

Transplantation of autologous lamellar scleral graft for the treatment of corneal perforation



Corneal perforations are ocular emergencies and are distinct from lacerations in that there is tissue loss.¹ Common etiologies include trauma, infection, underlying autoimmune disease, and loss of corneal innervation.¹ If not treated promptly, corneal perforations can lead to profound vision loss, infection, phthisis, and/or globe loss.² In developing countries, the number of corneal perforations is higher than in the developed world.¹ Treatment options for corneal closure are contingent on many factors, including perforation size.¹ Optimally, corneal tissue is used either in a penetrating keratoplasty or a lamellar graft to seal the partial- or full-thickness wound for long-term success. Additional options, some temporary, include cyanoacrylate glue, fibrin tissue adhesives, conjunctivoplasty, amniotic membrane transplantation, and pericardial or scleral lamellar grafts.^{1,3} New techniques continue to advance our repertoire for corneal perforations that are too large for tissue adhesives. For instance, Tourkmani et al.⁴ described the use of tectonic Descemet-stripping endothelial keratoplasty grafts for acute corneal perforations.⁴ Advantages over penetrating keratoplasty include shorter surgical time, quicker recovery, and no general anaesthetic needed. More recently, Seifelnasr et al.⁵ have documented the use of a small-diameter tectonic Descemet-stripping automated endothelial keratoplasty graft for closure of a traumatic perforation. This technique avoids sutures, thereby theoretically reducing postoperative astigmatism and lowering the risk of rejection. Additionally, visual recovery does not depend on suture removal. Some limitations of this procedure are the need for corneal tissue, failure to reepithelialize over the graft, and potential cataract formation.

In the developing world, corneal tissue banks and corneal surgeons are sparse, and therefore penetrating or lamellar keratoplasty is not always an option. A lamellar scleral graft for corneal perforation was first described in 1948.⁵ It has received little attention in the literature since.² We present a case of autogenous lamellar scleral graft transplantation for corneal perforation in a low-resource setting as a viable long-term alternative to keratoplasty when corneal tissue is not available.

A 37-year-old woman presented to the Zimba Eye Hospital (International Vision Volunteers), in Zimba, Zambia, with right eye irritation for 3 months. Her medical history was unknown. Her visual acuity was 20/100 OD and 20/25 OS. A chronic full-thickness perforation with iris wound incarceration was seen in the temporal cornea of the right eye measuring 1.5 × 1.5 mm (Fig. 1). Medial to the perforation, thinning and ulceration were starting. In the left eye, there was 30%–40% corneal thinning temporally. Dilated fundus examination was unremarkable. An autogenous partial-thickness fornix-based scleral graft was

harvested via superior conjunctiva and subtenon dissection to expose bare sclera. A beaver blade then was used to undermine and create a partial-thickness 1.5 × 1.5 mm scleral graft. Following grafting and repair, conjunctiva was repositioned with a Weck-Cel sponge (BVI, Waltham, Mass.) without suture repair. Using six 10-0 nylon sutures, the graft was sutured over the perforation (Fig. 1). After 4 sutures were placed, a cannula was used through the perforation site to reposition the iris before final closure. While all iridocorneal adhesions were broken, permanent residual corectopia remained as a result of iris damage. A contact lens was placed, and topical ciprofloxacin and prednisolone acetate 1% were given for a 2-week course, followed by a 2-month prednisolone taper. The patient was seen at 2 weeks with improved visual acuity of 20/30 OD and maintained corneal clarity and anterior chamber depth. She was lost to follow-up until 2 years postoperatively, when she re-presented with right eye irritation. Her acuity remained at 20/30, and examination showed irritation as a result of the sutures. Transparency of the scleral tissue had begun, as noted in Figure 2. Around the suture sites medially, opacification had developed. The sutures were subsequently removed (Fig. 3).

Use of an autologous scleral patch graft for corneal perforation was first described successfully in the 1940s by Larsson after multiple failed conjunctivoplasties.⁵ Since then, its use has remained relatively unreported. In 1983, Stilma⁶ documented the use of a lamellar scleral autograft on 6 eyes of 5 patients with Mooren's ulcer. The author noted that in the absence of a donor cornea, no eyes were lost, and 5 eyes were able to retain useful vision. Furthermore, Levartovsky et al.⁷ documented the use of a scleral graft on a 3-year-old child and found that it was a feasible option in even sealing of a full-thickness corneal perforation.

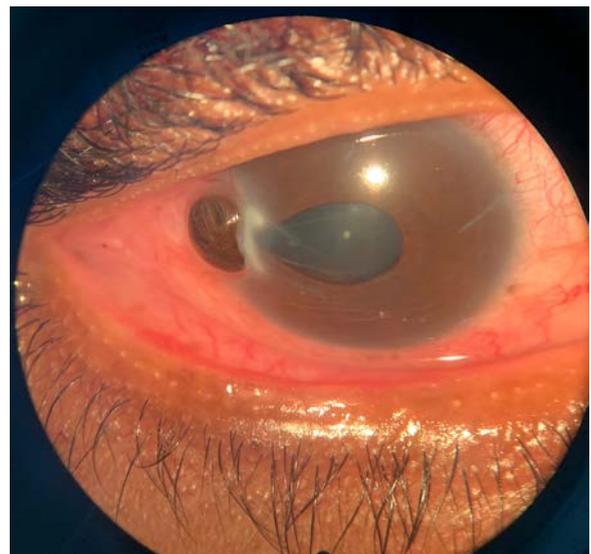


Fig. 1—Visualization of the chronic descemetocoele in the temporal cornea of the left eye.



Fig. 2—Autogenous lamellar scleral graft transplantation.



Fig. 3—Two-year postoperative result of scleral graft transplantation.

Scleral grafts were first investigated by Winkelman⁸ in 1951, and then Maurice and Singh⁹ used rabbits to investigate the ultrastructural changes that take place when a sclera graft is transplanted in the cornea using electron microscopy.⁹ It is believed that there is gradual replacement of the scleral collagen with corneal collagen and subsequent expression of corneal properties.^{2,8,9} An advantage of scleral tissue is that because of its fibril arrangement, it has higher tensile strength, and thus smaller and thinner slivers of tissue can be used.^{8–10} Transparency of scleral tissue embedded in cornea has also been noted and confers its advantage over other long-term solutions that do not result in corneal clarity.^{4,8} Unfortunately, in our case, opacification around the suture sites did occur because the patient was lost to follow-up prior to suture removal. However, maintenance of her visual acuity and eye health suggests that this is a viable option for corneal perforation when follow-up is tenuous, as it is in countries with limited resources. Additionally, we highlight the efficacy of using same-eye donor scleral tissue to

preserve the virginity of the contralateral eye, which is of critical importance in underlying autoimmune conditions that put patients at risk for bilateral involvement. As with deep anterior lamellar keratoplasty, our recommendation for suture removal is approximately 6 months.¹¹ Premature suture removal may enhance the risk of the patient developing wound dehiscence and impair adequate wound healing.¹²

In conclusion, a partial-thickness autologous scleral graft can serve as a viable alternative to correct a corneal perforation when a corneal transplant is not available, with the advantages of providing long-term ocular and visual stability with minimal further intervention required.

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Originally received Jun. 13, 2021. Final revision Aug. 27, 2021. Accepted Oct. 1, 2021.

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Footnotes and Disclosure

No conflicting relationship exists for any of the authors.

Use of ripasudil for rapid resolution of acute hydrops in keratoconus



Acute corneal hydrops (CH) is characterized by marked stromal edema from the influx of aqueous humour through a tear in Descemet membrane.¹ It is predominantly seen in patients with corneal ectasia and reported in up to 3% of patients with keratoconus.^{1,2} CH presents with an acute decrease in visual acuity, photophobia, and pain.¹ Conservative management of CH includes topical hypertonic

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. This study adhered to the Declaration of Helsinki. The University of British Columbia Clinical Research Ethics Board was contacted, and this study did not require institutional review board approval.

saline solution, cycloplegics, topical corticosteroids, topical antibiotics, and a bandage soft contact lens if needed for comfort.^{1,2} With these conservative measures, CH often resolves in 2–4 months.² This long duration of corneal edema not only prolongs the patient’s discomfort but also can have lasting sequelae such as infectious keratitis, corneal neovascularization, stromal scarring, corneal perforation, and the need for corneal transplantation.^{1,2}

In this article, we describe the successful use of the topical Rho kinase inhibitor ripasudil hydrochloride hydrate (Glanatec Ophthalmic Solution 0.4%, Kowa Co Ltd, Nagoya,

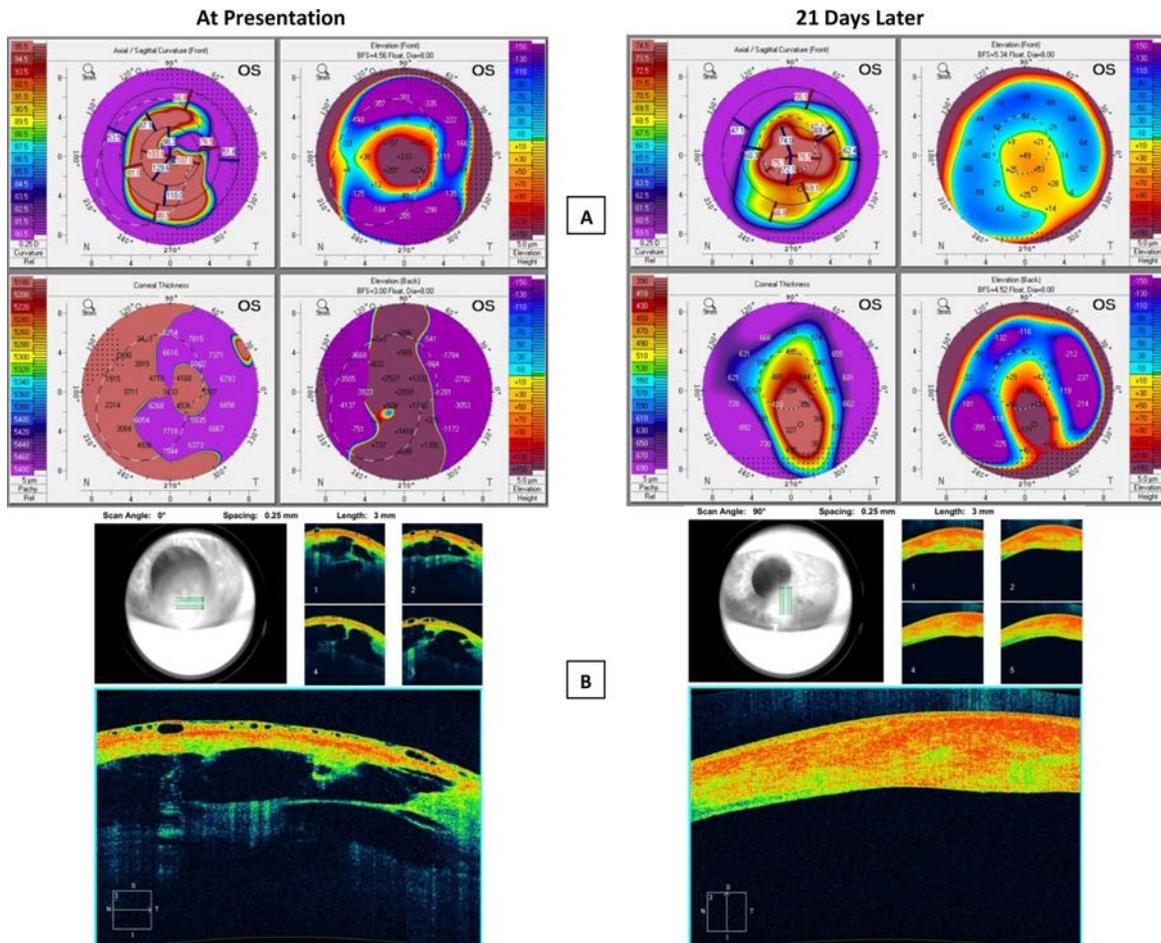


Fig. 1 — (A) Corneal tomography of the left eye depicting axial curvature, corneal thickness, and front and back elevation before and 3 weeks after ripasudil treatment. (B) Anterior segment optical coherence tomography of the left eye before and 3 weeks after ripasudil treatment.