CASE REPORT

Corneal melt following collagen crosslinking and topography-guided customized ablation treatment for keratoconus

The patient is a healthy 18-year-old Caucasian male with a 10-month history of progressive keratoconus. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Visual acuity was 20/40 uncorrected before treatment. He underwent bilateral corneal collagen crosslinking with riboflavin (C3R), topography-guided customized ablation treatment (TCAT), and bandage contact lens placement. Preoperative Visante Optical Coherence Tomography (Carl Zeiss Meditec, Dublin, Calif.) topography showed inferior thinning characteristic of early keratoconus in both eyes with minimal thickness measured as 484 μm on the right and 483 μm on the left. Postoperative medications were topical gatifloxacin 0.3% ophthalmic solution (Allergan, Irvine, Calif.) 4 times per day (QID), prednisolone acetate 1% (Allergan) every hour (Q1h) while awake for 3 days and then reduced to QID, and artificial tear drops QID. Tetracaine minims and dilute Alcaine drops were supplied for as-necessary analgesic use, but the patient chose not to use them.

Four days post-treatment, the patient awoke with pain in his right eye. He was assessed, and his bandage contact lens was exchanged. The following day, the contact lens was removed and gatifloxacin was substituted with ciprofloxacin hydrochloric acid 0.3% ophthalmic ointment (Alcon Canada, Mississauga, Ont.) Q1h and the prednisolone acetate reduced from QID to BID for the right eye. By postoperative day 7, the right eye had become more painful with increased epiphora. The ciprofloxacin ointment was replaced with moxifloxacin hydrochloric acid 0.5% ophthalmic solution (Alcon Canada) Q1h and Refresh Lacrilube ointment (Allergan) Q1h. By postoperative day 9, the patient's pain was worse and significant keratolysis had developed in his right central cornea; however, no hypopyon was present (Fig. 1A). Corneal cultures were taken, and the patient was started on oral doxycycline 100 mg BID, oral valacyclovir 1000 mg TID, fortified vancomycin (50 mg/mL) ophthalmic solution Q1h, and fortified tobramycin (14 mg/mL) ophthalmic solution Q1h. Moxifloxacin and prednisolone acetate were discontinued. The cultures showed no growth of any organisms.

Eleven days post-treatment, the central corneal melt continued to worsen, and the patient was urgently referred to our centre. On examination, uncorrected visual acuities were counting fingers and 20/40 OD and OS, respectively. There was evidence of lagophthalmos and blepharitis in both eyes. The right eye had a mildly hyperaemic conjunctiva, clear peripheral cornea, large central area of stromal and epithelial loss with keratolytic tissue loosely adherent to the adjacent stroma, and no hypopyon (Fig. 1B). The left eye was within normal limits with no signs of inflammation. Because of the rapid progression of the corneal melt, the patient was admitted urgently for amniotic membrane transplantation (AMT) to prevent impending perforation.

Under general anaesthesia, corneal cultures were performed, and the inflamed corneal tissue was debrided with a surgical blade and sent to pathology. Cryopreserved amniotic membrane from the Eye Bank of Canada (Ontario Division) was used to cover the defect. With the stromal side placed down on top of the recipient cornea, the amniotic membrane was sutured to the peripheral cornea with six 10-0 Monosof (Covidien, Minneapolis, Minn.) interrupted sutures. A second, larger piece of amniotic membrane was placed basement membrane side down and sutured 1 mm posterior to the limbus, into the episcleral tissue using eight 10-0 Vicryl (Ethicon, Cornelia, Ga.) interrupted sutures. A lateral one-half, temporary tarsorrhaphy was then performed. After surgery, the patient was restarted on his preoperative medications.

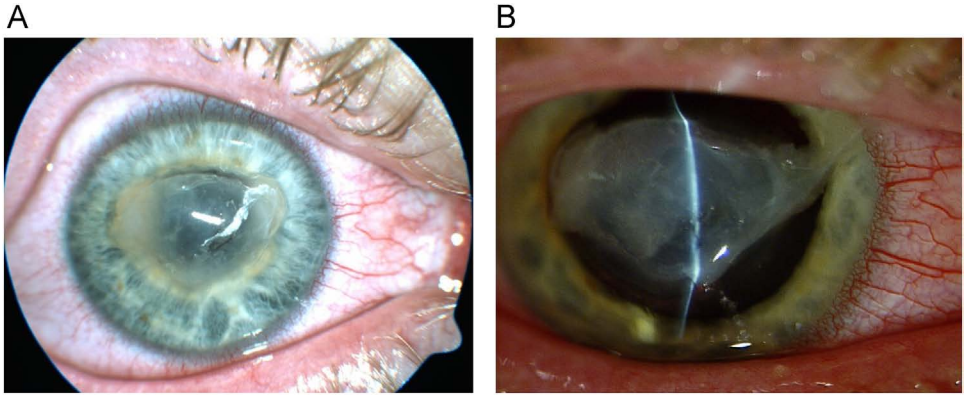

Fig. 1—Slit-lamp photographs of right eye after crosslinking with riboflavin (C3R) and sequential topography-guided customized ablation treatment (TCAT). (a) Postprocedure day 9, central keratolysis with clear peripheral cornea; (b) postprocedure day 11, large central area of stromal and epithelial loss with keratolytic tissue loosely adherent to the adjacent stroma, and impending perforation.

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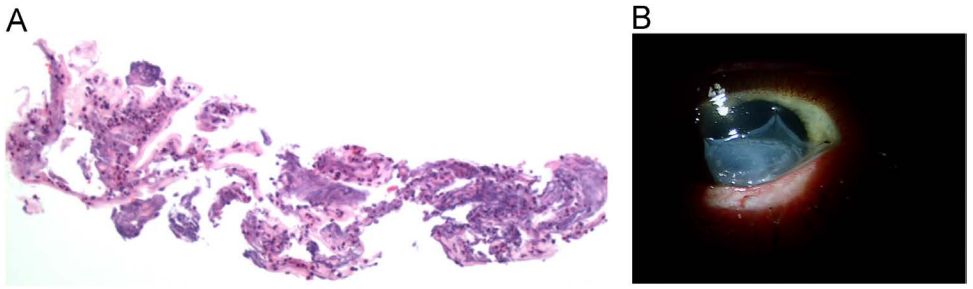

Fig. 2—(a) Histological section of hematoxylin and eosin–stained slide (100× magnification) reveals a small fragment of degenerated collagenous stromal tissue with marked acute inflammation. (b) Slit-lamp photograph of right eye 7 days after amniotic membrane transplantation and lateral tarsorrhaphy shows resolution of corneal melting.

Postoperatively, the patient had no pain. Gram-positive cocci were visualized on Gram stain; however, corneal cultures for bacteria, virus, parasites, and fungus were all negative. Systemic rheumatologic screening revealed that the patient was HLA-B27 positive with no extraocular findings. The pathology report revealed degenerated collagenous stromal tissue with marked acute inflammation (Fig. 2A). The patient steadily improved after surgery with complete resolution of both pain and keratolysis (Fig. 2B). Sixteen months postsurgery, the patient's ocular surface was stable with residual central scarring (Fig. 3A) and significantly thinned central corneal thickness (Fig. 3B). Uncorrected visual acuity was 20/70 OD (no improvement with manifest refraction). His left eye was within normal limits with uncorrected visual acuity of 20/20.

Post-AMT anterior segment optical coherence tomography showed significant thinning centrally with a layer of residual amniotic membrane with corneal re-epithelialization over the amniotic membrane in the right eye (Fig. 4A). Pentacam (Oculus Optikgeräte GmbH, Wetzlar, Germany) anterior segment tomography showed significant central corneal thinning with mixed, irregular astigmatism (Fig. 4B).

Discussion

We describe a case of corneal melting after C3R-TCAT. C3R-TCAT as an alternative to penetrating keratoplasty has been described in the literature since 2007.[1,2] It has the advantage of stabilizing the disease and therapeutic correction of irregular astigmatism commonly found in patients with keratoconus. In terms of patient selection, it is ideal for patients with contact lens intolerance. It has been shown to delay or avoid the need for penetrating keratoplasty.[1] However, potential complications described include haze and corneal endothelial decompensation.

Lin et al.[3] in their series of 72 eyes that underwent topography-guided photorefractive keratectomy for keratoconus combined with collagen crosslinking with 12-month follow-up, showed that 92% of patients had best-corrected visual acuity of 20/40 or better. The studied cohort had 4 eyes with delay in epithelial healing and subsequent haze, of which in 2 eyes the haze was significant enough to cause a reduction of >2 lines from preoperative best-corrected visual acuity.[3] There has not been a reported case in the literature of corneal melt after this procedure.

For collagen crosslinking, a prospective study evaluating 105 eyes with 12 months' follow-up reported that 3 eyes had developed stromal scar (2.9%) and 8 eyes (7.6%) had developed sterile infiltrates that resolved within 4 weeks of treatment with dexamethasone 4 times a day. None of these complications resulted in significant loss of corrected distance visual acuity.[4] Although there have not been any cases reported of keratolysis after collagen crosslinking for

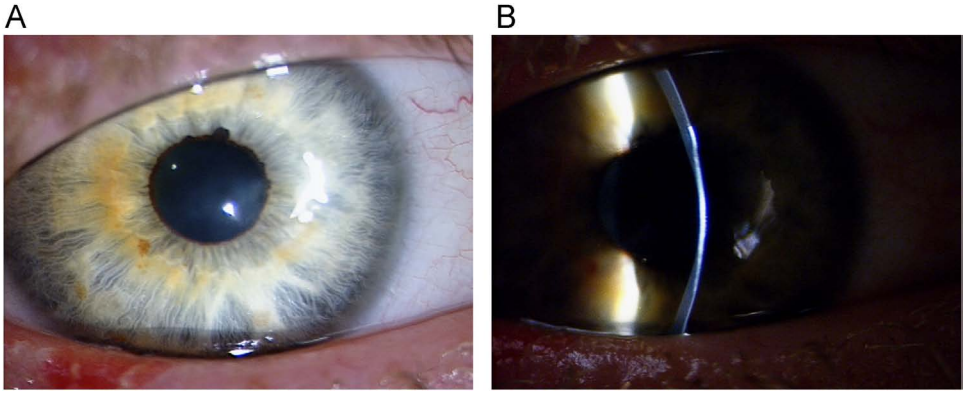

Fig. 3—Slit-lamp photographs of right eye 16 months after amniotic membrane transplantation and lateral tarsorrhaphy. (a) Faint residual central corneal scarring. (b) Slit beam shows significant central corneal thinning.