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# A Method to Prepare a Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK) Graft Using Donor Corneas With Narrow Scleral Rims

## A Case Report

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**Abstract:** Donor corneas with narrow scleral rims are often disqualified for Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK), mainly because of fluid leak and low pressure when they are mounted onto an artificial anterior chamber (AAC). This report describes a novel method to tight-lock a donor cornea with a narrow scleral rim so that microkeratome cutting is possible, allowing a DSAEK procedure to be completed.

A 50-year-old male suffering from Epstein-Barr virus (EBV) endotheliitis with resulting corneal edema in his left eye was the subject of this study. His best corrected visual acuity (BCVA) was 20/600. The patient underwent a DSAEK procedure; however, the microkeratome cutting of the donor cornea initially failed due to its narrow scleral rim, which caused the balance salt solution (BSS) to leak out of the AAC. A doughnut-shaped cushion was made from a surgical glove, which enabled a tight lock of the cornea to the AAC, enabling the chamber pressure to be raised and the microkeratome cutting to be completed. A subsequent DSAEK procedure was performed uneventfully.

Postoperatively, the patient received oral valganciclovir 450 mg b.i.d. to prevent EBV recurrence. The graft remained clear at 5 months post-op, and the patient's BCVA improved to 6/7.5. His endothelial count was 1830, which was ~79% of the original value.

Inserting a self-made cushion can enable donor corneas with narrow scleral rims to be used in DSAEK procedures and avoids unwanted switching from endothelial keratoplasty to penetrating keratoplasty (PKP).

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**Abbreviations:** DSAEK = Descemet's Stripping Automated Endothelial Keratoplasty, AAC = artificial anterior chamber, BCVA = best corrected visual acuity, BSS = balance salt

solution, EBV = Epstein-Barr virus, EK = Endothelial keratoplasty, OS = left eye, PCR = polymerase chain reaction, PKP = penetrating keratoplasty.

## INTRODUCTION

Endothelial keratoplasty (EK) is a surgical treatment for corneal endothelial dysfunction. It has several advantages over conventional penetrating keratoplasty (PKP) owing to its superior tectonic, topographic, and refractive stability.<sup>1,2</sup> Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK) is at present performed type of EK commonly.<sup>3-5</sup> Donor corneal tissue is dissected by an automated microkeratome before transplantation. The outcome of the cutting procedure will greatly affect the success of the operation. In general, a donor cornea must have a sufficiently wide scleral rim (usually >3 mm) to be successfully locked to an artificial anterior chamber (AAC) and to avoid fluid leak.<sup>6,7</sup> Sometimes, inexperienced personnel may harvest donor corneas that have inadequate scleral rims, rendering them unable to be used in DSAEK surgery. We present a novel technique to tight-lock donor corneas with inadequate corneoscleral rims to AACs to facilitate microkeratome cutting during graft preparation.

## CASE REPORT AND TECHNIQUE DESCRIPTION

A 50-year-old man had a history of uveitis and glaucoma in his left eye (OS) for 10 years, and he received cataract surgery 7 years before. He complained of recent blurred vision, and corneal edema was noted at his first visit to our hospital. Epstein-Barr virus (EBV) uveitis and endotheliitis OS were diagnosed based on polymerase chain reaction (PCR) results. After an oral dose of 900 mg valganciclovir twice daily for 1 month, active inflammation was silenced, but corneal edema still persisted (Figure 1H), and his best corrected visual acuity (BCVA) decreased to 6/200. Due to a lack of improvement of his corneal edema, DSAEK was suggested. Surgery was performed 1 year after the initial visit.

A Moria microkeratome and AAC system (Moria Inc, Doylestown, PA) were used for endothelial graft preparation. On the table, we found that the donor cornea had an irregular scleral rim that was only 2 mm in width, expanding ~150° (Figure 1A). The tissue was mounted onto the AAC after thoroughly coating the endothelium with Viscoat (Alcon). However, when the chamber pressure was raised, the balance salt solution (BSS) leaked from the junction of the donor cornea and the metal cover of the AAC, making microkeratome cutting impossible. To avoid being forced to perform PKP, we sought to find a material on the table that could serve as a cushion to stop the fluid leaking from the junction. We thought that a surgical

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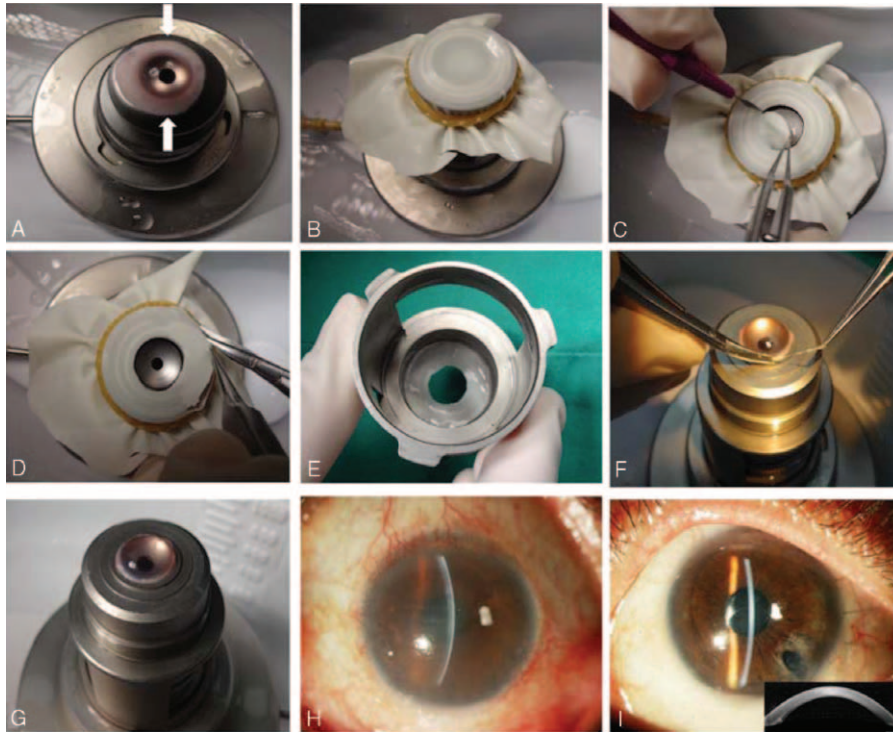
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**FIGURE 1.** (A) A 2 mm scleral rim extending  $\sim 180^\circ$  was noted in the donor cornea (arrow: scleral margin). (B) The glove is fixed to the artificial chamber with an elastic band. The glove is incised along the inner margin of the anterior chamber cover with a sharp point knife (C) and along the outer margin with a scissors (D). (E) The artificial chamber cover is turned upside down, and the doughnut-shaped glove is placed on the inner side. (F) Once centration is achieved, the anterior chamber cover is placed over the cornea and locked. Any protruding glove at the connection junction is trimmed off with Vannas scissors. (G) After fixation of the donor cornea and a rise in pressure, no leakage was noted from the junction. (H) General corneal edema was noted pre-operatively. (I) The cornea was clear at 4 months after the operation. The insert picture was obtained with corneal optical coherence tomography.

glove might serve this purpose. The surgical glove was composed of natural rubber latex coated with powder. We first cut a  $6 \times 6$  cm piece from the glove. The cut piece was irrigated with BSS to prevent powder contamination. With the coarse surface of the glove facing up, we then fixed the glove onto the metal cover of the AAC with a sterilized rubber band (Figure 1B). Either a sideport 15-degree blade or scissors was used to cut the glove first along the inner margin of the metal cover (Figure 1C) and then along the outer margin (Figure 1D). A doughnut-shaped piece was thus obtained. The metal cover of the AAC was inverted, and the doughnut-shaped cushion was placed on its inner side (Figure 1E). The donor cornea was then centered on the AAC, and after filling the chamber with BSS the metal cover was locked. The protruding edge of the glove was meticulously trimmed with Vannas scissors (Figure 1F). When the AAC pressure was elevated to 90 mm Hg (estimated by a Barraquer applanation tonometer), BSS oozing was no longer noted at the junction (Figure 1G). Then, the anterior corneal lamella was removed using a  $350 \mu\text{m}$  automated microkeratome. The letter “F” was marked on the peripheral stromal surface of the donor cornea with a marker pen before trephination to ensure correct orientation. A 9.0 mm donor graft was cut with a donor punch. A subsequent DSAEK procedure was performed uneventfully, and postoperatively the patient received oral valganciclovir 450 mg twice a day to prevent EBV recurrence.

Postoperatively, the patient’s lenticle was well attached and the cornea became clearer. Two weeks after surgery, the patient’s BCVA improved to 6/20. The most recent follow-up at 5 months postop showed that the patient’s BCVA had improved to 6/7.5 (Figure 1I). Corneal anterior chamber optical coherence tomography (RTVue Premier, Optovue; Fremont, CA) showed that the patient’s central lenticular and recipient corneal thicknesses were  $76 \mu\text{m}$  and  $472 \mu\text{m}$ , respectively (Figure 1I insert), and specular microscopy revealed an endothelial count of  $1830 \text{ cells}/\text{mm}^2$ , which was  $\sim 79\%$  of the original value.

## DISCUSSION

Tissue preparation is an important task during DSAEK surgery. A method for donor lenticle preparation for DSAEK has been described previously.<sup>8,9</sup> There are many situations that may affect the outcome of surgery, such as an inadequate corneoscleral rim, graft decentration, or iatrogenic damage to the endothelium caused by a collapsed AAC. Occasionally, when inexperienced personnel harvest a donor cornea with an inadequate corneoscleral rim and there is fluid leak due to the narrow scleral rim, AAC pressure can no longer be raised to 90 mm Hg,<sup>10</sup> making it impossible for a surgeon to complete a lamellar dissection. In this case, the surgeon is often forced to switch to using whole layer keratoplasty. A technique to

tight-lock a cornea to an AAC under such a condition would be very helpful.

A surgical glove is easy to obtain in an operating room. It is sterile and, more importantly, is elastic and therefore is suitable to serve as a cushion between a donor cornea and the metal cover of an AAC. The size of this doughnut-shaped cushion fits the inner side of the AAC cover. Because the inner surface of the AAC cover is smooth, friction between the corneal tissue and the metal cover is small and thus the corneal tissue tends to be pushed away upon an increase in pressure. A doughnut-shaped latex glove placed between the donor cornea and the metal cover provides a cushion to produce a barrier to prevent sliding of the corneoscleral rim upon pressure rise.

In this method, there are still some limitations. In our case, the width of the scleral rim was  $\sim 2$  mm, and it extended  $150^\circ$ . We do not know whether a donor cornea could still be tightly locked if its rim size was even smaller or if it extended for more “clock hours.” Additionally, latex powder contamination is another concern, and it must be removed thoroughly by irrigation before use. Surgical draping can be another substitute, but its elasticity is apparently inferior.

In summary, an inadequate scleral rim width is sometimes a cause to disqualify a donor cornea from being used in DSAEK surgery. Here, we propose using a latex cushion made of a surgical glove to facilitate a tight lock of a donor cornea to an AAC, so that lamellar dissection by a microkeratome is possible. *This surgical tip is especially useful in areas where donor corneas are rare and back-up donor corneas may not be available.*

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