Descemet membrane endothelial keratoplasty after sequential radial keratotomies, LASIK, and cataract surgery with endothelial decompensation

Christian Joe Farah, Mohamed El Halabi, Loay Daas, Berthold Seitz

ABSTRACT

Introduction: To demonstrate a safe way to treat endothelial decompensation after sequential radial keratotomies (RKs), laser-in-situ-keratomileusis (LASIK), and cataract surgery, avoiding to compromise a favorable refraction.

Case Report: We report the case of a 66-year-old female with decreased visual acuity in the left eye after sequential ex domo RKs, LASIK, and cataract operation. We performed a DMEK to treat endothelial decompensation but also to maintain the favorable preoperative refraction. The Descemet membrane endothelial keratoplasty (DMEK) surgery was uneventful. The best corrected distance visual acuity (CDVA) improved from logMAR 1.8 [Snellen equivalent (SE): 20/1262] to logMAR 0.5 (SE: 20/63) in the left eye after only five weeks of follow-up. Slit lamp examination revealed a clear cornea with circularly attached graft. The corneal apex pachymetry decreased from 794 to 575 µm while the corneal anterior power slightly increased from 32.3 to 33.9 diopters, inducing a minor myopization. Initial corneal astigmatism changed from 4.8 to 2.8 diopters with a regular with-the-rule configuration axis sliding from 180° to 176°. This improved the postoperative refraction with a spherical equivalent (SEQ) changing from +1.25 to −1.50 diopters.

Conclusion: Performing a DMEK could restore the visual acuity without compromising the preoperative corneal refractive abilities after previous RK, LASIK, and phacoemulsification with intraocular lens (IOL) implantation.

Keywords: Cataract surgery, DMEK, Endothelial decompensation, LASIK, Radial keratotomy

INTRODUCTION

Descemet membrane endothelial keratoplasty (DMEK) has proven to be successfully used in post-radial keratotomies (RKs) or other laser refractive surgeries [laser-in-situ-keratomileusis (LASIK), photorefractive keratotomy (PRK)] and cataract surgeries with secondary endothelial decompensation [1–4]. It induces on average only mild refractive shifts, and therefore may be ideal in managing corneal decompensation in refractive patients [1, 2]. We demonstrate a unique case of DMEK used after sequential RKs, LASIK, and cataract surgery with IOL implantation and endothelial decompensation.

CASE REPORT

A 66-year-old Arabic female presented herself with decreased visual acuity in the left eye after sequential ex domo RKs, LASIK, and cataract surgery. Previous corneal refractive operations were performed respectively in
1992, 2010, and 2019 in both eyes to correct myopia and astigmatism. On the day of admission, the best corrected distance visual acuity (CDVA) was logMAR 1.8 [Snellen equivalent (SE): 20/1262] in the left eye. An initial corneal topography revealed 4.8 diopters of regular with-the-rule corneal astigmatism at 180°. Optical pachymetry measured a preoperative central corneal thickness of 794 µm (Figure 1). Slit lamp examination revealed a cloudy cornea with stromal edema due to endothelial decompensation (Figure 2).

On the day of admission, the CDVA in the right eye was logMAR 0.2 (SE: 20/33). Corneal topography revealed 0.4 diopters of irregular against-the-rule corneal astigmatism at 60°. The slit lamp examination showed a transparent but swollen cornea without signs of Fuchs dystrophy. The six keratotomy cuts and the LASIK-flap were recognizable without signs of corneal ectasia or epithelial invasion in both eyes. Although macular details could not be seen properly in the fundus examination because of preoperative corneal edema, evidence of a cystoid macular edema (CME) could be proven by an optical coherence tomography (OCT) and is believed to be directly related to the previous cataract surgery (Figure 3).

After a discussion with the patient about the risks and therapeutic alternatives, we simultaneously performed a DMEK with intravitreal triamcinolone injection to treat the left eye endothelial decompensation without compromising preoperative corneal refractive abilities. All incisions were placed between RK scars.

At the 5-week postoperative follow-up, the CDVA improved from logMAR 1.8 (SE: 20/1262) to logMAR 0.5 (SE: 20/63) in the left eye with a manifest refraction of –0.25/–2.75 × 66°. The corneal anterior power had slightly increased from 32.3 to 33.9 diopters, inducing a minor myopization. Initial corneal astigmatism decreased from 4.8 to 2.8 diopters with a regular with-the-rule configuration axis sliding from 180° to 176°. This improved the postoperative refraction with a spherical equivalent (SEQ) changing from +1.25 to –1.50 diopters. The anterior segment OCT revealed a corneal transparency with a circularly attached graft (Figure 4). The postoperative pachymetry measured a reproducible central corneal thickness of 575 µm (Figure 5). Although a hyperopic shift is expected after DMEK, this elective operation induced a soft myopic shift that provided a significant visual improvement. The postoperative visual improvement and soft myopic shift may be explained, at least partially, by the simultaneous intravitreal injection of the steroid triamcinolone which significantly reduced the CME in the postoperative fundus examination and OCT (Figure 6), as well as the slight increase in anterior corneal power after DMEK.

DISCUSSION

With an increase of myopia in the population, the demand for refractive surgery has never been greater. Over the last decades, the development of new technologies has enabled a transition from manually assisted refractive surgeries (RK) to more precise laser assisted refractive surgeries, PRK in the late ×1980s and LASIK from the early ×1990s, in order to correct myopia and astigmatism. Nowadays, even with the development
of alternatives such as the laser-assisted subepithelial keratectomy (LASEK) and the small incision lenticule extraction (SMILE), LASIK remains the most practiced refractive surgery around the world. These types of surgery are most often performed in young patients who wish to get rid of their glasses or contact lenses. Moreover, the development of presbyopia at mid-age, cataracts sometimes progress faster than desired, leading to surgery. Approaches to avoid hyperopic refractive surprises after phacoemulsification and IOL implantation following previous myopic PRK and LASIK have evolved over the past 20 years [5, 6]. In a few cases, cataract surgery can lead to a secondary endothelial decompensation and bullous keratopathy.

In the presence of a monocular corneal decompensation, a careful examination of the other eye is necessary in order to exclude cornea guttata or even Fuchs endothelial dystrophy. Furthermore, an anamnesis searching for a possible eye trauma with or without intracamerai foreign body or even a history of herpetic endotheliitis is crucial. The combination of corneal refractive laser surgeries should not lead to endothelial decompensation itself, while the microperforations induced in RK can lead to early endothelial damage [7].

There have been case reports of both the use of penetrating keratoplasty (PKP) or Descemet's stripping automated endothelial keratoplasty (DSAEK) to correct intolerable side effects of decompensating endothelial corneas in post refractive-surgery patients [8, 9]. Non-contact excimer laser assisted trephination does have advantages over femtosecond laser or even manual trephination for PKP after RK as it avoids compression-based opening of the epithelial plug in the radial keratotomy scars [10, 11]. Lately, the use of DMEK has shown successful results in managing endothelial decompensation in an eye with previous RK or laser assisted refractive surgery (PRK, LASIK) [1, 4]. Due to the long remission time and the uncertain final refraction with surgically induced “re-myopization,” a PKP seems to be inadequate for these demanding patients. Furthermore, DMEK has shown to induce a better visual outcome than DSAEK postoperatively, with an earlier stabilization of the cornea [12]. However, the patient has to be informed that a preoperative irregular astigmatism after refractive surgery would remain after DMEK. In case of stromal decompensation with stromal scarring, DMEK would not restore sufficient corneal clarity and a PKP might then be the preferred approach. If a PKP is needed, the final refractive error after suture removal can be corrected by (toric) add-on IOLs.

**CONCLUSION**

We demonstrated a unique case of successful DMEK used after sequential RKs, LASIK, and cataract surgery with endothelial decompensation to restore vision but preserve the favorable refraction as it was before the cataract surgery.
REFERENCES


Author Contributions

Christian Joe Farah – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpreting of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Mohamed El Halabi – Acquisition of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Loay Daas – Analysis of data, Interpretation of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Berthold Seitz – Interpretation of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission

The corresponding author is the guarantor of submission.

Source of Support

None.

Consent Statement

Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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