

Repair of Eyelid Retraction due to a Trabeculectomy Bleb: Case Series and Review of the Literature

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Abstract: Superior limbal trabeculectomy remains a common surgical treatment for glaucoma. Positional effects on the overlying upper eyelid—both ptosis and retraction—have been associated with the procedure. More than 1 mechanism may explain retraction; however, the eyelid may elevate mechanically due to the underlying raised superior bulbar conjunctiva.

Since 1975, there have been 13 reported cases of eyelid retraction in 12 patients following the creation of glaucoma filtration blebs.¹⁻⁵ Given the paucity and relative diversity of reports, the mechanism(s) by which blebs may cause eyelid retraction remains uncertain. Likewise, the best techniques for surgical treatment may not be clear. We herein categorize the previously reported cases, including those that were repaired surgically, and report 3 cases of the successful use of a conjunctiva-sparing method of eyelid lowering.

MATERIALS AND METHODS

The study adhered to the principles of the Declaration of Helsinki and complied with the Health Insurance Portability and Accountability Act (HIPAA). We performed a retrospective chart review of 3 patients seen and treated at the Gavin Herbert Eye Institute, University of California (Irvine, CA) for eyelid retraction due to a trabeculectomy bleb. Specifics of each case follow. After informed consent, all 3 patients underwent a conjunctiva-sparing anterior blepharotomy levator recession for eyelid retraction in the following surgical technique.

Surgical Technique. The eyelid was anesthetized by local infiltration of a 4.5:4.5:1 cc admixture of 1% lidocaine with 1:100,000 epinephrine, bupivacaine, and 8.3% sodium bicarbonate. An eyelid crease incision was created with a No. 15 Bard-Parker blade, and Westcott scissor dissection was continued through the anterior lamella until the levator palpebrae aponeurosis was identified. Dissection and recession of the levator aponeurosis and Mueller's muscle were performed in a similar fashion to that previously described by Older.⁶ Sharp dissection at the superior tarsal border through the levator aponeurosis and, if needed, Mueller's muscle, allowed recession of several millimeters (Fig. 1). Per intraoperative eyelid level assessments, adjustments were made until adequate height and contour were achieved. The eyelid skin incisions were closed using a running 6-0 nylon suture. A Frost suture tarsorrhaphy was secured to the cheek to provide gentle downward traction to the upper eyelid and left in place for 1 week.

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A literature search was performed by entering the key words trabeculectomy, glaucoma filtering surgery, eyelid retraction, thyroid eye disease, anterior blepharotomy, aqueous humor composition, catecholamines, prostaglandins, and fibrosis in the PubMed and the Cochrane Library databases.

RESULTS

Case 1. A 57-year-old woman with a history of primary open-angle glaucoma presented 1 year after undergoing a trabeculectomy in the OD without mitomycin C use. She reported OD dryness and intermittent foreign body sensation and pain. Artificial tears only provided temporary relief. She denied a history of thyroid and prior eyelid disease, trauma, and surgery. On exam of the OD, the bleb was diffusely elevated, and margin reflex distance 1 (MRD1) was 7.5 mm. Extraocular motility assessment was normal with no remarkable changes in eyelid position. The superior cornea exhibited exposure keratitis, and the bleb revealed some thinning and risk for breakdown due to exposure. No other abnormalities were evident in all other areas of the conjunctival surface including the tarsal conjunctiva. In addition, we did not note any gross fibrosis of Mueller's muscle intraoperatively. Following retraction repair, the MRD1 was 4.5 mm, which was unchanged at the 13-month follow-up visit. The symptoms resolved, and the cornea and conjunctiva exam was normal postoperatively. The eyelid repair did not affect the bleb and its function. Intraocular pressure (IOP) in the OD remained in the target range during follow-up examinations.

Case 2. A 47-year-old man with a history of primary open-angle glaucoma presented 6 months after undergoing a trabeculectomy in the OS without mitomycin C. He reported foreign body sensation and pain, which was not relieved with lubricating drops or ointment. He was also dissatisfied with an asymmetric eye appearance due to the height of the left upper eyelid. He denied a history of thyroid and prior eyelid disease, trauma, and surgery. On preoperative exam, the bleb was diffusely elevated, and the MRD1 was 6.5 mm in the OS. Extraocular motility assessment was normal, with no remarkable changes in eyelid position. All areas of the conjunctival surface including the tarsal conjunctiva appeared to be normal. In addition, we did not note any gross fibrosis of Mueller's muscle intraoperatively. After retraction repair, 8 months postoperatively the MRD1 was 4.0 mm. The symptoms resolved, and the cornea and conjunctiva exam were normal postoperatively. The bleb appeared unchanged on slit-lamp biomicroscopic assessment, and the IOP did not change significantly during follow-up examinations.

Case 3. A 74-year-old man with a history of long-term open-angle glaucoma presented 19 years after undergoing trabeculectomies in OU. He reported foreign body sensation, pain, and dryness. The patient had a history of thyroid disease for which he took daily levothyroxine. He denied a history of eyelid disease, trauma, and surgery. On exam, the bleb in the OD was large and cystic. It appeared to lift the right upper eyelid, resulting in an MRD1 of 6.8 mm. There was no significant exophthalmos. Extraocular motility assessment did not reveal extraocular motility restriction or remarkable changes in eyelid position. The bleb was also exposed and thinning in the exposed areas (Fig. 1C; Fig. 2). In all other areas, the conjunctival surface did not exhibit any abnormalities. The bleb in the OS was flat. Serum level of thyroid-stimulating hormone was slightly decreased (0.398 mIU/l), but free T4 and T3 were within normal limits. Thyroid disease was considered a possible cause of this patient's eyelid retraction, but the chief vector seemed to be mechanical due to the underlying bleb. A retraction repair was performed. We did not note any gross fibrosis of Mueller's muscle intraoperatively. Three months postoperatively, the MRD1 was 3.5 mm, and eyelid contour was satisfactory (Fig. 2). The dry-eye symptoms resolved, and the cornea and conjunctiva exam was

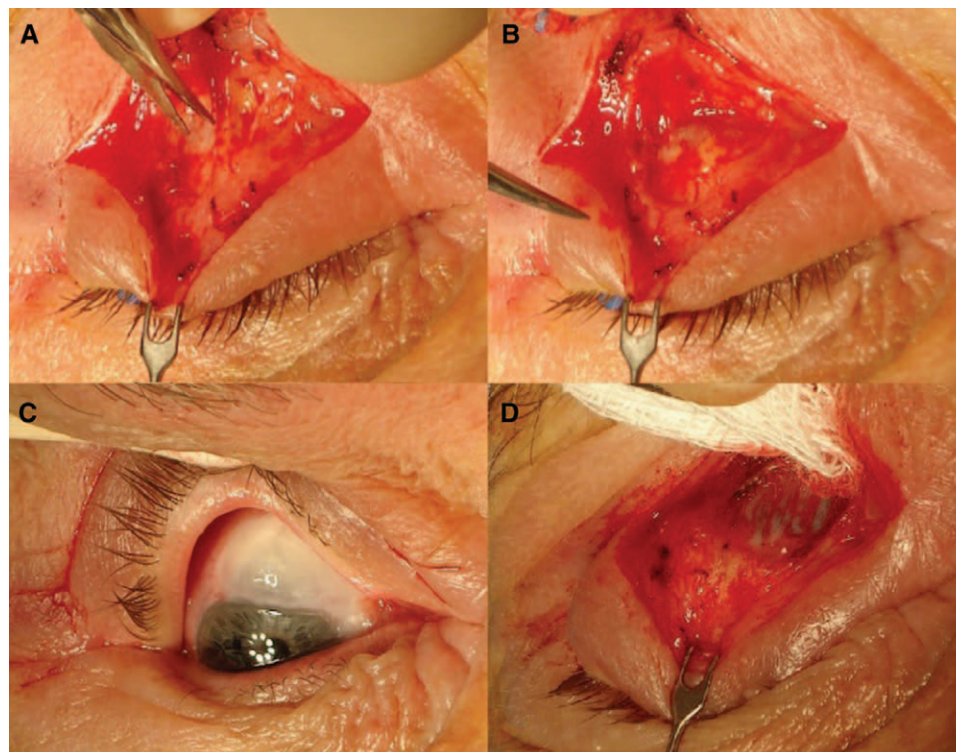


FIG. 1. Conjunctiva-sparing anterior blepharotomy. **A** and **B**, Dissection and recession of levator palpebrae aponeurosis and Mueller's muscle. **C**, Superior limbal trabeculectomy bleb. **D**, Conjunctiva visible and left intact during anterior blepharotomy.

normal postoperatively. The eyelid repair also did not appear to have an effect on the bleb or its function in the OD as the bleb remained large and cystic, and the IOP was not significantly different from preoperative measurements during follow-up examinations.

LITERATURE REVIEW

We identified 5 reports that discussed 13 cases of trabeculectomy bleb-related eyelid retraction in 12 patients. We summarized these cases in Table.

DISCUSSION

Trabeculectomy bleb-induced eyelid retraction appears to be an accepted diagnosis with an unclear mechanism.¹ Three

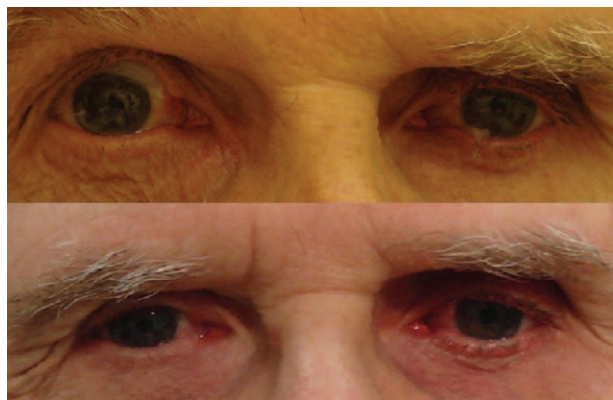


FIG. 2. **Top**, Right upper eyelid retraction with exposure of bleb and MRD1 of 6.8 mm before repair. **Bottom**, Eyelid appearance 3 months after conjunctiva-sparing anterior blepharotomy with right MRD1 of 3.5 mm and satisfactory eyelid contour. MRD1, margin reflex distance 1.

pathophysiologic hypotheses have emerged, which involve mechanical, chemical, and myogenic causes.

In this case series, the retracted eyelids assumed the contour of the blebs, corroborating the 2 previously reported cases favoring a mechanical etiology.^{2,5} While Bartley² did not include a pathophysiologic explanation for his case, it may be inferred from his image that the upper eyelid's contour was reshaped and repositioned by the elevated bleb. Further support may be the success of hyaluronic acid gel filling treatment reported by Vásquez and González-Candial. The temporary tissue expansion and weight effect may have allowed the eyelid to pass over the bleb.⁵ However, we believe eyelid loading strategies may be undesirable because they may compress or otherwise compromise the underlying bleb, but further investigation is warranted.

Putterman and Urist were the first to argue against a mechanical theory.³ They used a test of pulling the eyelid down over the bleb, and stated that the immediate retraction on release negated a possible mechanical hindrance etiology. This test was similarly negative in cases described by Awwad et al.¹ Although their cases may have been due to other etiologies, we do not believe a return to the retracted state after pulling down entirely negates a mechanical vector. The sensitivity and specificity of the pulling-down test for eyelid retraction mechanism needs further clarification.

Excess sympathetic stimulation of Mueller's muscle may be a chemical etiology. An oversensitive Mueller's muscle or the abnormal presence of a sympathomimetic substance may cause eyelid malposition. Putterman and Urist successfully lowered the eyelid in 1 case by cautery fibrosis of Tenon's capsule and sclera after theorizing that a flow of aqueous humor dissecting subconjunctivally from the bleb to the superior fornix may carry a substance causing contraction of Mueller's muscle (Case 6; Table).³

Awwad et al. proposed a myogenic cause by which fibrosis of Mueller's muscle could induce upper eyelid retraction, noting previous reports of giant papillary conjunctivitis from

Relevant details and treatment of cases of eyelid retraction following glaucoma filtering surgery

Case	Time of presentation (weeks postsurgery)	Height above superior limbus (mm)	Palpebral fissure difference in primary gaze (mm)	Palpebral fissure difference in downgaze (mm)	Bleb	Procedure	Treatment results	Favored mechanism
1. 18F ³	12	1	2	2	Multicystic, thin	—	Stable	Myogenic/chemical
2. 32F ³	8 (mild), 52 (obvious)	1.5–2	3	3	Cystic, diffuse	Conjunctiva-sparing (Levator/Muller recession)	Overcorrection; satisfactory after reoperation	Myogenic/chemical
3. 42M ³	20	1	2	2	Cystic	—	Stable	Myogenic/chemical
4. 45M ⁴	936 (18y)	—	4	—	Cystic, diffuse	Full-thickness (Graded anterior blepharotomy w/ adjustable sutures)	Satisfactory (0.5 mm difference in final palpebral fissure height)	Chemical/mechanical/both
5. 51F ⁵	4	2	2	Retraction present in downgaze	Cystic, diffuse	1. Full-thickness (Transconj mullerectomy) 2. Other (Posterior levator disinsertion) 3. Other (Hyaluronic acid gel (HAG) filling)	1. Unsatisfactory (Recurrence few months later) 2. Unsatisfactory 3. Satisfactory, but required reinjection	Mechanical
6. 57F ¹	1	3	4	4	Large, diffuse	Other (Cautery fibrosis of sclera)	Satisfactory 4 mo later	Chemical
7. 60M ²	—	—	—	—	—	Conjunctiva-sparing (Muller recession)	Satisfactory	Mechanical
8. 64M ⁴	—	—	5	—	Exuberant	1. Other (Bleb compression suture/subconj autologous blood injection) 2. Full-thickness (graded anterior blepharotomy on adjustable suture with posterior needling of bleb)	1. Unsatisfactory 2. Overcorrection; Satisfactory after reoperation	Chemical/mechanical/both
9. 67F ¹	Several	3	4	2	Diffuse	Conjunctiva-sparing (Mueller's excision)	Satisfactory	Chemical
10. 71F ⁴	—	3	5	—	Cystic, diffuse	—	—	Chemical/mechanical/both
11. 73F ⁴	20	1.5 OU	0	—	Cystic OU	—	—	Chemical/mechanical/both
12. 79F ⁴	12	2	4	—	Multicystic, thin	—	—	Chemical/mechanical/both

OU, both eyes.

irritation by a diffuse bleb and eyelid retraction in contact lens wearers. However, they did not observe conjunctival inflammation in their patients, which could subsequently irritate Mueller's muscle and cause its fibrosis.¹ They conjectured that irritation and fibrosis could result from substances in the aqueous humor, as in the proposed chemical mechanism, though none have been found.¹ Studies in lower mammalian species demonstrated an increased release of prostaglandins and catecholamine-forming enzymes in the aqueous associated with chronic sensory denervation and the ocular response to injury.^{8,9} Stratton and Shiwen recently described the possible role of prostaglandin E₂ (PGE₂)

in injured tissues in recruiting inflammatory cells and secondary activation of fibroblasts.¹⁰ Histopathologic and biochemical analysis of Mueller's muscle in these cases would prove useful. However, fibrosis mechanisms may be less likely because retraction is not worsened in downgaze.¹ In fact, the retraction was less evident on downgaze in 1 patient (Case 9; Table 1).³ None of our cases exhibited evidence of conjunctival irritation or fibrosis of Mueller's muscle grossly.

It seems that eyelid retraction could present any time after a trabeculectomy, as soon as 1 week per Awwad et al. and up to decades later as in our third case. Asymmetric scarring or

encapsulation at the filtration site may cause focal elevation of the blebs large enough to lift the upper eyelid,⁷ and explain the wide time range. The natural history of eyelid retraction may also be variable. Awwad et al. described 2 cases that presented initially at 2 and 5 months postoperatively and developed further retraction before stabilizing after a few more months.¹

Time of presentation does not appear to correlate with age though severity appears to be greater in older patients, as can be seen in Table. This may not agree with the fibrosis theory, as inflammatory reactions leading to scarring and fibrosis are generally more robust in younger patients.¹

To our knowledge, Case 3 is the first patient reported with a history of thyroid disease. Thyroid eye disease could explain the retraction; however, the eyelid margin seemed to follow an expected contour due to a mechanical elevation from the underlying bleb. Both mechanical and thyroid vectors could be contributory to eyelid retraction in this case.

The series reported by Awwad et al.¹ was similar to ours with conjunctiva-sparing recessions of the levator and Mueller's muscles. In contrast to full-thickness blepharotomies, we believe sparing conjunctiva that lines the globe and bleb may forestall damage to the delicate filtration blebs. Complications with transverse conjunctival incisions include full-thickness eyelid fistulas and flattening of the central eyelid.¹¹ Hintschich et al.¹² and Looi et al.¹³ addressed flattening of the eyelid with preservation of a central pedicle of conjunctiva and Mueller's muscle, respectively. Nimitwongsakul et al.¹⁴ described a further modification by preserving a central bridge of the levator-Mueller-conjunctival complex, of varying thickness, to achieve a natural eyelid contour. These full-thickness methods, however, still carry increased risks associated with disrupting the conjunctiva and may be particularly undesirable in the presence of a glaucoma filtering bleb. Other complications reported by Elner et al.¹⁵ included ptosis and wound dehiscence. For those who favor these techniques, arguments for the full-thickness anterior blepharotomy to treat eyelid retraction due to thyroid eye disease include less tissue dissection, consistent and predictable eyelid, height, and contour, and perhaps shorter operative time.¹⁶ For trabeculectomy bleb-induced eyelid retraction, we believe that a conjunctiva-sparing method provides these benefits in addition to fewer complications.

Trabeculectomy bleb-induced eyelid retraction is an interesting phenomenon that has multiple possible causes, with none being satisfactory in consistently predicting its occurrence.

A diversity of procedures has been described, and we lend support for a conjunctiva-sparing blepharotomy approach.

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