Case report

Descemet membrane endothelial keratoplasty for corneal decompensation due to iridoschisis

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ARTICLE INFO

Keywords:
Descemet membrane endothelial keratoplasty
Iridoschisis
Corneal edema
Diabetes mellitus

ABSTRACT

Purpose: To report a case of bilateral iridoschisis with cataracts and corneal decompensation in a patient who underwent cataract extraction and superficial iridectomy followed by Descemet membrane endothelial keratoplasty (DMEK).

Observations: A 58-year-old man with previously diagnosed iridoschisis, cataracts, and diabetes mellitus experienced progressive vision loss bilaterally due to corneal decompensation. Slit lamp examination revealed iridoschisis with iris fibrils contacting the corneal endothelium, stromal edema, and mild guttate changes bilaterally. Corneal findings were more severe in the right eye, including the presence of bullous keratopathy at the time of presentation. Cataract extraction with intraocular lens implantation and superficial iridectomy were performed in the right eye, followed by DMEK. These same procedures were performed subsequently in the left eye. Postoperatively, the patient had significant improvement in visual acuity and corneal edema.

Conclusions and importance: DMEK can be performed safely and successfully after staged cataract surgery with superficial iridectomy in eyes with endothelial decompensation caused by iridoschisis.

1. Introduction

Iridoschisis is characterized by iris degeneration, whereby anterior layers of the iris become atrophic and split from the posterior layers. Iris fibrils may contact the corneal endothelium and lead to endothelial dysfunction and subsequent corneal decompensation. Herein, we report our experience with a 58-year-old patient who developed secondary corneal edema due to iridoschisis. The patient underwent staged cataract extraction and superficial iridectomy followed by Descemet membrane endothelial keratoplasty (DMEK) to reverse the corneal edema and restore vision in both eyes. The Institutional Review Board at the University of Iowa determined that approval was not required for this study.

2. Case report

A 58-year-old man presented to our clinic with worsening vision in both eyes. He had been diagnosed with iridoschisis two years prior to presentation, and was treated by the referring ophthalmologist with bandage contact lenses in the more severely affected right eye to reduce symptoms from bullous keratopathy. He had a history of diabetes mellitus type I with proliferative diabetic retinopathy treated by panretinal photocoagulation 20 years prior to presentation. He had no other significant ophthalmic or systemic medical or surgical history. Initial clinical examination showed best-corrected visual acuity (BCVA) of 20/300 in the right eye and 20/50 in the left eye. Intraocular pressures measured with Tonopen tonometry were 18 and 15 mm Hg, respectively. Slit lamp examination revealed moderate stromal edema with mild guttate changes bilaterally (Fig. 1A–C). The right cornea displayed frank bullae inferiorly. Iridoschisis was noted to be prominent in the inferior quadrant of each eye with iris strands touching the corneal endothelium (Fig. 2). Neovascularization of the iris was not observed. Moderate nuclear sclerotic cataracts with brunescent were present bilaterally. Central corneal thickness (CCT) measured by ultrasound pachymetry was 658 μm in the right eye and 635 μm in the left eye.

A surgical plan was made to perform superficial iridectomy and cataract extraction with monofocal intraocular lens (IOL) implantation prior to DMEK in the right eye. The superficial iridectomy was performed using a vitrectomy handpiece (4000 cuts per minute, cut-I/A setting) to remove loose anterior iris strands, after the anterior chamber was filled with a dispersive viscoelastic and prior to performing the...
capsulorhexis. No iris restraining device was used. After performing uneventful phacoemulsification and in-the-bag lens implantation, freely mobile iris strands were noticed and additional vitrector-assisted superficial iridectomy was performed. One month later, uncomplicated DMEK was performed in the right eye using our previously published technique.1 Graft edge lifts were not noted. One month after DMEK in the right eye, BCVA was 20/30, slit lamp examination showed an attached DMEK graft with clear overlying stroma, and CCT was 538 μm.

Fig. 1. Slit lamp photos and Scheimpflug corneal imaging of the right eye demonstrate corneal decompensation due to iridoschisis at the time of initial presentation (A–C), and restored corneal anatomy one month (D–F) and one year (G–I) following Descemet membrane endothelial keratoplasty (DMEK). Preoperative iris degeneration and corneal changes were most prominent in the inferior quadrant (A–C). Resolution of corneal edema and removal of free-floating iris fibrils by iridectomy, performed with cataract surgery one month prior to DMEK surgery, is visible on postoperative slit lamp examination (D–E, G–H). Normalization of corneal pachymetry (μm) was achieved by one month after DMEK (F) and corneal thickness remained stable through one year postoperatively (I).

Fig. 2. Anterior segment optical coherence tomography of the right eye at presentation. Evidence of separation of the anterior iris stromal layer, and contact of iris fibrils with the posterior cornea, are present in the inferior quadrant (A, right side of image 315°) extending into the nasal quadrant (B, right side of image 0°).

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displacement and nanophthalmos. In iridoschisis, the anterior layers of the iris split from the posterior stroma and muscle layers and become atrophic, leading to a characteristic "shredded-wheat" appearance. Atrophic iris fibers can bow forward but normally remain attached to the iris and the ciliary body peripherally. These fibers can also break loose completely, becoming free-floating in the anterior chamber. Typically, degenerative iris changes are seen in the inferior quadrant, with the superior quadrant often appearing normal.

Although uncommon, iridoschisis has been associated with corneal decompensation, as occurred in this case. Damage to the corneal endothelium, which may lead to stromal edema and possibly bullous keratopathy, is typically focal in nature and limited to the areas of iridocorneal touch as was seen in our patient’s case. However, total corneal decompensation may occur. Corneal decompensation is thought to be a result of endothelial cell death due to mechanical trauma from iris brils that could contact the posterior cornea and DMEK graft tissue had been removed prior to surgery. Although the DMEK graft in the left eye developed an edge lift postoperatively, the superior temporal location and lack of iris strands to the area of concern indicate that this lift was not likely related to iris strands. The edge lift and attendant edema resolved completely with a rebubble procedure. While a “DMEK triple” procedure could have been performed along with iridectomy, we chose to stage the procedures with cataract surgery and iridectomy performed initially and DMEK to follow. This is the typical approach to cases of concurrent cataract and corneal edema at our institution. Advantages of staging the DMEK surgery include improved intraoperative iris control, which we felt was a distinct advantage given the limited predictability of iris behavior after iridectomy in the context of the patient’s iridoschisis.

Because iridoschisis occurs most commonly in the 5th through 7th decade, cataract is often a concomitant issue. Iridoschisis often necessitates special care during cataract extraction due to the presence of free iris brils that may flap into the pupillary axis. Forward-bowing anterior iris tissue can be attracted to the phaco needle or irrigation and aspiration tip by low pressure forces, which may lead to iris trauma and result in hemorrhage, iris tears, loss of contractile strength, or blood-aqueous barrier disruption. A surgical consideration during phacoemulsification in iridoschitic eyes is the removal of atrophic iris brils. While mechanical iris retraction devices can restrain iris fibers intraoperatively, they do nothing to prevent long-term postoperative complications resulting from anterior bowing of the iris brils and iridocorneal touch. A vitreous cutter may be used immediately prior to cataract extraction to remove loose brils, making phacoemulsification easier and preventing iridocorneal touch from occurring or recurring postoperatively. Performing iridectomy prior to cataract extraction does incur the risk, however, of damaging the anterior capsule. To minimize this risk, complete removal of the iris brils can occur after IOL implantation. In our patient’s case, more iris strands were seen in the right eye after IOL placement, and further iridectomy was performed. Thus, intraoperative removal of iris brils with a vitrector allowed for safe and uncomplicated cataract surgery while removing any floating iris brils that could contribute to iridocorneal touch and compromise subsequent endothelial keratoplasty.

4. Conclusions

In summary, this report details our approach to endothelial decompensation secondary to iridoschisis with iridocorneal touch. Staged cataract extraction and superficial iridectomy performed using an anterior vitrector device, followed weeks later by DMEK surgery, successfully resolved the corneal edema and greatly improved visual acuity without mechanical interference from anterior iris brils. We feel that this two-step surgical approach is an effective option in eyes with corneal edema and dependent on the operative eye.

This case report highlights the feasibility of performing DMEK to treat endothelial decompensation secondary to iridoschisis, and the merits of staged planning with appropriate attention to the cause for and treatment of decemompensation. DMEK was selected as the grafting technique because the thinner graft profile may reduce the risk of iridocorneal adhesions postoperatively. Both DMEK procedures were performed without mechanical interference from iris brils, during or after keratoplasty, because any iris brils that could contact the posterior cornea and DMEK graft tissue had been removed prior to surgery.

Patient consent

The patient consented to publication of this case verbally. This report does not contain any personal information that could lead to the identification of the patient.

Acknowledgements and disclosures

Funding

No funding or grant support.
Conflict of interest

All authors have no relevant financial interests and no financial disclosures.

Authorship

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

Acknowledgments

None.

References

1. Flanary WE, Vislisel JM, Wagoner MD, et al. Incidence of cystoid macular edema after Descemet membrane endothelial keratoplasty as a staged and solitary procedure. Cornea. 2016;35(8):1040–1044.

2. Gogaki E, Tzolaki F, Tiganita S, Skarlatou C, Balatsoukas D. Iridoschisis: case report and review of the literature. Clin Ophthalmol. 2011;5:381–384.

3. Srinivasan S, Batterbury M, Hiscott P. Bullous keratopathy and corneal decompensation secondary to iridoschisis: a clinicopathological report. Cornea. 2005;24(7):867–869.

4. Wang HB, Hu YX, Feng X. Corneal endothelial decompensation secondary to iridoschisis in degenerative myopic eyes: a case report. Int J Ophthalmol. 2012;5:116–118.

5. Danias J, Aslanides IM, Eichenbaum JW, Silverman RH, Reinstein DZ, Coleman DJ. Iridoschisis: high frequency ultrasound imaging. Evidence for a genetic defect? Br J Ophthalmol. 1996;80:1063–1067.

6. Smith GT, Liu CS. Flexible iris hooks for phacoemulsification in patients with iridoschisis. J Cataract Refract Surg. 2000;26:1277–1280.

7. Ghanem VC, Ghanem EA, Ghanem RC. Iridectomy of the anterior iris stroma using the vitreocutter during phacoemulsification in patients with iridoschisis. J Cataract Refract Surg. 2003;29:2057–2059.

8. Minezaki T, Hattori T, Nakagawa H, Kumakura S, Goto H. Non-Descemet’s stripping automated endothelial keratoplasty for bullous keratopathy secondary to iridoschisis. Clin Ophthalmol. 2013;7:1353–1355.

9. Weseley AC, Freeman WR. Iridoschisis and the corneal endothelium. Ann Ophthalmol. 1983;15:955–959 963–4.

10. Rozenberg I, Seabra FP. Avoiding iris trauma from phacoemulsification in eyes with iridoschisis. J Cataract Refract Surg. 2004;30:741–745.