

GLAUCOMA MANAGEMENT IN THE CORNEAL TRANSPLANT PATIENT

The potential for tube erosion necessitates vigilance.

BY ANNA K. JUNK, MD

CASE PRESENTATION



A 64-year-old white pseudophakic man with a history of left retinal detachment repair, including a scleral buckle and pars plana vitrectomy, subsequently developed glaucoma and corneal edema. The IOP was controlled on medication. The patient underwent two sequential penetrating keratoplasties (PKPs; Figure 1). After the placement of a Boston Keratoprosthesis (KPro; Massachusetts Eye and Ear Infirmary) combined with a superotemporal glaucoma drainage implant (GDI), he continued glaucoma medical therapy and experienced an uneventful postoperative course, with a permanent bandage contact lens and daily topical antibiotics.

Four months postoperatively, the patient presented with follicular conjunctivitis and hordeolum in his left eye. Brimonidine was discontinued. At follow-up, tube exposure was noted near the edge of the bandage contact lens (Figure 2). The tube was repositioned and covered with a scleral patch graft, and the contact lens fitting was adjusted. One year later, however, tube exposure recurred (Figure 3). This time, the superotemporal GDI was abandoned, the tube was amputated, and an inferonasal GDI was placed. One year later, the anterior aspect of the superotemporal GDI was exposed. This exposure has been observed without negative sequelae for the past 5 years.

WHAT IS THE RISK OF CORNEAL TRANSPLANT FAILURE IN PATIENTS WITH GLAUCOMA?

The landmark Cornea Donor Study (CDS)—a prospective, multicenter, double-masked, controlled clinical trial—assessed the risk of graft failure in moderate-risk PKP

recipients. The 5-year graft failure risk was 7% in patients with Fuchs dystrophy and 27% in pseudophakic/aphakic recipients. Prior glaucoma surgery and preoperative IOP-lowering medications were associated with a 58% incidence of 5-year graft failure.¹ Multivariate analysis of 10-year graft failure risk in the CDS was only significantly associated with glaucoma: patients with a history of glaucoma on IOP-lowering medication or glaucoma surgery had a 35% $\pm$ 23% failure rate compared to 14% $\pm$ 4% in patients without that history.²

A retrospective study comparing the survival of Descemet stripping endothelial keratoplasty (DSEK) and PKP in glaucoma patients on IOP-lowering medication or who had received a GDI also found high graft failure rates: 48% after PKP and 50% after DSEK, with DSEK failure occurring after 5.82 $\pm$ 6.77 months compared to PKP failure after 14.4 $\pm$ 7.7 months.³ There was no significant difference in graft survival rates between medically and surgically treated glaucoma.³ Tube location in the anterior chamber or pars plana was not a significant risk factor for graft failure in this study.³



AT A GLANCE

- Glaucoma treatments have been associated with corneal graft failure.
- Glaucoma drainage implants are common surgical options to promote IOP control after the placement of the Boston Keratoprosthesis, but tube erosion occurs at a higher rate in patients with this device. Vigilance is key to detecting tube erosion early, before more serious complications can occur.

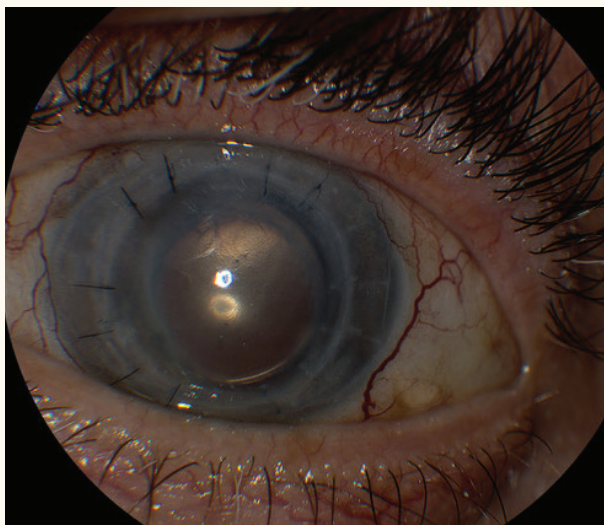


Figure 1. Slit-lamp view of the patient's left eye after the second failed PKP but before placement of the Boston KPro.

WHAT IS IT ABOUT GLAUCOMA THAT RAISES CORNEAL TRANSPLANT FAILURE RATES?

Glaucoma treatments have been associated with corneal graft failure⁴: topical medications increase inflammatory cells in conjunctival and limbal tissue, which may predispose patients to graft rejection. Preservatives such as benzalkonium chloride can induce inflammation. β -blockers and carbonic anhydrase inhibitors can facilitate endothelial failure. Cholinergic agents may disrupt the blood-aqueous barrier and cause inflammation, increasing the likelihood of graft failure.

Antimetabolites can be toxic to the corneal endothelium. Although mitomycin C is 125 times more potent than 5-fluorouracil in inhibiting corneal epithelial wound healing,⁵ subconjunctival mitomycin C has been shown to be less toxic to the corneal epithelium than 5-fluorouracil in the hands of glaucoma surgeons.⁶ The transient breakdown of the blood-aqueous barrier after trabeculectomy or GDI surgery can predispose the cornea to graft rejection. A GDI tube may cause endothelial damage when in direct contact with the cornea.

The incidence of glaucoma after PKP was 21.5% in a recent meta-analysis.⁷

WHAT IS THE RISK OF TUBE EXPOSURE AFTER GDI SURGERY?

In the Tube Versus Trabeculectomy (TVT) study, the risk of persistent corneal edema requiring PKP after the placement of a GDI was 16% compared to 9% in the trabeculectomy group.⁸ Revision of the tube shunt with placement of a new patch graft for tube erosion was required in 5% of patients with a GDI in the TVT study, and one of these patients needed further surgery for recurrent tube erosion.⁸

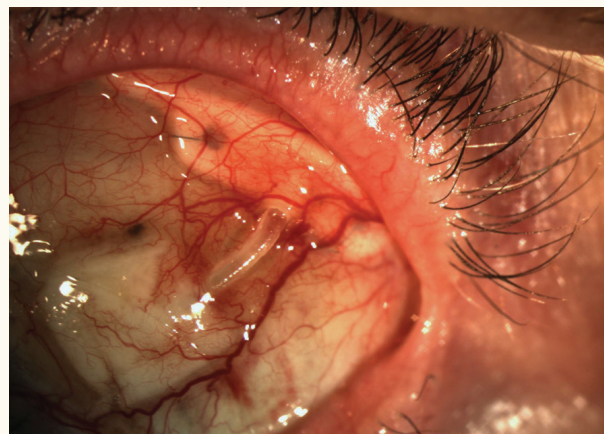


Figure 2. Initial tube exposure. The bandage contact lens is visible at lower left.

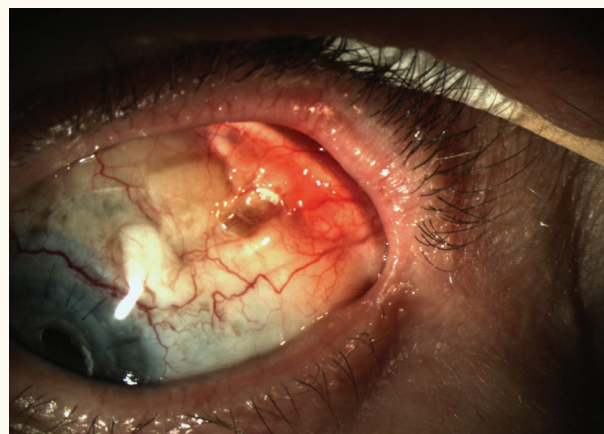


Figure 3. Recurrent tube erosion in close proximity to the contact lens.

A retrospective case-controlled review of 64 patients evaluated risk factors for tube erosion. Investigators reported an increased risk with younger age (48.2 ± 28.1 vs 67.3 ± 18.0 years), use of steroids at the time of exposure, and inflammation prior to tube exposure. The average time to tube exposure was 17.2 ± 18.0 months, and tube erosion was not associated with the type of GDI (Ahmed Glaucoma Valve [New World Medical] vs Baerveldt glaucoma implant [Johnson & Johnson Vision]).⁹

Trubnik and colleagues reported concomitant surgery as the only significant risk factor for tube erosion in 8.3% (28 eyes) of 339 eyes included in a retrospective comparative series.¹⁰

IS THERE EVIDENCE THAT NEWER, LESS INVASIVE GLAUCOMA SURGERIES OFFER A BETTER ALTERNATIVE TO GDIs?

The short answer is no. Reports on the success of angle surgery and other newer glaucoma procedures in patients with DSEK or PKP are anecdotal and limited to a single case report.

HOW DOES A KERATOPROSTHESIS ALTER COMPLICATION RATES RELATED TO GDI?

GDI is common surgical options to promote IOP control after the placement of the KPro. Compared to the TVT study, tube erosion rates are higher in patients with the KPro: 23.5% in eyes with a preexisting GDI versus 27.8% in eyes with concomitant GDI and KPro placement.¹¹ A recent retrospective review of 40 eyes with the KPro and GDIs reported 10 cases of tube erosion; nine of these GDIs were placed prior to the KPro. Associated complications were worse final visual acuity, endophthalmitis, hypotony, keratoprosthesis extrusion, and GDI removal.¹²

Lenis and colleagues retrospectively reviewed the safety of KPro and GDI placement. They reported tube exposure rates of 11.6% (5 of 43 with history of prior GDI placement) and 6.5% (3 of 46 with concomitant GDI).¹³

CONCLUSION

Tube erosion occurs at a higher rate in patients with the KPro. The fact that the recurrent erosion in the case presented herein occurred near the rim of the contact lens may suggest a causative relation. Vigilance is key to detecting tube erosion early, before more serious complications can occur. Revision of recurrent tube erosion is often best achieved by posterior repositioning of the GDI or placement of a new GDI in a different quadrant.¹⁴ ■

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