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RESEARCH

## CASE REPORT

# Bilateral immediately sequential endothelial keratoplasty in bilateral bullous keratopathy

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### Abstract

Pseudophakic bullous keratopathy is the presence of persistent corneal edema following intraocular lens implantation or cataract surgery. A 75-year-old lady presented to us with a right failed descemet stripping automated endothelial keratoplasty (DSAEK) performed elsewhere and a left eye with decompensating bullous keratopathy. A decision was made to proceed with a right DSAEK in the first instance. A second corneal graft became available due to a late cancellation. After further deliberation, the patient agreed to have the procedure done in both eyes. She received an immediate sequential bilateral endothelial keratoplasty with a DSAEK in the right eye and a descemet membrane endothelial keratoplasty in the left eye. This bilateral sequential endothelial keratoplasty resulted in faster bilateral visual recovery without complications. We postulate this as a viable option to speed bilateral visual recovery; accepting further evidence is required to support our assertion and help generate formal clinical guidance.

**Keywords:** Bilateral sequential endothelial keratoplasty; bullous keratopathy; descemet membrane endothelial keratoplasty; descemet stripping automated endothelial keratoplasty.

**P**seudophakic bullous keratopathy is the presence of persistent corneal edema following intraocular lens implantation or cataract surgery. This occurs due to endothelial failure, causing progressive stromal and epithelial edema. Significant epithelial edema forms bullae, hence being named bullous keratopathy.

The corneal endothelium plays a crucial role in maintaining the cornea's transparency. Damage and failure of this layer cause significant deterioration of vision. Associations include glaucoma, advanced age, previous intraocular surgery, previous ocular trauma, insertion of an anterior chamber intraocular lens, and Fuchs corneal dystrophy.

In the context of cataract surgery, it is estimated that around 0.1% to 2.35% of patients will develop post-operative

edema.<sup>[1]</sup> The diagnosis of PBK is mainly based on a clinical assessment of the patient's history and risk factors, along with a slit-lamp examination. Corneal transplantation remains the definitive treatment for PBK in the form of penetrating keratoplasty, descemet stripping automated endothelial keratoplasty (DSAEK), and descemet membrane endothelial keratoplasty (DMEK). Corneal collagen cross-linking and other surgical options can be deployed while awaiting a corneal transplantation.

### Case Report

A 75-year-old lady with underlying advanced glaucoma, bilateral trabeculectomy, and bilateral pseudophakia presented to us with a right failed DSAEK performed



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elsewhere. The examination showed thick DSAEK tissue with bullous keratopathy. Visual acuity at presentation was 6/60 in the right eye and 6/36 in the left eye.

On examination, her left eye cornea was found to be decompensating as well. A conversation was held during this consultation on which of her eyes should receive the corneal graft procedure first. A decision was made to proceed with a right-repeat DSAEK in the first instance.

On the day of surgery, two graft tissues were available due to a late cancellation. Whether we could use the additional available graft material in bilateral surgery was deliberated. The patient consented and agreed to have the procedure done in both eyes.

In January 2021, the patient received an immediate sequential bilateral endothelial keratoplasty with a DSAEK in the right eye and a DMEK in the left eye. The surgery went smoothly with no immediate complications. The post-operative appearance of her right eye is demonstrated in Figures 1 and 2, while the post-operative appearance of

her left eye is shown in Figures 3 and 4. Anterior segment optical coherence tomography for the left and right eye was taken post-operatively, as shown in Figures 5 and 6, respectively.

### Outcome and Follow-Up

One week later, the patient was followed up in the clinic. Her visual acuity was at hand movement in the right eye and 6/24 in the left eye.

After 6 weeks, her visual acuity was 6/12-1 unaided in the right eye and 6/12+1 unaided in the left eye. On examination, her corneal grafts were clear.

### Discussion

The immediately sequential approach is not usually employed in endothelial keratoplasty. There are no clear guidelines for immediately sequential bilateral endothelial keratoplasty. This approach is more commonly used in cataract surgery and delivers comparable post-operative outcomes to delayed sequential bilateral cataract surgery.<sup>[2]</sup>

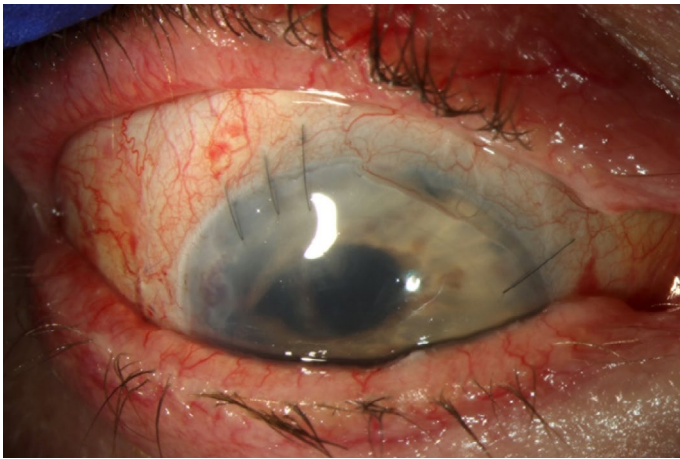


Fig. 1. Right eye post-procedure.

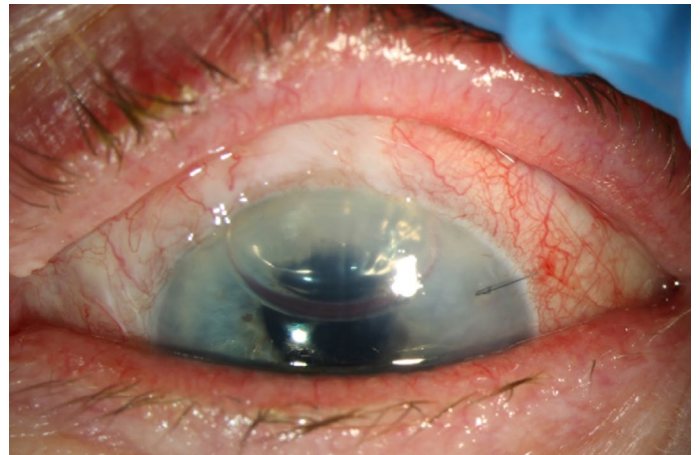


Fig. 3. Left eye post-procedure.

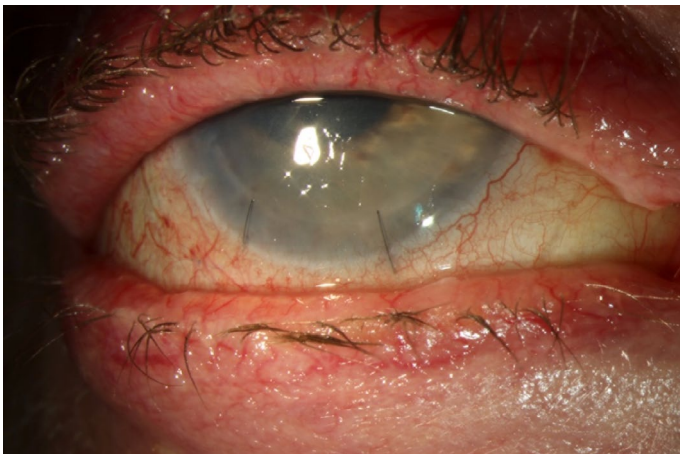


Fig. 2. Right eye post-procedure.

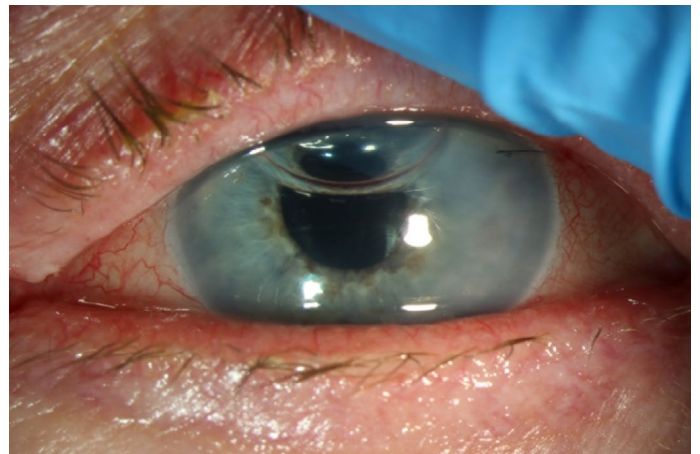
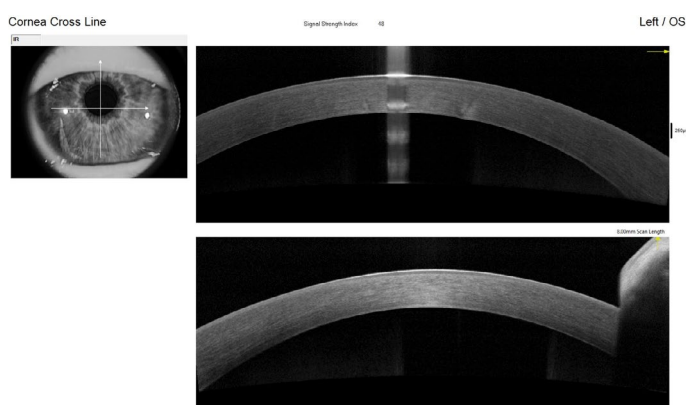


Fig. 4. Left eye post-procedure.



**Fig. 5.** Anterior segment OCT of left eye post-surgery.

From the outset, cataract surgeries and endothelial keratoplasties are very different surgeries. Due to that, the benefits and risks of immediately sequential cataract surgery may only partially translate to immediately sequential endothelial keratoplasties. However, there is still some overlap between the two.

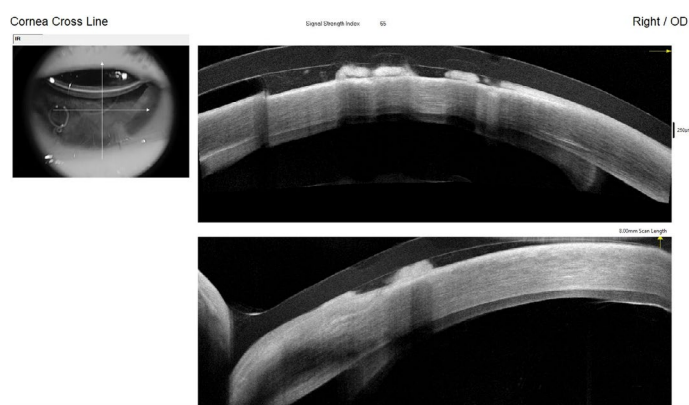
The most commonly cited risk of the immediately sequential approach would be the risk of bilaterally sight-threatening complications, mainly in the form of bilateral endophthalmitis.<sup>[3]</sup> However, most of the bilateral endophthalmitis cases reported were secondary to surgical procedures that did not have adequate levels of sterilization.<sup>[4]</sup> The overall rate of endophthalmitis was not expected to be higher in immediate sequential surgery compared to delayed sequential surgery.<sup>[5]</sup>

From a visual outcome perspective, a study conducted on 17,000 patients comparing immediately sequential cataract surgery to delayed sequential cataract surgery showed no significant difference in post-operative outcomes between the two different approaches.<sup>[6]</sup>

The other common argument against the immediately sequential approach is that performing the two surgeries separately allows time to detect early endophthalmitis and cystoid macular edema.

An immediate sequential approach enables swifter post-operative visual rehabilitation and fewer post-operative follow-up appointments.<sup>[7]</sup> These benefit patients and reduce the cost of delivery. Bilateral sequential surgery was shown to reduce the cost of cataract surgery by 14%.<sup>[8]</sup>

The immediately sequential approach to endothelial keratoplasty allows for further utilization of hemi-DMEKs. Hemi-DMEKs use half-moon-shaped corneal grafts, allowing for a single donor cornea to be used for two DMEK procedures. With the immediately sequential method, a hemi-DMEK could be done for both eyes using



**Fig. 6.** Anterior segment OCT of right eye post-surgery.

a single donor cornea, thus increasing the availability of donor tissue.<sup>[9]</sup> This is also supported by evidence that hemi-DMEKs provide similar visual outcomes to routine DMEKs.<sup>[10]</sup>

## Conclusion

We present a case of bilateral sequential endothelial keratoplasty. This resulted in a faster bilateral visual recovery without complications.

We postulate this as a viable option to speed bilateral visual recovery, accepting further evidence is required to support our assertion and help generate formal clinical guidance.

**Informed Consent:** Written informed consent was obtained from the patient for the publication of the case report.

**Peer-review:** Externally peer-reviewed.

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**Conflict of Interest:** None declared.

**Use of AI for Writing Assistance:** Not declared.

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## References

1. Yonekawa Y, Kim IK. Pseudophakic cystoid macular edema. *Curr Opin Ophthalmol* 2012;23:26–32. [\[CrossRef\]](#)
2. Herrinton LJ, Liu L, Alexeeff S, Carolan J, Shorstein NH. Immediate sequential vs. Delayed sequential bilateral cataract surgery: Retrospective comparison of postoperative visual outcomes. *Ophthalmology* 2017;124:1126–35. [\[CrossRef\]](#)
3. Henderson BA, Schneider J. Same-day cataract surgery should not be the standard of care for patients with bilateral visually significant cataract. *Surv Ophthalmol* 2012;57:580–3. [\[CrossRef\]](#)

4. Puvanachandra N, Humphry RC. Bilateral endophthalmitis after bilateral sequential phacoemulsification. *J Cataract Refract Surg* 2008;34:1036–7. [\[CrossRef\]](#)
5. Arshinoff SA, Bastianelli PA. Incidence of postoperative endophthalmitis after immediate sequential bilateral cataract surgery. *J Cataract Refract Surg* 2011;37:2105–14. [\[CrossRef\]](#)
6. Arshinoff SA. Immediately sequential bilateral cataract surgery—a global perspective. *US Ophthalmic Review* 2015;8:14. [\[CrossRef\]](#)
7. Arshinoff SA. Same-day cataract surgery should be the standard of care for patients with bilateral visually significant cataract. *Surv Ophthalmol* 2012;57:574–9. [\[CrossRef\]](#)
8. Lundström M, Albrecht S, Roos P. Immediate versus delayed sequential bilateral cataract surgery: An analysis of costs and patient value. *Acta Ophthalmol* 2009;87:33–8. [\[CrossRef\]](#)
9. Schaub F, Cursiefen C, Heindl LM. Retrospective appraisal of split-cornea transplantation: An audit of 1141 donor corneas. *JAMA Ophthalmol* 2015;133:1086–7. [\[CrossRef\]](#)
10. Lam FC, Baydoun L, Dirisamer M, Lie J, Dapena I, Melles GR. Hemi-descemet membrane endothelial keratoplasty transplantation: A potential method for increasing the pool of endothelial graft tissue. *JAMA Ophthalmol* 2014;132:1469–73. [\[CrossRef\]](#)