

Peer Review File

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Review Comments

Successful corneal solid tissue transplantation, beginning with penetrating keratoplasty (PKP), and evolving to include contemporary lamellar and endothelial keratoplasty, has been a tremendous advancement in the struggle to combat corneal blindness. The Boston type 1 keratoprosthesis (BKPro) is the most widely used prosthetic cornea in the treatment of corneal blindness. In the manuscript “Boston Type I Keratoprosthesis”, authors explored indications, surgical technique and postoperative outcomes as well as several core tenants in the management of BKPro patients.

Couple questions are required to be answered before it will be accepted.

Comment 1: Compared to donor keratoplasty, what were the advantages of prosthetic cornea? Please state in the introduction.

Reply 1: There are number of patients with high-risk features predictive of transplant failure, for whom donor keratoplasty is not a viable option, this is where the prosthetic cornea comes into place. While a human donor cornea is used to carry the prosthetic device, the optic will remain clear even in the presence of immunologic rejection or endothelial failure of the surrounding cornea. Furthermore, it decreases the need of systemic immunosuppression required in high risk cornea transplantation and its associated side effects. It will also result in faster visual rehabilitation and no postoperative irregular astigmatism that can hinder vision post penetrating keratoplasty. Another advantage is the ability to correct for aphakia incorporating the lens power into the optic of the prosthetic. This is also mentioned in the introduction.

Comment 2: How to suppress the inflammation for BKPro patients?

Reply 2: The inflammatory state of BKPro candidates should be optimized prior to proceeding with implantation. This is mentioned in the “Corneal melting and ocular surface” section of the article. The anti-inflammatory/immunosuppressive regimen

required is individualized to each patient. Patients with autoimmune disease may require systemic immunosuppression perioperatively and in many cases as maintenance therapy. Most BKPro patients are commonly maintained on topical corticosteroids alone with intentionally tapering to the lowest dose possible that will maintain a quiet ocular surface. Topical tacrolimus, cyclosporine and IVIG have also been used in our practice in patients requiring additional anti-inflammatory effect or steroid sparing agent. Oral tetracyclines are also commonly used.

Comment 3: The glaucoma is a prevalent and important cause of permanent loss of sight in Boston keratoprosthesis recipients. How to better perform glaucoma management in BKPro patients? Please state in the part of Glaucoma.

Reply 3: All patients undergoing keratoprosthesis in our service are evaluated and followed by the glaucoma service regardless of their history of glaucoma as are considered high risk even in the absence of disease. All patients with a history of glaucoma on anti-hypertensives will receive a filtering device at the time of KPro. We also often offer GDD surgery to patients without glaucoma at the time of kPro implantation. Measuring IOP can be difficult and we rely on scleral pneumotometry and digital palpation with a very low threshold for initiating therapy. Imaging of the optic nerve with RNFL OCT and visual fields are performed regularly. Goldman Visual fields are also used and have been shown to be helpful in tracking progression of disease (we published on this can add reference)Reference added. Some surgeons elect to keep all KPro patients on a topical glaucoma agent prophylactically. Topical agents may have reduced effect in these patients due to reduced area of absorption but are usually started first. Prostaglandin analogs may be poor options in patients with a history of macular edema or inflammation, and preservative-free formulations are preferred to decrease ocular surface pathology.

Beyond topical therapy, and in cases of impossible GDD procedure, endocyclophotocoagulation remains a late option to be used with caution due to its

inflammatory adverse effect profile. This is mentioned in the “Glaucoma” section of the article.

Comment 4: What are your good suggestions for improving the successful rate of BKPro transplantation? Or what were the prospect of BKPro transplantation in the future? Please state in the discussion.

Reply 4: We know that BKPro is effective in improving vision, but complications are common and can lead to vision loss. Focusing research efforts on decreasing the risk of postoperative complications that help improve long-term outcomes. Reducing the rate of retroprosthetic membrane formation for example could result in a reduced incidence of postoperative angle closure glaucoma, corneal melt and retinal detachment. The ideal artificial cornea would need to biointegrate with the host tissue to reduce the risk of infectious endophthalmitis and increase the rate of device retention. While solving this has eluded the KPro field for many decades, several devices are under investigation that attempt to improve on the BKPro design. Added at the end of the text.

Comment 5: The figure 1 was not clearly enough. And supplement the full-name of abbreviations in the figure legends.

Reply 5: The full name of abbreviations is supplemented both on the figure as well as on the figure’s legend.