Treatment of Refractory Keratitis After a Boston Type I Keratoprosthesis With Corneal Collagen Cross-Linking

Siamak Zarei-Ghanavati, MD, FICO, and Fatemeh Irandoost, MD

Purpose: To report a patient with refractory keratitis after a Boston type I keratoprosthesis treated with corneal collagen cross-linking (CXL).

Methods: Case report.

Results: A 29-year-old man with a history of chemical burn in the left eye underwent keratoprosthesis implantation. He developed infectious keratitis 4 months after surgery, which did not respond to topical antibiotics. The patient underwent corneal CXL with a shield covering the keratoprosthesis optic. Three weeks after CXL, the infiltration completely resolved.

Conclusions: Corneal CXL might be beneficial in the treatment of refractory keratitis in patients with the Boston type I keratoprosthesis.

Key Words: Boston type I keratoprosthesis, postkeratoprosthesis keratitis, corneal collagen cross-linking (Cornea 2015;0:1–3)

The Boston keratoprosthesis is a therapeutic option for visual rehabilitation of eyes after repeated corneal graft failure or in any condition with a poor prognosis for successful keratoplasty.1–3 Infectious keratitis still remains one of the main complications after keratoprosthesis implantation. To reduce postkeratoprosthesis infection and its devastating consequences, patients commonly receive topical antibiotics as prophylaxis. Despite a reduction in the incidence of postoperative infectious keratitis with the use of topical (and sometimes systemic) antibiotic prophylaxis, there is an overall infection rate of 0.04 to 0.07 per eye per year of follow-up.4,5 Postkeratoprosthesis infection is generally treated with topical with or without systemic antibiotics; however, it has a relatively low success rate. Kim et al5 reported a success rate of 47% with topical with or without systemic antibiotic therapy, and the remaining cases needed removal of the keratoprosthesis. We report a patient with refractory postkeratoprosthesis keratitis successfully treated with corneal collagen cross-linking (CXL).

CASE REPORT

A 29-year-old man with a history of chemical burn in the left eye received a Boston type I keratoprosthesis. The patient was given a bandage contact lens (BCL) and maintained on 25 mg/mL vancomycin and levofloxacin 5 mg/mL 4 times a day and 1 mg/mL betamethasone tapered to twice daily. A BCL was kept in place.

Four months after keratoprosthesis implantation, he presented with photophobia, red eye, and purulent discharge. Slit-lamp examination revealed a gray-white stromal infiltrate with an overlying epithelial defect, which was suspected to be infectious keratitis (Fig. 1A). The BCL was removed followed by scrapings of the infiltrate. Smear and culture were performed, and both had negative results for bacteria and fungi. Subsequently, fortified topical antibiotics were initiated. The patient’s topical medication consisted of frequent topical amikacin (14 mg/mL), topical vancomycin (25 mg/mL), topical amphotericin B (3 mg/mL), and topical voriconazole (10 mg/mL). Despite multiple antibiotic administration for approximately 2 months, no improvement was observed and the infiltration persisted beneath the anterior plate (Fig. 1B).

Given the role of CXL in infectious keratitis, the decision was made to perform this type of procedure for the patient. The procedure was conducted according to the standardized protocol of CXL for keratoconus with 30-minute UV application. We debrided the corneal epithelium and used a shield on the optical cylinder of the keratoprosthesis to prevent potential macular ultraviolet damage (Fig. 1C). A BCL was placed at the end of the procedure.

Postoperatively, topical medication was continued. The corneal epithelium healed within 2 weeks (Fig. 1D). Corneal infiltration resolved completely 3 weeks after CXL, and no recurrences occurred up to the final follow-up visit (3 months after CXL) (Figs. 1E, F). Retinal toxicity was not observed during follow-up, and the patient gained 2 lines of vision during this period.

DISCUSSION

Despite the use of prophylactic topical antibiotics after keratoprosthesis implantation, infection remains a major concern, affecting 3.2% to 16.7% of patients.1,2,4,5 The most common clinical presentation of postkeratoprosthesis infectious keratitis is opacity under the edge of the anterior plate of the keratoprosthesis, adjacent to the optical cylinder. Because the prevalence of bacterial and fungal infections is similar, it is recommended to treat the postkeratoprosthesis keratitis with both antibacterial and antifungal medications in the case of negative cultures. Unfortunately, the success rate for topical medication is not high, and more than half of the

© 2015 Wolters Kluwer Health, Inc. All rights reserved.
patients need keratoprosthesis removal. The reason could be the minimal penetration of topical antibiotics beneath the anterior plate or the presence of the implant that acts as a foreign body, avoiding complete eradication of the organism by antibiotic therapy.

In 1965, Tsugita et al showed that riboflavin and subsequent application of UVA light could be used for inactivation of RNA virus infesting tobacco plants. Since then, this type of treatment has been applied in the elimination of certain microorganisms to establish an aseptic environment.

In the field of ophthalmology, riboflavin plus UVA light application, which is known as corneal CXL, was first introduced as a minimally invasive treatment for corneal ectasia. Since then, a growing number of studies have suggested that CXL may be beneficial in antibiotic-resistant infectious keratitis. This treatment seems to be safe and effective and should be considered as part of the therapeutic approach in refractory cases with infectious keratitis.

In this study, we used CXL for the treatment of refractory keratitis after keratoprosthesis implantation. To the best of our knowledge, this is the first study to report the use of CXL in the treatment of this condition. Because both the smear and culture were negative for bacteria and fungi, viral or sterile corneal infiltration should be considered in differential diagnosis.

Fortunately, in addition to the direct eradication of the microorganisms in the area of minimal penetration of antibiotics (under the anterior plate), CXL increases corneal rigidity and theoretically reduces the risk of corneal melting, which is one of the main concerns after successful treatment of both infectious and noninfectious postkeratoprosthesis keratitis.

We therefore recommend CXL as a beneficial therapeutic option in the treatment of refractory keratitis after the Boston type I keratoprosthesis.

ACKNOWLEDGMENTS
We thank Dr Sophie Deng for her scientific comments and kind assistance in writing this article.

REFERENCES
1. Zerbe BL, Belin MW, Ciolino JB; Boston Type 1 Keratoprosthesis Study G. Results from the multicenter Boston Type 1 Keratoprosthesis Study. Ophthalmology. 2006;113:1779 e1–1779 e7.