CASE REPORT

Tailored lamellar keratoplasty: a new technique

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SUMMARY

We present a new method for treating complicated corneal gaps among patients who have previously undergone radial keratotomy (RK). After complete healing of a fungal keratitis in a patient who has undergone RK, we removed the oedematous corneal sector and put anterior tailored segment of a corneal button previously used for Descemet stripping endothelial keratoplasty. The patient's best-corrected visual acuity reached to 20/20 6 months later. This technique will compensate for oedematous parts without putting a significant effect on other parts such as purse string sutures.

BACKGROUND

For years, radial keratotomy (RK) was the procedure of choice for correcting myopia. RK includes deep corneal incisions in a radial pattern to flatten the central cornea. However, in last 20 years, RK has been replaced by excimer laser ablation surgery. The reason is structural instability, vascularisation of stromal scars, susceptibility to corneal perforation and globe rupture following the RK, which could potentially lead to some complications such as keratitis related to these weak points in the cornea, as well as fluctuating vision and hyperopic and sometimes myopic shift and irregular astigmatism.¹⁻³ There are some previous reports about corneal oedema because of endothelial degeneration.²

Suturing of one gap may result in opening the adjacent gaps, on the other hand suturing of all radial incisions might result in the regression of primary refractive error and irregular astigmatism. Herein we report a novel method of management

Figure 2 Confocal microscopy showing branching interlocking hypha-like structures.

for unstable gutter like structures and the resultant localised oedema after RK.

CASE PRESENTATION

A 48-year-old housekeeper Caucasian woman who had undergone RK 15 years ago was referred to our clinic with a history of photophobia, redness and ocular pain in her right eye since 4 days ago. Her uncorrected visual acuity (UCVA) was 20/100 in the right eye. A slit photograph showed sectorial corneal oedema and deep focal grey-white corneal infiltration as well as peripheral satellites in that sector associated with a 1×1 mm epithelial defect and ciliary injection. Other aspects of the examination were normal other than the protective ptosis (figure 1).

Figure 1 Slit photograph showing grey-white infiltration and satellite lesions; the corneal segment is oedematous and irregular.

Figure 3 Eighteen days after medical treatment, the infiltration has been totally improved.

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Figure 4 There is ring corneal infiltration, inferior corneal vascularisation and oedematous irregular segment after 4 months.

INVESTIGATIONS

A corneal smear showed fungal hyphae documented as *Fusarium* sp found by culture. Confocal scanning of that segment showed fungal hyphae in that segment in stromal sections (figure 2).

TREATMENT

After a 1-month period of treating with topical amphotericin 0.15%, the infiltration was resolved (figure 3).

Outcomes and Follow-up

However, after 2 months of discontinuation of topical antifungal, the oedema in that sector did not resolve and led to growing vascularisation and foci of sterile infiltration in the periphery of the involved segment (figure 4), the patient continued to complain of photophobia and redness. The confocal microscopy showed no remnant hyphae and the same endothelial characteristics under the involved sector as the other parts of cornea.

The oedema and infiltration healed using a therapeutic contact lens, however the symptoms came back after the removal of therapeutic contact lens. It seemed that poor wound healing, decoupled sector and exposed margins were related to these symptoms. We removed the oedematous corneal sector and put the anterior tailored segment of a corneal button previously used for Descemet stripping endothelial keratoplasty (see

Figure 5 Tailored lamellar keratoplasty performed 4 months later. This is the slit photograph after suture removal. The sutures were removed 4 months after the procedure.

Figure 6 Topography of the right eye 2 months after suture removal. It shows a nearly regular cornea in this RK patient, actually the cornea is a little steep in that segment.

online supplementary video). After taking a slit-lamp photo image and importing that in the Photoshop software, we found the exact sizes ($2.4 \times 4.1 \times 6.1$ mm) of the corneal lamella to replace the patient's oedematous and decoupled corneal segment after resecting that part using a crescent knife up to deep stroma. During the surgery, the image of the pretailored lenticle was painted on it with a thin head marker and rematched with the intended area in the patient's cornea. After being sure about the size and shape, the corneal tailored segment was put on place and fixating of the segmental corneal lamellar graft was performed with 10-0 nylon sutures. The patient was under the treatment with topical chloramphenicol four times a day for 1 week and topical betamethasone every 6 hours for 2 weeks following by topical fluorometholone every 6 hours for 1 month. The patient was under the treatment with topical amphotericin 0.15% every 6 hours during that period. The patient's best-corrected visual acuity reached to 20/20 6 months later with a with the rule astigmatism ($+1.50-2.00 \times 180$) refraction (figure 5). Figure 6 shows a nearly regular cornea in this RK patient, actually the cornea is a little steep in that segment.

DISCUSSION

Nowadays RK is rarely performed because of its serious complications. Moreover, after RK the eye is always in a serious risk of globe rupture while getting involved in trauma.²⁻⁴

Deep incisions in RK could decrease corneal sensation because of corneal nerve transections leading to dry eye symptoms,

decrease in wound healing and epithelial regeneration and breaking of the epithelial barrier could lead to persistent corneal oedema in that segment. Also, RK could hasten corneal endothelial degeneration as Moshirfar *et al* reported.^{2,5}

Suturing of the corneal segments after de-epithelialisation of gutters could lead to opening of other neighbour wounds. Elbaz *et al* proposed collagen crosslinking (CXL) as a safe and effective method to stabilise corneal structure in patients undergoing RK.⁶ Chawla *et al* reported an infectious keratitis caused by *Staphylococcus epidermidis* in a patient 20 years after the RK surgery resulting in a wound gap.⁷ They used a 10–0 nylon sutures to appose the wound gaps of the ruptured scar after healing of keratitis in a purse-string fashion. However, the suture caused severe corneal irregularity that necessitated suture removal after the acute phase.⁷

In this report, we presented a new method for treating complicated corneal gaps in patients who have previously undergone RK. We used tailored lamellar graft according to the recipient site to compensate for the gaps in RK patients. The importance of this technique is that it will compensate for oedematous parts without putting significant effect on other parts such as purse string sutures or CXL.^{6–9} We have performed this technique in two other cases before; one of them after bacterial keratitis and

the other one after minimal blunt trauma resulting in wound dehiscence, which was managed using a therapeutic contact lens and the persistent oedema was resolved in both cases. It seems that what could reduce the optical effect of this procedure is inaccuracy in depth measurement, suturing effect and scar formation in wounds. Addressing these weak points could lead to more regularity of cornea even in these post-emergency cases.

Contributors MS: planning, conduct, reporting, conception and design. SAT: planning and writing. ZFT: conclusion, follow-up and writing.

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Learning points

- Fungal keratitis may develop even many years after radial keratotomy (RK).
- Wound gaps could cause visual loss because of irregular astigmatism.
- Using tailored corneal lamellar keratoplasty seems to be a promising method for treating complicated corneal gaps in patients who have previously undergone RK improving the patients' symptoms, corneal integrity, visual acuity and decreasing the rate of superimposed keratitis.

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