



Case report

Results with the Boston Type I keratoprosthesis after Acanthamoeba keratitis



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ARTICLE INFO

Article history:

Received 1 October 2016
Received in revised form
12 January 2017
Accepted 12 January 2017
Available online 14 March 2017

Keywords:

Acanthamoeba keratitis
Boston Type I keratoprosthesis
Glaucoma
Corneal transplant

ABSTRACT

Purpose: To report the outcomes of implantation of the Boston Type I keratoprosthesis in three patients with Acanthamoeba keratitis (AK), a severe infection that can lead to significant visual loss.

Observations: Case series reporting three patients with difficult cases of AK that needed multiple corneal transplantations and glaucoma surgeries. All patients were implanted with the Boston Type I keratoprosthesis device. The main outcomes measure were the visual function and anatomical retention after implantation of the Boston Type I keratoprosthesis. All patients retained the device over the long-term and had good visual function. In one patient a retroprosthetic membrane developed and in another patient an epithelial lip developed over the anterior surface of the keratoprosthesis. The visual acuities range from 20/25 to 20/80 in the implanted eyes.

Conclusions and importance: The Boston Type I keratoprosthesis resulted in good anatomic and functional results after multiple graft failures after AK.

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1. Introduction

Acanthamoeba keratitis (AK) has been linked strongly to soft contact lens wear with inadequate disinfection and water exposure.^{1–3} The disease is perceived as a devastating corneal infection that can lead to significant visual loss and ocular morbidity.⁴ The prognoses vary based on the time until diagnosis, visual acuity (VA) at diagnosis, deep corneal infiltrates, and neovascularization. Many patients will need either therapeutic or optical keratoplasty.⁵ Robaei et al. reported worse visual prognoses in cases of therapeutic corneal grafts compared to optical corneal grafts performed in non-inflamed eyes.⁶ However, therapeutic transplantation in the acute phase should be considered in association with drug therapy in refractory cases and those with adverse evolution.⁷ In such cases, the graft survival rate is lower, and often these patients need multiple transplants to achieve visual rehabilitation.³

Anterior segment inflammation, iris atrophy, and secondary glaucoma have been associated with AK.⁸ Glaucoma associated with AK is often severe and frequently requires surgical intervention for intraocular pressure (IOP) control and visual preservation.²

The Boston Type I keratoprosthesis (Type I KPro, Massachusetts Eye & Ear Infirmary, Boston, MA) usually provides satisfactory visual rehabilitation and good device retention in most cases. Glaucoma is a complication and 21.6% of patients implanted with the Type I KPro might require glaucoma surgery to control the IOP.^{9,10}

We describe our experience with the Type I KPro device as an alternative option for visual rehabilitation after refractory AK with multiple graft failures.

The institutional review board of the Federal University of São Paulo approved this study.

2. Case reports

Case 1 is that of a 32-year-old man who was a contact lens wearer and developed AK in his right eye. He underwent two penetrating keratoplasties, cataract extraction with intraocular lens (IOL) implantation, and two glaucoma drainage device (GDD) implants. After the second graft failure, we implanted a pseudophakic Type I KPro device in January 2011. Five months postoperatively,

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the patient presented with retroprosthetic membrane formation requiring YAG laser treatment. After 5 years of follow-up, the patient has retained the device and has a best-corrected VA (BCVA) of 20/30 in the affected eye. The cup-to-disc ratio was 0.4 and the IOP seems stable by digital palpation (Fig. 1).

Case 2 is that of a 55-year-old woman who was a contact lens wearer for over 10 years. She developed AK and a rapidly progressive cataract and iris atrophy during treatment in her left eye in 2006. She underwent a triple procedure (penetrating keratoplasty with extracapsular cataract extraction and IOL implantation). Despite glaucoma medical treatment, the graft failed 1 year postoperatively. A GDD was implanted in 2008 to achieve better IOP control. The patient underwent two additional optical grafts, both of which failed. In November 2014, a pseudophakic Type I KPro device was implanted in her left eye. After 14 months of follow-up, the patient has retained the device and has a BCVA of 20/80 in the affected eye with a cup-to-disc ratio of 0.8 and stable IOP by digital palpation (Fig. 2).

Case 3 is that of a 27-year-old woman who was a contact lens wearer and developed AK in her left eye in 2002. The patient received a therapeutic corneal graft right after she presented to our service due to the severity of the infection. After that, she underwent an optical corneal graft and developed severe and refractory glaucoma that required multiple glaucoma procedures (three GDD were implanted). Her second graft failed 1 year later and we performed a third corneal graft combined with extracapsular cataract extraction and IOL implantation. This graft remained clear and relatively functional for 2 years. In 2009, she underwent implantation of a pseudophakic Type I KPro device in her left eye. After 7 years of uneventful follow-up, the patient has retained the device and has a BCVA of 20/25 in the affected eye. The cup-to-disc ratio is 0.6–0.7 and IOP seems stable by digital palpation (Fig. 3).

3. Discussion

AK is a devastating corneal infection that can lead to significant visual loss and ocular morbidity.⁴ The outcomes can vary depending on early diagnosis. Numerous studies have reported that postoperative complications in these patients are more common after therapeutic keratoplasty than after optical keratoplasty. Graft survival and visual outcomes were worse with therapeutic grafts. Evidence has suggested that outcomes are better if surgery is reserved for visual rehabilitation rather than therapeutic removal of the infected tissue. These studies also reported a high level of graft failure after AK.^{3,6}

According to the literature, the results of penetrating keratoplasty are better in cases of non-infectious etiology and primary transplants. Kitzmann et al. reported a graft failure rate of 45.5% after AK and Kashiwabuchi et al. reported that at 1 year of follow-up the 45% failure rate was higher compared to other infectious etiology.^{3,11}

Several studies have reported the outcomes with the Type I KPro when implanted to treat patients with a poor prognosis for conventional penetrating keratoplasty.^{12,13} Rudnisky et al. reported the long-term visual outcomes in 300 Type I KPro eyes. A significant VA improvement was observed from a mean preoperative VA of 20/1625 to a mean VA of 20/150 after 6 months; this value was relatively stable thereafter.¹³ Zerbe et al. found that a significant number of patients had improved VA after implantation of the Type I KPro. Preoperatively, 3.6% of patients had a BCVA of 20/200 or better; this percentage increased to 57% postoperatively; 19% had a postoperative VA of 20/40 or better after an average follow-up of 8.5 months. During the same period, the keratoprosthesis retention rate was 95%.¹⁴ Primary implantation of the Type I KPro in non-autoimmune corneal diseases effectively restored vision in 43 eyes. The complications included retroprosthetic membrane formation (51%), glaucoma progression (47%), corneal melt (19%), and sterile vitritis (14%).^{14–17} Glaucoma has been the primary reason for VA loss after Type I KPro implantation. Some authors have postulated that patients with glaucoma before Type I KPro implantation should be considered for glaucoma surgery before or simultaneously with Type I KPro implantation. Those authors also advised that the high number of eyes with disc pallor after Type I KPro implantation suggested that additional mechanisms other than elevated IOP might play a role in a type of optic neuropathy.¹⁷ Rixen et al. suggested that the absence of progressive end-stage glaucoma in the aniridia study might have resulted because simultaneous empiric glaucoma shunt procedures and KPro implantation might have yielded better outcomes.¹⁸ However, serious complications such as hypotony, choroidal detachment, and suprachoroidal hemorrhage have been reported in patients undergoing KPro implantation with preexisting GDDs. All of our patients had GDDs, but these complications did not develop in any of the current patients.

To the best of our knowledge, this is the first report on the implantation of Type I KPro for visual rehabilitation in patients with successful medical treatment for AK but with multiple graft failures and controlled glaucoma. It has been reported that the incidence of corneal graft failure and the need for re-grafting after AK is higher than in penetrating transplant for other infectious causes and in other non-infectious causes such as keratoconus and Fuchs' dystrophy.^{3,11} With this background, we performed keratoprosthesis type 1 surgery in our three patients. The most significant postoperative complications in one patient each were retroprosthetic membrane and an epithelial lip over the anterior surface of the Type I KPro front plate. The current VAs range from 20/25 to 20/80 and the device has been retained in all patients.

In conclusion, the Type I KPro seems to be a viable option after multiple graft failures after AK. The device offered a relatively long-term functional rehabilitation for these young working-age patients. This case series showed that the anatomic and functional success were comparable to other Type I KPro series displayed in non-infectious context and better than conventional transplantation.

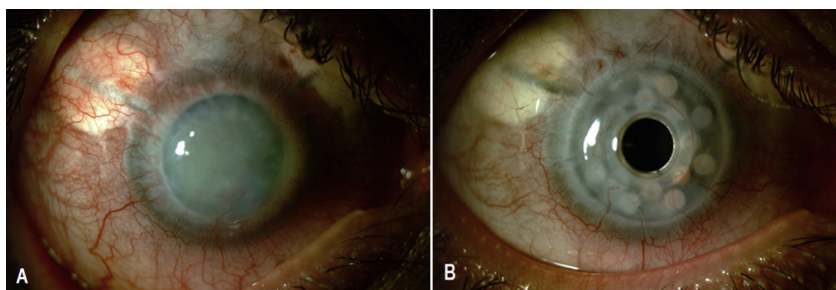


Fig. 1. A, Preoperative slit-lamp image of graft failure post *Acanthamoeba* keratitis. B, Postoperative slit-lamp image of the Type I KPro device.

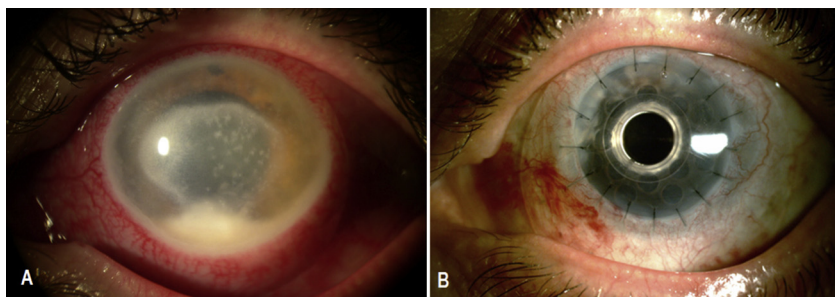


Fig. 2. A, Slit-lamp image of the classic ring infiltrate in late *Acanthamoeba* keratitis and hypopyon. B, Postoperative slit lamp image of the Type I KPro device.

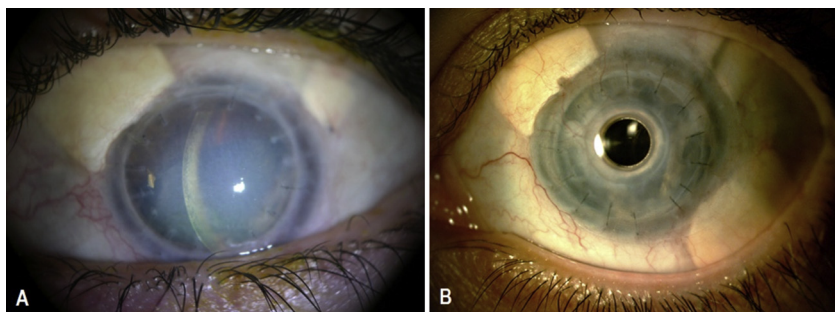


Fig. 3. A, Slit-lamp image of graft failure after *Acanthamoeba* keratitis. B, Postoperative slit-lamp image of the Type I KPro.

4. Patient consent

After obtaining approval from the institution's Investigational Review Board, 3 patients (3 eyes) with previous diagnosis of graft failure post AK were enrolled in this study. Informed consent was obtained (signed) from all subjects, and the research followed the tenets of the Declaration of Helsinki (CEP: 1179/07 UNIFESP).

Acknowledgements and disclosures

Funding

This study was supported by CAPES, Ministry of Education, Brazil (PNPD 2374/2011) and by Fundação de Amparo à Pesquisa do Estado de São Paulo.

Conflict of interest

The authors have no financial disclosures.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Acknowledgements

Medical International (Framingham, MA, USA) provided editing assistance.

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