CASE PRESENTATION
A 65-year-old white woman presented to the glaucoma service at the Illinois Eye & Ear Infirmary, Chicago, upon referral by her corneal specialist for increased IOP in each eye. The patient had an ocular history significant for autosomal dominant keratitis and had undergone successful bilateral 360° limbal stem cell transplantation 2 years earlier.

On presentation, she reported stable vision and stated she had no acute ocular complaints. Her ocular medications included a fixed combination of dorzolamide and timolol, latanoprost, prednisolone acetate, and cyclosporine in each eye. Her oral medication regimen included prednisone and sertraline. The patient had a documented local intolerance to topical brimonidine and pilocarpine.

She had a BCVA of 20/100 OU, and her IOP measured 29 mm Hg OD and 32 mm Hg OS. Central corneal thickness measured 604 µm OD and 503 µm OS. On gonioscopy, the anterior chamber angle in each eye was open. The slit-lamp examination demonstrated an intact limbal stem cell graft extending approximately 2 to 3 mm beyond the limbus in each eye (Figure 1). A funduscopic examination revealed advanced optic nerve head cupping in each eye, and automated visual field testing showed a dense inferior scotoma in each eye (Figure 2). A trial of therapy with oral methazolamide caused the patient gastrointestinal distress, fatigue, and dizziness.

HOW WOULD YOU PROCEED?
- Would you perform trabeculectomy surgery with an adjunctive antifibrotic agent?
- A microinvasive glaucoma surgical procedure?
- Diode laser cyclophotocoagulation via an internal or external approach?
- Glaucoma drainage implant surgery?

SURGICAL COURSE
Given the presence of a healthy corneal limbal stem cell graft, we were hesitant to perform trabeculectomy surgery with an adjunctive antifibrotic agent, which would have necessitated manipulation of the graft and might have increased the risk of irreversible corneal stem cell damage. We were also concerned that diode laser cyclophotocoagulation via either an internal or external approach would increase the risk of ocular inflammation and subsequent failure of the corneal limbal stem cell graft. Given the advanced nature of the patient’s glaucomatous optic neuropathy, we thought it unlikely that a microinvasive glaucoma surgery would sufficiently lower the IOP.
OUTCOME
The patient’s IOP measured below 15 mm Hg on all visits after 2 years of follow-up. A slit-lamp examination demonstrated well-positioned tube implants in the ciliary sulcus of each eye (Figure 4). Her visual field defects have remained stable with no evidence of progression. Fluorescein staining continues to show a healthy corneal surface (Figure 5), indicating viability of her ocular surface transplant.

DISCUSSION
Patients with a history of ocular surface transplantation often have coexisting glaucomatous optic neuropathy. Tsai et al reported an overall prevalence of 65.7%, ranging from 42.9% to 88.4% according to ocular surface disease subgroup, in 108 eyes.\(^1\)

Underlying mechanisms of glaucoma include congenital anomalies of the filtering angle associated with aniridia and inflammation/scarring of the ocular surface in patients with severe chemical and thermal injuries. A new onset of glaucoma after limbal stem cell transplantation likely relates to the need for long-term topical steroid therapy. Unfortunately, the occurrence of glaucomatous optic neuropathy may lead to irreversible visual field loss and a compromised visual outcome after otherwise successful ocular surface transplantation. The presence of glaucoma in this population requires a balanced approach to IOP lowering in order to decrease the risk of irreversible glaucomatous visual field loss while also minimizing the risk of further iatrogenic limbal stem cell damage.

Initially, topical medication may be effective in lowering IOP in this patient population, but local toxicity or intolerance often precludes the agents’ long-term use.\(^2\) Oral carbonic anhydrase inhibitor therapy may be an option, but these agents are often associated with adverse effects, including gastrointestinal symptoms, paresthesias, fatigue, electrolyte alterations, and nephrolithiasis.\(^3\) Standard trabeculectomy surgery has been shown to cause iatrogenic stem cell damage.\(^4\) Laser cyclophotocoagulation may incite ocular inflammation and threaten long-term survival of the ocular surface transplant.\(^5\) Glaucoma drainage implant surgery is a useful option, but anterior chamber placement of the tube increases the risk of corneal decompensation from presumed endothelial cell contact. The technique described herein for glaucoma drainage implant surgery via a limbus-based conjunctival incision and tube placement in the ciliary sulcus may be an effective option for patients with a history of ocular surface transplantation.\(^6\)

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