Superior limbic keratoconjunctivitis following ptosis repair

Superior limbic keratoconjunctivitis (SLK) is an inflammatory condition of the superior bulbar conjunctiva, tarsal conjunctiva, and upper cornea of unknown etiology. The pathogenesis of SLK is unclear, although it has been linked to mechanical microtrauma, deficiencies in tear film quality, and immunologic dysregulation.[1]

SLK usually presents with irritation, foreign-body sensation, grittiness, burning sensation, and photophobia. Clinically, SLK is characterized by marked inflammation of the tarsal and bulbar conjunctivae of the upper lid, fine punctate fluorescein staining of the superior corneal limbus and adjacent conjunctiva, and a proliferation of superior limbic epithelial cells.[2] Filaments also may be seen at the superior limbus or upper cornea.

Ptosis repair is one of the most common eyelid procedures performed by ophthalmologists and may be associated with SLK. We present the first five reported cases of SLK that occurred following anterior ptosis repair.

This retrospective case series involved a chart review of patients who developed SLK following ptosis repair by 3 surgeons (C.S., A.W., and D.S.) from January 2010 to September 2019. Patients with preexisting thyroid disease, dry eyes syndrome, and Sjögren syndrome were excluded. Patient demographic profile, surgical approach used, clinical presentation, and details of the medical and surgical management were studied. The data were maintained using Microsoft Excel (Microsoft Inc, Redmond, Wash.). The study was approved by the Central Adelaide Local Health Network Ethics Committee and adhered to the principles of the Declaration of Helsinki.

Five patients developed SLK following ptosis repair. The anterior levator advancement approach was used in all patients. A single 6.0 Vicryl suture was placed through partial thickness of the tarsus in the upper third of the tarsus, and the levator was advanced and resected as necessary. None of the patients had postoperative lid retraction, lagophthalmos, or loss of lid–globe apposition following the ptosis repair. All patients were female. The right eye was involved in 2 patients and the left eye in 3 patients. The mean age was 67 ± 7.3 years (range, 55–77 years).

Preoperatively, none of the patients had evidence of SLK. Following ptosis repair, the patients presented with symptoms of irritation, foreign-body sensation, red eye, grittiness, and heavy upper lids. The mean time interval from the surgery to the diagnosis of SLK was 7.8 ± 4 weeks (range, 3–13 weeks). Examination findings were consistent with SLK (Table 1). These include superior bulbar conjunctival

Table 1—Clinical profile of patients with SLK following ptosis repair

No.	Age (sex)	Side	Preoperative diagnosis of SLK	Ptosis approach	Onset of symptoms following surgery (wk)	Symptoms	Signs	Medical management	Surgery	Symptoms resolution (treatment modality)
1	63 (F)	L	N	Anterior levator advancement	4	Irritation, lid swelling and redness	Superior bulbar conjunctival and limbal staining, superior palpebral conjunctival reaction, superior limbal hypertrophy, PEEs	Lubricants, vitamin A, antibiotic, steroid, BCL	No	Medical
2	75 (F)	L	N	Anterior levator advancement (conjunctivoplasty)	7 Surgical	Irritation, foreign-body sensation, red eye	Superior bulbar conjunctival hyperemia and staining, superior limbal staining and hypertrophy, Schirmer I <5 mm, CC	Lubricants, antibiotic, steroid, rebamipide, punctal plug	Yes	
3	55 (F)	R	N	Anterior levator advancement	13	Grittiness, foreign-body sensation, red eye	Superior bulbar conjunctival hyperemia and staining, superior limbal staining, CC, lid wiper epitheliopathy	Antibiotic, steroid, rebamipide	No	Medical
4	67 (F)	L	N	Anterior levator advancement	3	Pain, photophobia, burning sensation, grittiness	Superior bulbar conjunctival hyperemia and staining, superior limbal staining, Schirmer I 4 mm, CC, lid wiper epitheliopathy	Lubricants, antibiotic, steroid, rebamipide, diquafosol sodium, punctal plug, BCL	No	Medical
5	77 (F)	R	N	Anterior levator advancement	12	Discomfort, irritation, heavy upper lids	Corrugated upper conjunctival staining, fine upper conjunctivae papillae, CC, blepharospasm, mild ptosis	Lubricants, punctal plug, BCL	Yes (conjunctival excision with amnion patch graft)	Surgical

SLK = superior limbic keratoconjunctivitis; PEEs = punctate epithelial erosions; BCL = bandage contact lens; CC = conjunctivochalasis

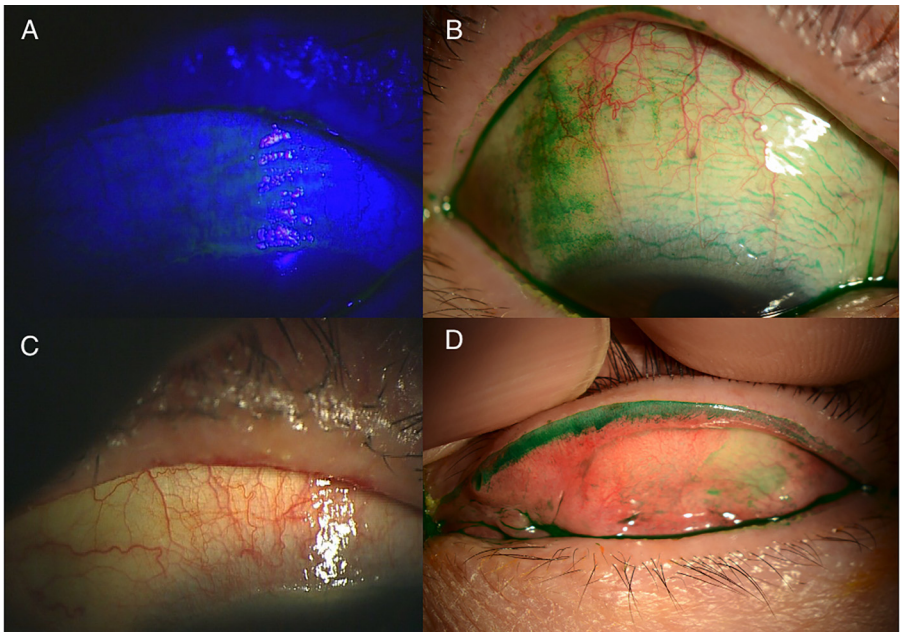

Fig. 1—Clinical photographs showing the superior limbic keratoconjunctivitis signs, including superior bulbar conjunctival and superior limbal staining with fluorescein 2% under blue light (A) and Lissamine green (B); superior bulbar conjunctival hyperemia and superior limbus hypertrophy (C); staining of the tarsal conjunctiva with Lissamine green (D).

and limbal staining (Fig. 1A, B), superior bulbar conjunctival hyperemia, and superior limbus hypertrophy (Fig. 1C) and staining of the tarsal conjunctiva (Fig. 1D).

All patients were initially trialled with medical management. Three patients (60%) required the use of a bandage contact lens. A punctal plug also was tried in 3 patients (60%). Two patients (40%) required surgical management to address the SLK, which consisted of conjunctivoplasty in case 2 and conjunctival excision with amnion patch graft in case 5.

Ptosis repair is one of the more common eyelid procedures performed by ophthalmologists. Our case series suggests an association with SLK. None of the patients in the present series had a previous diagnosis of SLK. All patients had normal anterior-segment examinations prior to surgery. Our surgeons routinely checked for signs of SLK preoperatively. Postoperatively, the diagnosis of SLK is often delayed and may be confounded by inflammation in the early postoperative setting. In our series, the diagnosis of SLK was made a number of weeks after surgery to reduce this risk.

The pathogenesis of SLK is unclear, although it has been linked to mechanical microtrauma, deficiencies in tear film quality, and immunologic dysregulation. Clinically, the mechanical theory for SLK has been associated with scarring of the superior tarsal conjunctiva [3] and upper eyelid blepharoplasty surgery.[4] This theory is also favoured in our case series. The mechanical theory proposes that SLK results from microtrauma between the opposing tarsal and bulbar conjunctivae, conjunctival stroma, and sclera.[1] Microtrauma can be triggered by perturbances in either the interface load between the bulbar and tarsal conjunctivae (e.g., exophthalmos, blepharospasm, contact lens wear), lid dynamics (e.g., blink rate), surface qualities (e.g., keratinization, limbal roll), and tear film deficiency.[1] Ptosis repair may cause conjunctival irritation and alter the lid–globe dynamics, leading to the development of SLK. Surgical treatment of conjunctivochalasis has been very effective in eyes otherwise unresponsive to medical therapies.[5] In this series, conjunctivochalasis was seen in 4 patients, requiring surgery in 2 patients. Botulinum toxin A injection into the orbicularis oculi area also may help to alter the muscle dynamics and improve symptoms in patients with SLK and dry eyes who have elevated blink rates.[6]

Tear film deficiency can lead to increased friction between the tarsal and bulbar conjunctivae, contributing to SLK. Dry eye states including keratoconjunctivitis sicca and Sjögren syndrome have been associated with SLK.[7] Keratoconjunctivitis sicca has been reported in up to one quarter of patients with SLK.[8] Patients in our series did not have dry eyes preoperatively, although they may have experienced postoperative tear film disturbance contributing to the development of SLK. Diquafosol sodium is a topical solution licensed in Japan for the treatment of dry eye disease.[9] It is a $P2Y_2$ receptor agonist that may help to increase fluid and mucin secretion from conjunctival cells.[9] Diquasofol sodium was associated with clinical improvement in 1 patient with postoperative dry eyes in our series.

The immunologic dysregulation theory is supported by the improvement of SLK following treatment with mast cell modulators such as cromolyn sodium[10] and rebamipide.[11] Rebamipide is a quinolone derivative that has anti-inflammatory effects including suppression of cytokines, and it attenuates tumour necrosis factor α–induced barrier dysfunction in the corneal epithelium.[11] Clinical improvement was associated with the use of rebamipide in 2 patients as part of other medical therapies in our series. Topical

cyclosporine also can be an effective steroid-sparing agent to help relieve the ocular symptoms of SLK.[12]

Medical and surgical therapies aim to address the proposed mechanisms in SLK. Initial local treatment options consist of avoiding contact lens wear and topical treatments including lubricants, steroids, vitamin A, cromolyn sodium, and rebamipide.[1,10,11] Lacrimal punctal occlusion and autologous serum drops can be considered in patients with tear film deficiencies.[7]

Surgically, lax bulbar conjunctiva can be treated to promote adhesion of the conjunctiva to the sclera (amniotic membrane transplant, silver nitrate/thermocautery).[13] Patient 5 underwent a conjunctival excision with amniotic membrane transplant. Conjunctivoplasty involving resection of the redundant conjunctiva can be effective when other treatment options have failed and was performed in 1 patient in our series.[5]

In conclusion, clinicians should be aware of the possible association between ptosis surgery and SLK. SLK is an uncommon condition that may be missed because the symptoms are nonspecific, and the characteristic ocular lesions may be hidden under the upper eyelid. Early diagnosis and treatment have the potential to alleviate symptoms that otherwise may be incapacitating for patients.

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References

1. Cher I. Superior limbic keratoconjunctivitis: multifactorial mechanical pathogenesis. Clin Exp Ophthalmol 2000;28:181–4.
2. Theodore FH, Ferry AP. Superior limbic keratoconjunctivitis: clinical and pathological correlations. Arch Ophthalmol 1970;84:481–4.
3. Raber IM. Superior limbic keratoconjunctivitis in association with scarring of the superior tarsal conjunctiva. Cornea 1996;15:312–6.
4. Sheu MC, Schoenfield L, Jeng BH. Development of superior limbic keratoconjunctivitis after upper eyelid blepharoplasty surgery: support for the mechanical theory of its pathogenesis. Cornea 2007;26:490–2.
5. Yokoi N, Komuro A, Maruyama K, Tsuzuki M, Miyajima S, Kinoshita S. New surgical treatment for superior limbic keratoconjunctivitis and its association with conjunctivochalasis. Am J Ophthalmol 2003;135:303–8.
6. Shen JF, Kusne Y. Botulinum toxin A use in dry eye patients with superior limbic keratoconjunctivitis (SLK). Invest Ophthalmol Vis Sci 2017;58:2698.
7. Goto E, Shimmura S, Shimazaki J, Tsubota K. Treatment of superior limbic keratoconjunctivitis by application of autologous serum. Cornea 2001;20:807–10.
8. Nelson JD. Superior limbic keratoconjunctivitis (SLK). Eye (Lond) 1989;3:180–9.
9. Matsumoto Y, Ohashi Y, Watanabe H, Tsubota K. Efficacy and safety of diquafosol ophthalmic solution in patients with dry eye syndrome: a Japanese phase 2 clinical trial. Ophthalmology 2012;119:1954–60.
10. Confino J, Brown SI. Treatment of superior limbic keratoconjunctivitis with topical cromolyn sodium. Ann Ophthalmol 1987;19:129–31.
11. Takahashi Y, Ichinose A, Kakizaki H. Topical rebamipide treatment for superior limbic keratoconjunctivitis in patients with thyroid eye disease. Am J Ophthalmol 2014;157:807–12 e2.
12. Sahin A, Bozkurt B, Irkec M. Topical cyclosporine a in the treatment of superior limbic keratoconjunctivitis: a long-term follow-up. Cornea 2008;27:193–5.
13. Yamada M, Hatou S, Mochizuki H. Conjunctival fixation sutures for refractory superior limbic keratoconjunctivitis. Br J Ophthalmol 2009;93:1570–1.

Footnotes and Disclosure

The authors have no proprietary or commercial interest in any materials discussed in this article.

Ultra-wide-field retinal imaging in tetralogy of Fallot before and after cardiac surgery

Congenital heart disease can be classified physiologically into 3 categories: volume overload, cyanotic, and obstructive. Cyanotic congenital heart disease (cCHD) includes lesions with right-to-left shunts or mixing abnormalities (e.g., transposition of the great vessels, persistent truncus arteriosus, tetralogy of Fallot).[1] Tetralogy of Fallot (ToF) encompasses a variety of anatomic abnormalities, including a large and unrestrictive ventricular septal defect, right ventricular outflow tract obstruction, overriding of the aorta, and right ventricular hypertrophy. The reported ocular findings in patients with cCHD are retinal vascular tortuosity, retinal hemorrhages, disc edema, papilledema, ischemic retinopathy, uveitis, and central retinal vein occlusion. Retinal vascular tortuosity is found to be the most frequent change.[2] The etiology of these vascular changes has been attributed to hypoxia and secondary erythrocytosis, even though systemic vascular endothelial growth factor (VEGF) levels are found to be elevated in these patients.[3] This article describes retinal vascular changes using ultra-wide-field (UWF) imaging in a case of ToF prior to and after surgical correction of ToF.