Case report

Rescue technique for a partially expulsed descemet membrane endothelial keratoplasty (DMEK) graft

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ABSTRACT

Purpose: To describe a novel surgical technique to rescue a partially expulsed DMEK graft after insertion.

Observations: We present a case of a 66-year-old woman with visually significant Fuchs endothelial dystrophy who underwent a DMEK surgery complicated by partial expulsion of the DMEK graft during insertion. To rescue the graft, MicroSurgical Technology (MST) forceps were inserted through a nasal paracentesis to grasp the DMEK graft and redirect it back into the anterior chamber. The surgical technique and postoperative outcomes are described. The partially expulsed graft was centered and attached successfully during surgery. Postoperatively, the patient required two rebubbling procedures, but achieved best-corrected visual acuity of 20/20 vision 1 month after surgery.

Conclusions: We describe an underreported complication and present a novel rescue technique for a partially expulsed DMEK graft that is effective and minimizes manipulation of the graft.

1. Introduction

Endothelial keratoplasty (EK) surgery, in particular Descemet Stripping Automated Endothelial Keratoplasty (DSAEK), has replaced full-thickness penetrating keratoplasty as the procedure of choice for endothelial decompensation due to predictable refractive outcome, faster visual recovery, and standardization of donor graft preparation. Recently, Descemet membrane endothelial keratoplasty (DMEK) has gained momentum due to even superior visual acuity, quicker visual recovery, and lower rates of corneal graft rejection. However, DMEK surgery is still not as commonly performed as DSAEK due to the technical difficulty of the surgery and increased intraoperative and postoperative complications, such as graft inversion, tissue damage during preparation or surgery, and graft detachment. Direct manipulation of the 10 μm graft, consisting of Descemet's membrane and endothelial cells, should be minimized to avoid endothelial cell loss and maximize visual recovery. The fragility of the graft, reliance on fluid mechanics, and lack of rescue techniques pose challenges when graft deployment does not proceed smoothly.

Herein, we describe a DMEK surgery complicated by partial expulsion of the graft and subsequent rescue. To our knowledge, there have been no prior reports of or described rescue techniques for an expulsed or partially expulsed DMEK graft.

2. Case report

The patient was a 66-year-old female who initially presented to our institution for cataract consultation. At the time, her best-corrected visual acuity in her left eye was 20/40, and she was noted to have moderate central guttae in both eyes, consistent with Fuch endothelial dystrophy. No endothelial cells were visualized on specular microscopy in both eyes.

She underwent a combined cataract and DMEK surgery in the left eye. The DMEK graft had an endothelial cell density of 3012 cells/mm². Death to preservation time was 4 hours and 56 minutes, and death to surgery time was 4 days. The graft was punched with an 8.0 mm Barron trephine and stained with Trypan blue prior to being loaded into the Straiko-Jones tube (Gunther Weiss Scientific Glassblowing Co, Portland, OR) for insertion into the eye through a temporal 3.2 mm incision.

During graft insertion, anterior chamber depth and intraocular pressure were modulated through the paracenteses using balanced salt solution on a 30-gauge cannula. However, the DMEK graft partially expelled around the Straiko-Jones tube, with half of the graft wedged in the main wound while the other half remained in the anterior chamber (see Fig. 1 and Video 1). We describe our rescue approach below.

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3. Materials and methods

In order to rescue the partially expelled graft, multiple maneuvers were attempted. The paracenteses were burped to further shallow the anterior chamber and lower intraocular pressure. With care to avoid directly touching the expulsed portion of the graft, the cornea was gently tapped and troked with a 30-gauge cannula to create small fluid waves in the anterior chamber in an attempt to move the graft centrally, which was unsuccessful. A pull-through attempt using aspiration was attempted by first enlarging an existing nasal paracentesis 180° away from the main wound. Without irrigation, an MST Duet aspiration cannula (Microsurgical Technology, Redmond, WA) was inserted through the nasal paracentesis across the anterior chamber and gentle aspiration applied to the leading edge of the DMEK graft in the eye to attempt to grasp the graft and pull it into the anterior chamber. However this did not provide enough suction power to successfully free the graft from the main wound.

As a final resort, MST smooth tip forceps were inserted through the nasal paracentesis across the anterior chamber to carefully grasp the DMEK graft at its nasal edge. Simultaneous injection of small amounts of balanced salt solution (BSS) through separate paracenteses was performed as needed to maintain adequate anterior chamber depth. The wound was immediately sutured, the graft was unfolded and centered successfully, and 20% sulfur hexafluoride (SF₆) gas was injected into the anterior chamber.

Supplementary video related to this article can be found at http://dx.doi.org/10.1016/j.ajoc.2018.04.015.

4. Results

On postoperative day 1, the patient’s vision was hand motion vision in the operative eye, and the graft was detached inferiorly and temporally. The patient required two rebubbling procedures with air to
achieve full graft attachment (see Fig. 2). By post-operative month 1, the cornea was clear with best-corrected visual acuity of 20/20 and corneal pachymetry of 557 μm. At her post-operative month 6 appointment, the patient’s best corrected visual acuity was 20/20, the corneal thickness was 573 microns, and specular microscopy revealed an endothelial cell density of 574 cells/mm². One year post-operatively, her best-corrected vision remained 20/20, corneal pachymetry was 568 μm, and the endothelial cell count was 618 cells/mm².

5. Discussion

In this case, we successfully rescued a DMEK graft that was partially expelled from the main wound by using a novel pull-through technique with MST forceps. There are several options for rescuing an expelled DMEK graft, each of which carries its own set of advantages and disadvantages. The DMEK graft can be completely removed from the anterior chamber with forceps, then reloaded and reinjected. However, this approach likely causes more endothelial cell damage as the entire graft will be subject to mechanical compression as it is pulled through the main wound as well as the focal compression force from the forceps. Moreover, if significant posterior pressure contributed to graft ejection in the first place, a second attempt will encounter the same challenge. To minimize inducing additional compression damage to the portion of the DMEK graft still within the anterior chamber, one can grasp the expelled portion of the DMEK graft with forceps and reposition it through the main wound into the anterior chamber, similar to a forceps insertion technique for a DSAEK. Similarly, the expelled portion of the DMEK graft can be repositioned into the eye with a 27 or 30-gauge cannula. However, these maneuvers can also induce further damage to the graft due to excessive manipulation and risk complete expulsion of the graft when the wound is gaped.

Pull-through techniques using a carrier scaffold are used successfully among some DMEK surgeons9,10 and have been demonstrated to induce minimal damage to the DMEK graft with a very low 9.9% endothelial cell loss.9 In our case, we used a modified pull-through technique, theorizing that this rescue approach would mitigate additional surgical trauma to an already compromised graft by manipulating less of the graft. Pulling the graft into the anterior chamber via an aspiration cannula may be attempted, as was initially done in this case. However, the success of this approach may be limited by the ability to generate adequate suction force to manipulate the graft. Moreover, dry aspiration can quickly shallow the anterior chamber, and the surgeon during the postoperative course. If the patient is motivated, we recommend multiple rebubble attempts before giving up on the graft. One year post-operative results for this patient were encouraging with excellent visual acuity and stable endothelial cell count.

As DMEK surgery becomes more commonly performed, there will be an increase in complications and a need for a “toolbox” of intraoperative maneuvers. In this report, we illustrate an underreported complication of DMEK surgery and describe a novel technique that can successfully rescue a partially expelled DMEK graft resulting in excellent visual outcome.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

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