracranial structures. Although many patients experience stable or improvement in post-operative vision, severe post-operative visual acuity decline and other serious complications are a reality for some patients and appropriate pre-operative counseling is necessary. Long term monitoring for recurrence is essential since complete tumor resection is often unattainable.

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64 – Merkel Cell Carcinoma with Metastasis to the Inferior Rectus Muscle

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Introduction: Merkel cell carcinoma (MCC) is a rare neuroendocrine carcinoma of the skin with frequent metastatic disease and high mortality. We report a case of MCC with metastasis to the inferior rectus muscle and subsequent dramatic response to pembrolizumab.

Methods: This is a comparative case study discussing a case of MCC metastatic to the inferior rectus muscle, which is, to the authors' knowledge, the first such case reported in the literature. The case presentation and course is compared with other reported cases of MCC with orbital metastasis and evaluated for similarities and differences. The literature of MCC orbital metastasis is then reviewed along with that of metastatic disease to the extraocular muscles.

Results: a. MCC with intraorbital metastasis has been reported in the literature three times prior based on current review[1-3]. Due to its rarity, an orbital metastatic MCC diagnosis may be overlooked resulting in a delay in treatment. Our patient's clinical course included an initially false-negative biopsy of a left lower lid and cheek mass followed by clinical progression. A repeat biopsy demonstrated MCC. Treatment included wide local excision, chemotherapy, and radiation. The patient then developed unilateral periorbital swelling, subconjunctival hemorrhage, and chemosis on the contralateral side. A work-up revealed metastatic disease to the orbit involving the inferior rectus muscle. The patient was treated with repeat radiation and pembrolizumab, demonstrating excellent response. A review of the literature revealed only three other reports of MCC metastatic to the orbit, two of which were also localized to an extraocular muscle. Johnson et al reported a case of MCC metastatic to the superior rectus in 2013. Cugley et al reported the first biopsy-proven case to the medial rectus in 2018 and this also demonstrated a response to pembrolizumab [1,2]. Additionally, Kouzmina et al described a case of metastasis to the "orbita" in 2017, but no further details were provided regarding anatomical location of the metastases[3]. Metastatic disease to the extraocular muscles is rare, and reported cases reveal other neuroendocrine cancers such as melanoma and carcinoid, as well as breast cancer, renal cell carcinoma, gastric cancer, and lymphomas as the primary[4-9]. Interestingly, each of these has been postulated to be viral-associated, some with more definitive levels of evidence than others- MCC with Merkel cell polyomavirus (MCPyV), melanoma with melanoma-associated retrovirus (MAR), renal cell carcinoma with BK virus, and Epstein-Barr virus (EBV) with gastric cancer, lymphoma, and breast cancer[10-13]. The predilection for metastasis to the EOMs in these types of virus-associated cancers is currently unreported and its mechanism of action unknown.

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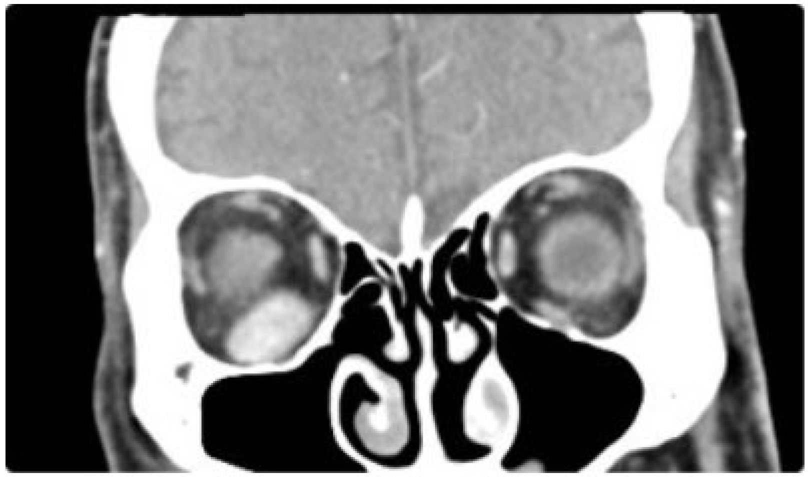
Conclusions: MCC should be on the differential for orbital metastatic disease. Further research should focus on identifying proper treatment protocols, considering the reported good response to pembrolizumab of two patients, including the current case[1]. Given the multiple reports of neuroendocrine and other virus-associated tumors metastasizing to extraocular muscles, further research should explore this possible relationship and its potential mechanism of action.

Figure 1

Figure 2



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65 – Metastatic Breast Carcinoma Mimicking Giant Cell Arteritis

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Introduction: The purpose of this study is to describe a patient who was referred for a temporal artery biopsy due to new onset scalp pain – investigation revealed an alternative cause for her symptoms and obviated the need for temporal artery biopsy.

Methods: This is a retrospective case report.

Results: A 71-year-old Caucasian woman was referred in December 2017 by her general ophthalmologist for a temporal artery biopsy for suspected giant cell arteritis (GCA). In the preceding week, she experienced a new onset headache with right scalp tenderness, jaw claudication, weight loss, and fatigue. The referring physician obtained blood work, including ESR, CRP, and CBC, all of which returned normal. She was started on prednisone 80mg PO daily with resolution of her headache. Past medical history was notable for type II diabetes, sleep apnea, and ER+/PR+/HER-2 negative breast cancer treated with radical bilateral mastectomy, radiation, and aromatase inhibitor therapy in remission for the past 7 years.

Visual acuity at distance with correction was 20/30 on the right and 20/20 on the left. Intraocular pressures were normal. Pupillary examination was normal without a relative afferent pupillary defect. Extraocular movements were full. Confrontational visual fields were full. Stereoacuity was 40 seconds of arc. Color plates were full. Her temporal artery pulses were robust. There was tenderness to palpation of the right temporal area. The left side was non tender. Anterior segment and dilated fundus examinations were unremarkable.

Given the lack of afferent or efferent visual dysfunction and the negative blood work, we decided to consider alternative causes for her symptoms prior to pursuing a temporal artery biopsy.

MRI of the brain and orbits was obtained. A T1 hypointense and T2 hyperintense lesion arising from the anterior right frontal bone measuring 30 x 28 x 21 mm was identified. Calvarial expansion and cortical destruction was evident. There was also subtle subgaleal tumor extension into the right anterior frontal scalp. This was well-visualized in coronal T1 post contrast MRI (Figure 1) and axial T1 post contrast MRI (Figure 2). The area of abnormality was presumed to be metastatic breast cancer.

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The patient was subsequently referred to her oncologist as well as neurosurgery. Bone scan showed re-demonstration of right calvarial metastasis, for which neurosurgery decided did not require biopsy for diagnosis. Further metastatic work-up revealed multiple lesions in the lungs, liver, and left adrenal gland. Biopsy of the adrenal gland mass revealed triple negative breast carcinoma consistent with metastasis. She underwent palliative right skull radiation therapy and was started on low dose carboplatin chemotherapy in February 2018. In February 2019, she was switched to olaparib due to increasing intolerance of carboplatin. Staging imaging done at that time showed no significant change in existing metastases and no new metastatic lesions.

Conclusions: Less than 1% of patients with GCA have normal ESR and CRP.[1] In patients with normal blood work and no signs of ocular motor cranial nerve palsies or ischemic optic neuropathy, oculoplastic surgeons should consider alternative diagnoses in patients referred for temporal artery biopsy.

Figure 1

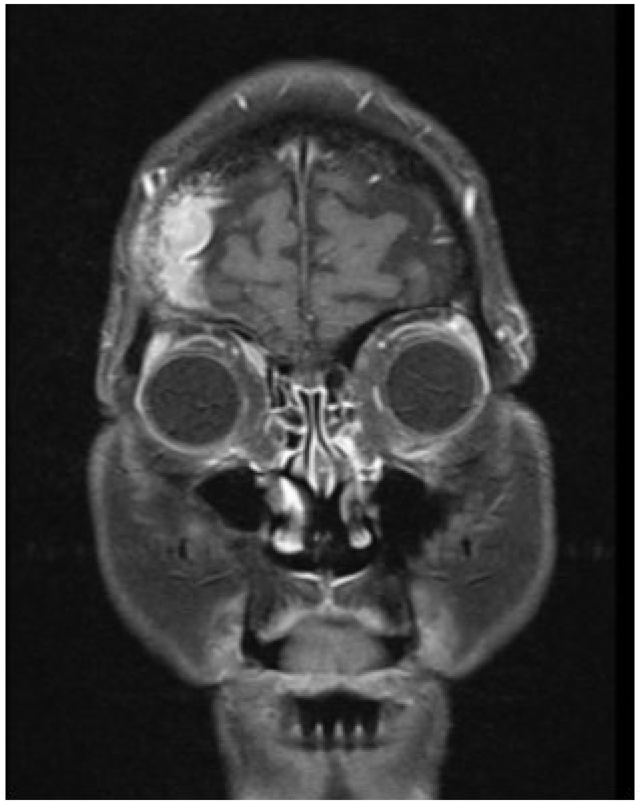
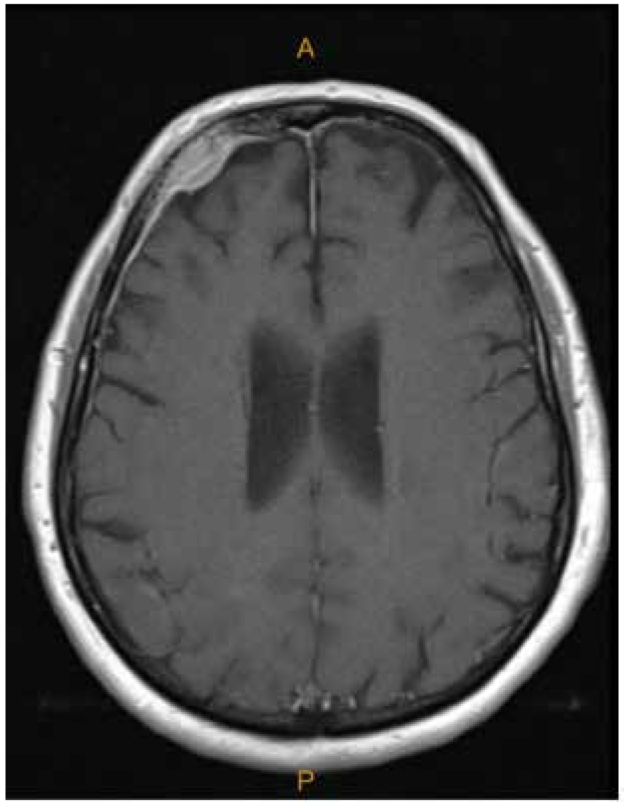


Figure 2



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66 – Microbiology of Orbital Cellulitis in Pediatric and Adult Patients: A Special Case for Streptococcus anginosus

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Introduction: The purpose of this study was to examine the pathogens causing orbital cellulitis in pediatric and adult populations at a tertiary care center.

Methods: Charts of patients with orbital cellulitis were identified using ICD 9 and 10 codes at a tertiary care center from January 2010 to July 2017. All patients with a clinical diagnosis of orbital cellulitis confirmed with CT or MRI were included in the study. The charts were reviewed for microbiological characteristics of orbital cellulitis. Patients with fungal infections were excluded from this review.

Results: Of the 92 patients (46 pediatric, 46 adults) with orbital cellulitis, the male to female ratio was 1.9:1.0 in children and 1.1:1.0 in adults. Average age of children was 8.0 years; median: 7.25 years; range: 4 months – 17 years. Among adults, the average age was 53.2 years; median: 54.5 years; range: 23 – 83 years.

Microbiological cultures (either blood, sinus, wound or abscess) were taken from 90% patients (41 of 46 children and 42 of 46 adults). Blood cultures were positive in 15% of cases; (5/33) pediatric and (3/20) adult patients. Cultures from orbital abscess, surgical sinus or wound swabs were positive in 72% (23/32) pediatric and 82% (32/39) adult patients.

Streptococcus species were present in 41.5% (n=17/41) of children and 19% (n=8/42) of adults ($p<0.05$), with Streptococcus anginosus present in 26.8% (n=11/41) and 11.9% (n=5/42) of children and adults respectively. Staphylococcus species were isolated in 59.5% (n=25/42) adult and 24.4 % (n=10/41) pediatric patients ($p<0.05$) with MRSA present in 21.4% (n=9/42) and 4.8% (n=2/41) of adult and pediatric population respectively ($p<0.05$). Polymicrobial infections were found in 26.2% (n=11/42) and 24.4% (10/41) of adult and pediatric population respectively.

Interestingly, 100% (n=16) of patients identified with Streptococcus anginosus had orbital infection complicated with postseptal abscess (thirteen subperiosteal and three orbital abscesses) compared to 64.1 % (n=25/39) of patients with other isolates ($p<0.05$). All (n=16) patients infected with Streptococcus anginosus required surgical intervention, compared to only 76.9% (n=30/39) of patients with other isolates ($p<0.05$). Furthermore, fifty percent (8/16) of patients with Streptococcus anginosus required repeat surgery during their hospitalization compared to only 26.7% (n=8/30) of patients with other isolates.

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Conclusions: Our results show that: 1) Streptococcus anginosus orbital infections are strongly associated with the development of subperiosteal or orbital abscesses; 2) Streptococcus anginosus is a significant risk factor for surgical management of orbital cellulitis. Additionally, our results indicate that there is a trend of increased need for a repeat surgical intervention in patients with Streptococcus anginosus infections when compared to other microbial isolates. 3)There is a significant difference in the microbiology between adult and pediatric populations. Orbital cellulitis treated at a tertiary care center in the Pacific Northwest region is more likely to be caused by Staphylococcus species in adult patients and Streptococcus species in pediatric population. This difference might be due to the different etiologies of orbital cellulitis in children and adults.

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67 – Motor-Driven "Palpebral Spring" to Restore Natural Blink in Facial Nerve Palsy

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Introduction: In contemporary approaches to facial reanimation to improve eyelid function in chronic facial nerve palsy, a variety of strategies may be utilized, though each has significant limitations [1]. The authors describe a novel motor-driven palpebral spring and surgical technique to implant the device, with the hypothesis that an automated blink function – closely recapitulating a complete natural blink – may be achieved.

Methods: A linear direct current piezoelectric motor (Micromo, Clearwater, FL, USA) was utilized, capable of producing linear oscillating movements of an embedded 15-mm drive-rod, with adjustable stroke speed and interval (**Figure 1A**; motor, drive-rod, and endcaps identified by solid arrow, dashed arrow, and asterisks, respectively). The motor contains analog hall sensors that allow it to be operated by a motion controller (Micromo, Clearwater FL, USA), with an external power source generating 24 Volts with 2 Amps of current. Controller settings were adjusted through external software, and the drive-rod was set to a speed of 100 mm/sec, approximating spontaneous blink speed in healthy adults [2]. The device was implanted into eyelids of two adult human cadavers for testing. In this technique, a contoured spring wire derived from a Crawford nasolacrimal stent (FCI Ophthalmics, Pembroke, MA, USA) was passed through a lateral orbital rim drill hole in the vicinity of Whitnall's tubercle and sutured to the upper tarsus (**Figure 1B-C**). The wire was then fastened to an endcap on the motor's drive-rod (**Figure 1D**). The motor was then powered on and movement of the upper eyelid was recorded with photographic and video analysis.

Results: In both upper eyelids tested, the motor generated spontaneous eyelid movement, with the oscillating stroke of the drive-rod corresponding to the down-phase and up-phase of a complete blink (**Figure 2**). Photographic and video analysis of the phases of each blink demonstrated complete eyelid closure in all cases. With the oscillating function turned off in the down-phase, the eyelid remained closed without lagophthalmos in both cases; when the oscillating function was re-applied, automated blinking resumed.

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Conclusions: These results demonstrate generation of a motor-driven complete blink resembling natural eyelid motion, and serve as proof of principle for a medical device that may be introduced *in vivo* in patients with chronic facial nerve palsy. Future applications for this device may include surgical implantation of a fully integrated indwelling motor unit, taking the place of a lateral orbital rim bone window, with external power source and controller that could be worn on a spectacle frame and linked via induction coupling. After implantation, the unit could be initialized via interaction with a smartphone application and programmed to include a desired number of full-excursion blinks per hour. Furthermore, as the device prototype was also able to generate sustained and complete eyelid closure, this may enable a titratable 'sleep mode' without lagophthalmos. This facial nerve prosthesis may be able to improve cosmesis, prevent potentially vision-threatening sequelae of exposure keratopathy, and more closely restore eyelid mimetic function than other contemporary surgical methods.

Figure 1

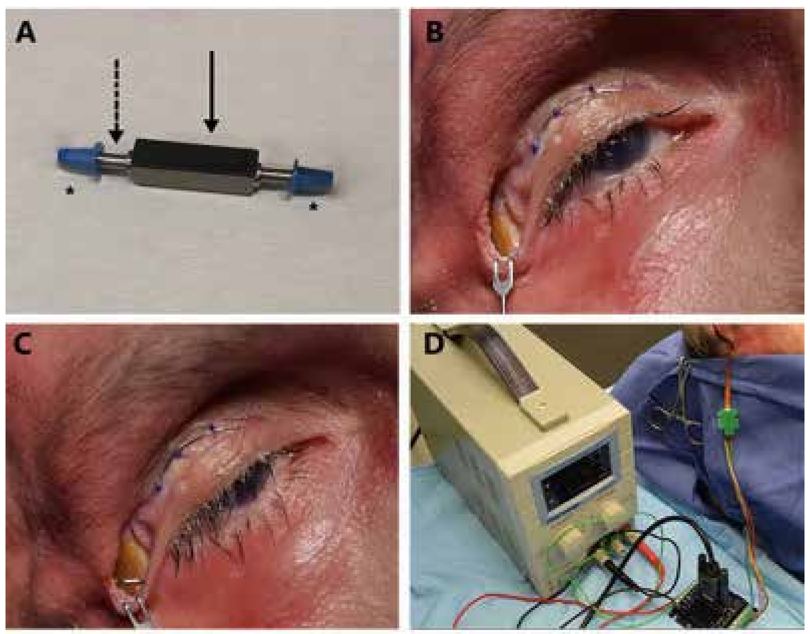
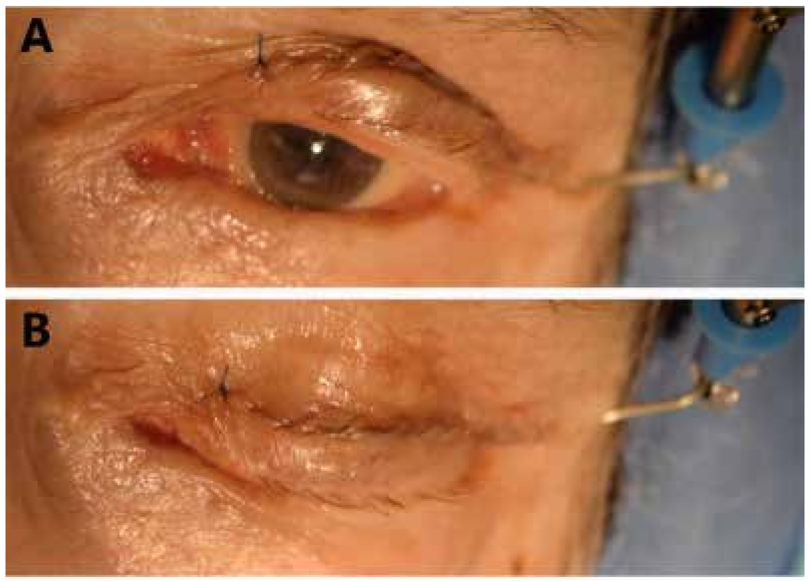


Figure 2



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68 – Mucoepidermoid Carcinoma of the Lacrimal Sac: Clinical, Morphologic, Immunohistochemical, and Molecular Genetic Analysis

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Introduction: Lacrimal sac mucoepidermoid carcinoma (MEC) is extremely rare, with less than 20 reported cases in the literature.[1] A subset of MEC originating in the salivary glands and other glandular containing tissues has been found to express a *CRTC1/3-MAML2* gene fusion product that has diagnostic and prognostic utility.[2] Presence of *CRTC1/3-MAML2* has been associated with lower histologic grade, less advanced clinical stage, and longer disease free and overall survival.[2] Conversely, it has been proposed that *CRTC1/3-MAML2* negative tumors may be more appropriately termed adenosquamous carcinomas with mucoepidermoid carcinoma-like features.[3] Additionally, salivary gland MEC has been shown to demonstrate EGFR pathway activation, which may be influenced by *CRTC1/3-MAML2* fusion and *EGFR* gene copy number alterations.[2] The purpose of this study was to assess whether lacrimal sac MEC is a counterpart of *CRTC1/3-MAML2* gene fusion-related salivary gland MEC and whether EGFR pathway activation and gene copy number alterations are observed in this tumor.

Methods: Retrospective case series of all patients with lacrimal sac MEC identified between 1990-2018 at a single institution. Data collected included age, sex, clinical findings at presentation, management, follow-up, tumor morphology, immunohistochemistry (CK7, CK20, p63, and EGFR), and *MAML2* and *EGFR* fluorescence in situ hybridization (FISH) studies.

Results: Six patients with lacrimal sac MEC were identified including 5 males (83%). Median age was 63 years (range 24-66). The most common presenting symptoms were unilateral epiphora (6/6, 100%) and medial canthal mass (4/6, 67%) (Figures 1A&2A). Symptom duration ranged from 4 to 16 months (average 9 months). Imaging in all cases demonstrated a soft tissue mass centered in the lacrimal sac with an average size of 2 cm (range 1.5-2.5 cm) (Figures 1B&2B). Management included radical resection (5/6, 83%), orbital exenteration (1/6, 17%), and post-operative radiation (4/6, 67%). All patients remained recurrence-free at an average follow-up of 12 months (range 7-16 months). Microscopically, all tumors had morphologic and immunohistochemical features of MEC (CK7 and p63 positive) and overexpressed EGFR (Figures 1C&2C-D). *MAML2* FISH was negative for *MAML2* gene rearrangement in all tumors. *EGFR* FISH demonstrated amplification in the *EGFR* gene in one tumor (1/6, 17%) (Figure 1D).

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Conclusions: Our results suggest that lacrimal sac MEC is not a counterpart of prognostically favorable *CRTC1/3-MAML2* gene fusion-related salivary gland MEC and may be more appropriately termed adenosquamous carcinoma. While *MAML2* may not be a therapeutic target for lacrimal sac MEC, EGFR pathway activation and *EGFR* amplification in a subset of these neoplasms suggest the potential role for anti-EGFR agents.

Figure 1

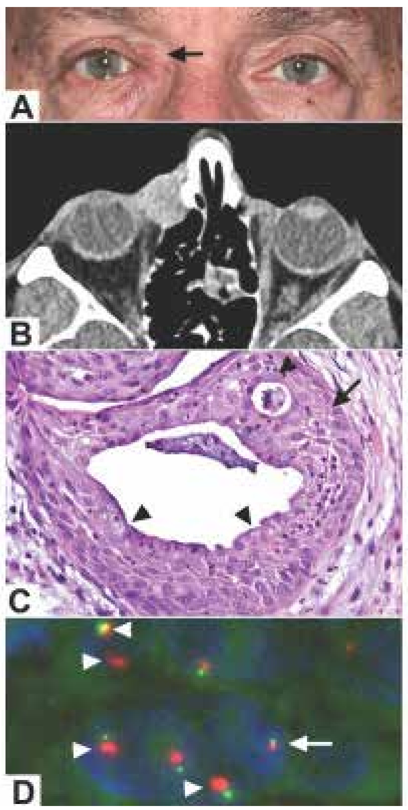
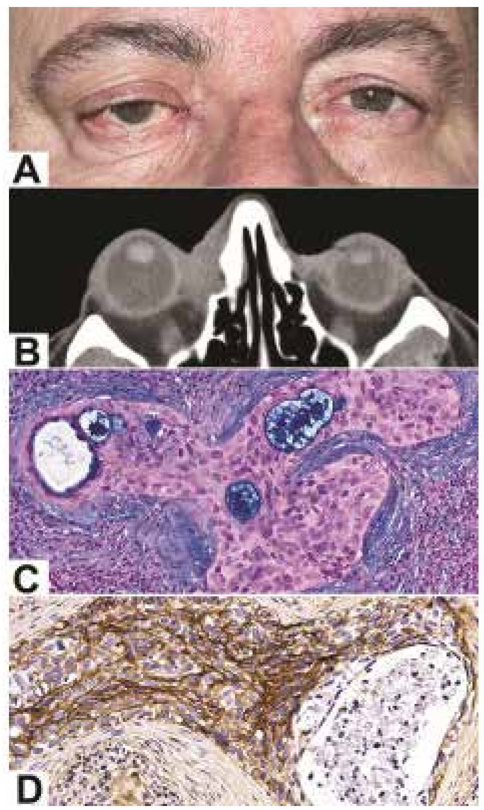


Figure 2



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69 – Multi-Center Retrospective Review of Pediatric Clothing Hanger Injuries at Two Level 1 Trauma Centers

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Introduction: While various etiologies of pediatric eye and eyelid trauma have been extensively reported in the literature, a study examining the prevalence and outcomes of such injuries due to clothing hangers have not. This is the first multi-institution retrospective study to determine the demographics and outcomes of ocular and periocular clothing hanger injuries in the pediatric population.

Methods: A retrospective chart review of 1,980 children presenting to the emergency department with ocular and periocular injuries at two level 1 trauma centers between 2008 and 2018 was conducted. Children between one month and 18 years of age who sustained a clothing hanger injury were included in the study. Patient demographics, course of injury, repair, follow-up time, and complications were evaluated and analyzed using Excel statistical software.

Results: The 14 children with clothing hanger injuries represented 0.71% of all patients presenting to the emergency room for ocular and periocular injuries (Figure 1). The majority were males (57%) and African American (57%), with a mean age of 5.0 years (range: 1 to 15 years). The injuries most commonly occurred with metal hangers (50%) and at department stores (57%). Of the nine children who presented with eyelid lacerations, 4 (44.4%) also had unilateral canalicular lacerations of the lower lid (Figure 2 and 3A-B). These children were treated with monocanalicular stents; 3 were treated in the operating room and one was treated in a minor procedure room. The stents were removed after a mean of 45.4 weeks (range: 11 to 144 weeks), with zero reports of post-operative epiphora. Of all clothing hanger injuries, 43% required surgical interventions, with the most common indication being canalicular laceration (50%), ruptured globe (33.3%), and full-thickness eyelid lacerations (16.6%). The remaining children sustained injuries that did not required operative intervention and were discharged after treatment in the emergency room. Follow-up time was a mean of 10.7 months (range: 1 to 66 months), with one child requiring reoperation 41 days after for a traumatic cataract extraction.

Conclusions: The consequences of clothing hanger injuries to the eye and adnexa can be severe. The curved angulation of the clothing hanger may increase the chances of eyelid and lacrimal system injury. Preventative measures at home and outside the home should be taken to protect children from these injuries.

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Figure 1

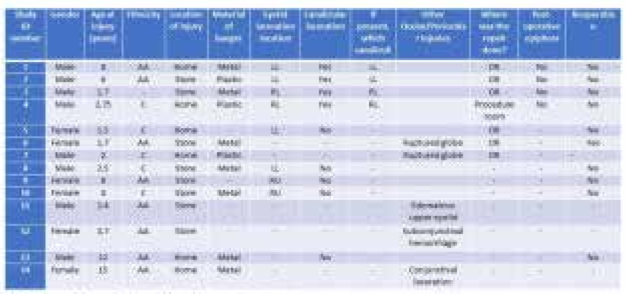

Figure 1: Demographics of patients who sustained ocular/periocular injuries from clothing hangers.

Figure 2

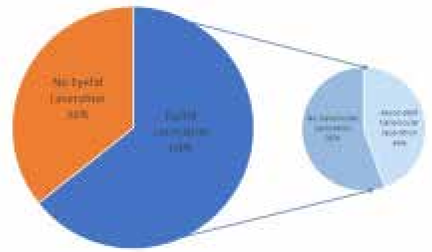

Figure 2: The percentage of children who presented with eyelid lacerations from clothing hanger injuries and the percentage who had an associated canalicular laceration.

Figure 3

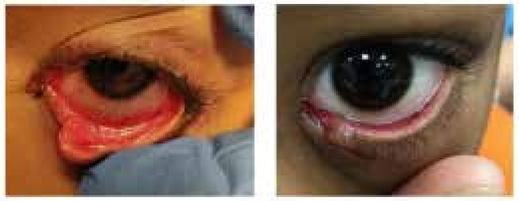

Figure 3A and 3B: Two children who sustained lower eyelid and canalicular lacerations from clothing hanger injuries.

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70 – Multifocal Orbital Myositis in Granulomatosis with Polyangiitis

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Introduction: Orbital manifestations of granulomatosis with polyangiitis (GPA) can include an extraconal mass adjacent to bony sinonasal destruction, diffuse orbital inflammation and lacrimal gland involvement. Antineutrophil cytoplasmic antibodies (ANCA), which support a diagnosis of GPA are detected in only 20% of cases in which involvement is limited to the orbit. Rarely, GPA can masquerade as a case of nonspecific myositis; therefore it is important to keep this diagnosis in the differential and consider expedient, confirmatory biopsy.

Methods: We describe a multifocal, recalcitrant case of orbital myositis caused by granulomatosis with polyangiitis in a young woman.

Results: A 43 year-old woman with a history of asthma, arthritis and polycystic ovary syndrome was referred with a 10-month history of pain in the left orbit. Two years prior to presentation, she had similar pain in the right orbit which was evaluated with CT and MRI (Figure 1A & B) and diagnosed as non-specific orbital inflammation (NSOI) and treated with systemic steroids. She underwent full recovery and a year later, was again treated for presumed NSOI of the left orbit with isolated medial rectus myositis with 60 mg of prednisone. The patient was unable to taper her dose due to rebound pain so she was kept on 60mg of daily prednisone by her physician for 10 months. She presented to us with cushingoid features, restricted abduction of the left eye and focal injection over the left medial rectus insertion while on 60mg of prednisone (Figure 2A & B). Computed tomography (CT) was performed, which revealed a massively enlarged and inflamed medial rectus muscle (Figure 1C & D). There was also no significant sinus disease or sialadenitis The plan was to taper the prednisone in preparation for biopsy of the medial rectus muscle, but repeat imaging due to severe pain while on 20mg of prednisone revealed enlarged medial and newly involved lateral rectus muscles (Figure 1E & F) . An orbitotomy with biopsy of the lateral rectus muscle demonstrated epithelioid histiocytes with perivascular inflammation and negative IgG4 staining, highly suggestive of GPA. Steroid-sparing treatment with Rituximab was commenced with promising early results.

Conclusions: In patients with relapsing and recalcitrant extraocular muscle inflammation undergoing systemic steroid treatment, a muscle biopsy must be considered to confirm the diagnosis. In addition to neoplasia, GPA should also be on the differential. There are only rare cases of GPA affecting a single extraocular muscle reported in the literature, the most recent on in the New England Journal of Medicine (Lefebvre et al.) and to our knowledge, this is the first case of orbital GPA affecting multiple extraocular muscles.

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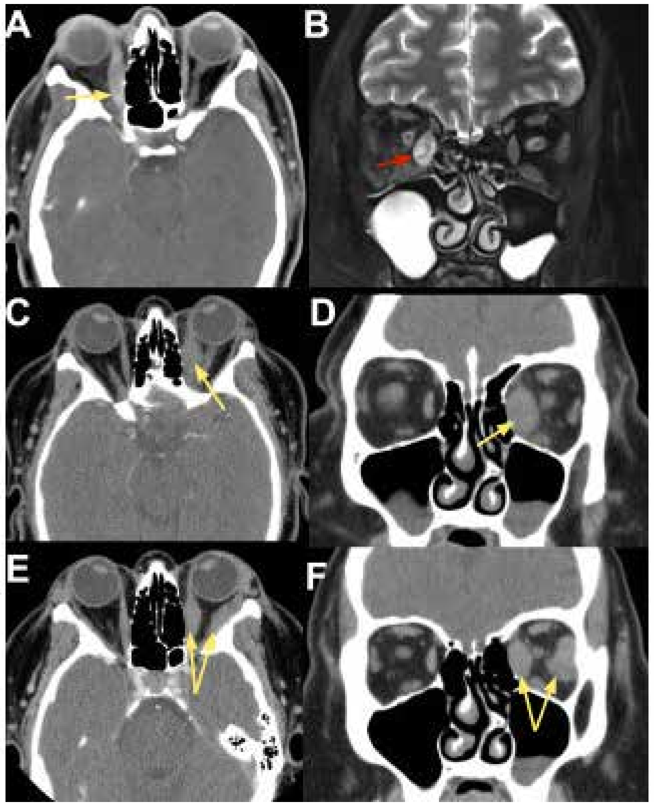
Figure 1

Figure 2



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71 – Mycoses Fungoides – A Case Study of Severe Cicatricial Ectropion

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Introductory Statement: Mycosis Fungoides, a low-grade cutaneous T cell Lymphoma, can involve multiple extracutaneous tissues, but uncommonly affects ocular adnexal tissue. A range of intraocular and adnexal manifestations, most commonly eyelid tumors[1,7-8], have been described [1-7].We describe a case of an 85 year old male with severe bilateral upper and lower eyelid cicatricial ectropion and lagophthalmos with exposure keratopathy, who was unable to initially undergo graft harvest and grafting. This case highlights the difficulty of grafts in advanced active inflammatory and malignant conditions while on chemotherapy and adds to the limited literature of mycosis fungoides affecting ocular tissue.

Methods: We describe a retrospective case report of an 85 year old male with severe bilateral cicatrical ectropion and lagophthalmos with exposure keratopathy, unable to initially tolerate lamellar grafting.

Results: An 85-year-old male with a history of hypothyroidism, significant ultraviolet exposure, and malignant melanoma of his left scalp (Stage IIC *cT4b, cN0, cM0)* currently on Pembrolizumab, reported 4 years of persistent granulomatous rosacea of his face, scalp, and forehead. Previous biopsies did not reveal any malignancy.

However, recent progressive erythema and thickening of his eyelids and forehead prompted a biopsy that revealed dense dermal nodular lymphocytic infiltrate extending into the epidermis. Polymerase chain reaction of the tumor cells was positive for B-Cell and T-Cell receptor gamma gene rearrangements, consistent with mycosis fungoides. He was subsequently started on Bexarotene, transitioned to Vorinostat, and finally Pembrolizumab.

Initial evaluation revealed a visual acuity of 20/60 and 20/400. There was no afferent pupillary defect. The external exam revealed erythematous skin, epithelialized palpebral conjunctiva, and dense bilateral upper and lower cicatricial ectropion, worse on the left [Figure 1]. The left upper eyelid was densely fused to the preseptal skin and there was bilateral lagophthalmos. The anterior segment exam revealed a diffuse haze of his left cornea without evidence of ulceration or perforation. The remainder of the exam was unremarkable bilaterally.

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The patient underwent bilateral upper and lower lid cicatrix release with bilateral temporal tarsorraphies. Due to the potentially poor prognosis for graft survival and limited harvesting sites due to diffuse involvement of the disease, no grafts were placed. Instead, the anterior lamellar defects were dressed with 3% bismuth tribromophenate impregnated petroleum dressing gauze [Figure 2] and allowed to heal by secondary intention, in the hope of buying time until a healthy donor site could be utilized. The dressings were removed 2 weeks post operatively [Figure 3]. The patient's cutaneous inflammation improved on Pembrolizumab and two months later he underwent successful bilateral upper and lower eyelid skin grafting from the supra-clavicular region [Figure 4].

Conclusion: Mycoses Fungoides uncommonly affects ocular tissue but has the potential to cause severe vision threatening disease. Akin to the cutaneous manifestations, the eyelid involvement is challenging to treat, and poses a higher risk for progressions and recurrence[1]. Ocular involvement may also be refractory to traditional therapeutic options, often requires surgery, and may have limited surgical outcomes. Our patient has limited systemic involvement with uncharacteristically early ocular involvement found at the time of diagnosis. We suggest that severe ocular involvement may serve as a proxy for the severity of underlying systemic involvement. Therefore, ophthalmic exams are an important facet of the comprehensive management of mycoses fungoides.

Figure 1

Figure 1: Preoperative photo illustrating severe cicatricial ectropion of both eyes, with more severe changes on the left. Anterior lamellar shortening most severe on the left upper eyelid.

Figure 2

Figure 2: (A) Intraoperative photo with large anterior lamellar defect (B) Xeroform gauze sutured into anterior lamellar defects with interrupted 4-0 silk. Goal was to temporary close skin and optimize healing to facilitate potential future graft.

Figure 3

Figure 3: 2 weeks postoperative. Photos of the right upper eyelid (A) and left upper lid (B) illustrating defects healing by secondary intention after xeroform gauze was removed.

Figure 4

Figure 4: The patient's cutaneous involvement improved with Pebrolizumab allowing for bilateral supra-clavicular graft harvesting. Status post bilateral upper and lower eyelid skin grafts from bilateral supra-clavicular region.

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72 – Next-generation Sequencing Reveals Germline ATM Mutation and Somatic PIK3CA and BCOR Mutations in a Case of Metastatic, Chemoresistant, Infantile, Orbital Embryonal Rhabdomyosarcoma

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Introduction: Rhabdomyosarcoma (RMS), one of the most common malignant orbital tumors in children, is rarely found in infants less than 1 year old. Poor prognosis is known to be associated with alveolar subtype and chromosome translocation. Despite a significant improvement in failure-free survival for children with RMS over the past decade, the same improvement in outcome has not been seen for infants.[1] It is still unclear why RMS biology and response to therapy in infants differ from those of older children or adults.

Methods: We report a case of a 7-month-old male infant with metastatic, chemoresistant, orbital embryonal RMS. Consent was obtained from patient's mother for tumor and blood specimen to be sent for comprehensive genomic sequencing panel, which analyzes 595 genes relevant to the diagnosis, prognosis and therapeutic targeting of cancer.

Results: Patient first presented with rapidly progressive left proptosis over 6 weeks (Figure 1A). Orbital imaging revealed a large, well-circumscribed medial orbital mass without intracranial extension (Figure 1B). Pathology from an incisional biopsy was consistent with embryonal RMS. Chemotherapy consisting of vincristine, actinomycin D and cyclophosphamide (VAC) was inducted.[2] After one cycle of chemotherapy, the clinical evaluation showed rapid primary tumor progression (Figure 2A). Re-imaging revealed interval enlargement of orbital mass with newly-detected intracranial extension via orbital apex (Figure 2B). Bone marrow biopsy revealed metastatic disease and therefore patient was reclassified as high-risk group for more intensive treatment protocol. Decision was made to perform craniotomy combined with orbital exenteration for local disease control. Tumor margin was positive at the posterior medial part, where it invaded into anterior cavernous sinus. Genomic sequencing revealed 3 mutations that have not been commonly reported in RMS.[3] Firstly, germline ATM loss-of-function (LOF) mutation was detected in the patient's blood sample as well as the tumor specimen. Secondly, somatic PIK3CA gain of function mutation, and lastly, somatic BCOR LOF mutation were found in the tumor specimen. No chromosomal translocation was detected. The presence of germline ATM LOF mutation may explain the increased chemo-resistance and adverse prognosis.[4] It also implies that the patient may benefit from PARP inhibitors such as Olaparib (NCT03233204) through synthetic lethality, but its use in RMS has never been previously reported. Aberrant PIK3CA and BCOR genes identified have previously been implicated in fusion-negative RMS.[5] PIK3CA inhibitors could be another group of therapeutic candidates, although their use in RMS are still investigational. Despite standard high-dose neoadjuvant chemotherapy (ifosfamide, etoposide and VAC regimen)[6] in combination (continued)

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with radiation therapy (50.4 Gy x 28 fractions) and relatively stable local disease, the patient developed distant brain metastasis 5 months after initial diagnosis and is currently under palliative care.

Conclusions: Both germline and somatic mutations were found in this unfortunate case of metastatic infantile orbital RMS. Next-generation sequencing may be offered to detect the precise genetic mutations, predict clinical outcome, and identify potential targeted therapy for those that fail conventional therapy.

Figure 1

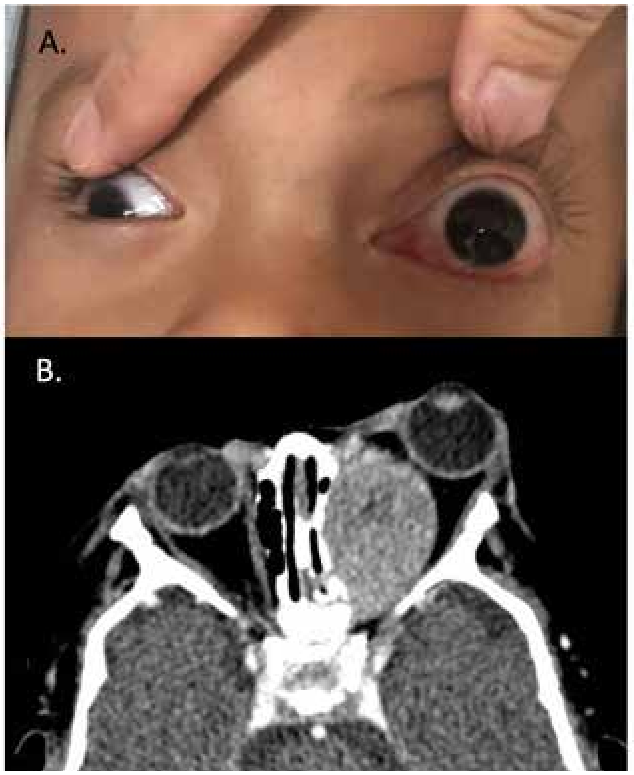
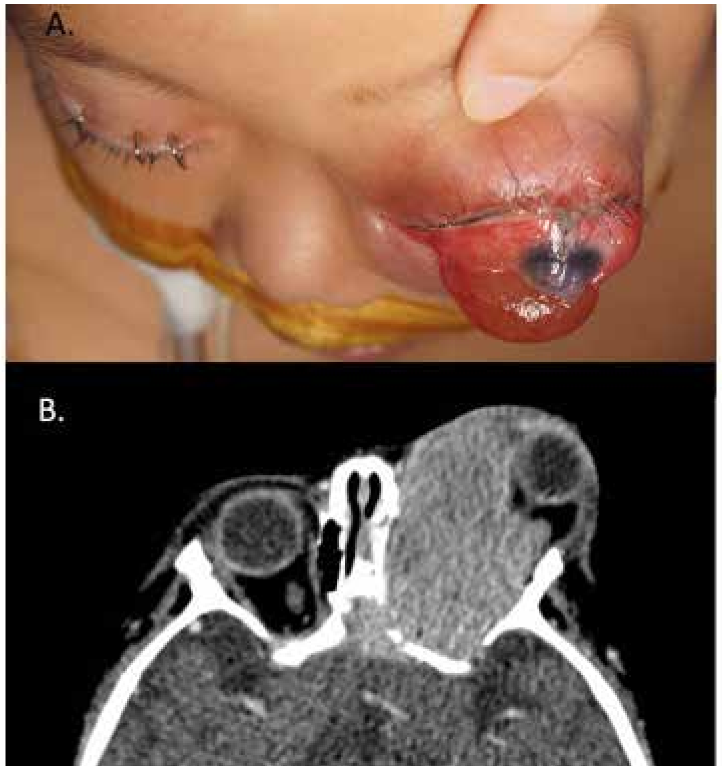


Figure 2



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73 – Nylon Foil "Wraparound" Implant for Isolated Orbital Floor Fractures

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Introduction: The purpose of this study is to evaluate the previously described "wraparound" technique of implanting a single 0.35-mm-thick nylon foil across isolated floor fractures and partially up an intact medial orbital wall within weeks of orbital trauma. The authors have found that this technique works well not only for combined fractures involving the floor and medial wall, but also in isolated floor fractures as well.

Methods: This retrospective, interventional case series includes patients with isolated medial floor fractures without external orbital or facial fractures, without prior surgery, and who were in the early posttrauma phase. 64 consecutive orbits were treated between 5 and 21 days after the inciting trauma with a "wraparound" technique. The surgical technique is provided in detail. Comatose patients, those with cranial nerve palsies, severe globe injury, anophthalmia, or previous repair of the same fractures were excluded. Mean follow up was 204 days. Postoperatively, patients were evaluated for enophthalmos, implant malposition or extrusion, extraocular motility, and diplopia.

Results: In 61 of 64 orbits, normal globe position, and full postoperative ductions without diplopia was accomplished. One patients required explantation of the nylon foil implant due to gaze restriction and persistent diplopia. Two additional patients had mild restriction of ductions with diplopia in far positions of gaze that did not warrant surgical revision. No other patient had globe malposition, restrictive myopathy, lid malposition requiring revision, vision loss or diplopia. Implant migration, extrusion, abscess, mucocele, and fistula formation were not observed.

Conclusions: The previously described wraparound technique for 0.35-mm nylon foil implantation continuously across orbital floor and medial wall in the setting of isolated orbital floor fractures is well tolerated, and associated with minimal postoperative enophthalmos or diplopia in this series. We theorize that wrapping the implant up the medial wall allows for a more anatomic curvature of the orbital floor and medial strut than seen with onlay of the implant over the floor fracture alone.

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74 – Ocular Perfusion following Orbital Apex Exenteration

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Introduction: Classically, the globe is perfused by the ophthalmic artery, which provides vascular supply to the nerve, choroid, retina, and extraocular muscles. When occlusion of the ophthalmic artery occurs, ocular ischemic syndrome rapidly develops leading to retinal neovascularization and hypotony. We discuss an interesting case of a patient who underwent exenteration of the orbital apex with globe preservation for invasive rhino-orbital-cerebral Aspergillosis and provide an anatomical explanation for how the globe remained perfused despite transection of the ophthalmic artery.

Methods: A patient who underwent orbital apex exenteration is presented.

Results: A 68 year-old man with type 2 diabetes mellitus and a history of kidney transplantation on chronic immunosupression presented with a two week history of right sided vision loss and proptosis. He had recently been hospitalized two months prior for invasive sinus Aspergillosis which was treated with functional endoscopic sinus surgery.

An MRI performed on admission showed new enhancing tissue at the right orbital apex and floor of the anterior cranial fossa and falx (Figure 1) consistent with progression of invasive fungal sinusitis. The patient's hospital course was complicated by seizures from invasion into the skull base. He underwent a bicoronal craniotomy with resection of the dura, cribiform plate, and sinus exenteration. Due to this extensive surgical resection, a partial exenteration of the right orbital apex with preservation of the globe and anterior orbital structures was performed via cranio-orbital approach (Figure 2). Following surgery, the patient was stabilized on medical therapy and discharged.

Two months post-operatively, the patient's vision was no light perception with complete right sided ptosis and ophthalmoplegia. There was loss of corneal sensation and significant enophthalmos (Figure 3). Notably, despite resection of the orbital apex including the ophthalmic artery, the anterior and posterior segment showed no evidence of neovascularization and the globe maintained adequate intraocular pressure without hypotony (Figure 3). This remained stable at six month follow up (Figure 4).

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Conclusions: This case highlights the rich collateral circulation of the orbit. Despite the transection of the ophthalmic artery, our patient's globe maintained perfusion without evidence of ocular ischemic syndrome. The ophthalmic artery off the internal carotid artery is classically described as the main vascular supply to the globe. However, vascular anastomoses via the recurrent meningeal artery and meningo-lacrimal artery link the maxillary artery (off the external carotid) to the lacrimal/distal ophthalmic artery, providing retrograde perfusion to the globe. In our patient, the extensive resection by neurosurgery and otolaryngology created a large defect that, following a complete orbital exenteration, would have required a microvascular free flap to reconstruct. By performing a limited apex exenteration and utilizing the robust orbital anastomoses, the globe remained perfused without hypotony and phthisis, providing adequate coverage of a large bony defect of the orbit, sinuses, and anterior cranial fossa.

Figure 1

Figure 2

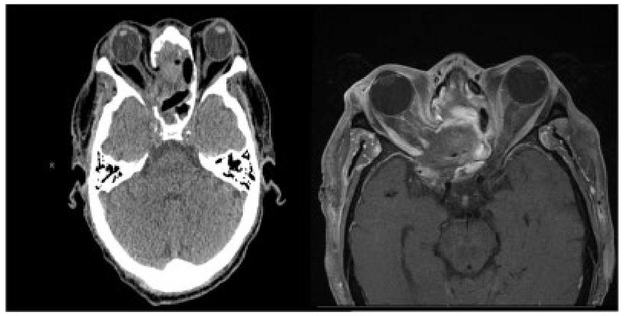

Figure 3

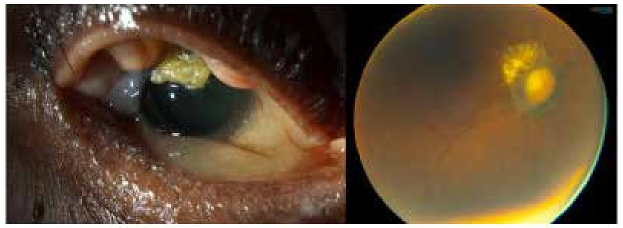

Figure 4

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75 – Oculoplastic Surgeon Level Rating of Festoons / Chronic Malar Edema using Deep Neural Networks

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Introduction: Classification of anatomical variation on the face using images is a challenging task, even for experienced oculoplastic surgeons. A particularly challenging problem is the assessment of a particular intervention. This is often achieved by using a panel of trained experts to subjectively appraise pre and post intervention images[1][2]. Deep convolutional neural networks (CNNs) show potential for general and highly variable tasks[3]. We demonstrate the classification of lower eyelid edema and festoons using a single CNN, trained from images directly, using only pixels as inputs. We tested the CNN's performance in rating pre and post intervention photographs after participants with festoons were treated with microneedling and radiofrequency, against 25 ASOPRS members.

Methods: In this prospective study, patients who presented with aesthetic concerns regarding festoons were considered for study entry. Only patients with evidence of festoons were included, while those with previous surgery or interventions concerning the face were excluded. Frontal photographs of patents prior to and post treatment, with MRF were taken. Twenty-five randomly selected ASOPRS members were asked to rate the festoons of each patient from photographs pre and post treatment, using a scoring system ranging from 0 to 3 (0 = no festoons, 1 = small festoons, 2 = moderate festoons and 3 = large festoons). The CNN also rated the festoons in a similar fashion while focusing on the lower lid. Ratings were computed to absolute values and compared using a t test.

Results: Twenty-seven participants were included in the study (26 females and one male), with a mean (SD) age of 51 (8.4). The mean (SD) follow up time after therapy was 6.2 months (3.1). ASOPRS members found a mean (SD) change of -0.08 (0.13) following therapy, while the CNN found a mean change of -0.09 (0.03). The difference was not significant ($p = 0.91$), while the effect size was small (Cohen's $d = 0.07$).

Conclusions: Treatment with MRF does not have a significant impact on festoons / chronic malar edema. The CNN achieves performance on par with 25 ASOPRS members when asked to rate the outcome of MRF therapy for festoons, demonstrating an artificial intelligence capable of rating interventions with a level of competence comparable to oculoplastic surgeons. Deep neural networks may be used to reliably identify anatomical variations in patients and provide an objective means for appraising different interventions in patients.

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76 – Optimizing Cosmetic Outcomes in the Direct Supraciliary Brow Lift

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Introduction: The direct supraciliary brow lift is a proven, effective procedure to correct brow ptosis, but is often avoided due to aesthetic concerns of the supraciliary scar. In this study, we review the literature as well as our own experience of to summarize the key technical nuances that yield optimal cosmetic outcomes in direct brow lifting.

Methods: We performed a comprehensive literature review of direct supraciliary brow lift techniques and provide a summary of the key procedure nuances that optimize the aesthetic outcome. A retrospective analysis of a single surgeon's aesthetically-oriented direct browlift technique from 2010 to 2019 was performed to review critical surgical principles, post-operative outcomes, patient satisfaction and adverse events. Patients with short follow-up times were excluded.

Procedure Technique: The cardinal points of patient's medial, central and lateral brow ptosis are marked pre-operatively during dynamic exam. Once anesthetized, the planned suprabrow ellipse excision is marked, with inferior aspect placement within the superior-most brow hairs, and incision design avoiding central overelevation (Figure 1A).[1-8] Along the supraciliary brow a #15 blade incision is beveled 45-degrees medially, transitioning to minimal bevel laterally, varying the degree along the length of the brow to accommodate changes in follicle trajectory (Figure 1B). A matching bevel is maintained at the superior wound edge (Figure 1C). The skin and subcutaneous tissue are excised down to the level of the frontalis muscle (Figure 1D). Subcutaneous tissue debulking and wound edge undermining are necessary to optimize wound edge approximation and eversion (Figure 1E-F). Additional subcutaneous tissue debulking is performed beyond the medial wound extent to reduce glabellar the "dog ear". A layered meticulously executed skin closure is essential, using monocryl sutures deep and fast-absorbing plain gut or polypropylene sutures superficially (Figure 1G-H). Polypropylene sutures are removed seven days after surgery. Beginning at post-operative week 2, patients are instructed to apply daily 1% hydrocortisone lotion and topical silicone to the incisions. Patients showing any signs of hypertrophic or visible scarring are given the opportunity to pursue microneedling treatments with topically applied 5-fluorouracil (5-Fu).[9,10]

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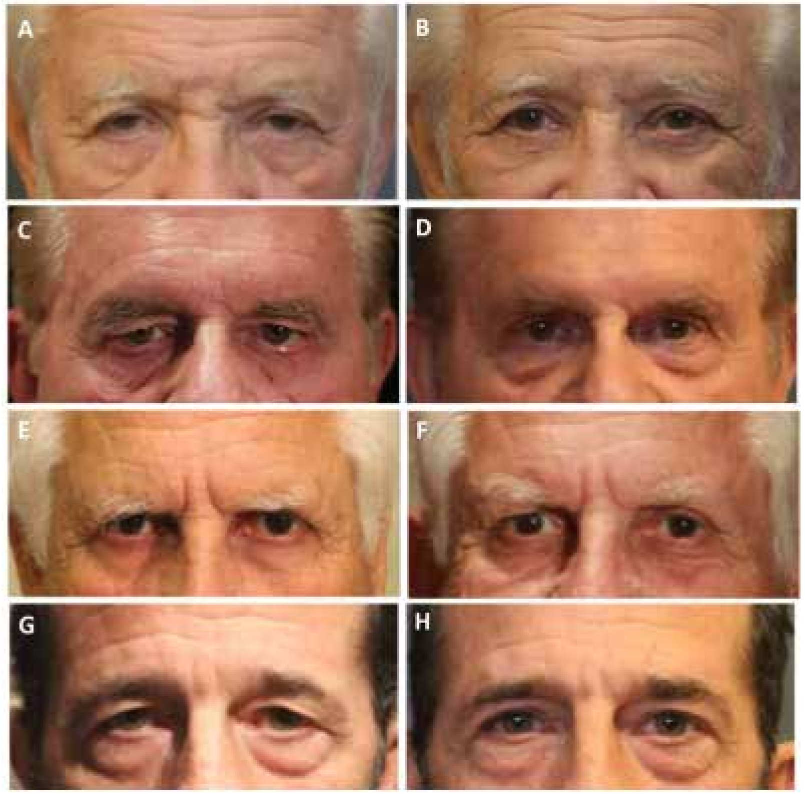
Results: We identified 76 patients (141 total brows) who underwent direct supraciliary brow lifting by this technique. 76% were males. They were followed for an average 4.9 months (range 0.3-82.6 months) post-operatively. Figure 2 shows four representative patient (A, C, E, G) pre-operative and (B, D, F, H) post-operative photos. At time of final clinic visit, 72 patients (94.7%) reported complete satisfaction with results, while only three (3.9%) had concerns regarding scar visibility, anticipated to improve with time. One patient felt his brow to be over-elevated and one had continued cosmetically-undesirable frontalis recruitment. Minor adverse outcomes were found in four patients (5.3%), and included transient paresthesias (n = 3) and hypertrophic scarring (n = 1). Post-operatively, 2 patients (2.6%) underwent microneedling with use of 5-Fu to optimize healing.

Conclusions: The direct supraciliary brow lift is a minimally-invasive and effective procedure to correct brow ptosis. There has been an evolution of technique over the years, and modern technique may yield excellent cosmesis when key principles are utilized.

Figure 1

Figure 2



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77 – Orbital and Adnexal Lymphoma: A Tertiary Referral Centre Experience

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Introduction: To present clinical features, histology and long-term prognosis of all patients with biopsy-proven orbital and periocular lymphoma presenting to a tertiary referral centre in the UK.

Methods: : A retrospective chart review was carried out for all patients who had histological diagnosis of orbital and adnexal lymphoma from 2005 to 2018. All the biopsies were performed at a single UK tertiary referral centre. The notes of 56 patients were reviewed. The main outcomes identified were clinical presentation, histology, rate of orbital involvement from primary disease and relative time interval, treatment and prognosis.

Results: The median age was 66.7 years, and 57.1% of patients were female. Mean follow-up was 5.8 years. The most common clinical presentation included ptosis (12.5%), lid oedema or fullness (12.5%), diplopia (10.7%), and proptosis (5.4%). Orbital involvement was extraconal in 95 % of the cases, and bony erosion was found in only in 3.6%. 17.9% of patients had primary lymphoma elsewhere and the mean interval prior to the orbital presentation was 5 years. In 30% of patients the orbital histotype was different from the primary site. Extranodal Marginal Zone Lymphoma (EMZL) turned out to be the most common histotype (34.1%). EMZL featured the lowest Local Recurrence Rate (LRR) (0.41%), as opposed to Diffuse Large B cell Lymphoma (DLBCL) which featured the highest LLR at 7.3%.

Conclusions: This is one of the largest single-centre series from the UK where histology of orbital and adnexal lymphoma is reported and correlated with LRR. The most common and least aggressive histotype turned out to be EMZL. Change of histotype between primary site and orbital involvement is not a rare event. Biopsy remains key in the diagnostic work-up.

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78 – Outcomes of Inferior Turbinate Infracture for Congenital Nasolacrimal Duct Obstruction

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Introduction: The purpose of this study was to evaluate the efficacy and safety of inferior turbinate infracture in cases of congenital nasolacrimal duct obstruction (cNLDO) complicated by impaction of the inferior turbinate.

Methods: In this consecutive retrospective interventional case series, 165 eyes of 120 patients who underwent lacrimal probing combined with nasal endoscopy-guided inferior turbinate infracture were included. Resolution of cNLDO was the primary outcome measure.

Results: Mean age at presentation was 23.7±14.0 (range, 7 to 80) months. Mean follow-up was 31.4±20.1 (range, 3 to 72) months. In the group of inferior turbinate infracture results were gratifying with a resolution of cNLDO in (149) 90.3%. 8 patients were diagnosed with secondary atonic sac. 7 patients underwent dacryocystorhinostomy, 7 patients required repeat re-probing and inferior turbinate infracture and 2 patients needed probing with intubation.

Conclusions: Nasal endoscopy-guided inferior turbinate infracture is highly effective and safe, with an impressive resolution of cNLDO.

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79 – Physician Perceptions of Active Thyroid Eye Disease in the United States of America

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Introduction: Pharmacotherapies are only effective in active thyroid eye disease (TED). Therefore, physician recognition of active disease is paramount for clinical treatment. The purpose of this study is to evaluate physician perceptions in assessing active TED.

Methods: Physicians identified patients within their practice who had active, moderate-to-severe TED. They then filled out a survey regarding their patients' clinical information. Physician-labeled disease activity was examined and compared to American Thyroid Association (ATA) TED activity guidelines.[1] Differences in patient and TED characteristics were compared using Fisher's exact tests for categorical variables.

Results: A total of 181 physicians (73 endocrinologists, 108 ophthalmologists) provided data for 714 patients (mean age = 49.4 ± 13.6 years, mean TED duration = 4.2 ± 5.1 years, 102 severe cases [14.3%]). Of these patients, only 307 (43.0%) were classified as active by ATA criteria. Clinical activity score was less than 2 in 281 (39.4%) patients. One hundred ninety-two patients (26.9%) had an active TED course of less than 3 years, and 115 (16%) had inactive disease of greater than 3 years duration.

Conclusions: The majority (57.0%) of patients who were designated as having active TED did not actually meet formal ATA criteria for active disease. It is possible that some of these patients (although inactive by ATA criteria) actually had extended active disease. These patients may also have had a more severe disease course and physicians may have been categorizing patients as active based on signs of congestion, rather than true signs of disease activity. It appears that there is significant variability in perception of TED activity. Further standardization of active TED classification methods may be beneficial to guide medical treatment, as pharmacotherapies are only effective during active disease.

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80 – Possible Influence of Upper Blepharoplasty on Intraocular Pressure

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Introduction: Increased levels of intraocular pressure are the main risk factor for the progression of glaucoma. There is anecdotal evidence that upper blepharoplasty might lead to increased intraocular pressure (IOP). Nevertheless, to the best of our knowledge, this association has not been previously studied. Thus, it is unknown if the indication of an upper eyelid blepharoplasty should be more carefully evaluated in glaucoma suspect and glaucoma patients. The purpose of this study was to investigate the possible influence of upper eyelid blepharoplasty on intraocular pressure.

Methods: This prospective study evaluated the IOP at baseline and one, two, six weeks and six months after an upper blepharoplasty in individuals with mild to moderate dermatochalasis. Upper blepharoplasty might change the pressure exerted by the upper eyelid into the cornea, and this could affect the corneal surface and the IOP; thus, the corneal topography was also recorded before and at 6 weeks.

Results: The IOP of 50 eyes was evaluated. The mean (± standard deviation) preoperative IOP was 14.09±0.35 mmHg. A statistically significant increase in IOP was observed at 1 (15.20±0.39 mmHg, p=0.006), 2 (15.70±0.39 mmHg, p<0.0001) and 6 weeks (15.09±0.41 mmHg, p<0.0001) postoperatively. A statistically significant increase in steep K (preoperative: 44.66± 2.06, 6 weeks: 44.78±2.28, p=0.007) and corneal astigmatism was also observed (preoperative: 0.78±0.43, 6 weeks: 0.89±0.45, p=0.006) at 6 weeks.

Conclusions: Upper blepharoplasty resulted in a mild and statistically significant increase in intraocular pressure postoperatively. Because an increase of 1 mmHg of intraocular pressure has been shown to be associated with an approximately 10% increased risk of glaucoma progression, our results suggest that upper blepharopasty should be carefully evaluated in glaucoma and glaucoma suspect patients.

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81 – Pressure Ulcer following Circumferential Head Dressing; Small Case Series and Review of Literature

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Introduction: Pressure ulcer (PU) almost always occurs in systemically ill patients due to limitation of movement or immobility, vascular impairment, and or medical devices. It is very rare in healthy persons with no intrinsic risk factors and has not been reported after forehead lift and dermoid excision procedures. Therefore, we aimed to report 4 patients (from 4 different surgeons) with forehead and eyebrow PUs after endoscopic forehead lift (3 patients) and dermoid excision (1 patient) as well as review the literature regarding to its clinical presentation, pathophysiology, prevention, and treatment in order to recommend a stepwise approach to forehead PU.

Methods: Literature review was performed (January 2019) using the Medline database on Pubmed using the following search terms for articles in the English language: “pressure injury,” “pressure ulcer,” “pressure necrosis,” “pressure sore,” “facial pressure injury,” “pressure dressing injury,” “circumferential dressing injury,” “circumferential bandage injury,” and “device necrosis.” After reviewing the abstracts and reference list of selected articles, a total number of 96 articles were finally included.

Results: PU developed in otherwise healthy subjects after endoscopic forehead lifting (3 patients) and dermoid excision (1 patient) with encircling head dressing (16- 72 hours). It gradually improved and ended up almost no visible scar in one subject (Figure 1) and visible scar in 3 subjects (Figure 2) at the last follow up. PU almost always occurs in systemically ill patients with ≥1 risk factors: immobility with fixed prolonged position, diabetes, perfusion impairment, and use of medical devices. Head and neck is the most frequent site in device-related PU. External pressure, shearing forces, and reperfusion injury are 3 main contributing factors in its pathophysiology. Prevention is mainly based on management of the underlying diseases (if any), external pressure release, and frequent skin examination. Treatment strategy is according to the stage of PU and presence of concomitant infection which include wound dressing and debridement as well as using antiseptics, antibiotics, and nutrients.

Conclusions: Early loosening of the encircling head dressing and frequent examination of the skin are the only preventive and diagnostic measures. Immediate removal of the pressure and staging of PU are the starting treatment actions. While different wound dressings have been proposed, none has shown a superiority over the others. Wound debridement is an essential step for granulation and epithelialization. Good hydration, sufficient calorie intake, and vitamin/ mineral supplements help heal the PU.

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Figure 1

Figure 2

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82 – Primary Squamous Cell Carcinoma of the Lacrimal Gland: A Case Report

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Introduction: The purpose is to describe a rare case of high risk HPV-positive squamous cell carcinoma of the lacrimal gland.

Methods: Case report, with histology.

Results: A 78-year-old Caucasian female presented with a mass in the right upper superolateral orbit that had progressively enlarged over several months. There was no associated pain or tearing, and no history of eyelid surgery. There were no cutaneous lesions on examination. She had no double vision and her extra-ocular movements were full. CT scan of the orbits with and without contrast showed asymmetric soft tissue enlargement of the right lacrimal gland with mild mass effect on the adjacent right lateral rectus muscle and lateral globe without significant displacement. There were no adjacent osseous erosions. Histopathologic analysis of the biopsy specimen revealed invasive squamous cell carcinoma (SCC) with basaloid features. In addition, in-situ hybridization was positive for high risk human papillomavirus 16 and 18. The patient underwent lateral orbitotomy with removal of the right lacrimal gland tumor en bloc, followed by radiation treatment. There was no recurrence of tumor seen on CT at 6 months follow-up.

Conclusions: This is a case of primary SCC of the lacrimal gland within the context of high risk HPV-positivity and no cutaneous involvement. Primary malignant neoplasms of the lacrimal gland are uncommon causes of lacrimal gland swelling[1], representing 1-2% of referrals to specialist orbital clinics.[2] Primary SCC is extremely rare with only 5 reported cases in the literature.[3-7]It has been reported that HPV-positive head and neck cancers have a better prognosis and increased sensitivity to both chemotherapy and radiotherapy, compared to HPV-negative tumors.[8]

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Figure 1

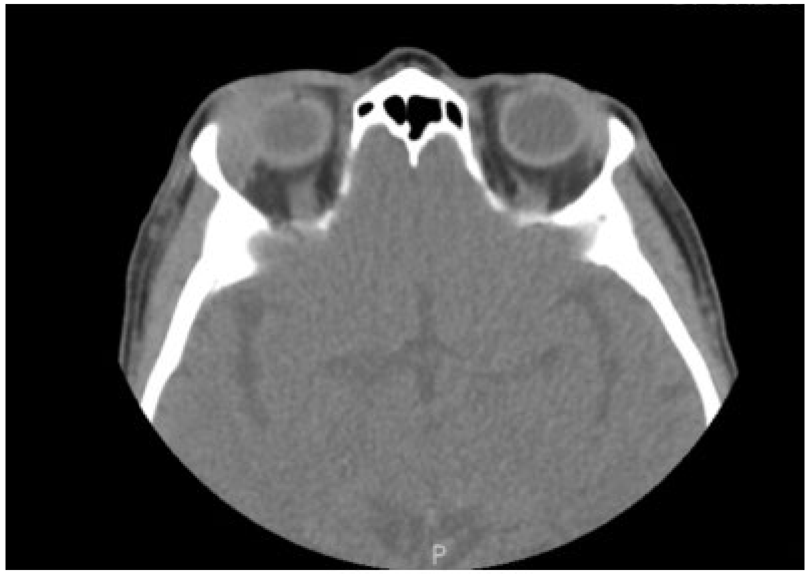


Figure 2

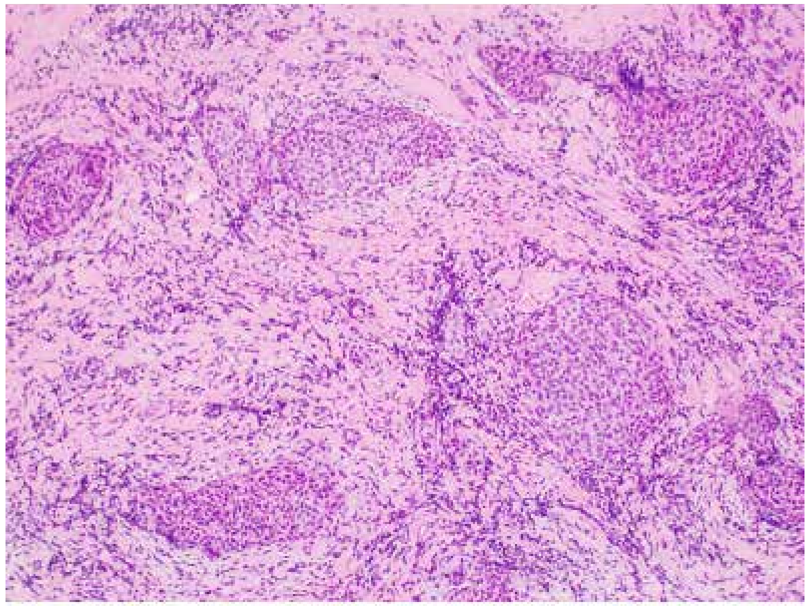
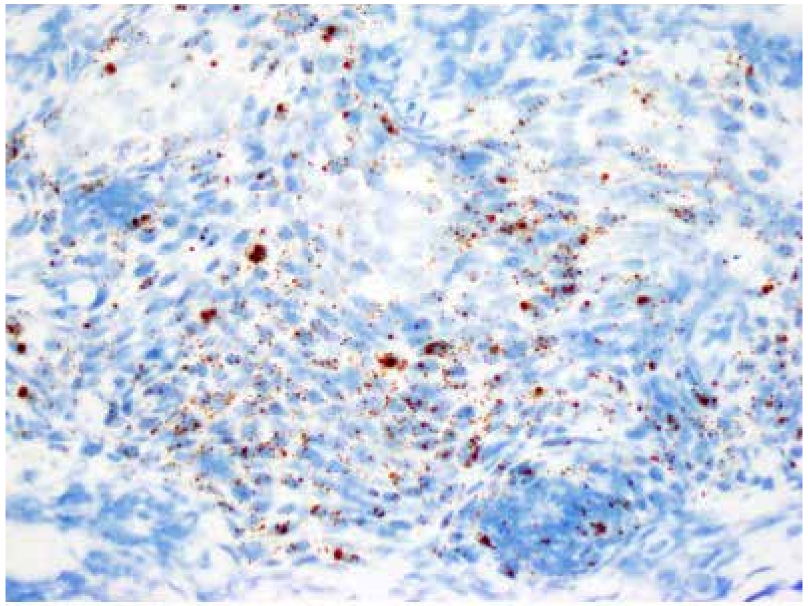


Figure 3



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83 – Quality of Life Outcomes for Excision and Reconstruction of Periocular Non-Melanoma Skin Cancer.

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Introduction: Quality of life (QoL) should be an important outcome measure in the care of non-melanoma skin cancer (NMSC). QoL reflects the impact of disease on a patient's functioning, as well as physical, psychological, emotional, and social well-being. Understanding how periocular NMSC affects QoL informs the physician of the patient's perception of the disease, its treatment, and subsequent recovery. It allows for better patient education and peri-operative counselling, as well as an improved doctor-patient relationship. Herein, we assess the QoL outcomes for excision and reconstruction of periocular NMSC at a single institution.

Methods: A prospective study of consecutive consenting patients with biopsy proven periocular NMSC that underwent Mohs micrographic surgery and reconstruction between 2016 and 2018. QoL was measured using the Skin Cancer Index (SCI) and FACE-Q. The SCI is a 15 item, validated, disease-specific QOL instrument with 3 distinct subscales: Emotion, Social, and Appearance. Higher scores indicate better QoL. The FACE-Q questionnaire is a validated patient-reported outcome instruments used in facial plastic procedures with eye-specific domains. Lower FACE-Q adverse effects scores shows better outcome while higher FACE-Q early life impact of treatment scores indicate better QoL. Patients completed the SCI and FACE-Q adverse effects questionnaires at the pre-operative visit, one week post-operative visit, and three month post-operative visit. Patients also completed the FACE-Q early life impact of treatment questionnaire at the two post-operative visits. Survey scores were standardized on a 100-point scale, except for the FACE-Q adverse effects, which is scored from 6 to 24. Statistical analysis was performed with the paired t-test and linear regression.

Results: A total of 40 patients completed the survey out of 55 patients enrolled into the study. The median age of the patients was 69 years (range 25–98) with a female predominance of 60%. Histopathology identified basal cell carcinoma in 82.5% and squamous cell carcinoma in 17.5%. The total SCI mean score increased with reconstruction from 61.4±22.1 at baseline to 69.7±19.3 at post-operative week 1 ($p < 0.001$) and to 87.8±14.8 at post-operative month 3 ($p < 0.001$). The FACE-Q early life impact of treatment mean score increased from 74.3±15.4 at post-operative week 1 to 93.3±12.4 at post-operative month 3 ($p < 0.001$). The FACE-Q adverse effects mean score initially worsened from 9.9±3.5 preoperatively to 10.6±3.5 ($p = 0.338$) at post-operative week 1, but improved to 8.5±3.0 at post-operative month 3 ($p = 0.026$). Improvement in the FACE-Q early life impact of treatment score was weakly associated with non-smoking status ($p = 0.078$). The SCI and FACE-Q adverse effects scores showed no association with measured demographic and clinical characteristics, including age, gender, complications, smoking status, and reconstruction method.

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Conclusions: Patients undergoing excision and reconstruction of periocular NMSC experience improved QoL as measured by the SCI and FACE-Q instruments. While QoL modestly improved in the first week after surgery, likely reflecting relief from the psychological burden of malignancy, the greatest improvement in QoL occurred in the late post-operative period, emphasizing the importance of the final functional and aesthetic result on patient well-being.

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84 – Reconstruction of Large Upper Eyelid Defects using Reverse Hughes Flap and Sandwich Graft of an Acellular Dermal Matrix

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Introduction: To report the use of reverse Hughes flap and sandwich graft of an acellular dermal matrix for reconstruction of large full-thickness defects of upper eyelids in cancer patients.

Methods: Clinical data of 6 cases of upper eyelid defects reconstructed using a reverse modified Hughes flap and a sandwich graft of an acellular dermal matrix as a tarsal substitute at a single institute were reviewed. Tarsoconjunctival flap from the donor lower eyelid was mobilized to reconstruct the posterior lamella, and an acellular dermal matrix was grafted onto the tarsoconjunctival flap. Skin-orbicularis muscle flap superior to the defect was advanced to cover the acellular dermal matrix graft and the lid crease formation sutures were applied to avoid the postoperative entropion. The tarsoconjunctival pedicle was divided 3 to 8 weeks after the surgery.

Results: All 6 patients had sebaceous carcinoma of the upper eyelid, and the full-thickness defects were 66% or more of the eyelid after tumor excision. One patient with a tumor involving the upper punctum underwent a lacrimal system reconstruction with silicone stent insertion at the time of surgery. Follow-up (median, 33months; range, 6-50 months) revealed satisfactory functional and cosmetic outcome in all patients. No patient had disease recurrence, exposure karatopahty, upper eyelid entropion, persistent usage of bandage contact lens, lower eyelid deformity, and acellular dermal matrix-related complications such as allergic reaction, infectious transmission, and immunologic rejection by the last follow-up.

Conclusions: Reverse Hughes flap and sandwich graft of an acellular dermal matrix as a tarsal substitute was successful in reconstructing large upper eyelid defect. Acellular dermal matrix graft and lid crease formation sutures are useful to enhance the stability and to prevent postoperative entropion of the reconstructed upper eyelid.

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Figure 1

Figure 2

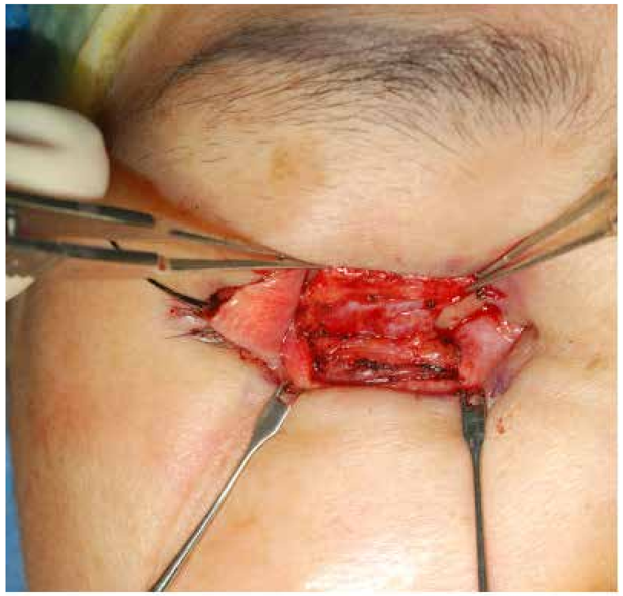

Figure 3

Figure 4

Figure 5

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85 – Renal Medullary Carcinoma with Metastasis to the Temporal Fossa and Orbit

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Introduction: We present the first report to our knowledge, of renal medullary carcinoma with metastasis to the temporal fossa and orbit in a young man of Hispanic descent with sickle cell trait.

Methods: A retrospective case review was performed to describe the clinical, imaging, and histopathologic findings of renal medullary carcinoma with metastasis to the orbit in a patient of Hispanic descent with sickle cell trait.

Results: A 22-year-old man of Hispanic ancestry, presented with a six-month history of right-sided headache and 4 days of blurred vision, double vision, and pain with right eye movement. Ophthalmic examination demonstrated visual acuity of 20/20 OU, color plates of 2.5/6 OD and 3/6 OS (the patient's ophthalmic history includes red-green color blindness), full confrontational visual fields OU, and metamorphopsia in the right eye. Extra-ocular motility was full OU, but painful in the right eye. Right-sided proptosis (Hertel 22, 18; base 100 mm) and mild upper lid ecchymosis were noted along with a soft, palpable mass at the right temporal region (Figure 1). Dilated eye exam was within normal limits without evidence of optic nerve or retinal abnormality.

MRI brain demonstrated an avidly enhancing extra-axial mass (5.9 cm craniocaudal x 4.9 cm transverse x 4.6 cm anterior/posterior) centered around the temporal bone with extension into the middle cranial fossa with mass effect on the anterior temporal lobe, as well as the lateral aspect of the extra-conal right orbit with slight mass effect on the lateral rectus (Figure 2). CT chest/abdomen/pelvis revealed a heterogenous mass in the right kidney with possible extension into the renal sinus. Hemoglobinopathy screen revealed 38.2% Hgb S, consistent with previously undiagnosed sickle cell trait.

A biopsy of the lesion in the temporalis muscle revealed a high grade infiltrative neoplasm, arranged in nests and cords, with areas of geographic necrosis. The tumor cells were highly pleomorphic, with abundant eosinophilic cytoplasm as well as occasional intracytoplasmic vacuoles. The nuclei were hyperchromatic, with prominent and sometimes eccentric nucleoli. Frequent mitotic figures were identified. Immunohistochemistry showed positive reactivity to PAX-8, CK, CK7, CAM5.2, and loss of SMARCB1/INI-1, which were consistent with a diagnosis of RMC (Figure 3).

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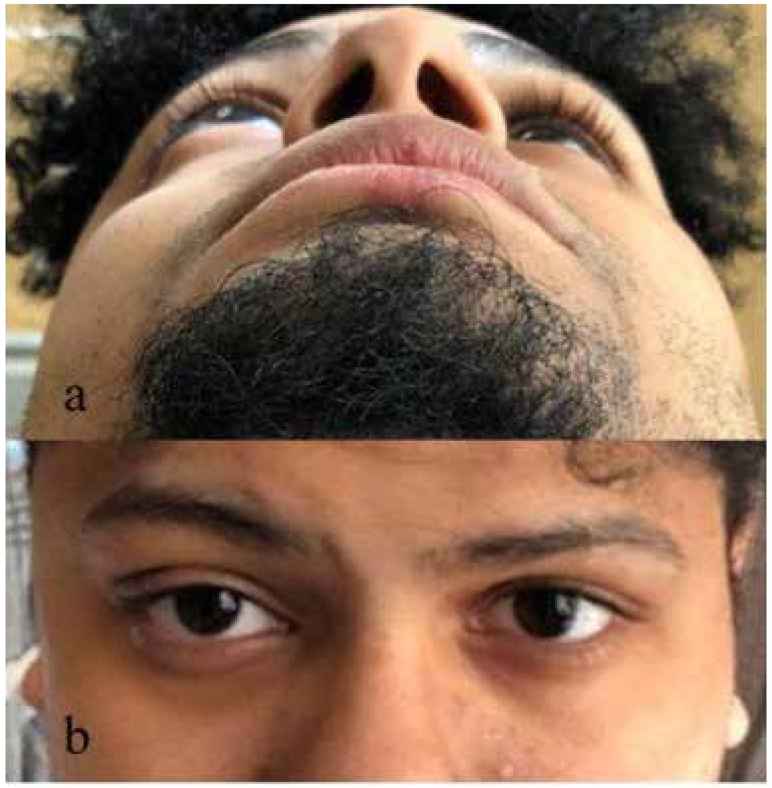
Conclusions: RMC metastasis to the orbit is exceedingly rare and to the authors' knowledge has only been described in one previous report in a patient of African ancestry.[1] Our patient denied any known history of African descent. To date, the biological mechanism for the association of RMC and sickle cell trait remains to be elucidated. It has been noted that RMC is characterized by the complete loss of expression of the chromatin remodeler and tumor suppressor *SMARCB1*.[2,3] Currently, there is no standard treatment regimen that has been shown to improve survival. In cases with metastatic disease at the time of initial presentation, median survival has been 4.0 months.[4]

Figure 1



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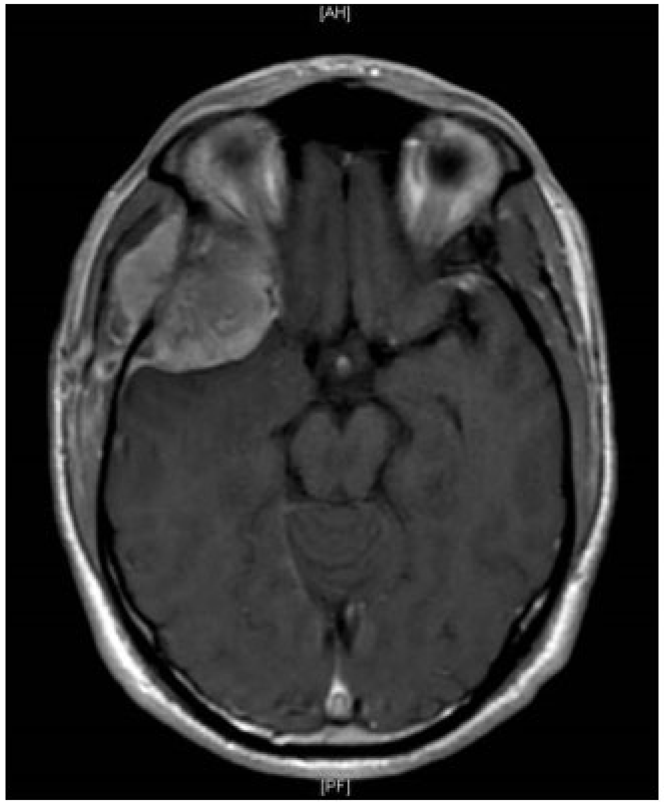
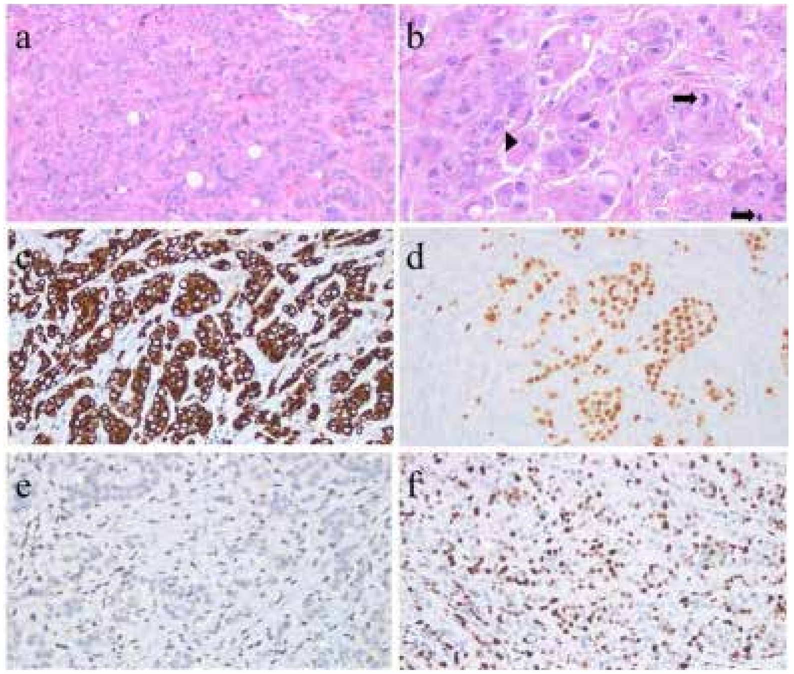


Figure 3



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86 – Repair of a Full Thickness Eyelid Defect with a Bilamellar Full Thickness Autograft in a Porcine Model (Sus scrofa)

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Introduction: It has been demonstrated the pedicle of a tarsoconjunctival flap advancement does not appear to supply the flap itself and the vascularization of the remaining eyelid/tear film is thought to offer adequate nourishment for survival of the flap; as such, a swine model was constructed to assess the viability of a bilamellar autograft for repair of large full thickness lid defects.

Methods: Full-thickness defects of varying sizes were created in each lower eyelid of four Yorkshire/Yorkshire crossed swine. The defects were then closed with a full thickness ipsilateral graft from the upper eyelid. Large full-thickness defects were then created in the upper and lower lids of eight Yorkshire/Yorkshire crossed swine and closed with bilamellar autografts from the contralateral lids. The subjects were then monitored post-operatively and assessed clinically for graft viability at post-operative days one, seven, and thirty. At the conclusion of the thirty day post-operative monitoring period, necropsy was performed and histopathologic analysis utilized to assess cell morphology and vessel ingrowth of the graft sites.

Results: In total, twenty-eight full-thickness bilamellar grafts were constructed and examined. At the conclusion of the post-operative monitoring period, twenty-seven of the grafts were deemed clinically viable and vascular ingrowth was determined to be equivalent to unaffected eyelid sections by histopathologic analysis. One case of post-operative hematoma was noted in the failed graft. One case of post-operative wound dehiscence required subsequent surgical repair. No clinically significant notching of the graft sites were noted. No cases of wound infection, corneal decompensation, or forniceal shortening were identified.

Conclusions: This analysis demonstrates the viability of a full-thickness bilamellar autograft as a surgical alternative in the repair of large full-thickness eyelid defects in a porcine model. The post-operative outcomes are consistent with the recent literature. Additional studies need to be performed to assess the procedure's clinical utility in human subjects before incorporation into clinical practice.

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Figure 1

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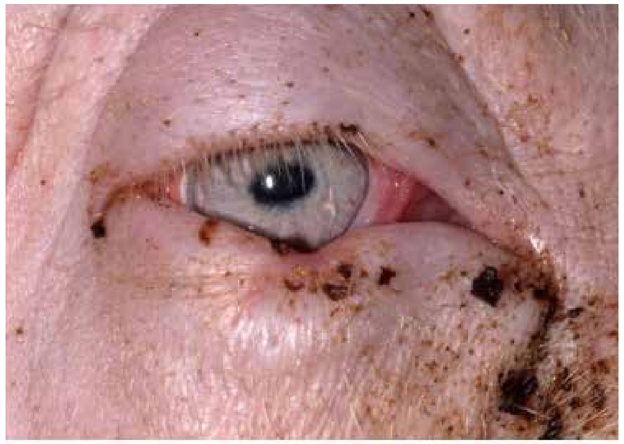

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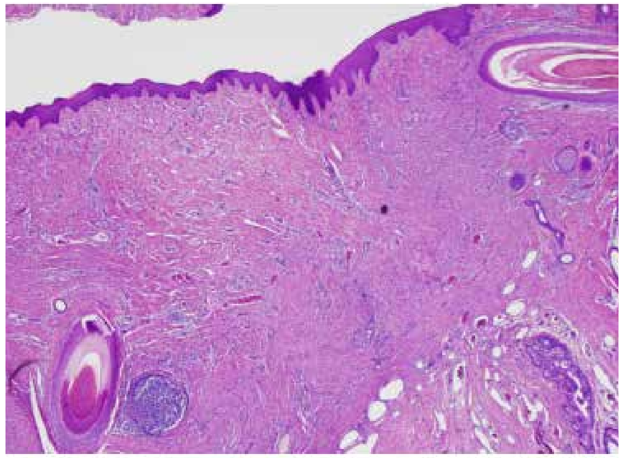

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87 – Restoration of Cilia-Deficient Upper and Lower Eyelids with Reconstructive Eyelash Grafting via Cilia-Bearing Adjacent Tissue Transfer or Full Thickness Skin Grafts Utilizing Ipsilateral or Contralateral Eyelid Tissue

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Introduction: The absence of lashes is a stigmata of previous eyelid injury or malignancy. Previous attempts at eyelash restoration have involved transplantation of hair-bearing skin grafts or multiple follicular units harvested from the scalp, eyebrows, sideburns, and leg hair.[1] However, these methods result in surrogate eyelashes of inconsistent length, variable thickness, and misdirected cilia causing keratopathy. We describe a novel eyelash reconstructive method by adjacent tissue transfer or autologous grafting of full thickness eyelid skin containing follicular units harvested from the ipsilateral or contralateral eyelids.

Methods: A retrospective review of patients with previous eyelid reconstruction within the past year at one institution was conducted. Two patients had undergone secondary reconstruction of the upper or lower eyelid using autologous periocular tissues containing eyelash cilia.

Results: *Patient 1* is a 40-year-old female with history of multiple reconstructions for basal cell carcinoma and squamous cell carcinoma of the right lower eyelid. She developed recurrent basal cell carcinoma 10 years later of the right lateral canthus, upper, and lower eyelids and underwent repeat Mohs excision (Figure 1a) and reconstruction with tarsoconjunctival flap, periosteal flap, and full thickness preauricular area skin graft. Postoperatively, she had absence of lashes involving the lateral upper and lower eyelid (Figure 1b). Six months after reconstruction, she underwent secondary reconstruction by lateral canthoplasty, and adjacent tissue transfer and full thickness skin graft containing lashes from the medial upper eyelid to the lateral upper eyelid (Figure 2). The patient was pleased with the results at postoperative month 5 (Figure 3) and had additional right upper and lower eyelid reconstruction by full thickness skin graft containing cilia from the contralateral upper and lower eyelid (3 month follow-up pending).

Patient 2 is a 57-year-old female with history of left lower eyelid basal cell carcinoma status post Mohs excision and reconstruction with Hughes flap and full thickness postauricular skin graft. The lower eyelid lashes were absent centrally but present laterally (Figure 4). She desired lashes centrally for mascara application. Eighteen months after the original reconstruction, a left lower eyelid cicatricial release was performed and a full thickness skin graft containing lashes from the lateral left lower eyelid was transplanted into the defect (Figure 5a). At postoperative week 1.5, she maintained viable cilia on the graft (Figure 5b) (3 month follow-up pending).
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Conclusions: Adjacent tissue transfer and grafting of strips of follicle-containing skin from the ipsilateral or contralateral eyelid restores eyelashes in previously reconstructed non-eyelash bearing eyelids. Unlike previously described methods, these grafts do not require chronic trimming to adjust their length, have an appearance consistent with the surrounding remaining eyelashes, and maintain a natural orientation. Interestingly, whereas transplanted cilia are typically lost initially after transplant and grow back months later, both of our patients retained the majority of transplanted hair postoperatively. If complete restoration of a full line of lashes is impossible, a "shelf bracket" approach involving restoration of medial and lateral lashes allows for the support of false lashes.

Figure 1

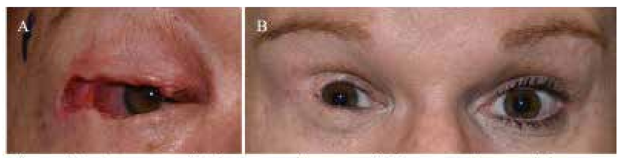

Figure 1A: Appearance of right upper and lower eyelids demonstrating remaining upper and lower lid lashes after Mohs excision of recurrent basal cell carcinoma.
Figure 1B: Post-reconstructive photograph demonstrating loss of lashes in the upper and lower lateral two thirds of the right eyelids. Note advancement and rounding of the lateral canthal angle covering the lateral scleral triangle.

Figure 2

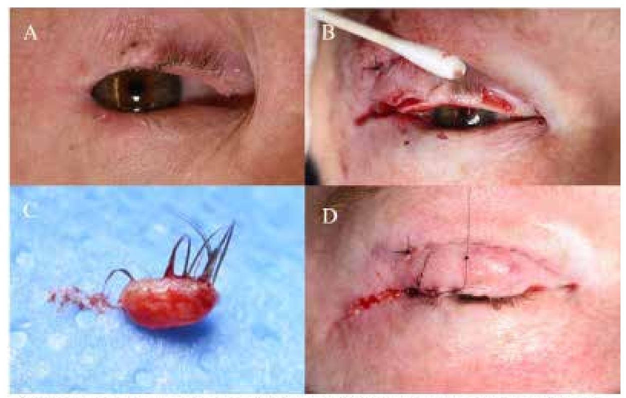

Figure 2. Preoperative (A) and intraoperative (B-D) photographs demonstrating the site of lash harvest (B), full thickness skin graft containing lash cilia (C), and site of graft and eyelash placement (D).

Figure 3

Figure 3. Five month postoperative photograph demonstrating healthy eyelash graft with multiple cilia.

Figure 4

Figure 4. Appearance of left lower eyelid after Mohs excision and reconstruction demonstrating mild lower eyelid retraction and absence of lower eyelid lashes centrally.

Figure 5

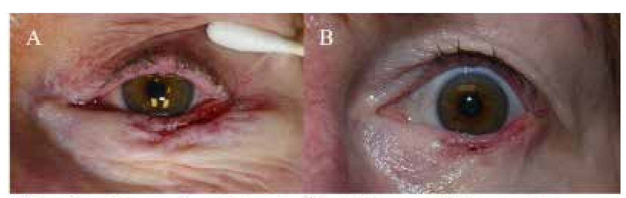

Figure 5A: Intraoperative photograph of the left lower eyelid demonstrating cicatricial release and placement of full thickness skin graft containing lashes from the left lateral lower eyelid.
Figure 5B: One week postoperative photograph of the left lower eyelid demonstrating retention of lashes after placement of the skin graft.

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88 – Risk Factors for Enucleation in Patients with Traumatic Globe Rupture: A Retrospective Review

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Introduction: Prior studies have evaluated risk factors related to globe ruptures that may lead to poor visual outcome, including initial visual acuity, presence of relative afferent pupillary defect, zone of injury, loss of ocular contents, and ocular trauma score (OTS) [1]. Some studies also document the rate at which patients who have suffered open globe injuries result in enucleation, however none include risk factors that may lead to the need for enucleation specifically [2]. Our study aims to identify specific findings that may predict subsequent need for enucleation in patients who suffer open globe injuries.

Methods: Retrospective chart review of patients who underwent surgical repair of traumatic ruptured globe injuries at the University of Louisville Hospital or Norton Children's Hospital in Louisville, Kentucky from 2010 through 2018. Patients of all ages, races and sex were included. Patients must have undergone globe rupture repair with or without enucleation and have followed up for minimum 3 months. Patient's lost to follow up, who suffered non-traumatic globe ruptures, or were enucleated greater than 1 year post injury were not included.

Results: 162 eyes were included in the study. Of those, 31 (19%) were enucleated. The most common reason for enucleation was a blind painful eye (71%). One patient in the enucleation group had presenting visual acuity (VA) of Hand motions (HM), while the remainder (97%) had light perception (LP), no light perception (NLP), or VA that was unable to be assessed secondary to patient consciousness. Preoperative vision in the non-enucleation group ranged from 20/20 to NLP with 59% of patients having HM vision or better. 99.3% of patients who were enucleated had positive findings of globe rupture on CT scan compared to 61% of non-enucleated eyes. Relative afferent pupillary defect (RAPD) was positive on presentation in 53% of eyes in the enucleation group compared to just 29% in the non-enucleation group. More severe globe ruptures unable to be salvaged during repair were more likely to undergo primary enucleation. There does not appear to be a difference in size/location of globe rupture, mechanism of injury, or presence of additional traumatic injuries between the two groups.

Conclusions: Factors that may lead to enucleation after traumatic globe rupture include presenting VA, presence of RAPD, evidence of globe rupture on imaging, and severe globe injuries unable to be salvaged. Patients with these risk factors should be counseled to the possible risk of globe removal surgery in the future. It does not appear that mechanism of injury, anatomical location of injury, or presence of additional facial/bodily injury is a risk factor for enucleation after traumatic globe rupture.

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89 – Seeding of Conjunctival Melanoma Into the Lacrimal System; A Case Series and Review of Current Literature

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Introduction: This case series features two patients who presented within six months of each other with lacrimal sac melanoma and a history of previously treated conjunctiva melanoma on the ipsolateral side. We describe the case characteristics and review of the literature regarding presentations, evaluations, and treatment recommendations relevant to treated conjunctival melanoma with delayed involvement of the lacrimal drainage apparatus (LDA).

Methods: This retrospective case series identified two recent patients at Wills Eye Hospital who had been remotely diagnosed and treated for biopsy-proven conjunctival melanoma and presented with LDA melanoma on the ipsilateral side. The patients histories, pathology, presenting complaint and surgical findings were examined. The authors extensively reviewed current literature for diagnostic techniques and management of this rare disorder.

Results: Case 1 involved a 74-year-old female presenting with epiphora and a black mass posterior and inferior to her medial canthal tendon. Case 2 involved a 91-year-old male with 1.5 years of hemolacria and no external findings. Diagnosis of LDA melanoma was made by external biopsy in case 1 and endoscopic biopsy in case 2. In both cases tumor pathology matched that of the initial and remotely treated conjunctival melanoma. The time between the initial excision and treatment of the patients' conjunctival melanoma and diagnosis of LDA melanoma was 8 years in patient 1, and 6 years in patient 2. Both patients were followed by ocular oncology since their conjunctival melanoma treatment, and in both cases the ocular exam, including b-scan, ubm ultrasounds, and full dilated exam in the Ocular Oncology Clinic at time of lacrimal melanoma diagnosis confirmed no ocular recurrent or residual disease.

In review of the literature; risk factors for extension of the conjunctival melanoma to the lacrimal system include: greater than 4mm thickness of primary conjunctival tumor, site of tumor on the conjunctiva and presence of corneal involvement (4). Common sites of distant metastases include: regional lymph nodes, parotid gland, liver, bone, and skin (1,3,4). Current treatments include en bloc excision of the LDA, maxilectomy, orbital exenteration, systemic chemotherapy/immunotherapy, and radiation.

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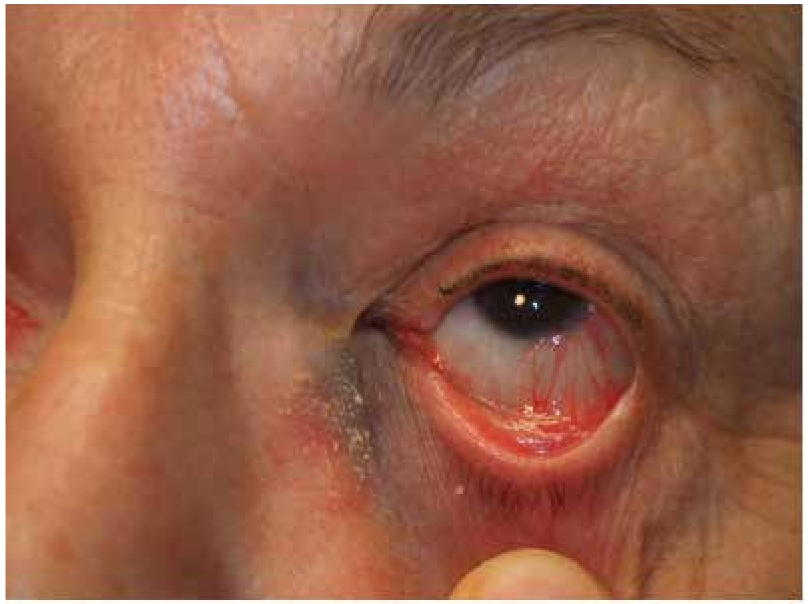
Conclusions: Seeding of conjunctival melanoma into the lacrimal system resulting in LDA melanoma is a rare occurrence with wide variation in the timing of diagnosis, presenting symptoms, clinical histories, systemic workups, and treatment modalities used. In review of our two cases and the few similar cases in the literature we identified several commonalities that can be used to help Oculoplastic Surgeons in the diagnosis and surgical management of this disorder as well as the systemic workup and treatments for these patients.

Figure 1

Figure 2



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90 – Single-Stage Reconstruction of Infected Exposed Implants in Anophthalmic Sockets Without Postoperative Antibiotics

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Introduction: Infection of exposed implants in anophthalmic sockets requires reconstruction. While some authorities have advocated an initial surgery to remove the implant and clear the infection, an intervening episode of wound healing, and a subsequent intervention to rehabilitate the socket, a single-stage surgery would theoretically facilitate faster recovery and reduce anesthesia exposure. Furthermore, avoidance of antibiotics could prevent side effects, toxicities, and microbial resistance. This study was performed to document the impact of single-stage surgery without the use of postoperative antibiotics in this setting.

Methods: A retrospective review of patients with indicative signs and a history of culture-proven infection of exposed implants who underwent single-stage implant removal, antibiotic washout, and socket reconstruction with a dermis-fat graft without systemic postoperative antibiotics was performed. Patients who did not have at least three months of follow up were specifically excluded. Demographic information and outcome metrics were assessed.

Results: Eighteen patients (12 males, 6 females, mean age = 53.4 years) were identified and followed for a mean of 12.1 months. Infectious signs cleared in all patients, and no patient developed a recurrent infection. One patient (5.55%) experienced an area of graft thinning, although this problem resolved spontaneously. No patient required an additional surgery.

Conclusions: Single-stage rehabilitation of infected anophthalmic sockets with implant exposure is technically feasible, and, in this cohort of patients, the absence of postoperative systemic antibiotics did not result in infectious complications. This approach reduces costs, decreases the duration of recovery, and avoids the potential side effects and risks of antibiotics.

91 – Sphenoid Wing Meningioma Treated with Endoscopic Transorbital Approach

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Introduction: Sphenoid wing meningioma can present proptosis or compressive optic neuropathy (CON) as well as intracranial mass from its specific anatomic location. We want to evaluate endoscopic transorbital approach (TOA) for sphenoid wing meningioma, and assess orbital manifestation of the tumor especially for compressive optic neuropathy caused by the tumor.

Methods: The patients treated with TOA for sphenoid wing meningioma from Dec 2016 to Dec 2018 were collected, and the clinical and imaging data were reviewed. Lateral orbital space and middle cranial fossa was reached with TOA. In cases for more exposure, extended TOA making lateral orbital bony window or endoscopic endonasal approach was added. Preoperative and postoperative clinical and imaging findings and visual functions were compared.

Results: Sixteen patients (2 males and 14 females) were included: 11 patients (69%) involving orbital and intracranial region and 5 patients (31%) with intracranial region. In orbital manifestations, lateral wall Hyperostosis was in 6 patients; extraconal tumor infiltration was in 11 patients; intraconal tumor infiltration was in 5 patients; and superior rectus and lateral rectus encasement was in 7 patients. Involvement of posterior intraconal orbit was found to affect CON more often than other shapes of tumor invasion. CON presented in 7 patients and proptosis in 10 patients were all improved after surgery. There was no significant complication related with the surgery. Additional treatment including Gamma knife surgery was applied in cases with residual tumor.

Conclusions: This minimally invasive surgical debulking procedure was successful in treating sphenoid wing meningioma without leaving significant adverse events. Lateral bony wall decompression and limited tumor resection at the orbital apex was effective for compressive orbitopathy from sphenoid wing meningioma.

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Figure 1

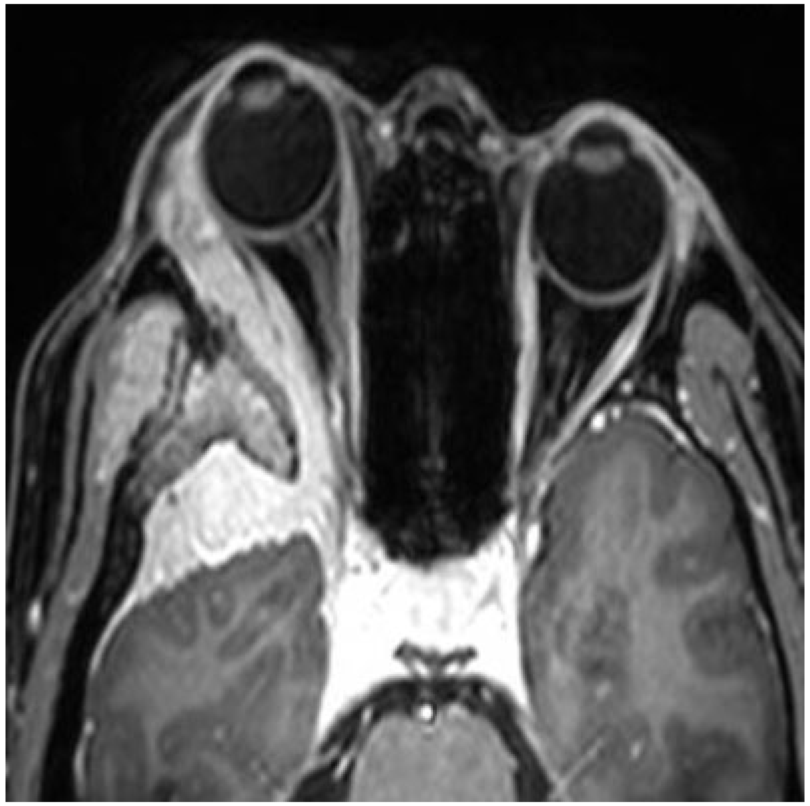
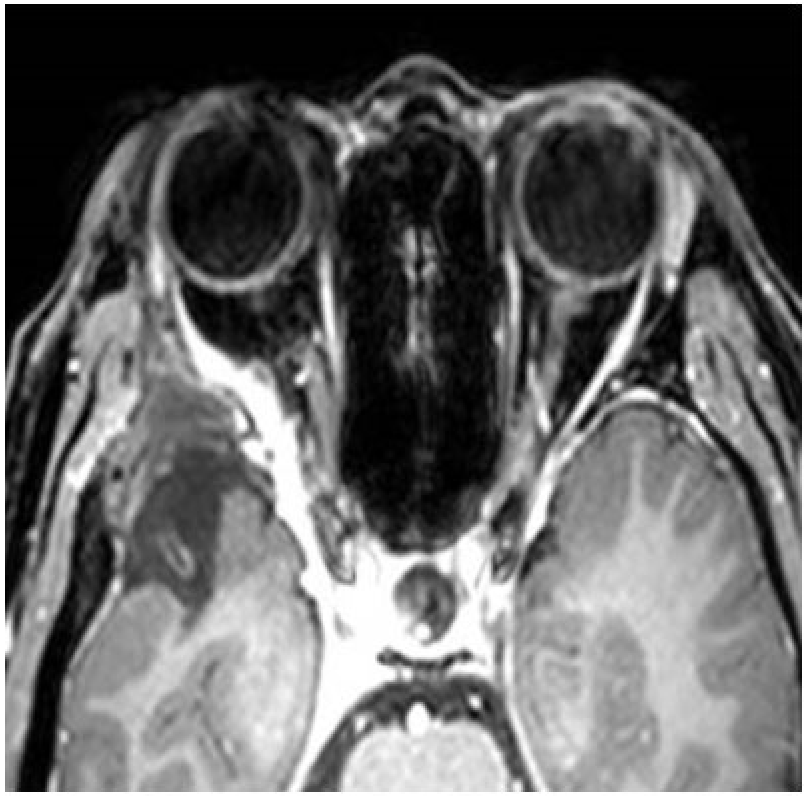


Figure 2



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92 – Spheno-orbital Dermoid Presenting as Orbital Cellulitis and Osteomyelitis: Need for CT Scan in Infants

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Introduction: Herein we report a dermoid cyst initially presenting as an orbital abscess and sphenoid wing osteomyelitis.

Methods: The case was reviewed for clinical data, imaging, histopathology, and outcome.

Results: A 10-month-old female presented to the emergency department with a two-day history of the left upper eyelid worsening on topical antibiotics. She had a history of a mild upper respiratory infection ten days prior to presentation. Her examination at presentation revealed left upper eyelid edema with erythema and mechanical ptosis. Her eye was white and quiet with an unremarkable anterior and posterior segment examination. There was a small congenital dimple in her temple region. (Figure 1) Her white blood cell count was mildly elevated and her CRP (42.8) and ESR (77) were markedly elevated. She was admitted for IV antibiotics and close monitoring. After 48 hours of antibiotics her exam remained largely stable, and MRI was performed. Imaging revealed enhancement of the left lateral and superior orbit with several fluid collections that extended to the lateral orbital wall and greater wing of the sphenoid with meningeal enhancement along the floor of the middle cranial fossa. (Figure 2) Incision and drainage and biopsy was performed via an eyelid crease incision. Pus-like material was in the superior subperiosteal space as well as a large cavity within the sphenoid. Pathology of the tissue revealed granulation tissue with surrounding granulomatous inflammation. She improved significantly postoperatively and was discharged on IV antibiotics. She returned to the hospital on two occasions with recurrence of symptoms. On the third hospitalization a CT scan was obtained revealing a perisutural orbital dermoid with a dermal sinus tract with surrounding inflammation of the bone and soft tissue. (Figure 3). A combined complete resection with neurosurgery with excision of the involved greater wing of sphenoid and the sinus tract. Final pathology was confirmed dermoid. (Figure 4)

Conclusions: Dermoid cysts of the skull base are rare,[1]with only one similar case previously reported.[2]MRI was performed three times in this patient to limit the radiation in this pediatric patient. However, CT imaging was essential to diagnosis in this case, as the bone involvement was key to the diagnosis and treatment plan for this patient. The dural sinus tract to the skin introduced infection to the cyst and a mixed infectious and inflammatory reaction resulted. This is the first case of a sphenoid wing dermoid presenting with osteomyelitis and adjacent orbital cellulitis.

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Figure 1

Figure 1: Initial presentation and congenital dimple

Figure 2

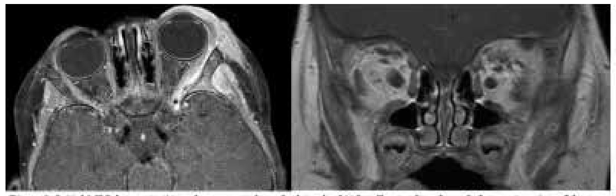

Figure 2: Initial MRI demonstrating enhancement along the lateral orbital wall extending through the greater wing of the sphenoid

Figure 3

Figure 4

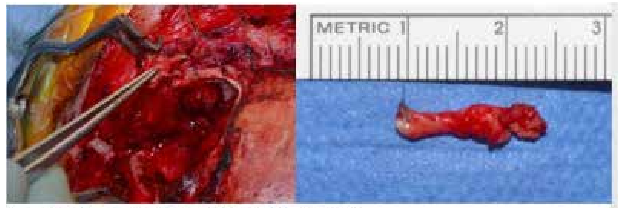

Figure 4: Complete excision showed dermoid in situ and then after removal

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93 – "Split-Face" Evaluation of Skin and Ocular Surface Changes induced by Periorbital Fractional CO_2 Laser Resurfacing

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Introduction: The purpose of this study was to evaluate the efficacy and safety of eyelid and periorbital skin fractional CO_2 laser resurfacing combined or not to upper blepharoplasty.

Methods: Prospective evaluation of 16 female subjects, 45-65 years old, presenting with photodamaged skin and dermatochalasis. All subjects underwent unilateral periorbital fractional CO_2 laser resurfacing (SmartXideCO_2laser, DEKA) 30 days prior to upper blepharoplasty. Quantification of collagen types I and III from laser treated and untreated palpebral samples removed at blepharoplasty was performed by histochemical analysis (Picrosirius Red staining).

Blinded, independent investigators evaluated rhytidosis in pretreatment and 6-month post-treatment digital images. Dry eye assessment questionnaire (OSDI), Schirmer testing, tear film break-up time (FBUT), fluorescein stain, conjunctival impression cytology and meibography were used to assess tear film and ocular surface changes before and serial times after resurfacing and blepharoplasty.

Results: All subjects completed the study and no complications were observed. Histochemical analysis showed significant increase in collagen types I and III in the samples submitted to fractional CO_2 laser treatment, and collagen type I was detected in greater proportion. There was a significant improvement of periorbital rhytidosis 30 days after laser resurfacing. There was an increase in FBUT on the 7th day after laser treatment. There were no changes in Schirmer test, meibography, tear meniscus height, corneal staining and OSDI after laser resurfacing. There was an increase in OSDI questionnaire, corneal staining and a decrease in Schirmer test after blepharoplasty.

Conclusions: Periorbital fractional CO_2 laser resurfacing demonstrated to be a safe and effective method to improve photodamaged palpebral skin, with histochemical evidence of increase in collagen types I and III and no damage to ocular surface.

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94 – Subcutaneous Tocilizumab Injections for Active Thyroid Eye Disease in Smokers Refractory to Combined Orbital Radiation and Systemic Steroids

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Introduction: Tocilizumab (TCZ) is a humanized monoclonal anti-IL-6 receptor antibody that has been used to treat active thyroid eye disease (TED). Prior studies have administered TCZ as monthly intravenous infusions (8 mg/kg)[1], and only one study thus far has reported using subcutaneous tocilizumab (SC-TCZ) injections (162 mg SQ q2 weeks x 4) for treating active TED[2].

Methods: This is a case series of patients treated with SC-TCZ for active thyroid eye disease refractory to combined orbital radiation and systemic steroids.

Results: Three patients were identified, and all were middle-aged females with an extensive current or recent smoking history with persistent and prolonged active thyroid eye disease following combination orbital radiation and systemic steroids. All had markedly elevated TSI levels, CAS scores ranging from 5-9 on a 10 point scale, and one had compressive optic neuropathy. All patients were started on SC-TCZ dosed at q1 week intervals and then tapered to q2 week intervals for a minimum of 4 months with improvement in CAS score, proptosis, and subjective quality of life. One patient had a reactivation upon stopping treatment but responded well after repeat treatment for an additional 4-month course. Side effects included fatigue and malaise for 1-2 days following injection. There were no cases of neutropenia, serious infections, or other adverse reactions. All patients underwent standard pre-treatment and surveillance lab testing.

Conclusions: This is only the second and largest report of SC-TCZ to treat active TED, and this case series involved smokers with TED refractory to systemic steroids and orbital radiation. Treatment was effective when dosed at q week to q 2 weeks intervals for a minimum of 4 months of treatment, and there were no serious adverse effects. Compared to monthly intravenous infusions, self-administered subcutaneous injections offer the advantages of reduced cost, improved convenience, and greater potential for titration of treatment dosing, intervals, and duration. Further studies are needed to compare efficacy, safety, and cost-effectiveness of subcutaneous injections versus intravenous infusions of Tocilizumab.

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Figure 1

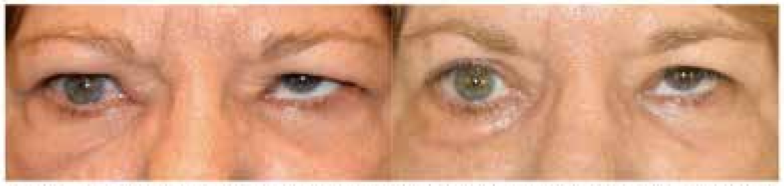

Figure 1. This 64-year-old female active smoker with an extensive past smoking history presented with persistent and prolonged active TED following oral and intravenous steroids, total thyroidectomy, orbital radiation, and orbital decompression surgery. Before (left) and after (right) treatment with subcutaneous injections of Tocilizumab 162 mg q week (11.2 mg/kg/month) for 4 months. The patient had improvement in eyelid edema and erythema, conjunctival injection, caruncular edema, and proptosis.

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95 – Subperiosteal Hematoma Masquerading as Orbital Metastases in a Young Patient with Metastatic Colonic Adenocarcinoma

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Introduction: Non-traumatic subperiosteal orbital hemorrhage (NTSOH) is a rare condition, most commonly associated with vascular malformations, coagulopathies and sudden increase in venous pressure.[1] We present a case of a NTSOH initially misdiagnosed as an orbital metastasis in a patient with known metastatic adenocarcinoma who had recently undergone an endoscopic retrograde cholangiopancreatography (ERCP).

Methods: Case report.

Results: A 22-year-old male was newly diagnosed with metastatic colonic adenocarcinoma and peritoneal carcinomatosis. The patient underwent cytoreductive surgery, hyperthermic intraperitoneal chemotherapy, and an ERCP was performed to assess for biliary metastasis. Upon awakening after the procedure, the patient developed sudden onset of left sided proptosis, ptosis, and binocular vertical diplopia (Figure 1A). No decrease in vision was noted, but a small left supraduction deficit was seen. Magnetic resonance imaging showed a smoothly marginated, crescentic 2.5 x 2.7 x 0.7cm extraconal mass in the superior left orbit, with heterogeneous hyperintense T2 signal, isointense T1 signal, and mild thin enhancement along its inferior margin (Figure 1B, C) causing compression of the superior rectus muscle. The radiographic imaging was suspicious for a new metastatic lesion and he was treated with an empiric trial intravenous dexamethasone for two days with improvement in his symptoms. He was discharged on oral dexamethasone. The patient presented in our clinic one week later with resolution of diplopia and improved proptosis and ptosis (Figure 2A). There was resistance to retropulsion of the left orbit but no palpable mass. Visual acuity was 20/20, no cranial nerve deficits were noted, and the optic nerve appeared normal. There were no signs of ischemic optic neuropathy. Repeat MRI two weeks after the first showed significant interval decrease in size of the mass with resolution of mass effect and proptosis (Figure 2B, C). Given the sudden onset of symptoms, rapid improvement, and characteristic radiographic characteristics, the orbital mass was concluded both clinically and radiologically to be consistent with hemorrhage and not metastasis. The patient had normal coagulation labs. The sudden increased venous pressure from his supine position during the ERCP likely caused the subperiosteal hemorrhage.

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Conclusions: NTSOH is a rare entity that can be overlooked in the diagnosis of a patient with a new orbital mass on radiographic imaging. Characteristic MRI appearance is of a well-defined, biconvex, non-enhancing mass of varied intensity, typically in the superior orbit.[2] In the absence of visual compromise, as in our patient, NTSOH can be managed without surgical intervention. This case highlights how known metastatic disease may influence diagnostic considerations and how alternate etiologies should be considered.

Figure 1

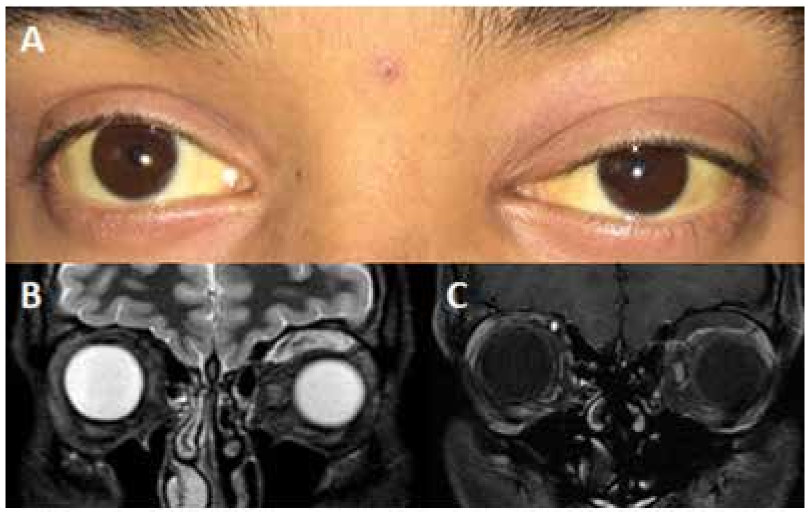
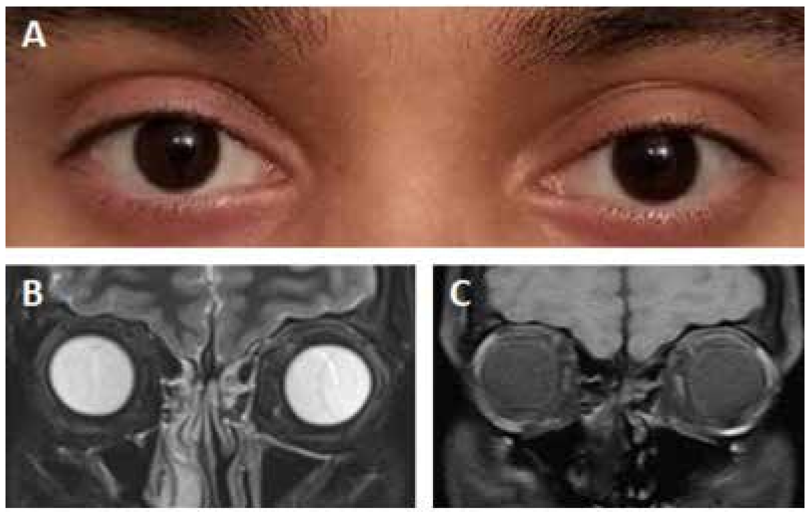


Figure 2



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96 – Superior and Inferior Ophthalmic Vein Thrombosis and Intracranial Complications associated with Orbital Cellulitis and Sinusitis

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Introduction: Sinusitis has many known orbital and intracranial complications. We report a rare case of a constellation of superior ophthalmic vein (SOV) and inferior ophthalmic vein (IOV) thrombosis, cavernous sinus thrombosis (CST), subdural empyema, and orbital abscess associated with sinusitis.

Methods: Case report

Results: A 70-year-old male presented with 1 week of sudden-onset redness and swelling of his right eye with some blurry vision, mild pain, discharge, and headache, without cold-like symptoms or nasal congestion. The day after symptoms started, he had been started on a course of 100mg prednisone daily by another provider due to concern for non-specific orbital inflammation, but his symptoms worsened. Family members reported that he seemed confused at times and was less active than usual.

On exam, visual acuity was decreased to 20/400, and color vision was decreased to 1/12 plates (control only). He was unable to move the right eye. There was significant periorbital edema and proptosis and the conjunctiva was injected and chemotic. Intraocular pressure (IOP) was 43. Examination of the left eye was within normal limits. CT and MRI showed subdural empyema along the right temporal lobe with associated meningitis, right SOV and IOV thrombosis, right CST, multiple right orbital abscesses, and chronic sphenoid and ethmoid sinusitis.

He was treated with vancomycin and ampicillin-sulbactam, and canthotomy/cantholysis was performed with improvement in IOP to 19. He was taken to the OR for drainage of the orbital abscesses and evacuation of subdural empyema. Cultures taken intraoperatively were positive for Streptococcus viridans and Parvimonas micra, and blood cultures were positive for Streptococcus viridans bacteremia. He remained on IV ampicillin-sulbactam for a 4-week course and completed a 3-month course of anticoagulation. Postoperatively, the patient improved significantly with recovery in visual acuity to 20/70 and full color plates. At his most recent visit, he continued to have a relative afferent pupillary defect and some limitation in extraocular motions.

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Conclusions: Sinusitis can have a number of orbital and intracranial complications, including orbital cellulitis, venous sinus thrombosis, and spread of infection to the brain as in meningitis, empyema, or abscess formation.1 Although CST is a known complication of sinusitis and orbital cellulitis, reports of concurrent SOV and IOV thrombosis as in this patient are rare. Two cases of concurrent SOV and IOV thrombosis have previously been reported in the literature, one with associated CST and one without.2, 3 Intracranial complications of sinusitis can present with nonspecific symptoms such as headache and altered mental status, as in this patient.4, 5 This case highlights the importance of maintaining a high index of suspicion for intracranial involvement in cases of sinusitis and orbital cellulitis. It also stresses the importance of avoiding prophylactic use of steroids until underlying infectious disease can be satisfactorily ruled out.

Figure 1

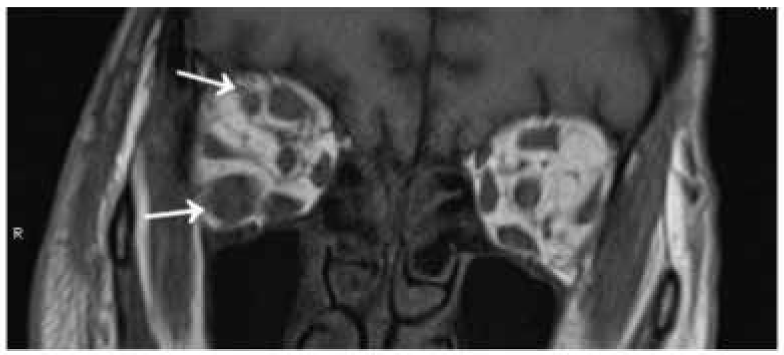

Fig 1. T1-weighted MRI showing dilated right superior and inferior ophthalmic veins. Postoperative image.

Figure 2

Fig 2. Contrasted CT showing dilated non-filling loop of right superior ophthalmic vein (arrow); normal left superior ophthalmic vein (arrowhead) for comparison.

Figure 3

Fig 3. T2-weighted MRI showing filling defect in the right cavernous sinus. Postoperative image.

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97 – Superior Orbital Rim Bone Contouring through a Minimally Invasive Eyelid Crease Approach for Facial Feminization

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Introduction: Forehead and brow contouring are used to feminize the appearance of the upper face in females and transgender females. Previously described surgical approaches for forehead and brow contouring in facial feminization of the upper face include sculpting of the bone overlying the central forehead, glabellar region overlying the frontal sinus with or without a frontal sinus ostomy, and central and lateral superior orbital rims. These procedures require a mid-forehead, pretrichial, or bicoronal approach for adequate exposure. However, some patients do not have a prominent central forehead or glabella, and only require contouring of the superior central and lateral orbital rims. For these patients, we describe a novel minimally invasive surgical approach to feminize the periocular brow area.

Methods: A retrospective review of patients who underwent bilateral upper eyelid blepharoplasty in conjunction with bone contouring of the mid-forehead, anterior frontal sinus wall, and superior orbital rims was conducted. For patients who underwent this combination of procedures, the upper eyelid blepharoplasty was performed first, followed by contouring of the superior orbital rims with a surgical approach through the blepharoplasty eyelid crease incision. A bicoronal approach was then used for the remainder of the forehead contouring, during which the previous areas of bone sculpting through the eyelid crease incision were examined.

Results: Two patients were included in this study (Figure 1A-B, 3). For both patients, the superior central and lateral orbital rims were safely and successfully contoured through the upper eyelid incision (Figures 1C-D, 4). Examination of the previously burred areas after creation of a bicoronal flap did not show any additional areas needing contouring that could not be accessed through the upper eyelid incision. Prior to creation of the bicoronal flap, access to the glabellar and mid forehead areas was examined in both patients. The supraorbital nerve was easily identified and protected during the dissection. While the glabellar area was accessible with an angled drill handle, blind burring of the bone overlying the anterior frontal sinus was thought to be unsafe as the margins of the frontal sinus and the thickness of remaining bone was unable to be assessed visually, putting the patient at risk for full thickness bony defect overlying the frontal sinus or, more dangerously, the intracranial space (Figure 4C). In both patients, there was difficulty accessing the mid forehead area due to the tension of the overlying skin and curvature of the skull. Postoperatively, both patients achieved excellent cosmetic results for feminization of the periorbital area (Figures 2, 5).

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Conclusions: In patients who desire contouring of the superior central and temporal orbital rims only, an approach through the upper eyelid crease is a minimally invasive and safe method for visualization and bony sculpting of those areas. While the anterior frontal sinus region can be accessed through this incision, the authors do not feel it would be safe to blindly contour in this region. The mid forehead area is not easily accessible through this approach. This incision is also conducive to concurrent upper eyelid blepharoplasty, upper eyelid ptosis repair, and internal lateral canthopexy.

Figure 1

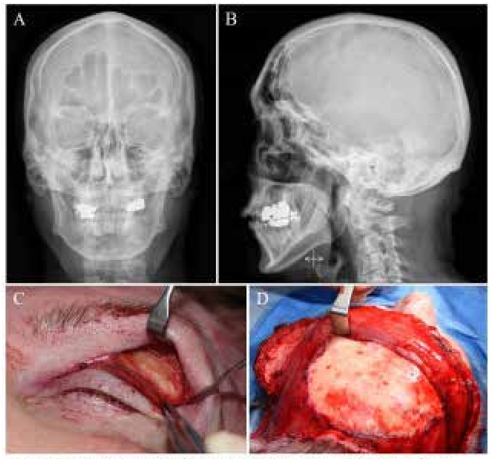

Figure 1A-B. Skull x-ray demonstrating frontal (A) and sagittal (B) views of the bony structure of the forehead and frontal sinus. Note that this patient did not have a frontal sinus prominent enough to require a frontal sinus osteotomy.

Figure 1C-D. Intraoperative photographs demonstrating exposure of the superotemporal and central superior orbital rim through the upper eyelid crease approach (C). The exposure from the bicoronal approach (D) allowed for identification and delineation of burr marks in areas previously accessed through the eyelid crease incision, indicating the area of central and lateral orbital rim bone that is able to be directly visualized and safely burred through the upper eyelid incision.

Figure 2

Figure 2A-F. Frontal, three-quarter, and profile view photographs of the patient preoperatively (A-C) and at postoperative month 2 (D-F) demonstrating reduction in central forehead bossing and prominence of superior orbital rim.

Figure 3

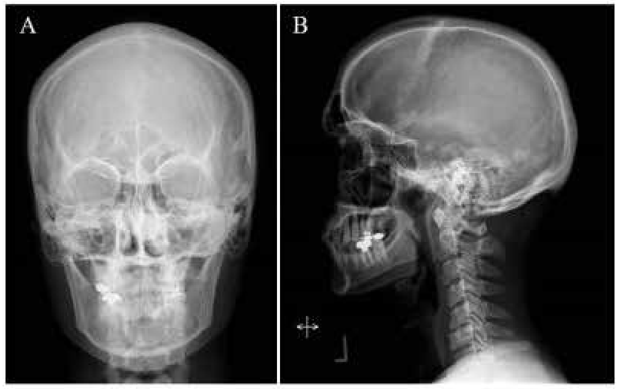

Figure 3. Skull x-ray demonstrating frontal (A) and sagittal (B) views of the bony structure of the forehead and frontal sinus. Note that this patient did not have a frontal sinus prominent enough to require a frontal sinus osteotomy.

Figure 4

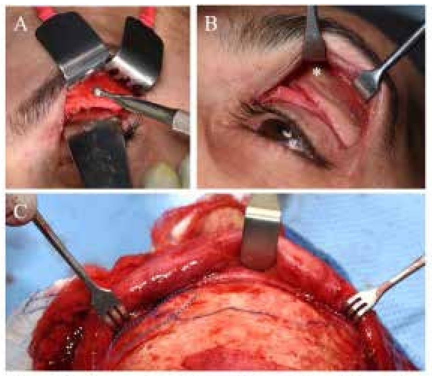

Figure 4A-C. Intraoperative photographs demonstrating sculpting of the superotemporal and central superior orbital rim through the upper eyelid crease incision (A-B). Note the medial and superomedial extent of the superior orbital rim that is able to be achieved through this exposure. The lateral ridge of the superciliary arch (*) is accessible through this approach. The exposure from the bicoronal approach (C) allowed for the identification and delineation of the bony area previously accessed and burred through the eyelid crease incision (dotted line), as well as the boundaries of the frontal sinus (purple ink). Full thickness bone entry within the area delineated by the purple ink will result in entering the frontal sinus, causing a soft bony defect that is palpable through the soft tissues of the forehead. Full thickness bone entry into the area outside of the purple ink will result in dangerous entry into the intracranial vault.

Figure 5

Figure 5A-D. Frontal, three-quarter, and profile view photographs of the patient preoperatively (A-C) and at postoperative week 2 (D). At the time of submission, the patient is still in the immediate surgical recovery period and cosmetic results of the procedure are difficult to ascertain due to postoperative swelling. Further follow-up photographs are pending.

98 – Supernumerary Extraocular Muscles in Thyroid Eye Disease

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Introduction: Supernumerary extraocular muscles, while almost invariable in monkeys, are uncommon in humans.[1] Their presence in patients with thyroid eye disease is even more rare, with only five reported cases in the literature.[2-4] Herein, we report two cases of accessory extraocular muscles affected by thyroid eye disease, the first demonstrating a typical presentation and second a more atypical presentation necessitating biopsy. The second case is also the first described with histopathologic confirmation of an inflamed accessory muscle.

Methods: Patients with both an accessory extraocular muscle and thyroid eye disease were identified. Charts were reviewed for clinical information and imaging results. When applicable, histopathology was also reviewed.

Results: Two patients were identified with an accessory extraocular muscle affected by thyroid eye disease.

Case 1: A 38-year-old man with Graves' disease presented with pressure, pain, and swelling of the left eye and diplopia on far left gaze. Examination revealed bilateral (left>right) proptosis, resistance to retropulsion, and left upper and lower eyelid retraction but notably full extraocular motility. CT scan of the orbits revealed an accessory extraocular muscle originating from the orbital apex and passing anteriorly between the inferior and lateral recti (Figure 1A,B). The muscle was enlarged compared to a CT done seven years earlier prior to his diagnosis of Graves' disease (Figure 1C,D). He was treated conservatively with topical lubrication and oral selenium.

Case 2: A 48-year-old man with Graves' and thyroid eye disease presented for a second opinion of a left orbital mass. He reported bulging of the left eye and diplopia in upgaze. On examination, there was 5 mm of left proptosis and limitation in upgaze (Figure 2A-C). Five months prior at an outside institution, he underwent a negative systemic inflammatory work-up, CTA and MR imaging, two 1-week courses of oral prednisone with no clinical improvement, and left orbitotomy with biopsy of the inferior rectus, which was consistent with thyroid eye disease. MR imaging prior to (Figure 3A) and following (Figure 3B) initial biopsy showed an enlarged inferior rectus with a discrete enhancing mass superolateral to it. Given the uncertain diagnosis, he underwent left lateral orbitotomy with repeat biopsy and orbital decompression. Intraoperatively, there was noted to be a structure superior to the inferior rectus. Biopsy of the mass showed striated muscle with chronic nongranulomatous inflammation (Figure 3C,D), consistent with an inflamed accessory extraocular muscle due to thyroid eye disease.

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Conclusions: Supernumerary extraocular muscles are rare. Involvement in thyroid eye disease can have variable presentation, typically as an incidental imaging finding localized between the inferior and lateral recti (Case 1) or atypically being mistaken for an inflammatory orbital mass (Case 2). Although it has been previously described on imaging,[2-4] the second case we present is the first to our knowledge of a biopsy-confirmed accessory extraocular muscle affected by thyroid eye disease. Supernumerary extraocular muscles may be involved in the inflammatory process of thyroid eye disease, can cause confusion in interpretation of orbital imaging, and are an important anatomical variation of which the orbital surgeon should be aware.

Figure 1

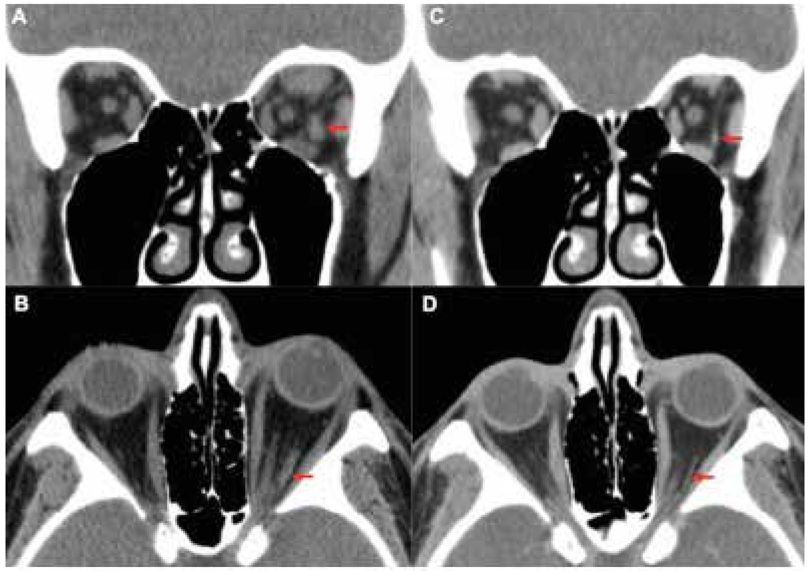


Figure 2

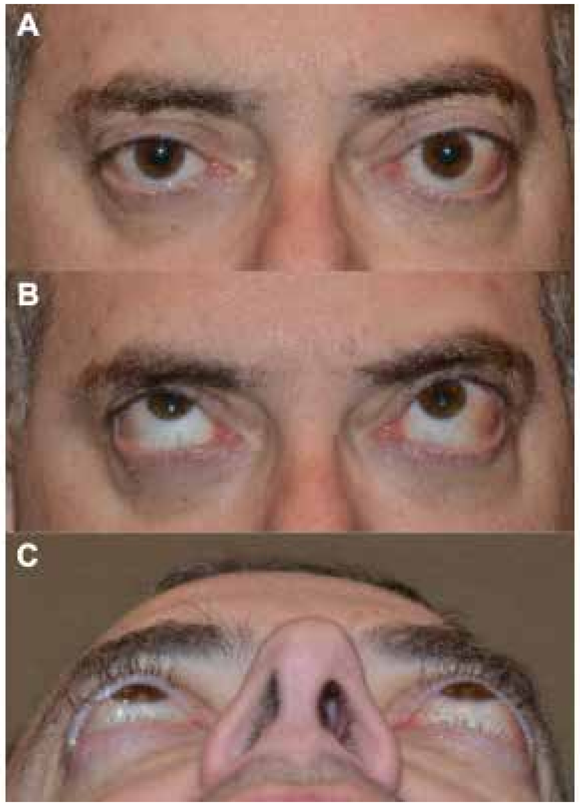
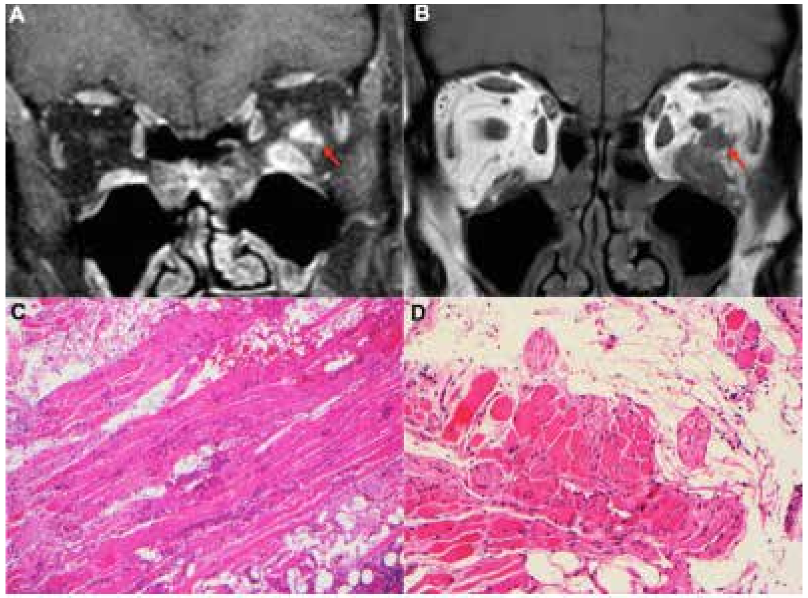


Figure 3



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99 – Supranumerary Lacrimal Caruncle: A Case Series

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Introduction: The purpose of this study is to describe two patients with clinical findings consistent with a supranumerary lacrimal caruncle; a congenital abnormality characterized by the presence of caruncular tissue found in addition to, and separate from, a normal lacrimal caruncle.[1,2] Over the past fifty years, only three cases have been described in the English literature and no case that we are aware of has been described during the first two decades of life.[1,3,4]

Methods: A retrospective chart review of the electronic medical record was performed. Patients were included in the case series if there was both clinical evidence (including photographs) and histologic evidence to support a diagnosis of a supernumerary lacrimal caruncle. All paraffin-embedded tissue sections were stained with hematoxylin and eosin and reviewed by an ocular pathologist (VME).

Results: Two patients (a 13-year-old African-American male and a 63-year-old Caucasian female) were found to have clinical and histologic evidence to support a diagnosis of a supernumerary lacrimal caruncle. Both lesions were unilateral and found incidentally. The adolescent was asymptomatic and the adult noted intermittent ocular irritation. There was no history of ocular or adnexal diagnoses, surgery, or trauma. On eversion of the lower eyelid, there was an elevated fleshy appearing ovoid lesion (4 x 3 mm and 8 x 3 mm, respectively) on the inferomedial palpebral conjunctiva that was separate from the lacrimal caruncle and the eyelid margin (**Figure 1 – A,C**). The lesions contained numerous yellow micronodules and were surrounded by a normal appearing conjunctiva. The remainder of the ophthalmic examination was unremarkable in each case. Both patients elected to undergo lesion excision. Histology demonstrated non-keratinizing squamous epithelium rich in goblet cells and a stroma containing sebaceous glands, hair follicles, and fibro-adipose tissue at the base of the lesion (**Figure 1 – B,D**). Both wounds were allowed to heal by secondary intent and the post-operative course was unremarkable without evidence of recurrence (3 month follow-up in each case to date).

Conclusions: We describe two patients with clinical and histologic findings consistent with a diagnosis of a supernumerary lacrimal caruncle. This series documents, to the best of our knowledge, the only known case of a supernumerary lacrimal caruncle to be described in the first two decades of life. Both lesions were completely separated from the lacrimal caruncle by a strip of normal conjunctiva, differentiating them from caruncular dysplasia, which can be associated with ocular adnexal abnormalities such as Goldenhar Syndrome.[1] Similar to other lesions described in the literature, both lesions were found on the inferomedial aspect of the palpebral conjunctiva inferior to the lacrimal punctum.[1,3,4]

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Figure 1

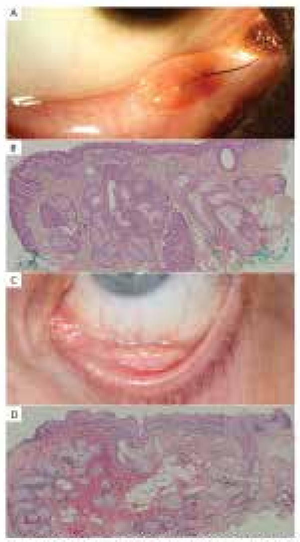

Figure 1: Clinical and histologic features of two patients diagnosed with supernumerary lacrimal caruncle. A & C) External photographs demonstrating an elevated fleshy ovoid lesion with micronodules that was found in the inferomedial conjunctiva and was distinctly separated from the lacrimal caruncle by a strip of normal conjunctiva. Note the similarity in appearance between the lesion and the normal lacrimal caruncle in each case. The loose eyelash present in photograph A is an artifact and was not adhered to any structures. B & D) Histologic sections of each lesion (hematoxylin-eosin; original magnification ×40). Section B corresponds to the patient in photograph A, and section D corresponds to the patient in photograph C. Each section demonstrates a goblet cell rich non-keratinizing squamous epithelium with pilosebaceous units, accessory lacrimal gland tissue, and fibroadipose tissue at the base of the lesion.

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100 – Surgical Decompression for Compressive Optic Neuropathy (CON) in Thyroid Eye Disease (TED) – A 15-year Southeast Asian Experience

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Introduction: Thyroid Eye Disease is an ever increasingly diagnosed and managed, orbital debilitating condition worldwide. Compressive Optic Neuropathy(CON) is an uncommon yet devastating complication. While most patients are healthy and tolerate the procedure well, those with comorbidities, suffer significant counsequences despite good visual outcomes

To evaluate the clinical, biochemical, radiological profile and clinical outcomes of patients who underwent surgical decompression for CON in TED in a multi-racial, Southeast Asian population.

Methods: Retrospective chart review of patients who underwent surgical decompression for CON in TED seen and managed by the multidisciplinary Thyroid Eye Clinic.

Parameters: visual acuity, color vision, pupillary response, radiological appearance of optic nerve and the orbital apex, autoantibody titres, automated perimetry and electrophysiology testing where available.

Compressive optic neuropathy was defined as new onset of subjective/objective drop in BCVA, color vision changes, visual field deterioration, RAPD in the presence of Active TED.

Results: 84 Orbits of 47 patients underwent orbital decompression in the 15-year period out of which 28%(24 orbits, 13 patients) underwent decompression for CON.

Demographics: 62% were Chinese, 23% Malay, 8% Indian and Indonesian, 7% others respectively.

Age range: 41-82 years (mean 61yrs).

M: F ratio: 1.6:1.

Comorbidities: 9/13 patients (69%) - Diabetes, Hypertension and Hyperlipidemia.

Smoking: Interestingly, while 8/13 were smokers (38% active & 23% passive) 5/13 (38%) were non-smokers.

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Onset of Graves' orbitopathy: Majority (77%) had subacute to chronic orbitopathy(> 6 wks, longest 30 yrs) and 15% had relatively rapid onset (4-6 weeks).

Thyroid function: 53.84% were hyperthyroid, 30.76% were hypothyroid and 7.69% were euthyroid.

Dyschromatopsia, noted in 10 eyes preoperatively, cleared in 9 (90%) postoperatively, one patient had poor vision from severe maculopathy.

Antibodies: TRAB was positive in 84.61%,TSI IN 53.84%, Anti-TPO in 7.69%.

Optic neuropathy and outcomes:

Of 10 patients with preop visual acuity of 20/50-20/100, 90% improved to 20/40 or better, 10% remained same (corneal scar). Of 3 patientswith20/200 or less (all with an RAPD), 2 improved to 20/40 or better with resolution of RAPD.

- Interestingly, 1 of 4 CON patients who had pERG was reported normal.
- Radiological features: Optic nerve stretch - 100%, enlargement of muscles followed IMSLOw rule in 100%, fat in SOF 92% and enlarged SOV in 8% only.
- Visual field deficits: Generalized constriction (n=8, 62%) followed by inferior scotoma (n=3, 23%) and normal (n=2, 16%).

Postoperative complications: 23% (n=3).

Ischemic stroke (n=1) – An incidental finding on routine postop CT Scan.

Submassive pulmonary embolism requiring anticoagulation(n=1) and

Steroid induced acute pancreatitis and thoracic aortic aneurysm(n=1) requiring urgent medical and surgical intervention. All of them were unrelated to the surgical decompression procedure itself.

Conclusions: Surgical decompression of the orbit is an effective treatment for TED-associated CON.

Clinical examination assessing the pupils for RAPD and color vision still surpasses the investigations that are ordered. Physicians or patients may miss the early signs of optic neuropathy as those with more severe orbitopathy tend to have congestive symptoms that could mask the subtle decrease in visual function.

Positive predictive factors include younger age, shorter duration of neuropathy indicating earlier disease course. Co-morbidities should not be a limiting factor for surgery but should be considered seriously.

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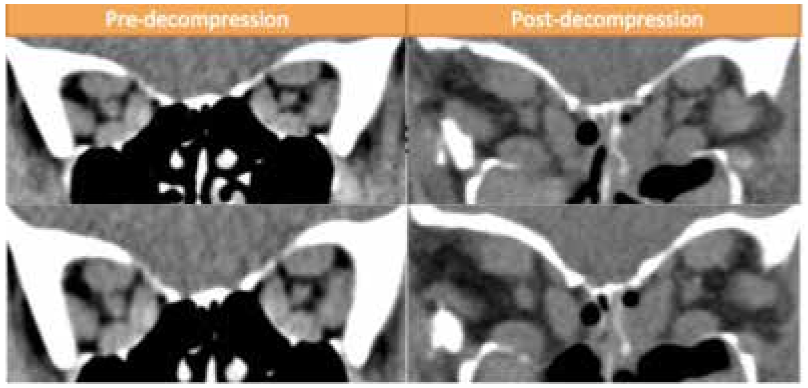
Figure 1



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101 – Suture Cheek Suspension Augments Periorbital Static Rehabilitation in Facial Nerve Palsy

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Introduction: Facial nerve palsy may lead to significant functional facial and ocular morbidity. Soft tissue resuspension may improve both functional and aesthetic deficits in facial palsy.[1] We have adapted a minimally-invasive mid-face suspension,[2,3] which is be easily combined with routine paretic periocular rehabilitation to optimize outcomes.

Methods: Seven patients with unilateral facial nerve palsy underwent mid-cheek suture suspension simultaneous with periocular surgical rehabilitation. A temporal incision is made and dissection carried along the deep temporalis fascia to the lateral orbital rim and medial zygoma, deep to the intermediate fat pad. In severe cases, a second incision via superior buccal sulcus can be utilized to maximize cheek soft tissue mobilization. The periosteum of the maxilla is exposed and dissection carried superiorly in a subperiosteal plane along the anterior face of the maxilla. Further release proceeds from the piriform aperture to the masseteric ligament until the two dissection planes are connected.

Each end of a 0-0 silk tie on a Keith needle is inserted into distinct stab incisions along the nasolabial fold or midcheek (Figure 1A-B), the cheek soft tissues engaged, and needle externalized through a lateral canthal incision (Figure 1C-D). The needle is then redirected through the lateral canthal incision and guided along the preformed dissection plane to exit through the temporal incision (Figure 1E). An identical procedure is performed along the three separate entrance sites. Tension may be adjusted to achieve adequate mid-face suspension with the goal of initial overcorrection (Figure 1F). The suture ends are secured to the deep temporalis fascia. When indicated, the superficial musculo-aponeurotic system (SMAS) may be independently elevated and secured to the deep temporalis fascia using a 3-0 polydioxanone suture to achieve additional temporal support.

Results: Seven patients (mean age 69) with unilateral facial nerve palsy and bothersome, symptomatic facial droop were identified. All patients underwent simultaneous oculoplastic procedures, including upper eyelid gold weight implantation (n = 5), lateral canthoplasty (n = 3), ipsilateral brow lift (n = 2) and lower lid filler (n = 1). The aforementioned mid-cheek suture suspension was concomitantly performed, and customized based on individual patient needs. With an average follow-up of 8.7 months (range 3-24 months), all patients demonstrated lasting improvement in facial asymmetry (Figure 2), and reported satisfaction with their results. There were no significant post-operative complications, although three patients experienced transient cheek paresthesias.

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Conclusions: Midfacial static soft tissue resuspension is an excellent minimally-invasive surgical option for static facial rehabilitation in patients with facial nerve paralysis that can be performed at the time of periocular rehabilitation to enhance functional and aesthetic outcomes of traditional periocular paretic reconstruction.

Figure 1

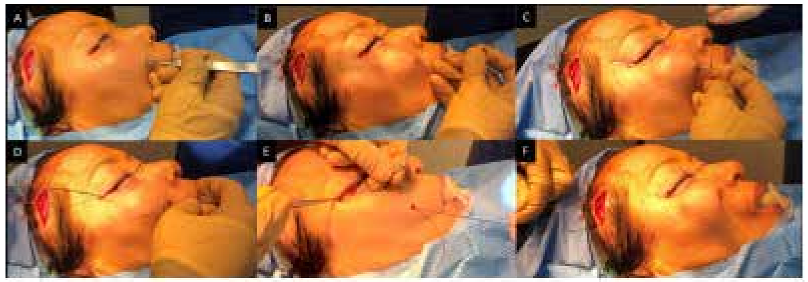
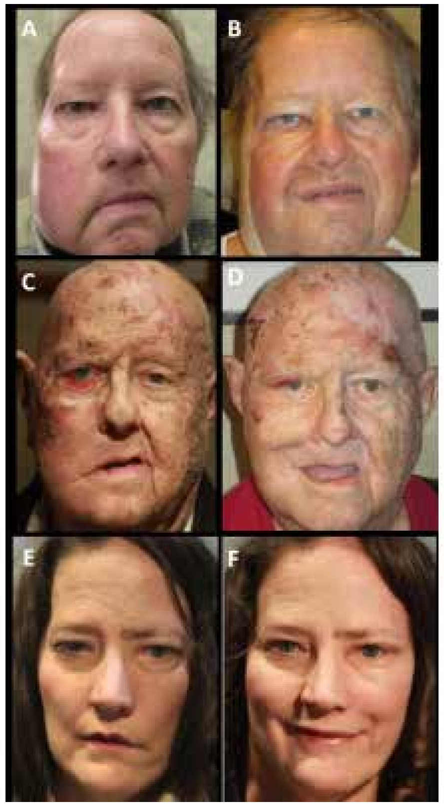


Figure 2



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102 – Symmetric versus Asymmetric Resection Length for Asymmetric Ptosis managed with Mullers Muscle Conjunctival Resection

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Introduction: Conventional teaching suggests that the amount of tissue resected during Muller's muscle conjunctival resection (MMCR) surgery is a determinant of final marginal reflex distance (MRD1) outcomes. In the case of asymmetric ptosis, this approach would predict that the lower side should receive a greater resection length. However, recent reports suggest the relationship between resection and elevation may be more variable that previously thought (1), perhaps questioning this strategy. The objective of this study was to assess surgical outcomes of a standard resection length of 7 mm technique compared to a 4:1 variable resection length algorithm in patients with asymmetric MRD1 undergoing MMCR surgery.

Methods: In this cross-sectional case-control study, eyes of patients > 18 years of age who presented with asymmetric preoperative MRD1 >1mm and underwent MMCR surgery were included. Eyes were segregated into 2 groups: 1) Cases that underwent MMCR surgery with a fixed resection length of 7 mm (standard group); 2) Cases underwent MMCR surgery with a 4:1 ratio of resection length (variable group). Eyes were matched from the standard group to the variable group with the respect to age (within 10 years) in a 2:1 ratio. MRD1 was measured digitally from pre- and postoperative photographs. Primary outcome measure was postoperative absolute symmetry, defined both linearly and as dichotomous symmetry, defined as final absolute symmetry to <1mm difference in MRD1 between the eyes. Secondary outcome measures were final MRD1 and change in MRD1. Multiple linear regression and logistic regression analyses were conducted to predict post-op symmetry as a function of symmetric vs. asymmetric resection as well as pre-op difference in MRD1.

Results: Eighty six eyes from forty three patients with 34 eyes from 17 patients in the standard group and 52 eyes from 26 patients in the variable group were included. There were no significant preoperative differences between two groups in term of mean (SD) age [70.4 (11.75) vs 66.4 (11.13) years; p=0.44], preoperative MRD1 (1.09 vs 1.20 mm; p=0.77) nor preoperative difference in MRD1 (1.66 vs 1.40mm; p=0.12). No significant differences in postoperative MRD1, change in MRD1 and difference postoperative MRD1 between groups were noted (2.48 vs 2.85 mm; p=0.47, 1.39 vs 1.64 mm; p=0.12 and 1.03 vs 0.67 mm; p=0.51).

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Regression analysis found that neither the method of surgery (symmetric vs. asymmetric resection, $P > 0.05$), nor the pre-operative difference in MRD1 ($P > 0.05$) were significantly related to a postoperative outcome of symmetry. Similar results were achieved in the logistic regression model on symmetry outcome <1mm. The accuracy of this model was found to be 70.6% and was consistent whether tested in those patients who achieved postoperative symmetry (n=36) or asymmetry (n=15).

Conclusions: Our study did not demonstrate a meaningful difference in postoperative symmetry outcome between a standard (7mm) and variable (4:1) resection length algorithm for MMCR in asymmetric ptosis.

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103 – The “Forgotten” Lid-Sharing Procedure: Revisiting the Lower Eyelid Pedicle Flap for Large Full-Thickness Upper Eyelid Defects

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Introduction: We are very familiar with performing Hughes procedures fairly commonly, and occasionally performing a Cutler-Beard procedure. Sometimes, for near total upper eyelid reconstruction, a Cutler-Beard procedure may not be the best option; the largest shortcoming being an absence of lashes and possibly an unstable eyelid. Although illustrated in our literature, a rotational pedical from the lower eyelid into the upper eyelid seems to be underutilized for reconstruction of greater than 50% upper eyelid defects. This presentation will demonstrate the first stage and important nuances of second stage reconstruction of modified rotational pedicle flaps form the lower eyelid to the upper eyelid with detailed photos of 3 cases in a series of patients.

Methods: Three patients are reported who had carcinomas resected from their upper eyelid, resulting in a greater than 50% defect. Two patients had large medial defects where upper eyelid modified Tenzel procedures were first performed prior to immediately advancing a rotational full thickness pedicle flap from the lower eyelid into the created lateral eyelid defect; effectively restoring the lash line across the entire upper eyelid. The third patient had a large lateral right upper eyelid defect. In her case a rotational full thickness pedicle flap from the lateral right lower eyelid was shared with the upper eyelid.

Results: In all three cases, a second stage procedure was performed 4 weeks later, restoring more normal eyelid function and acceptable eyelid appearance.

Conclusions: Sharing the full thickness lateral lower eyelid as a rotational pedicle to repair greater than 50% full thickness upper eyelid defects is an effective and reliable way to perform reconstruction with some advantages over a Cutler-Beard procedure. This can be combined with a modified Tenzel procedure in the first stage for larger medial upper eyelid defects and there are nuances to the second stage that can improve long term results.

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Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

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104 – The Clinical Spectrum of Periorbital Vascular Complications after Facial Filler Injections

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Introduction: To report clinical features of vascular complications after cosmetic facial filler injections.

Methods: Clinical data of 6 patients who had occlusion of the ophthalmic artery or its branches after facial filler injections were reviewed.

Results: Injected materials were hyaluronic acid in all cases. Injection sites included the glabellar region (3cases) and nasal dorsum (3cases). Four patients had blindness caused by central (3cases) or branch (1case) retinal artery occlusion. Four had ptosis and ophthalmoplegia, but recovered within 3months. All had skin discoloration and blister, but recovered within 4months. One had phthisis bulbi which was cosmetically managed by retrobulbar filler injection.

Conclusions: Cosmetic facial filler injections can cause periorbital artery occlusion, and the clinical features are diverse according to the location and extent of obstruction. Visual prognosis is poor in most cases while the other complications can be recovered with supportive treatment.

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105 – The Effect of a Points System on Incentivizing Academic Behaviors of Attending Ophthalmologists

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Introduction: To evaluate the effect of a monetary points system on incentivizing academic accomplishments such as research output, mentorship, and administrative responsibilities in ophthalmology attendings.

Methods: A points system was implemented starting in the 2017 academic year (July 1, 2016 – June 30, 2017) in which ophthalmology attendings were able to accrue points for eight categories of academic achievement (mentorship, publications, research, administrative activities, educational activities, extramural professional activities, honors/awards, and philanthropy). Differing amounts of points could be obtained depending on difficulty of achievement; points were then converted to an end of year monetary bonus.

We retrospectively reviewed the publications of fifteen ophthalmology attendings in the PubMed database. We compared the overall number of publications, number of first/senior author publications, and corresponding impact factors of journals in the two years of data before the incentivized system was implemented with two years of data afterwards. We also analyzed tracked points awarded to ophthalmologists for eight categories of academic achievement in the first and second year of the points program (AY-2017 and AY-2018). Two tailed paired t-tests were used to compare differences in publication rate and points accrued between years among ophthalmology attendings.

Results: There was no significant change in the number of publications, number of first/senior author publications, or impact factor of manuscripts for attending ophthalmologists after the institution of the points system. However, there was significantly more involvement in mentorship, administrative, and extramural activities from academic year 2017 to academic year 2018 as shown in figure 1. Mean points awarded for mentorship increased from 1.19 to 5.88 ($t=3.820$; $p<0.01$), mean points awarded for administrative activities increased from 11.44 to 14.88 ($t=3.29$; $p<0.01$), and mean points awarded for extramural professional activities increased from 3.63 to 4.38 ($t=2.54$; $p=0.02$).

Conclusions: Implementation of the monetary points based program did not result in any significant change in the research activity of attending ophthalmologists. The points program did however lead to an increase in mentorship, administrative, and extramural professional activities.

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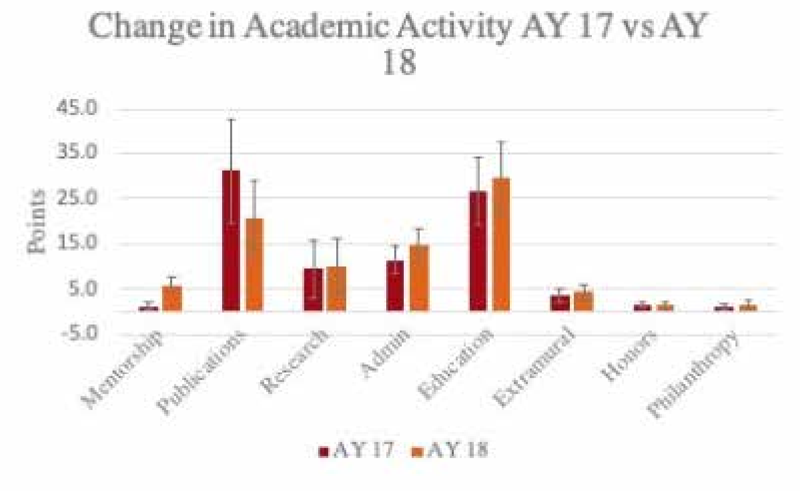
Figure 1



106 – The Effect of Early Postoperative Swelling on Change in Upper Eyelid Position after External Levator Resection and Blepharoplasty

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Introduction: The final outcomes of external levator resection (ELR) and upper blepharoplasty can be difficult to predict in the early postoperative period due to swelling. The purpose of this study was to determine if early postoperative swelling has an effect on change in upper eyelid position after either ELR or blepharoplasty.

Methods: In this observational cohort study, two groups of patients >18 years old were identified: those who underwent ELR or upper blepharoplasty. Patients were excluded if they were [1] Patient photographs were evaluated by 10 experts and 16 professional image graders, and based on previous analysis these were combined into a single mean score for each time point. The primary outcome measure was change in MRD1 from preoperative visit to POM3. The secondary outcome measure was change in MRD1 from POW1 to POM3. The data was analyzed using linear regression models.

Results: The sample consisted of 54 patients, which included 31 (57.4%) women and 23 (42.6%) men with mean (SD) age of 68.4 (8.7) years. There were 25 patients in the ELR group and 29 in the blepharoplasty group. Regression on change in MRD1 from preoperative visit to POM3 including POW1 swelling score and surgery type as variables found neither swelling ($p = 0.07$) nor surgery type ($p = 0.3$) to be significant predictors ($R^2 = 0.08$). Regression on change in MRD1 from POW1 to POM3 including POW1 swelling score and surgery type as variables ($R^2 = 0.1$) found swelling to be a significant positive predictor ($p = 0.03$), with a one unit increase in swelling score corresponding to a 0.35 mm increase in MRD1. However, surgery type was not a significant predictor ($p = 0.2$).

Conclusions: Early postoperative swelling does not affect the final outcome of ELR or upper blepharoplasty, though patients with more early postoperative swelling can expect greater improvement in eyelid position at late follow-up. These results have implications for counseling patients at the early postoperative visit and planning for revision surgery if needed.

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Figure 1

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107 – The Effect of Meshed Acellular Dermal Allograft as a Lining Material after Orbital Exenteration

Ji woong Park, Jung-Hoon Kim, Kyung In Woo, Yoon-Duck Kim
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Introduction: Orbital exenteration is a radical procedure that involves the removal of the contents of the orbit. Reconstruction of the exenterated socket can be accomplished in several ways, including spontaneous granulation, partial-thickness or full-thickness skin grafts. Acellular dermal allograft is a good option for treating major burns to prevent scar formation, it can be made into a mesh graft to allow the graft to contour to the orbit without overlapping and fluid accumulation. We have used meshed acellular dermal allograft as a lining material after orbital exenteration in 14 patients and evaluated the efficacy and safety.

Methods: Fourteen patients who underwent orbital exenteration using meshed acellular dermal allograft from 2009 to 2018 were collected. Outcome measures included the rate of epithelization and complications.

Results: Mean age at operation was 69.1 years. Indication for surgery was malignancy in all patients. Mean follow-up period was 12.1 months. Full or nearly full-epithelization occurred in 10 of 14 patients (71.4%) at 1 month, and 9 of 12 patients (75.0%) at 3 months. There was delayed epithelization in 3 patients (2 adjuvant radiotherapy, 1 poor wound care). There was no serious complication related to the graft, but there was a fungal infection (Aspergillus) 18 months after operation and improved without any complications after oral antifungal therapy.

Conclusions: Meshed acellular dermal allograft may allow for more rapid healing of the socket than spontaneous granulation while obviating the need to harvest split-thickness skin from a secondary donor. It can be a good substitute for split-thickness skin graft after orbital exenteration.

Figure 1

(A) Intra-operative (B) 2 weeks post-operative (C) 1 month post-operative

Figure 1. Intraoperative and postoperative view of a 82-year-old man with a squamous cell carcinoma of eyelid who underwent total exenteration using meshed acellular dermal allograft

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108 – The Effect of Sleep Position Preference on Periorbital Symmetry

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Introduction: Periorbital structures such as the eyebrow and eyelid play key roles in visual function and aesthetic appearance. Sleep position preference has been shown to have a significant correlation with facial aging and symmetry in previous studies[1]. The effect of sleep position on the eyelids and eyebrow position has not been evaluated, however. Knowledge of the effect of sleep position on these characteristics is crucial to understanding patients' baseline eyelid and eyebrow characteristics, surgical planning, and maximizing post-operative results. This study investigates the relationship between patients' sleep position preference and the degree of eyebrow ptosis, eyelid ptosis, and upper eyelid dermatochalasis.

Methods: A prospective study of consecutive patients visiting an academic ophthalmology clinic was conducted in compliance with the Institutional Review Board. Eligibility criteria included the absence of any periocular-altering trauma, surgery, or disease process. Previous contact lens use resulted in exclusion from the study. Study participants were given a questionnaire to ascertain their sleep position preference. Standardized digital photographs of patients were obtained and Image J software was used to obtain positional measurements for periorbital structures. Upper and lower eyelid ptosis, upper eyelid dermatochalasis, and eyebrow ptosis were assessed by the following image measurements: the distance from the pupil centroid to the upper eyelid margin (MRD1; marginal reflex distance 1), the pupil centroid to the lower eyelid margin (MRD2; marginal reflex distance 2), the upper eyelid margin to the visible upper eyelid skin fold (TPS; tarsal platform show), and the pupil centroid to the superior limit of the central eyebrow (BP; brow position) (Figure 1). Standard corneal limbus-to-limbus distance was used to convert measurements into millimeters[2]. These results were then compared to the patient reported sleep position preference to determine correlation.

Results: A total of 71 patients satisfied the selection criteria, of which 28 patients preferred sleeping on the right side, 24 patients preferred left side, 13 patients preferred sleeping on both sides, and 6 patients preferred sleeping supine (Table 1). Five patients who preferred prone sleep position were not included in the analysis. Patients with either right or left sleep side preference demonstrated significantly lower MRD1 image measurements for the side on which they customarily sleep. No significant differences were seen in other image measurements among patients with sleep side preference. Patients without sleep side preference had no significant differences between right and left periorbital image measurements (Table 2). A higher degree of upper eyelid symmetry was observed among patients without sleep side preference (Table 3).

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Conclusions: These results suggest that patients with a predominant sleep side preference demonstrate a significant ipsilateral increase in upper eyelid ptosis and upper eyelid height asymmetry. There were no differences noted in lower eyelid position, central eyebrow position, or amount of upper eyelid dermatochalasis.

Figure 1

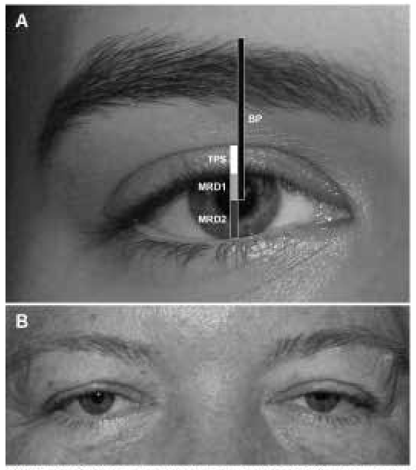

Figure 1. (A) Image measurements include MRD1, marginal reflex distance 1; MRD2, marginal reflex distance 2; BP, Brow position; TPS, tarsal platform show. (B) A patient with left-side sleep preference demonstrating left greater than right upper eyelid ptosis.

Table 1

Table 1. Patient Demographic

	Sleep Side Preference			
	With Sleep Side		Without Sleep Side	
	Right-sided (n=28)	Left-sided (n=24)	Both Sides (n=13)	Supine (n=6)
Age (Mean, years)	58 ± 15	54 ± 17	58 ± 21	61 ± 9
Sleep Duration (Mean, hours)	6.8 ± 1.1	7.1 ± 1.0	7.2 ± 1.4	7.3 ± 0.8
Gender				
Female	18	12	5	5
Male	10	12	8	1

Table 2

Table 2. Image Measurements in Patients with or without Sleep Side Preference

Image Measurements (Mean ± SD, mm)		Sleep Side Preference			
		With Sleep Side (n=52)	P-value	Without Sleep Side (n=19)	P-value
MRD1	Sleep Side	3.34 ± 1.21	**0.0004**	3.78 ±1.36	0.72
	Non-Sleep Side	3.64 ± 1.12		3.75 ± 1.47	
MRD2	Sleep Side	5.74 ± 1.11	0.37	6.15 ± 0.68	0.22
	Non-Sleep Side	5.65 ± 0.97		5.98 ± 0.62	
BP	Sleep Side	23.07 ± 4.82	0.98	22.11 ± 2.85	0.99
	Non-Sleep Side	23.08 ± 4.45		22.11 ± 3.62	
TPS	Sleep Side	3.66 ± 2.42	0.59	2.98 ± 1.74	0.35
	Non-Sleep Side	3.56 ± 2.39		3.18 ± 1.72	

MRD1, marginal reflex distance 1; MRD2, marginal reflex distance 2; BP, Brow position; TPS, tarsal platform show
SD = Standard Deviation
***Bold** indicates statistical significance (p-value calculated using paired *t* test)

Table 3

Table 3. Degree of Symmetry Measured by Difference in Image Measurements

Image Measurements Difference (Mean ± SD, mm)	Sleep Side Preference		
	With Sleep Side (n=52)	Without Sleep Side (n=19)	P-value
MRD1	0.52 ± 0.40	0.29 ± 0.27	**0.02**
MRD2	0.39 ± 0.54	0.43 ± 0.44	0.79
BP	1.81 ± 1.74	1.45 ± 1.16	0.99
TPS	1.01 ± 0.76	0.70 ± 0.59	0.35

MRD1, marginal reflex distance 1; MRD2, marginal reflex distance 2; BP, Brow position; TPS, tarsal platform show
SD = Standard Deviation
***Bold** indicates statistical significance (p-value calculated using paired *t* test)

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109 – The Natural History of Ocular Surface Disease Changes in Thyroid Eye Disease

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Introduction: Ocular discomfort is a common complaint that affects up to 85% of Thyroid Eye Disease (TED) patients. Dry eye in TED is multifactorial, involving inflammatory, mechanical and biophysical processes, both individually and in an overlapping fashion. The purpose of this study is to understand the relationship between the natural history, physical findings and the severity of dry eye symptomatology in TED.

Methods: In this single institution prospective cohort study, all TED patients managed by a single clinician over a 2-year period were assessed in a standard fashion. Those with an alternate diagnosis, previous surgery and/or current systemic steroid use were excluded. Data of interest collected at baseline visit included clinical activity score (CAS), time since onset of disease, punctate epithelial erosions (PEE), lagophthlamos, evidence of superior limbic keratoconjunctivitis (SLK) by lissamine staining and marginal reflex distance (MRD1) measurements. The Ocular Surface Disease Index (OSDI) instrument was utilized as a measure of ocular surface disease symptomatology. Score greater than or equal to 33 (severe) was defined as the primary outcome measure. A multivariate logistic regression was performed on two groups (less than 9 months and over 9 months) to assess association of clinical variables to change in OSDI scores in the early and stable stages of disease. The model was defined to include the following a-priori defined variables: sex, age, CAS, presence of lagophthlamos, presence of PEE, presence of SLK and MRD1.

Results: Of the assessed patients, 88 met inclusion and exclusion criteria. Of the sample, 80.7% (n=71) were female and mean (SD) age was 50.6 years (16.3). There were 42 patients in the group with onset of symptoms under nine months and 46 patients over nine months. There were no significant differences between the groups in age, sex, prevalence of PEE, lagophthalmos or SLK. Mean CAS score was greater under 9 months (2.45) than over 9 months (1.29) ($p<0.05$).

In multiple logistic regression for the group with under 9 months from onset of symptoms, CAS was found to be the only significant predictor of severe OSDI score. Every increase in CAS of 1 yielded a 2.0x increased risk of severe of OSDI score (table 1). For the patients over 9 months from onset of symptoms, PEE was found to be the only significant predictor of severe OSDI. The presence of PEE was associated with a 5.9x increased risk of severe OSDI score (Table 2).

Conclusions: Ocular surface disease correlates with inflammatory signs experienced by TED patients within the first 9 months. After 9 months, the CAS was no longer predictive of OSDI severity, whereas the presence of PEE became a more important predictor. Dry eye symptoms in TED are multifactorial, and tend to be a manifestation of inflammation early in the disease and exposure later.
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Figure 1

Table 1: logistic regression model on to severe Ocular Surface Disease Index (OSDI) score (≥33) for subjects with onset of symptoms to presentation less than 9 months.

	P-VALUE	ODDS RATIO
Sex	0.294	0.220
Age	0.853	0.995
CAS score	0.034*	2.018
Any lagophthalmos	0.609	1.760
Any PEE	0.996	0.995
Any SLK	0.834	0.713
Mean MRD1	0.800	0.905

‡ CAS: clinical activity score, PEE: punctate epithelial erosions, SLK: superior limbic keratoconjunctivitis, MRD1: marginal reflex distance

Figure 2

Table 2: logistic regression model on to severe Ocular Surface Disease Index (OSDI) score (≥33) for subjects with onset of symptoms to presentation greater than 9 months.

	P-VALUE	ODDS RATIO
Sex	0.253	0.336
Age	0.441	1.021
CAS score	0.249	1.533
Any lagophthalmos	0.604	1.540
Any PEE	0.029*	5.886
Any SLK	0.943	1.127
Mean MRD1	0.179	0.725

‡ CAS: clinical activity score, PEE: punctate epithelial erosions, SLK: superior limbic keratoconjunctivitis, MRD1: marginal reflex distance

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110 – The Negative Impact of Thyroid Eye Disease on Social Perception

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Introduction: Thyroid eye disease (TED) can significantly affect a patient's quality of life by changing their visual function and appearance. Most studies supporting this observation have used self-reported measures by the patients. We aim to expand our understanding of the impact of TED on lay observers' facial perception and social perception.

Methods: This is a prospective, randomized, controlled experiment. One hundred casual observers were recruited to view the frontal facial photographs of seventeen patients with varying severity of TED and five control patients without TED. Observers rated the overall attractiveness and affect of each patient, as well as appearance of the eyes. In addition, observers were asked to rate their own level of comfort conversing with the person, and to predict the person's health status, difficulty at making friends, degree of social isolation, and how likely they are to have an unpleasant reaction to his/her facial appearance.

Results: Patients with moderate to severe TED were rated as less attractive by observers. On a 10-point scale, they were rated on average -1.0 (95% confidence interval [CI]: -1.4, -0.6) or -2.4 (95% CI: -2.9, -2.0) points less attractive, respectively. Clinical factors that negatively impacted perceived attractiveness include greater upper or lower eyelid retraction (-0.6; 95% CI: -0.8, -0.4), conjunctival injection (-1.5; 95% CI: -1.9, -1.1), conjunctival chemosis (-1.7; 95% CI: -2.2, -1.3), proptosis (-0.2, 95% CI: -0.25, -0.15), and severity of strabismus (-0.04; 95% CI: -0.06, -0.03). Patients with mild TED were rated as having slightly improved affect (0.48; 95% CI: 0.12, 0.84), while those with moderate (-0.56; 95% CI: -0.91, -0.23) or severe (-0.93; 95% CI: -1.35, -0.52) TED were rated as having worse affect. Perceived attractiveness, affect, eye appearance, health status, difficulty at making friends, social isolation, unpleasant reaction, and conversational discomfort were found to be highly correlated with one another. Iterative principal components analysis was performed and the following 4 psychosocial factors were used to create a "negative facial perception" variable: perceived eye appearance, difficulty at making friends, social isolation and unpleasant reaction. Mixed effects regression using this composite variable showed that patients with severe TED have on average an 11.7 standard deviation increase in their negative facial perception compared with control patients ($p < 0.001$).

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Conclusions: Patients with moderate to severe TED are perceived by observers to be significantly less attractive, have more negative affect, lower health status, more difficulty in making friends, more social isolation, and receive unpleasant reaction from others. Observers also feel less comfortable having a conversation with patients with TED. In summary, this study solidifies the measurable and significantly negative impact moderate to severe TED has on the social perception of the affected patients.

111 – The Post-levator Implantation Slim Model Gold Weight Design for Paralytic Lagophthalmos

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Introduction: To evaluate the outcomes of newly designed gold weight for treatment of paralytic lagophthalmos in patients with previously exposed gold weights.

Methods: The slim model gold weight was designed for post-levator implantation based on an average dimension minus 2 standard deviation (mean-2SD) of eyelid anatomy of 50 eyelids from 25 Asian cadavers with sickle shape tarsus. It is semi-elliptical shape with the widest base length of 22.4 mm and the height of 8.8 mm. Medical records of facial palsy patients with exposed/impending exposed gold weight implant underwent implant removal with concurrent slim model gold weight implantation were reviewed. Preoperative and 6 month post-operative standard photographs were evaluate for eyelid positions, eyelid contour and lagophthalmos.

Results: Eight facial palsy patients who underwent weight removal due to extrusion with concurrent placement of slim model gold weight in the post-levator plane were included in the study. The average age was 66±9.9 years with 2 males and 6 females. The mean pre-operative MRD1 of the operated and the normal eyelid was 0.3±1.8 mm and 4.1±0.8 mm respectively. The primary cause of the low MRD preoperatively was poor eyelid contour due to the exposed implant. The mean MRD1 of patients after slim model gold weight implantation eye was 3.1±0.9 mm with 0.6±0.6 mm lagophthalmos. All patients had excellent eyelid contour after implantation of the slim model implant in the plane beneath the levator aponeurosis. There were no complications.

Conclusions: The slim model gold weight shows good functional and aesthetic outcome in Asian eye with exposed standard gold weight implant.

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Figure 1. 48 year old female with standard pretarsal weight (left). After removal of traditional weight and placement of thin post-levator weight (right).

Figure 2. 55 year old female with standard pretarsal weight (left). After removal of traditional weight and placement of thin post-levator weight (right).

Figure 3. Example of thin gold weight prior to implantation.

112 – The Utility of Diffusion Weighted Imaging by Oculoplastic Surgeons to Differentiate Benign and Malignant Solid Orbital Tumors

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Introduction: We aim to establish the utility of apparent diffusion coefficients (ADC) of diffusion weighted imaging (DWI) by oculoplastic surgeons in the clinic setting to differentiate benign and malignant solid orbital tumors, and seek to validate ADC cut-off values observed in literature.

Methods: This study is a single-institution, retrospective chart review of patients who have benign or malignant biopsy-confirmed solid orbital tumors, and brain MRIs. Patients who did not have DWI/ADC imaging and tumors smaller than 1 cm were excluded. Two oculoplastic surgeons and one medical student were instructed to locate and measure orbital tumor ADC values (10^{-6} mm^2/s) using the region of interest (ROI) tool. Readers were blinded to tumor diagnosis and patient history. The tumors were independently located and ADC values were obtained using the ROI single slice method. Statistical significance of descriptive variables were calculated using one-way ANOVA and Student's t-tests, receiver operating characteristic curves were calculated to optimize ADC cut-off values, and inter-rater reliability was assessed using intra-class correlations (ICC).

Results: Twenty-nine orbital tumor cases met our inclusion criteria. There were 6 benign tumors and 23 malignant tumors; lymphoma was the most common type of tumor (14 cases, mean ADC 608.04, SD 297.78). Mean ADC values for benign orbital tumors were 1612.55 (SD 592.49), and 752.01 (SD 208.75) for malignant tumors. There was no significant association between ADC values and age, sex, BMI, steroid use, radiation treatment, and chemotherapy. Our calculated optimized ADC cut-off to differentiate benign and malignant orbital tumors was 1221.88 10^{-6} mm^2/s (sensitivity 83.34, specificity 100%, LR- = 0.17). Inter-rater reproducibility was excellent (ICC 0.88, 95% CI [0.77-0.94]). Compared to calculated ADC cut-off values, our three readers had a combined accuracy of 93.6% (100%, 100%, 80.7%).

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Conclusions: This is the first study validate ADC values for the characterization of orbital tumors with non-radiologists. Without priming readers with location instructions or patient characteristics, most tumors were correctly described at the surgeon and medical student level. Our ADC cut-off of 1221.88 10^{-6} mm^2/s for benign and malignant solid orbital tumors agree with previously established values in literature. Our results show that oculoplastic surgeons can use ADC measurements to accurately differentiate benign and malignant solid orbital tumors. Our study speaks to the robust nature of ADC values, given its generalizability to novice readers and its reliability across multiple MRI vendors. We advocate for the inclusion of ADC and DWI sequences in the imaging of orbital lesions, as this tool provides a quick method to characterize solid orbital tumors in the clinical setting, and can help guide patient-physician discussions regarding decision to biopsy vs serial observation.

Table 1

Table 1. Descriptive Summary of ADC Values of Malignant and Benign Solid Orbital Tumors, Oculoplastics Reader 1 (x 10^{-6} mm^2/s)

Type of Mass	Number	ADC (mean and SD)	ADC (minimum)	ADC (maximum)
Lymphoma	14	608.04 ± 297.78	476.12	1108.73
Cavernous Hemangioma	2	1231.83 ± 14.07	1221.88	1241.78
Meningioma	2	664.92 ± 37.35	638.51	691.33
Rhabdomyosarcoma	2	888.13 ± 97.60	819.12	957.14
Adenocarcinoma	1	1082.12	-	-
Neurofibroma	1	1869.29	-	-
Plasma Cell Neoplasm	1	989.09	-	-
Pleomorphic Adenoma	1	1635.46	-	-
Pleomorphic Sarcoma (Mixed)	1	1210.00	-	-
Prolactinoma	1	844.26	-	-
Sarcoidosis	1	1052.62	-	-
Schwannoma	1	2654.26	-	-
Solitary Fibrous Tumor	1	474.90	-	-
Transitional cell carcinoma	1	875.87	-	-

Note: There were 6 benign and 23 malignant pathology cases. Two cases of meningioma, one case of prolactinoma and one case of solitary fibrous tumor that were included in the malignant category due to atypical features and management in accordance with malignant tumors.

Table 2

Table 2. Benign vs Malignant Orbital Tumors by ADC (x 10^{-6} mm^2/s)

Oculoplastics Reader 1	**Mean (SD)**
Benign	1612.55 ± 592.49
Malignant	752.01 ± 208.75
Oculoplastics Reader 2	**Mean (SD)**
Benign	1166.08 ± 787.40
Malignant	1007.62 ± 443.16
Medical Student Reader	**Mean (SD)**
Benign	1623.26 ± 501.08
Malignant	809.70 ± 193.76

Note: There were 6 benign and 23 malignant pathology cases. Two cases of meningioma, one case of prolactinoma and one case of solitary fibrous tumor that were included in the malignant category due to atypical features and management in accordance with malignant tumors.

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113 – Thyroid Eye Disease in India: Demographic and Clinical Profile of 1000 Consecutive Patients

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Introduction: To report the demographic and clinical profile of Thyroid Eye Disease (TED)presenting to a Tertiary Eye Care Institute in India.

Methods: All patients who were diagnosed to have Thyroid Eye Disease (TED) between theyear 2007-2017 at the Ophthalmic Plastic Surgery service, at a Tertiary Eye Care Institute in India were included in this retrospective observational study. The demographic details of parameters such asage, gender and laterality, presenting signs and symptoms, clinical activity score (CAS) atpresentation, and systemic thyroid status were assessed.

Results: A total of 1000 consecutive patients of TED were evaluated in the 10-year period.Average age at presentation was 44.9 years (range 8-89), 529 (53%) were males, and 358 (36%) had unilateral TED. Systemic thyroid status (n=913) showed 342 (37%) wereEuthyroid atpresentation. Of the patients who were active at presentation (n=476), 141 (29.7%) wereclinically active (CAS > 4) and 335 (70.3%) were silent presenters (disease onset < 12 months, but CAS < 3). Dysthyroid optic neuropathy was noted in 71 (7%) cases. A prominent eye wasthe most common presenting symptom (64%). Presenting signs included proptosis (58%), lowerlid retraction (49%), upper lid retraction (48%), diplopia (6%), ptosis (5.6%), and microbial keratitis (1.3%).

Conclusions: TED in India presents to the tertiary eye center at a younger age, with slight male preponderance. One-third (37%) areEuthyroid and half (48%) are clinically active atpresentation. Of the active TED patients, 70.3% were silent presenters, and ptosis was a unique presenting sign noted in 5% cases.

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114 – Tissue Inflammatory Responses to Hyaluronic Acid Filler: Restylane, Belotero, and Juvederm

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Introduction: Hyaluronic acid (HA) is a glycosaminoglycan consisting of repeating units of the D-glucuronic acid and N-acetyl-D-glucosamine. It is an essential component of the dermis extra-cellular matrix, and its structure is reportedly identical across species, therefore it is considered a low immunogenicity product[1]. Despite this, there are many cases in the literature detailing immediate and late onset nodules and granulomas in patients treated with hyaluronic acid intra-dermal injectables[2]. Previous studies have reported on the histology and persistence of various filler materials[3,4]. The objective of this study was to compare the histological characteristics and histopathologic responses to three different brands of hyaluronic acid intra-dermal injections.

Methods: Three different brands of HA gel dermal filler (Restylane®, Belotero Balance®, Juvederm® Ultra XC) were injected into the retroauricular dermis of three healthy human volunteers (age range 18 to 22). One month after injection, skin punch biopsy was performed. Histopathology [hematoxylin and eosin (H&E), periodic acid-Schiff (PAS), Alcian Blue, Table 1] and immunohistochemical markers of inflammation (CD3, CD20, CD68, Table 2) were examined.

Results: Three patients completed the study. All three patients demonstrated pseudocapsule formation with mild chronic inflammation as a reaction to at least one filler material (Table 1). Juvederm did not show pseudocapsule formation in any patient. Belotero was the only material to be associated with the presence of giant cells (Figure 1). Trends among inflammatory patterns and HA fillers varied from patient to patient rather than filler types. Patient 1 only had a mild reaction to one filler (Juvederm), while Patient 2 and 3 had a mild inflammatory response to all filler types. Patient 1 was a mixed infiltrate. Immunohistochemistry results are shown in Table 2. Patient 2 was CD68+ in one and CD3+ in another. Patient 3 had CD68+ cells in all samples and CD3+ in two. CD20+ cells were not identified in sufficient number to be considered positive in any sample.

Conclusions: Although HA fillers are described as inert materials, all three types (Restylane, Belotero, and Juvederm) in our study led to some degree of inflammatory response. Both Resylane and Belotero resulted in pseudocapsule formation, while Juvederm did not. Cellular characteristics and degree of response appear to segregate by patient, with some patients demonstrating greater inflammatory response than others. Filler material appears to be characterized variably by both inflammation and pseudocapsule formation.

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Figure 1

	Patient 1	Patient 2	Patient 3
H&E-R	Negative	Mild chronic inflammation but largely obscured by haemorrhage	Pseudocapsule Abundant polymorphs Chronic inflammation
H&E-B	Negative	Mild chronic inflammation. Single giant cell seen	Pseudocapsule Mild chronic inflammation
H&E-J	Negative	Chronic inflammation with few eosinophils and few plasma cells	Negative
PAS-R	Mild inflammation	Negative	Acute and chronic inflammation Pseudocapsule
PAS-B	Negative	Mild chronic inflammation Honeycomb appearance of filler. Pseudocapsule	Mild chronic inflammation
PAS-J	Negative	Minimal inflammation Pseudocapsule	Pseudocapsule Very mild chronic inflammation
Alcian Blue-R	Pseudocapsule Some material with and some without a pseudocapsule	Haemorrhage Negative	Acute and chronic inflammation Pseudocapsule
Alcian Blue-B	Negative	Pseudocapsule Mild haemorrhage Giant cells few Chronic inflammation	Dispersed filler material with pseudocapsule Few dispersed lymphocytes
Alcian Blue-J	Negative	Chronic inflammation No capsule	Less dispersed filler, smaller globules No or minimal inflammation

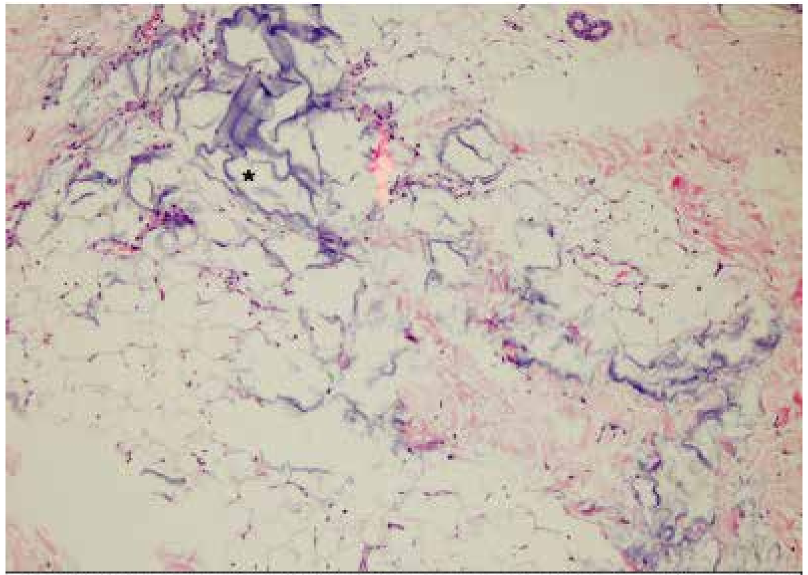
R = Restylane; B = Belotero; J = Juvederm

Figure 2

	Patient 1	Patient 2	Patient 3
CD68-R	Mild inflammation Negative	Negative	Moderate chronic inflammation Acute inflammation Macrophages Negative
CD68-B	Negative	Positive	Chronic inflammation Macrophages Negative
CD68-J	Negative	Negative	Few scattered macrophages Very mild chronic inflammation
CD3-R	Mild inflammation Distant T cells but not near the filler material	Mild chronic inflammation Positive	Positive T cells
CD3-B	Negative	Chronic Inflammation Weakly positive	Negative
CD3-J	Weakly positive Very few T cells seen	Chronic inflammation Weakly positive	Few T cells Weakly positive
CD20-R	Negative	Negative	Negative
CD20-B	Negative	Negative	Negative
CD20-J	Negative	Few B cells CD20 positive	Negative

R = Restylane; B = Belotero; J = Juvederm

Figure 3



H&E stain of Belotero tissue sample from Patient 2. Black asterisk represents HA filler and pink arrow denotes a giant cell.

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115 – T-Shaped Wedge Resection of the Upper Eyelid: An Alternative to the Pentagonal Wedge

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Introduction: This study describes a modified technique of the traditional pentagonal wedge resection in upper eyelid reconstruction which may result in improved cosmesis due to greater alignment of incisions with relaxed skin tension lines.

Methods: The surgical technique is described and a retrospective chart review of all patients who underwent the T-shaped wedge resection between June 1, 2011, and June 1, 2017, by three surgeons was performed. Technique: A horizontal eyelid crease incision is made across the upper eyelid skin. A rectangular full-thickness excision extending to the eyelid crease (and superior tarsal border) with an additional superior triangle of posterior lamellar excision is then performed. The anterior lamella above the eyelid crease is left intact and the eyelid crease incision is used to distribute the relative excess anterior lamellar tissue above the eyelid crease over the horizontally shortened tissue below the eyelid crease. (Figure 1)

Results: One hundred and four eyelids of 102 consecutive patients were included. Mean patient age was 57 and the procedure was performed on 49 right upper lids and 55 left upper lids. The indications for eyelid resection were benign lesions (n=57), basal cell carcinoma (n=27), trichiasis (n=15), and squamous cell carcinoma (n=3). Two patients experienced mild post-operative lagophthalmos. All patients were satisfied with their post-operative appearance. (Figure 2) None of the patients required reoperation related to the initial procedure.

Conclusions: The T-shaped wedge resection is an alternative to the traditionally described pentagonal wedge resection of the upper lid and may result in improved cosmesis by distributing the redundant tissue associated with a full thickness upper eyelid excision along the natural horizontal eyelid crease rather than into a vertical incision extending above the eyelid crease.[1-3] Other methods of avoiding the vertical scar above the eyelid crease have been described.[4-7] Although several surgeons have adopted the T-shaped wedge technique, its description has yet to appear in the peer-reviewed ophthalmic literature.[8]

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Figure 1

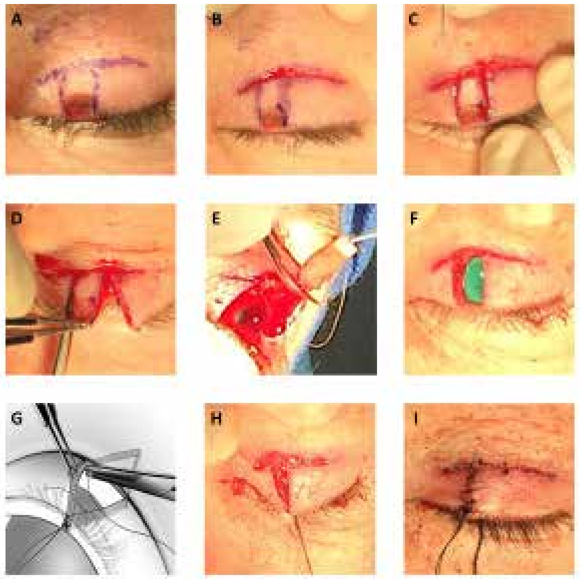

Figure 1. A. The eyelid crease is marked as well as two vertical lines flanking the lesion up to the crease. **B.** An eyelid crease incision is made. **C.** Vertical incisions are made through the skin flanking the lesion. **D.** Iris scissors are used to cut full-thickness through the eyelid up to the eyelid crease and superior tarsal border. **E.** Posteriorly, the dissection resembles the familiar pentagonal wedge. **F.** The defect following the rectangular wedge resection. **G.** A silk suture is passed though the eyelid margin and the eyelid is placed on downward traction to avoid septal incarceration. The tarsus is repaired with 6-0 polyglactin suture. **H.** The skin of the vertical incision is closed first. The longer skin above the eyelid crease is distributed evenly across the shorter skin below the crease. **I.** The completed T-shaped closure.

Figure 2

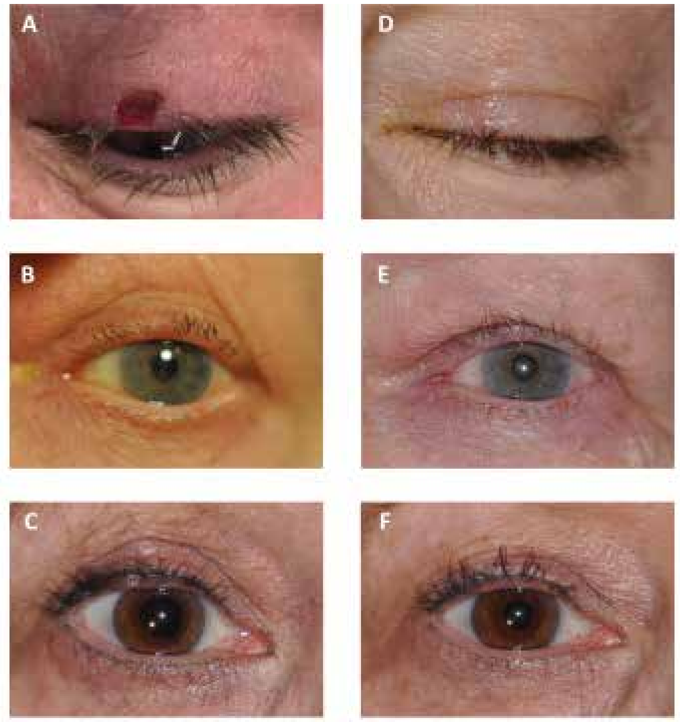

Figure 2. A, B ,and C. Three patients' upper eyelids prior to T-shaped wedge resection. **D, E, and F.** The appearance of the upper eyelid after repair. Note the preservation of the natural upper eyelid crease.

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116 – Ultrasound Biomicroscopy of the Lower Eyelid: Findings in Normal Eyelid and Involutional Entropion

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Ophthalmic Plastic Surgery Service, LV Prasad Eye Institute, Hyderabad, India

Introduction: To report ultrasound biomicroscopic features of lower eyelid structures in normal and patients with involutional entropion.

Methods: Thirty lower eyelids of 15 normal subjects underwent Ultrasound Biomicroscopy (Quantel 50 MHz) by two independent observers. Measurements were performed in the vertical mid-pupillary, limbal, and canthal plane. The tarsus, orbicularis muscle, capsulopalpebral fascia(CPF), and the retractor-conjunctiva complex were assessed for echogenicity and thickness.

Ten lower eyelids of 8 patients with involutional entropion were also subjected to UBM(Quantel 50 MHz) by the same imaging protocol, and compared to intraoperative findings noted by a single surgeon masked to UBM findings.

Results: Thirty lower lids of 15 normals (mean age 25 years) were evaluated. Fifteen (50%) were right lower eyelids, and 8 were males. Skin-orbicularis layer (layer 1) was hyperechoic; tarsus & CPF (layer 2) was hypoechoic and a continuous uniform layer. Glandular structure of Meibomian glands was identified in 100% cases. Retractor-conjunctiva complex (layer 3) was hyperechoic. Mean thickness of pretarsal orbicularis was 0.68mm ±0.18; pre-septal orbicularis 0.89mm ±0.16; tarsus 0.57mm ±0.12; CPF 0.42mm ± 0.13, & retractor-conjunctiva complex 0.79mm ±0.18. Anatomical differentiation was less useful in canthal region. Except for CPF ($p = 0.004$), the agreement between two observers for other measurements was within 0.05 mm.

There were ten eyelids of 8 patients with involutional entropion with the mean age of the patients 66.3 years. The mean thickness (in mm) of pretarsal orbicularis was 0.69±0.23, pre-septal orbicularis 1.01±0.31, tarsal plate 0.56±0.13, capsulopalpebral fascia 0.32±0.17 and retractor-conjunctiva complex was 0.74±0.20. The pre-tarsal orbicularis was noted to be thinner, with no muscle over-riding. Abnormality of retractor (dehiscence/dis-insertion) was picked up in 8 out of 10 eyelids on UBM.

Conclusions: Three lamellae of lower eyelid have distinct echogenicity on UBM. Mean measurements of lower eyelid anatomic landmarks are reported. UBM can predict abnormal retractor-tarsus interphase in 80% cases of involutional entropion. Overriding orbicularis does not occur in involutional entropion.

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Figure 1

Figure 2

Figure 3

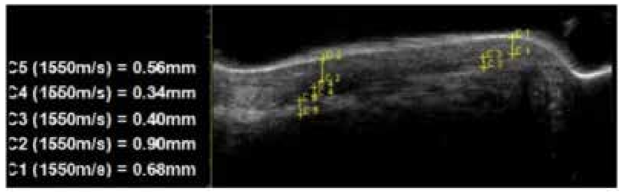
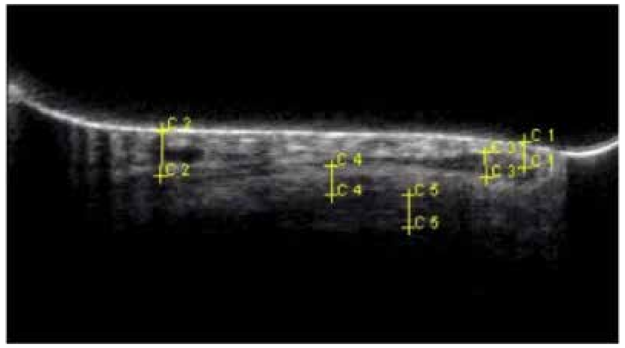


Figure 4



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117 – Vemurafenib in the Treatment of Orbital Erdheim-Chester Disease. A Review of Ophthalmic findings and Clinical Outcomes

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Introduction: Vemurafenib is a systemic drug that reverses vision loss by inhibiting the B-Raf enzymes in the cancer cells affected by orbital Erdheim-Chester Disease (OECD), a rare histiocytic disorder with poor historical visual and survival prognosis.[1] Despite prior reports of isolated cases of OECD and the use of vemurafenib, no studies have attempted to present the prevalence of ophthalmic manifestations in OECD and comparative analysis of the clinical outcomes by treatments. This study aims to present the ophthalmic findings, progression, and outcome comparison of vemurafenib (INN) to historical treatments (HT) in orbital Erdheim-Chester Disease (OECD).

Methods: All patients with OECD from the study institution were included. Authors searched literature published in the English language from Jan 1983 to Dec 2018 with ‘erdheim chester disease’ inclusive of the terms, ‘orbital,’ orbit,’ ‘eye,’ ‘eyelid,’ ‘retina,’ ‘chorioretinal,’ ‘pathogenesis,’ and ‘epidemiology.’

Results: Forty-two cases were identified. Mean logMAR visual acuity (VA) was 0.39 (SD=0.51). Proptosis (71%) and duction deficits (45%) were common presenting signs. Exam showed optic disc edema (33%), xanthelasma (26%), and subretinal changes (21%). Progression of optic neuropathy (5%), choroidal effusion (5%), and retinal neovascularization (5%) were seen despite treatment. Cardiac (33%) and intracranial (12%) involvements were observed. Overall mortality from OECD was 31%. VA changes were -177% in 14 HT cases and +18% in 5 INN cases (p=0.09). All INN cases showed regression of mass on imaging.

Conclusions: OECD presents with many ophthalmic findings. INN improves visual outcomes in patients with OECD.

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Table 1

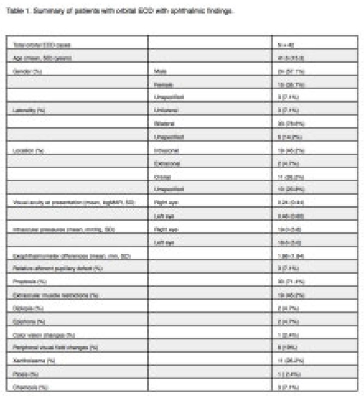
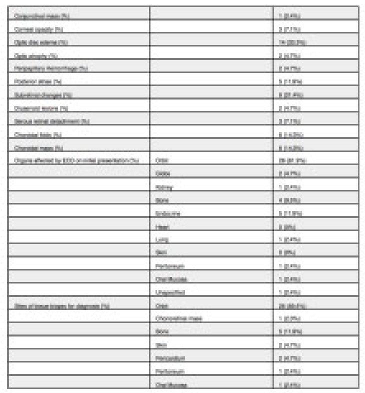
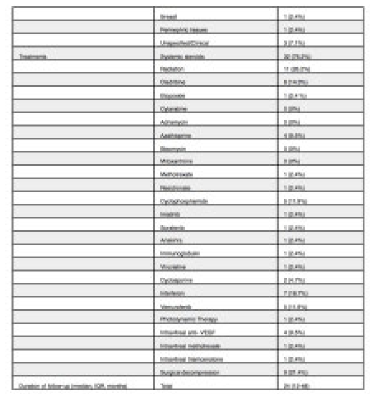


Table 1. Summary of patients with orbital ECD with ophthalmic findings.





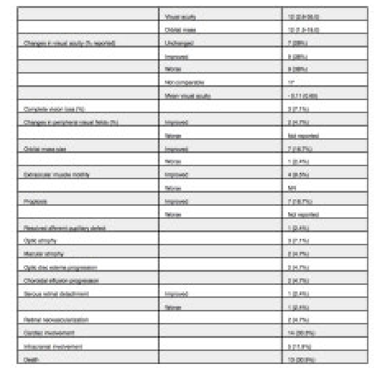


Table 2

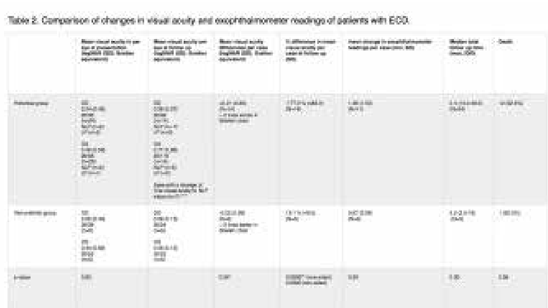


Table 2. Comparison of changes in visual acuity and exophthalmometer readings of patients with ECD.

* No statistical differences in the average visual acuity change in each eye between the vemurafenib group and the historical group after treatment (p-value >0.05).
** No statistical significance in the percent differences in average visual acuity change in each eye between the vemurafenib group and the historical group after treatment (p-value >0.05) using one-sided or two-sided exact Wilcoxon nonparametric test.
*** No statistical significance in the number of eyes with a change in final visual acuity to NLP vision between the vemurafenib group and the historical group after treatment (p-value >0.05). However, five out of seven eyes had 20/20 vision at presentation.

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118 – Visual Preservation via Optic Nerve Sheath Fenestration in Congenital Orbital Fibrosis

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Introduction: Congenital orbital fibrosis (COF) is an idiopathic, non-progressive, unilateral, congenital condition in which variable fibrosis is demonstrated in the orbit resulting in a constellation of findings including restrictive strabismus, upper eyelid malposition, and axial displacement of the globe[1-3]. We present a series of four patients with COF, review the factors affecting visual function, and describe improvement after optic nerve sheath fenestration for optic nerve edema in one of the patients.

Methods: Retrospective, interventional, non-comparative case series.

Results: Four male patients were identified with COF who presented at a mean age of 11 months (range 1-21 months). Two of our four patients presented with decreased ocular motility and gaze deviation of the affected eye. Globe displacement was variable: two patients presented with exophthalmos and one presented with enophthalmos. Two patients demonstrated ptosis and one presented with eyelid retraction. On MRI, three patients had fibrosis of the superior, medial and inferior rectus and superior oblique muscles (Figures 1 and 2). Two patients showed fibrosis of the lateral rectus and inferior oblique muscles. Exam revealed two patients with optic nerve atrophy and one with optic nerve edema (Figure 3). Three patients underwent orbitotomy and pathology was consistent with orbital fibrosis. Three patients demonstrated amblyopia, one of which showed excellent response to treatment. One patient underwent frontalis suspension for ptosis repair. To prevent optic nerve compromise and maintain visual function, the patient with papilledema underwent optic nerve sheath fenestration. Pre-operatively, the patient's visual acuity was 20/94 on the affected side. At two month follow-up, the patient's visual acuity and optic nerve edema were improved.

Conclusions: Visual outcomes in patients with congenital orbital fibrosis can be affected by amblyopia secondary to ocular misalignment, ptosis, and/or anisometropia, and optic atrophy[1-3]. Current literature, however, does not stress the significance of fundus examination and optic nerve evaluation in this patient population. It is of utmost importance that patients with COF undergo a complete ophthalmic exam as many of these factors are treatable. Amblyopia therapy should be instituted quickly in most patients, and strabismus and ptosis can be successfully treated to prevent visual decline. Although optic atrophy secondary to optic nerve compression may not be treatable, those patients with optic nerve edema may benefit from optic nerve sheath fenestration, as suggested by our patient. Prompt diagnosis and treatment will ensure a greater chance for visual preservation.

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Figure 1

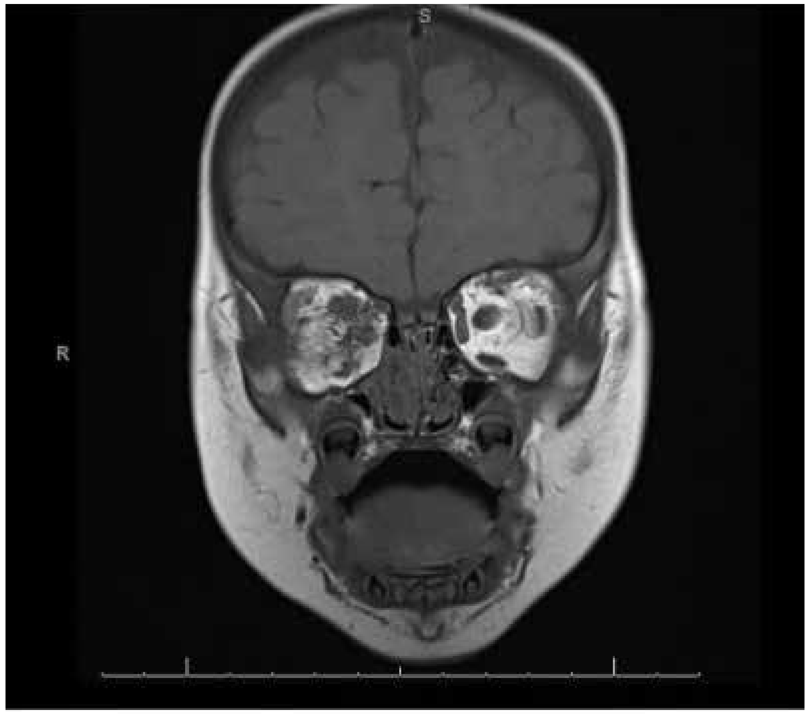


Figure 2

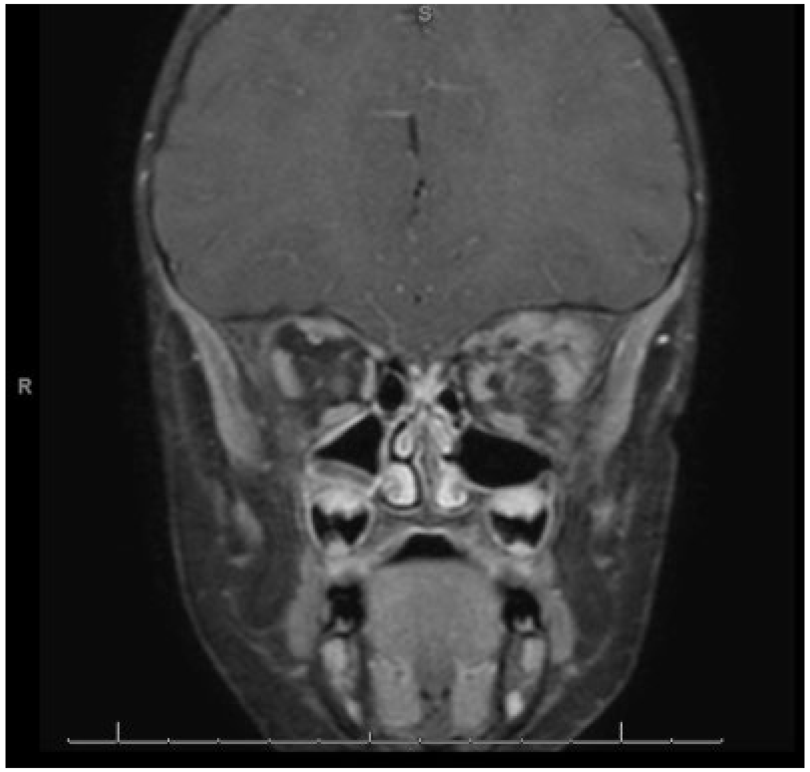
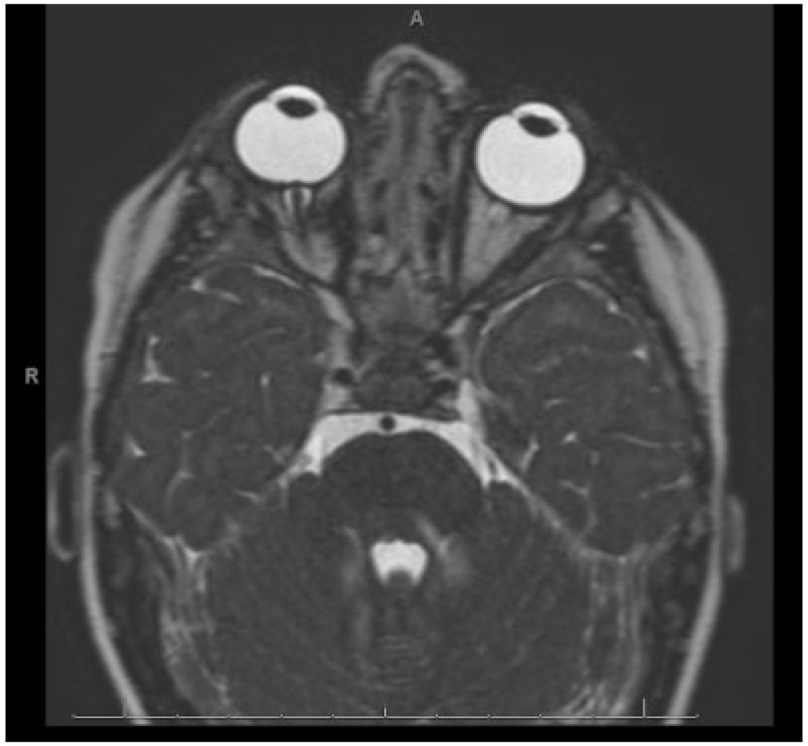


Figure 3



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119 – Wound Dehiscence Following Upper Blepharoplasty: A Review of 2376 Cases

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[1]TOC Eye and Face, Austin, Texas, United States of America, [2]Ophthalmology, University of Pittsburgh, Pittsburgh, Pennsylvania, United States of America

Introduction: There have been limited studies to evaluate specifically the incidence of wound dehiscence following isolated upper blepharoplasty.[1,2] We performed a large-scale review of patients who underwent upper blepharoplasty to evaluate the rate of wound dehiscence, assess risk factors and report management outcomes.

Methods: A retrospective review was performed of all patients who underwent upper blepharoplasty at a single surgery center by ASOPRS fellowship-trained eyelid surgeons from 2010 to the present. Patients were identified by CPT code, and pertinent demographic information, operative reports and clinical notes were analyzed. All upper blepharoplasty incisions were closed using either 6-0 fast-absorbing plain gut or polypropylene suture in a running fashion, with an additional single interrupted suture near the lateral wound edge. Those patients who underwent concomitant procedures, and those without post-operative follow-up, were excluded. Incidence of wound dehiscence was ascertained, and further assessed by patient age (≤ 67, or > 67), gender, and suture type. Results were analyzed using a two-proportion Z-test, with p-values < 0.05 considered statistically significant.

Results: A total 2615 patients (5226 eyelids) were identified who underwent bilateral upper blepharoplasty. Of these, 1190 patients (2376 eyelids) met inclusion criteria. Four underwent unilateral surgery and 1186 underwent bilateral surgery. Seventy percent had incisions closed with fast-absorbing plain gut suture and 30% were closed with polypropylene. Thirty-one patients with poor follow-up were excluded.

In total, there were 35 instances (1.5%) of wound dehiscence in 33 patients at an average 9 days (range 0-30 days) following surgery. These patients had an average age 66.3 years, and 50% were female. Two patients had bilateral wound dehiscence after an exertional activity. Thirty-two had incisions initially closed using 6-0 fast-absorbing plain gut suture, and 3 were closed using 6-0 polypropylene suture.

Seventeen patients with wound separation were observed for secondary healing, sixteen (94.1%) of whom healed with an acceptable cosmetic outcome. One patient underwent delayed scar revision at post-operative month 6. Fourteen patients with wound dehiscence were repaired primarily using suture, and three had wounds reapproximated with cyanoacrylate surgical skin adhesive. All patients reported satisfaction with final outcome.

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Evaluation of wound dehiscence rates by demographic factors revealed male gender to be a significant predictor of wound dehiscence ($p = 0.0046$). Age was not a predictor of wound dehiscence ($p = 0.6246$). Suture choice also influenced wound healing, with higher rate of wound dehiscence when fast-gut suture was used, as compared to polypropylene ($p = 0.0025$). Overall dehiscence rate by suture type was 3.9% and 0.6% for plain gut and polypropylene, respectively.

The other most common adverse events included allergic reaction to post-operative erythromycin ointment (1.5%, n = 18), inclusion cyst formation (1.3%, n = 15), and dry eye (0.3%, n = 4). Hypertrophic scarring (0.2%, n = 2), focal hematoma (0.2%, n = 2), infection (0.2%, n = 2) and lagophthalmos (< 0.1%, n = 1) were less commonly encountered. Nine patients (0.8%) were bothered by residual dermatochalasis, 8 of whom underwent revision surgery.

Conclusions: Isolated upper blepharoplasty carries a remarkably low overall complication rate. Wound dehiscence is rare, and more commonly seen in male patients and in those closed with fast-absorbing plain gut suture. Patients with wound separation may be successfully managed conservatively or with secondary repair.

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120 – Xenograft Skin Substitute (Porcine Urinary Bladder Extracellular Matrix) for Treatment of Periocular Skin Defects

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Introduction: Acellular allograft and xenograft skin substitutes complement traditional options, which include myo-cutaneous advancement flaps and skin autografts, for reconstruction of periocular anterior lamella defects. Such skin substitutes are comprised of sterilized extracellular matrix from a cadaver or mammal and provide a non-antigenic framework into which host tissues eventually integrate and revascularize. This study describes our experience with porcine bladder matrix for periocular anterior lamella and donor site skin defects either as a stand-alone treatment, or in conjunction with other reconstructive procedures. We hypothesized that the size and location of the skin defect would influence the number of additional matrix treatments and ancillary procedures required.

Methods: Institutional Review Board approval was obtained. We retrospectively reviewed 17 cases wherein patients were treated with porcine bladder matrix for defects of the periocular anterior lamella or of preauricular donor graft sites at two oculoplastic practices between 2016 – 2018. Powdered porcine bladder matrix was applied to the skin defect and then overlaid with a sheet of wound matrix. Subsequent rounds of treatment as well as other reconstructive procedures were applied as necessary. Univariate analyses by Pearson's chi-squared test or proportional-odds model were performed.

Results: Twenty-five sites (21 primary, 4 donor) in 17 individuals (8-95 years, $M = 58.8 \pm 21.0$ years, 10 male) were treated with skin substitute. Primary defects of the periocular anterior lamella were located at the upper lid (4), lower lid (12), medial canthus (2), lateral canthus (1); post exenterated socket (1), brow (1), and preauricular donor site (4). Defects were secondary to Mohs resection (11 sites), necrotizing fasciitis (5), donor site or surgical wounds (4), and to epidermolysis bullosa (1). All wounds were successfully healed. Additional matrix treatments beyond the initial application were administered in five sites, while ancillary reconstructive procedures were performed for 7 sites. A larger-sized defect was associated with a requirement for more ancillary procedures ($p = 0.006$). Similarly, defects of the upper lid were associated with use of more ancillary procedures; lower lid defects and other periocular defects required fewer ancillary procedures ($p < 0.001$).

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Conclusions: Porcine bladder matrix skin substitute is a useful adjunct to healing periocular anterior lamella defects in a variety of settings, including post-Mohs, exenterated sockets, necrotizing fasciitis, and trauma. Such repairs are useful in non-surgical candidates but must take into account varying levels of complexity based on lesion location. Of note, the smaller the defect, the less likely it will require additional reconstructive procedures.

Figure 1

Figure 2

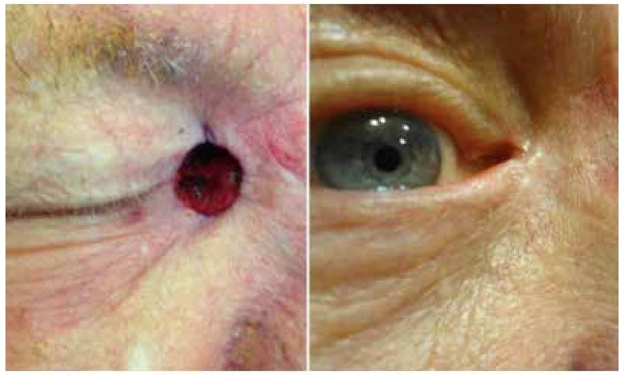

Figure 3

Figure 4

Figure 5

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1 – Adjustable Ptosis Correction via Posterior Mullers Muscle and Levator Advancement with Minimal Superior Tarsectomy

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Introduction: The purpose of this study is to report the results of a modified surgical technique for adjustable ptosis correction utilizing a posterior levator advancement with minimal superior tarsectomy as an alternative to the traditional Fasanella-Servat[1,2].

Methods: A retrospective chart review was performed. Inclusion criteria were patients who underwent ptosis repair via posterior mullers muscle and levator advancement with minimal superior tarsectomy by a single surgeon (R.D.L.). Patient demographics including age, gender, laterality of surgery, and post-operative follow up were reviewed. Postoperative change in margin reflex distance 1 (MRD1) was calculated both at one week and one month following surgery (POM1)[3]. Exclusion criteria included patients who had undergone prior upper eyelid surgery by an outside surgeon. Post-operative symmetry was defined as a difference in MRD1 less than 1 mm between the upper eyelids. Need for adjustment and complications including revision were documented.

The surgical technique incorporates passing a suture through superior levator fibers before running the suture beneath matching hemostats placed onto the superior tarsal border. This pass allows the surgeon to advance levator fibers onto a foreshortened tarsus through a posterior approach. The minimal tarsectomy allows for post-operative adjustments to ensure optimal symmetry[4].

Results: eyelids of 82 patients underwent posterior Mullers muscle and levator advancement with minimal superior tarsectomy and were included in the analysis. 69 patients had bilateral surgery and 13 patients had unilateral surgery. Average improvement in MRD1 at POM1 was 2.57 mm (Standard Deviation 1.08, $p < 0.001$). Postoperative symmetry was achieved in 98.5% of eyes after one surgery or in office adjustment. A total of 8 (5.3%) eyes had adjustment in the office within 14 days of the procedure, consisting only of downward traction placed on the eyelid margin with a cotton tipped applicator. All patients who underwent adjustments had final MRD1 symmetries within 1 mm at final follow up. Patients were noted to have a change in MRD1 of 0 – 2 mm following the adjustment. Three patients underwent reoperations. Postoperative complications included dry eye (n=10) and corneal abrasion (n=2). Average follow up time was 10.6 months (range: 1 – 152).

Conclusions: The adjustable posterior mullers muscle and levator advancement with minimal superior tarsectomy is an effective surgical modification to correct blepharoptosis and has the added benefit of in office corrections of minor asymmetries. Our study demonstrates that the majority of patients have symmetric eyelid height following the surgery and complications are rare. This procedure may add to the oculoplastic surgeons' repertoire and provide a simple and adjustable means of ptosis repair.

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Figure 1

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2 – Bilateral Marcus Gunn Jaw Winking Syndrome – A Rare Diagnosis

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Introduction: We present a video of an unusual case of a 14 year old girl who presented with history of bilateral upper lid excursion with jaw movement.

Methods: Visual acuity was 6/6 right eye (RE) and 6/6 left eye (LE). Palpebral aperture of 11 mm in RE and 9 mm in LE was noted. Marginal reflex distance of 5 mm was noted in the RE and 3 mm in the LE. Levator function of more than 15 was noted in both eyes. Bilateral moderate excursion of upper lid was noted with jaw movement. Ocular movements were normal and so was her pupil examination. Bells phenomenon was good.

Results: She was aware of this abnormal excursion of lid movement and was being teased by her peers. She was keen to have this surgically corrected. We performed bilateral levator dis-insertion and fascia lata brow suspension with Crawford technique. Postoperative no abnormal lid movement was noted and the lid was in good position and contour.

Conclusions: Bilateral jaw wink ptosis is extremely rare and we would like to present this as video and its management.

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3 – Cannula-assisted Periocular Triamcinolone Injection for Eyelid and Malar Edema in Thyroid Eye Disease

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Introduction: Periocular steroid injections can effectively treat eyelid and malar edema in inflammatory thyroid eye disease.[1] Providers may be reluctant to perform such injections due to risk of central retinal artery occlusion and blindness.[2] Blunt cannulas, which are used to inject dermal fillers, can be used for periocular injection of steroids with reduced risk of intravascular injection. We present a technique of cannula-assisted periocular triamcinolone injection for eyelid and malar edema in thyroid eye disease.

Methods: Description of surgical technique in a case series of patients.

Results: Our technique starts with a small wheal of local anesthetic is first created at the malar eminence. A 23g needle is used for skin puncture and a 25g 1.5-inch blunt cannula is used to inject the triamcinolone with multiple retrograde passes in a preseptal and/or retroseptal plane. Typically, 1 cc of 20 mg/ml triamcinolone is injected per side as needed. Thus far, we have injected twenty patients with this technique who have had significant reduction of their malar edema. There have been no serious complications of significant hematoma, post-operative bruising, granuloma formation or iatrogenic arterial occlusion leading to loss of vision.

Conclusions: Cannula-assisted periocular triamcinolone injection for eyelid and malar edema can produce transient reduction of eyelid and malar edema. This can be repeated every 1-2 months and may reduce the risk of devastating visual complications.

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Figure 1

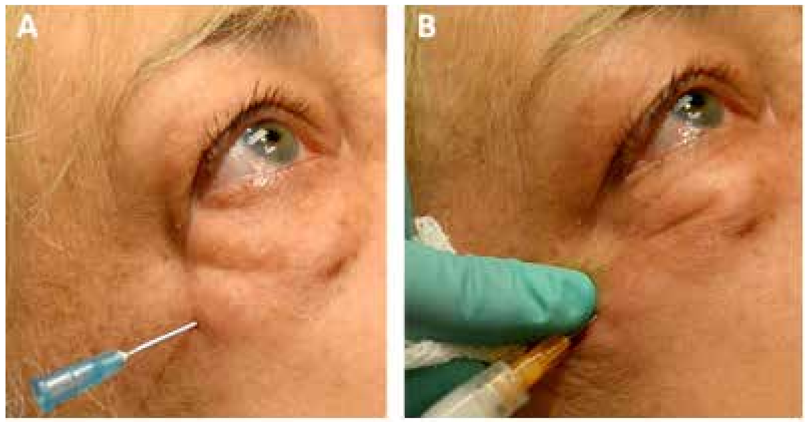

Figure 2

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4 – Congenital Lacrimal Fistula: I Cut the Road Less Travelled By

Mrittika Sen[1], Gaurav Garg[1], Supriyo Ghose, Shiva Shankar T[2], Santosh Honavar[1]
[1]Ophthalmic Plastic Surgery and Ocular Oncology, Centre for Sight, Hyderabad, India, [2]Ophthalmic Photography, Centre for Sight, Hyderabad, India

Introduction: A review of the embryology and origin, presentations and associations, histopathology and surgical excision of a congenital lacrimal fistula while drawing analogy to Robert Frost's, 'The Road not Taken'.

Methods: Video film

Results: Congenital lacrimal fistula is a rare developmental anomaly with an accessory duct originating from the lacrimal drainage system and opening into the skin. It is frequently unilateral and may be isolated or can be associated with anatomical abnormalities of the lacrimal apparatus and systemic conditions. There are various treatment modalities including lacrimal duct probing, cauterization, fistulectomy with or without dacryocystorhinostomy. In this video we discuss the etiopathogenesis, classification, clinical features and histopathology of congenital lacrimal fistula and demonstrate a simple technique of closed fistulectomy in a child with patent nasolacrimal duct.

Conclusions: This surgery, if performed with patience and precision can achieve complete excision of the fistulous tract with good anatomic and functional outcome.

5 – Endoscopic Corneal Neurotization with Ipsilateral versus Contralateral Supraorbital Nerve Transfer

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Ophthalmology, Dr Dan Plastic Surgery, Fort Lauderdale, Florida, United States of America

Introduction: It is currently unclear if hypesthesia in the supraorbital nerve territory is a contraindication to ipsilateral supraorbital nerve transfer for the treatment of neurotrophic keratopathy. The goal of this study is to compare the efficacy of endoscopic corneal neurotization using an ipsilateral versus a contralateral supraorbital nerve branch in patients with neurotrophic keratopathy and ipsilateral supraorbital nerve hypesthesia.

Methods: Retrospective case series of four patients with facial and trigeminal nerve involvement secondary to intracranial tumor removal. All underwent simultaneous or prior facial reanimation. All four patients had complete corneal anesthesia prior to surgery, central corneal scarring and severely impaired vision (LP to HM) in the affected eye. In addition, all patients presented with severe hypesthesia in the territory of the ipsilateral supraorbital nerve.

Results: Two patients were treated with ipsilateral and two with contralateral supraorbital nerve transfer using the endoscopic approach. Visual acuity improved from LP to 20/80 in the ipsilateral group and from HM to 20/100 in the contralateral group. Corneal sensation improved from complete anesthesia to mild hypesthesia in all patients. Central corneal scar decreased in size and density in all patients. In vivo confocal microscopy was done in two patients and showed new nerve branches in the corneal stroma.

Conclusions: Ipsilateral endoscopic corneal neurotization with a hypoaesthetic supraorbital nerve is at least as effective as contralateral supraorbital nerve transfer. Ipsilateral endoscopic corneal neurotization has many advantages over contralateral nerve transfer including: less morbidity, shorter operative time and the transfer of a larger trunk of supraorbital nerve to the neurotrophic cornea. This could explain the faster recovery of visual function and corneal sensation seen with the ipsilateral supraorbital nerve transfer. Further confocal microsopy studies are under way to compare quantitatively the density of the new, stromal nerve fibers between the groups.

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6 – Endoscopic Removal of Fronto-Temporal Dermoid Cyst

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LV Prasad Eye Institute, Hyderabad, India

Introduction: To demonstrate endoscopic removal of a fronto-temporal dermoid in a young adult.

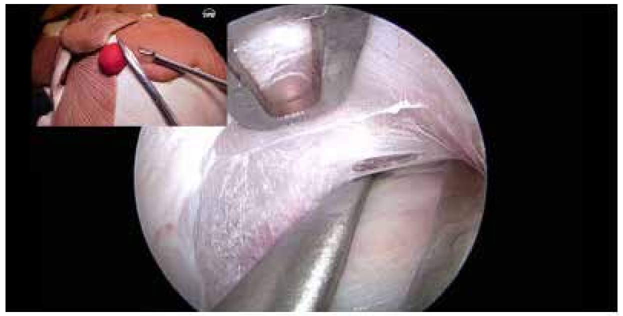
Methods: An eighteen year old female presented with left fronto-temporal dermoid cyst. Periorbitaldermoid cysts often present in childhood, and are classically excised via an eyelid crease approach, sub-brow incision resulting in visible scar. Late presentations of fronto-temporal dermoids are a challenge due to their size. The endoscopic approach was performed by placing two radial incisions 1.5cm behind the hairline in the scalp. Dissection was carried out in two planes.The cyst was exposed and removed via endoscopy.

Results: The endoscopic technique can be applied to lesions in the fronto-temporal region for a minimally invasive approach. By placing the incisions hidden in the scalp, this approach allows removal of the cyst, preserving the scalp and forehead sensation without visible scars.

Conclusions: This video represents a minimally invasive approach to a large fronto-temporal dermoid in an adult. Endoscopic approach allows complete dissection of the cyst with excellent cosmetic and functional outcomes.

Figure 1

Figure 2



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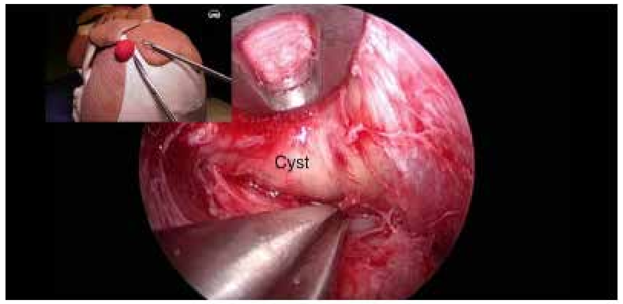

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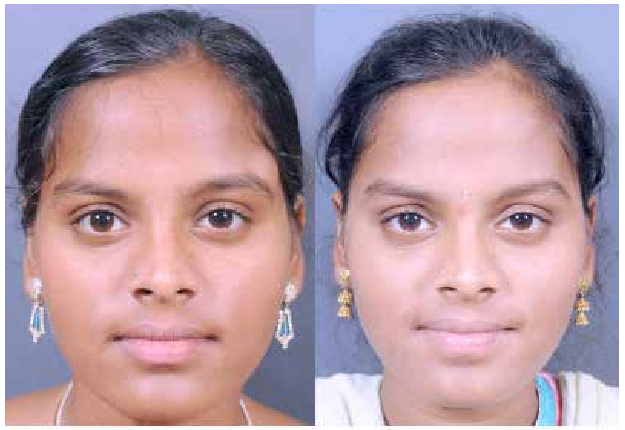

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7 – Eyelid Margin Reconstruction using the "Cross Your Heart" Vertical Mattress Suture Technique: A New Technique

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Introduction: Traditional eyelid margin reconstruction after tumour resection and following trauma involves the use of several vertical or vertical mattress sutures at the eyelid margin with the sutures left long and tied or taped to the eyelid skin (Fig 1). Although an effective technique, it is not uncommon for the sutures to work loose and irritate the cornea. Furthermore, several sutures are placed along the eyelid margin, which can further risk corneal irritation.

Methods: Over the last 20 years we have been using a technique which was inspired by the "Cross your heart Bra" designed by a popular maker of such garments. Using this and the principles of plastic surgery, horizontal and vertical support to the eyelid margin are obtained, negating the need for potentially loose sutures along the eyelid margin. Tarsal sutures are placed in the traditional way. However, the eyelid and the upper part of the eyelid is closed using the technique illustrated in the attached video.

Results: This technique has stood the test of time over the last 20 years with an effective closure being obtained. The occasional patient may develop a slight notch at the eyelid margin, especially if a large defect is being repaired. Before-and-after photographs and videos are used to illustrate this technique.

Conclusions: Sometimes, simple changes to long-accepted techniques can help the surgeon avoid complications or make the management of such simple problems more effective. We believe this is one of those techniques which would benefit all who perform closure of eyelid margins.

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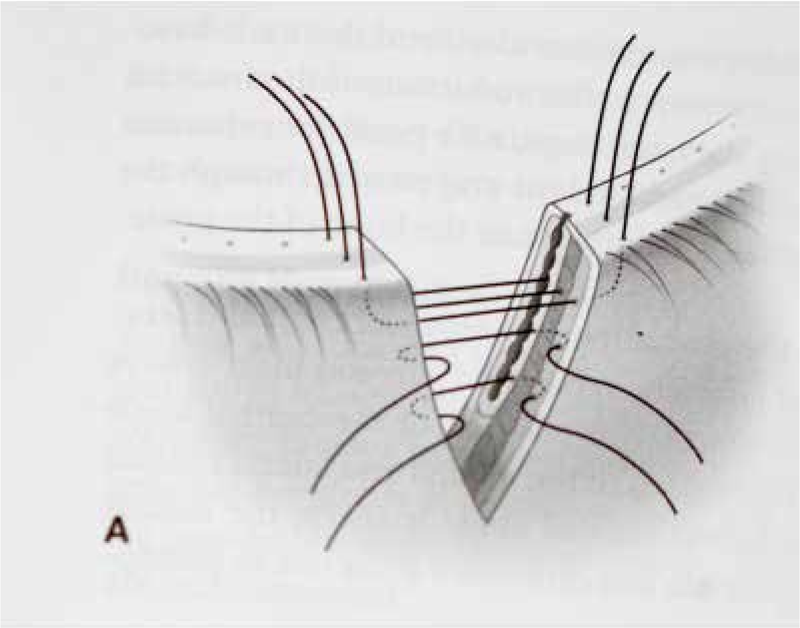
Figure 1



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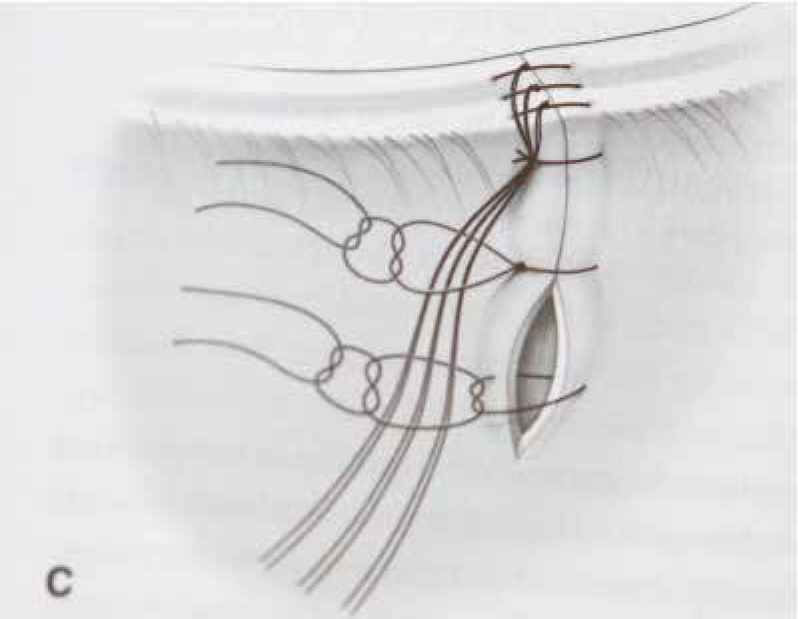

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8 – Lateral Wall Implant as an Adjunct to Lateral Wall Orbital Decompression in Severe Thyroid Eye Disease

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Introduction: The purpose of this study is to describe a lateral wall implant as an adjunct in lateral orbital wall decompression in severe thyroid eye disease.

Methods: This study is a retrospective review of 5 patients who underwent prior orbital decompression but had persistent proptosis. These patients proceeded with repeat lateral wall decompression with adjunct lateral wall implant placement with a 0.6 mm porous polyethylene-coated titanium implant. First, the residual lateral rim and lateral wall are completely removed with a high speed burr to the orbital apex. Then, the medpore-coated titanium implant is appropriately sized and shaped in a convex configuration and placed into the lateral wall defect. The purpose of the implant is to laterally displace the temporalis muscle, creating additional space for the orbital contents. The implant is secured with a single titanium screw. Data collection included: visual acuity, intraocular pressure, exophthalmometry, eye motility, eyelid position, and complication rates.

Results: Seven orbits in 5 patients underwent maximal lateral wall decompression and reconstruction using the medpore-doated titanium implant. Four males and 1 female were included with ages ranging from 25 to 73 years. Visual acuity improved an average of 2.4 lines (range 0 to 5 lines). Intraocular pressure improved an average of 9.25 mmHg (5 to 13 mmHg). There was reduction of proptosis by 5.5 mm on average (2.5 to 8 mm). Eyelid retraction improved on average by 2.8 mm (1 to 5 mm). Horizontal eye movements improved by 10% on average (-25% to +25%). One patient developed mild limitation in abduction post lateral wall reconstruction. Another patient felt a palpable edge and underwent a second procedure to trim the anterior edge of the implant. There was no residual temple deformity, trismus, conjunctival scarring, orbital hemorrhage, or vision loss.

Conclusions: In thyroid eye disease, maximal three-wall and fat decompression is indicated for proptosis reduction and disfigurement.[1-3] The amount of space created in lateral wall decompression can be limited by the amount of native bone present and the temporalis muscle which can enter the newly decompressed space, displacing the orbital soft tissues medially. In severe or recalcitrant cases, we propose the placement of a lateral wall implant as an adjunct to laterally displace the temporalis muscle and create additional space. This technique accomplishes further reduction of proptosis in patients who have undergone traditional three wall decompression where further proptosis reduction is desired.

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Figure 1: A 59-year-old male who underwent prior decompression but had reactivation and persistent disfiguring proptosis. He underwent bilateral lateral wall reconstruction with an adjunct lateral wall implant, with an improvement in proptosis by 4 mm and 7 mm in the right and left eyes, respectively.

Figure 2: Pre- and post-op CT images of the same patient in the (a) axial view and (b) coronal view

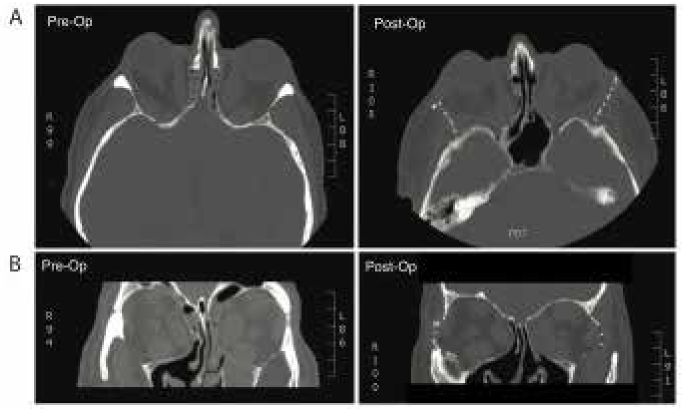
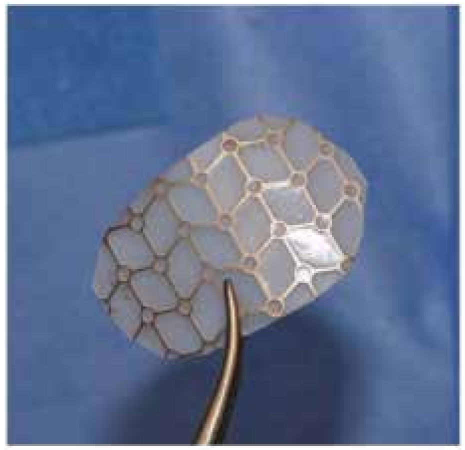


Figure 3: Intraoperative view of the adjunct lateral wall implant prior to placement.



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9 – Limited Orbicularis Myectomy for Apraxia of Lid Opening.

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Introduction: Apraxia of lid opening (ALO) is a difficult and frustrating, condition for both the patient and the ophthalmologist. ALO is characterized by the inability to initiate voluntary eyelid opening that usually needs surgery like orbicularis myectomy. This involves excision of the orbicularis muscle fibres, which helps in in overcoming levator palpebrae inhibition.

Methods: We describe a relatively simple, safe and reproducible technique of limited orbicularis myectomy that gives good results in patients with ALO.

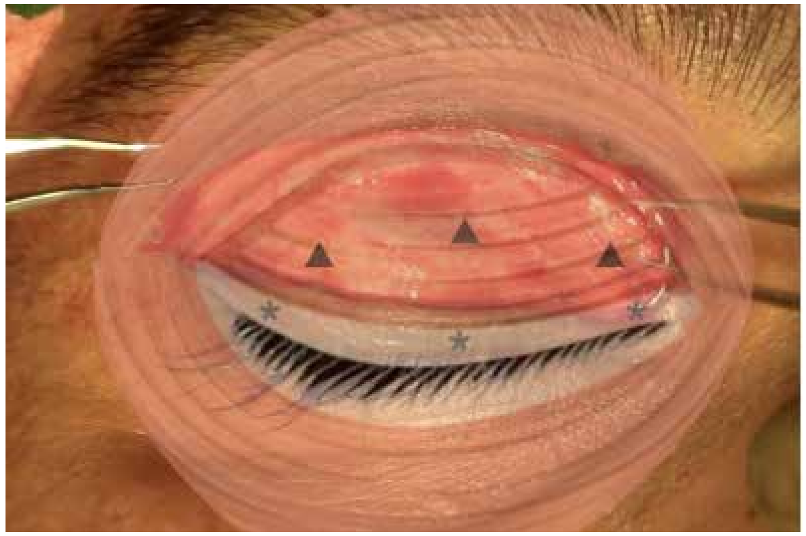
Results: Previously described techniques have involved aggressive approaches that involved excision of the pretarsal, preseptal and the orbital part of the orbicularis and other adnexal muscles - the procerus and corrugators. However, our technique involves a conservative approach with complete excision of the pre-tarsal and preseptal orbicularis; augmented with a limited blepharoplasty. The video includes step-by-step demonstration of the identification the structures and tissue planes.

Conclusions: A limited orbicularis myectomy is a safe procedure that gives acceptable and predictable results in apraxia of eyelid opening.

Figure 1

Figure 2

Figure 3



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10 – Localization and Extraction of an Intra-orbital Foreign body with a Magnet

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Introduction: We present a surgical video demonstrating the localization and extraction of intraorbital ferromagnetic foreign bodies in a 7 year-old male with the aid of a magnet.

Methods: A 7-year old patient presented with right eye pain and swelling after being shot with a ball-bearing (BB) gun. CT scan of the orbits revealed two foreign bodies retained inferior to the right eyebrow and in the superior orbit. No free pellet was available to determine if the BB was ferromagnetic. The decision was made to use an electromagnet as a surgical aid to remove the BB pellets.

Results: The patient underwent superior orbitotomy via lid crease incision. The first BB pellet was visible subcutaneously inferior to right eyebrow. A small incision was made, and the electromagnet was used to confirm the pellet's ferromagnetic quality and extract the pellet with minimal tissue dissection. The magnet was then used to identify the location of the second pellet deeper in the orbit. Radiologically, it was noted to be extraconal, posterior and inferior to the lacrimal gland. The magnet was used to detect and "hold" the pellet, aiding in the blunt dissection and prevenging tissue damage. The wound was then closed and the patient's receovery was uneventful. While magnets are routinely used to remove ferromagnetic intra-ocular foreign bodies, there are few reportsiin the literature regarding their use for orbital foreign bodies. The utility of a magnet in this case was aided by 1) the presence of a second superficial pellet to confirm its ferromagnetic quality and 2) the orbital pellet's relatively safe superior extraconal location.

Conclusions: Intra-orbital metallic foreign bodies should be removed when safely possible and clinically reasonable. Failure to do so may prevent a patient from ever undergoing Magnetic Resonance Imaging (MRI) in the future. Foreign bodies may be easily identified using conventional imaging methods; however they may be challenging for the surgeon to locate and extract. We demonstrate use of a magnet intra-operatively as a cost-effective and efficient surgical adjunct to localize and retrieve intra-orbital ferrogmagnetic foreign bodies.

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Figure 1

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11 – Medial Orbitotomies – Techniques with Case Examples

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Introduction: The medial orbit is the most vascular and difficult to access with limited visualization and vital structures

A conceptual approach is important with knowledge of applied anatomy before medial orbitotomies may be embarked upon

We herewith showcase case examples with demonstration of surgical technique, indications, contraindications and limitations of medial orbitotomies

Methods: Case series with demonstration

Results: Good outcomes with sound preoperative planning, intraoperative execution and postoperative monitori

Conclusions: A sound knowledge of applied anatomy, good surgical techniques with atraumatic surgery with minimal damage to vital structures is essential in delivering good outcomes in all orbitotomies, especially with medial orbitotomies

12 – Spectral Analysis of the Upper Eyelid Kinematics in Hemifacial Spasm

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Introduction: Hemifacial spasm (HFS) is a condition in which, by nature of the disease, in the large majority of cases, there is an affected and a contralateral non-affected side. We are not aware of previous studies that assessed the energy generated by the upper eyelid movements in order to assess interocular differences in upper eyelid kinematics in patients with hemifacial spasm.

Methods: Patients with hemifacial spasm were examined using a high-speed video camera (PointGrey FI3-U3-13S2C-CS) and micro LED diodes, placed in the pretarsal area of the upper lids. Exclusion criteria included prior eyelid or intraocular surgery, patients with any ocular surface or eyelid conditions, bilateral HFS, strabismus, patients with secondary movement disorders or neuropathic diseases in addition to HFS, and treatment with botulinum toxin injections fewer than 4 months. Eyelid movements were recorded bilaterally for three minutes. Spectral analysis of the spontaneous upper eyelid movements in HFS patients was evaluated on the affected and non-affected sides. Using the Fast Fourier software, the area of power spectrum density (PSD), which represents the function relating frequency versus energy of the movements, and the percentage of overlapping movements (0 = no symmetry and 100 = perfect symmetry) were calculated.

Results: Twenty-nine HFS patients (19 females) with moderate to severe HFS, according to Jankovic rating scale, were recruited for this study. The mean age of the patients was 64.3 ± 10.6 years (range: 42–84 years). Area of the energy generated by the upper eyelid movements on the affected side was significantly higher (51,541.7 ± 46,025.1) than on the non-affected side (36,020.6 ± 37,139.3; p= 0.001). Percentage of overlapping movements was found to be 63.55%.

Conclusions: Spectral analysis of lid movements permitted to assess the frequency distribution of lid movements as well the degree of interocular motion symmetry in HFS patients. Interocular assessment of upper eyelid kinematics in these patients showed a significantly higher generation of energy on the affected side. Taking into consideration that eyelid movements in this condition have a wide range of amplitudes and different patterns on the affected side, the use of high-speed videography and small LED diodes, associated with the use of the Fast Fourier software, permitted a more accurate movement detection than other attempts of objectively evaluating eyelid movements in HFS. Furthermore, the use of this technology permitted to reveal underlying eyelid movement abnormalities that could go undetected by either physician or patient.

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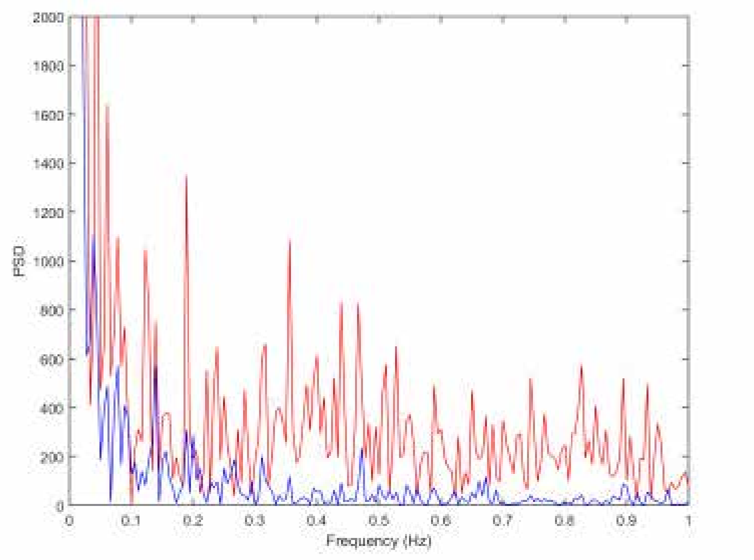
Figure 1



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13 – Surgical Management of Superior Sulcus Deformity Using Autologous Fat Flaps or Grafts

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Introduction: Superior sulcus hollowing, especially if unilateral, poses a significant cosmetic problem. Different methods and techniques were previously described, however complete and long-lasting management of this condition is still challenging. Successful surgical management of this condition is selected patients with autologous fat transposition and dermis-fat graft techniques will be demonstrated.

Methods: For bilateral cases, after limited skin excision, orbicularis and septum was opened and all fat pads were decapsulated and reshaped to obtain freely mobile fat flaps. Medial flap was pulled laterally and attached to the central fat pad. Then, the united single large fat flap was pulled superolaterally and attached to underneath the lateral-most portion of the orbicularis muscle.

For unilateral cases, dermis-fat grafts were used. Upper eyelid blepharoplasty with limited skin excision was followed by horizontal incision of orbicularis muscle. The septum was widely opened and the fat pads were released from their attachments. Dermis-fat grafts of 30X10X10mm obtained from the left lower abdomen were transferred to the anterior surface of the released eyelid fat pads with dermal side up and the grafts were shaped to slightly overcorrect the condition. Superior dermis line was continuously sutured to the superior fat capsule, while the inferior portion of the graft was snug into the sulcus and left unsutured. The superior skin-orbicularis flap was then draped over the graft to assess the desired volume effect, and fat was trimmed further, if necessary. Crease reconstruction was then carried out by passing interrupted sutures from upper skin to supratarsal levator aponeurosis to lower skin. Skin incision was closed with running polypropylene sutures.

Results: Postoperative antibiotic oinment was used BID for 1 week and all sutures were removed at 1 week in each case. Symmetric and satisfactory results with immediate correction of hollowness were obtained in all patients. Fat transposition cases had excellent nasal filling, however temporal hollowing was not as effectively corrected as dermis-fat graft cases. Healing of the bilateral cases with fat transposition was eventless, however settling of the postoperative course was slow in unilateral cases that underwent dermis-fat graft transfer, lasting an average of 1 month before the swelling subsided. The only temporary complication was ptosis in graft cases that lasted between 1-3 months. All cases were stable during follow-up for at least 24 months.

Conclusions: Autologous fat surgery may provide permanent solution to the hollow superior sulcus deformities. Surgical correction with fat transposition in bilateral cases and dermis-fat graft in unilateral cases provided effective and safe correction of superior sulcus hollowness without the risk of compromising periorbital structures and eyelid functions.

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14 – The Caretaker-reversible Tarsorrhaphy

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Introduction: To present a modification of the reversible tarsorrhaphy[1-6] that can be easily opened and securely reclosed as necessary by caretakers and sometimes even the patient.

Methods: 9 patients (ages 20-95-year-old) received temporary tarsorrhaphies. Indications included lagophthalmos secondary to cicatricial changes from burns (2), seventh nerve palsy (2), and neurologic disability from cerebellar malformation (2). 4 patients had exposure keratopathy, 3 patients had neurotrophic ulcers, and 1 patient had severe corneal ulcer requiring frequent cornea examinations.

Materials included intravenous (IV) tubing or instrument protectors as bolsters and 4-0 polypropylene suture. The 4-0 suture is first passed through and through one end of IV tubing approximately 20 mm in length. Starting on the lateral upper lid and approximately 4 mm above the lash line, the suture is placed through the skin and into the tarsus. The suture exits through the eyelid gray line with the surgeon flipping the eyelid to ensure that there is a solid tarsus bite that is not full thickness. The needle should then proceed to enter the gray line of the lower eyelid parallel to the upper eyelid and exit through the skin below the lash line (Figure 1). These steps through the eyelid are repeated in the opposite direction (Figure 2). An air knot is tied above the upper eyelid approximately one centimeter above the base of IV tubing. A second air knot can be tied higher to provide a handle easily allowing the caretaker to close the eyelid. Figure 3 demonstrates how to close (A-C) and open (D-F) the tarsorrhaphy.

Results: Healthcare professionals, family members, and even patients themselves could easily open, close, and maintain the tarsorrhaphy. Temporary tarsorrhaphies were replaced every 4-8 weeks as needed (one lasting 3 months without replacement despite QID openings and closures). In all cases, the polypropylene suture was well-tolerated. No scarring nor long-term sequelae occurred.

Conclusions: The caretaker-reversible tarsorrhaphy can be broadly used as a temporizing measure, allowing patients or their caretakers to apply topical treatments, provide vision to orient patients in the ICU, or allow frequent cornea examinations.

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Figure 1

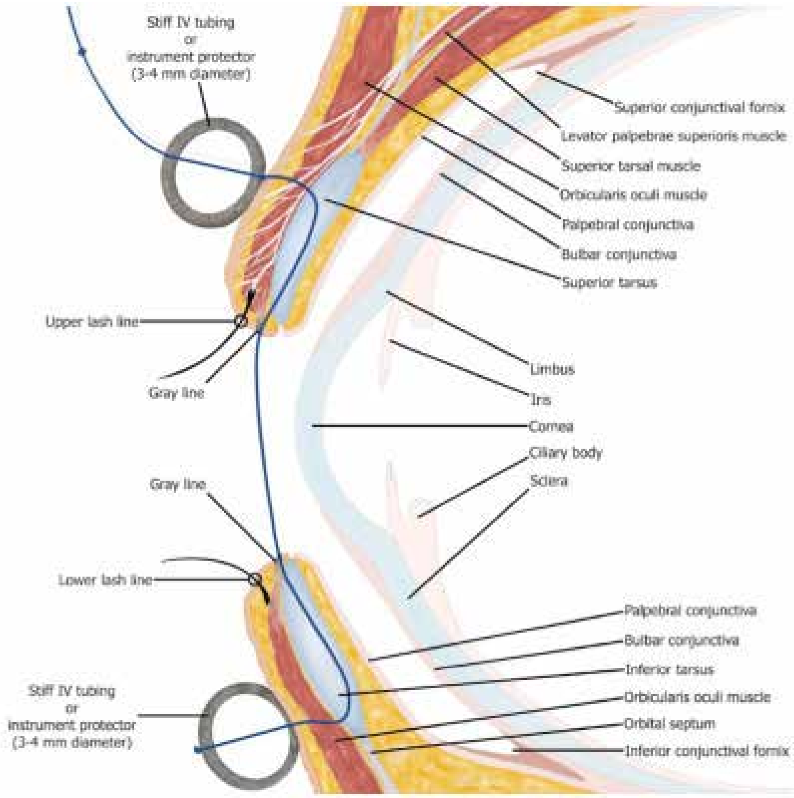
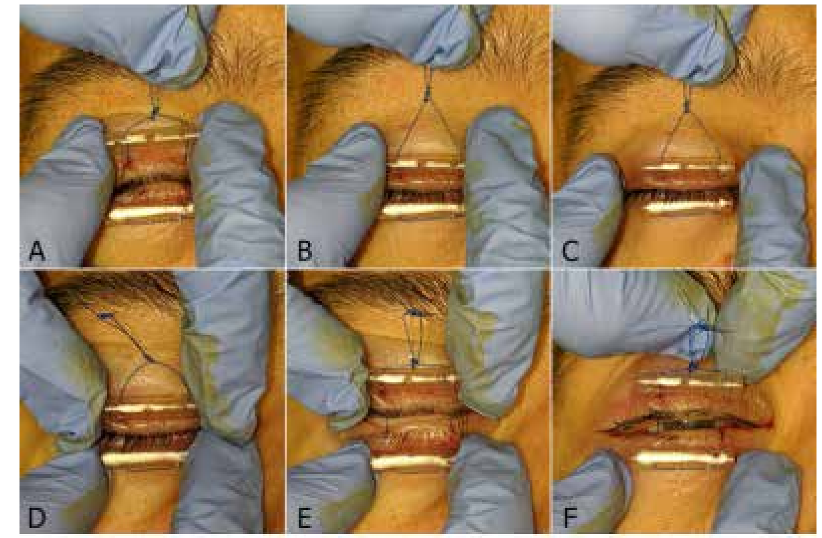


Figure 2

Figure 3



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15 – The "Central Six" of Ptosis Repair

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Introduction: Eyelid contour is a key component to satisfactory lid position and appearance following ptosis repair, the components of which have been highly debated and remain difficult to objectively measure.1-4 We seek to minimize the number of intraoperative adjustments required and reduce re-operation rates by addressing only the central six millimeters of tarsus when reapproximating levator to the anterior surface of tarsus, thereby eliminating contour as an adjustable variable.

Methods: All patients who underwent external levator resection with blepharoplasty for correction of involutional ptosis between 7/1/2017 and 6/30/2018 by a single surgeon were retrospectively reviewed. The same technique was used for each eyelid with uniform suture placement. One 6-0 silk horizontal mattress suture was placed partial thickness through the superior third of tarsus 3 mm lateral to the center of tarsus; another was passed 3 mm medial to the center of tarsus. No sutures were placed outside of this central 6 mm zone. Patient fixation was used to determine lid height and symmetry. Once satisfactory, the sutures were tied down in a permanent fashion and the eyelid position again verified. The skin was then closed in interrupted and running fashion using an absorbable gut suture. 169 eyelids in 102 patients were evaluated. Preoperative and postoperative photos were taken on each patient. Data obtained included preoperative and postoperative MRD1, intraoperative and postoperative complications, re-operation rates, and patient satisfaction with appearance of lid contour and symmetry.

Results: Mean follow up time was 3.27 months. The mean pre-operative MRD1 was 0.68 mm. The mean postoperative was 3.12. All patients had recovery of an anatomically normal temporal peak height. Two of 169 eyelids (1.18%) required re-operation due to residual ptosis. Four eyes (2.37%) had postoperative lagophthalmos less than 2mm, which did not induce exposure keratopathy and did not require surgical revision. 93 of the 102 patients (91.18%) had satisfactory symmetry defined as less than or equal to 1mm difference between right and left MRD1. Ninety-nine of the 102 patients were satisfied with their postoperative appearance.

Conclusions: This simple and standardized technique for suture placement gives reliable and effective results for external elevator resection for ptosis repair by eliminating contour as a adjustable variable. Addressing the central six millimeters of tarsus is not only paramount, but is also in and of itself satisfactory in achieving optimal contour during external levator resection, without regard to more medial or lateral lid anatomy.

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16 – The Faden-style Lower Rhytidectomy

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Introduction: The faden operation anchors the rectus muscle to the sclera posterior to the muscle's insertion. This fixation suture reduces the rotational force as the eye rotates towards the direction of that muscle. Similarly, this ophthalmic principle can be applied to neck lifting to improve the resultant cervicomental angle. The hyoid bone forms the vertex of the cervicomental angle, and placing a posterior fixation suture through the anterior digastrics weakens the rotational force and posteriorly displaces the position of the hyoid bone. The objective is to present a novel variation to lower rhytidectomy.

Methods: Retrospective, interventional study, including consecutive cases undergoing this approach to lower rhytidectomy. Pre- and post-operative photographs, patient demographics, and complications were reviewed systematically.

Results: Reviewed a single surgeon's three-year experience, with a total of 220 cases. 95% of patients were female with average age of 60. Adjunctive procedures performed at the same time included upper rhytidectomy, fat grafting, upper blepharoplasty, lower blepharoplasty, brow lifting, and chin implantation. Postoperative photos showed deepening of the cervicomental angle. Complications of this technique include pain upon swallowing, which resolved within two weeks in all cases.

Conclusions: Suturing the anterior bellies of the digastric muscles while performing lower rhytidectomy posteriorly displaces the hyoid bone by weakening the rotational force of the digastric muscles. This decreases the overall cervicomental angle and enhances the effect of the overlying platysmaplasty.

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Figure 1

Figure 2

Figure 3

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