DSAEK Pearls for Cataract Surgeons

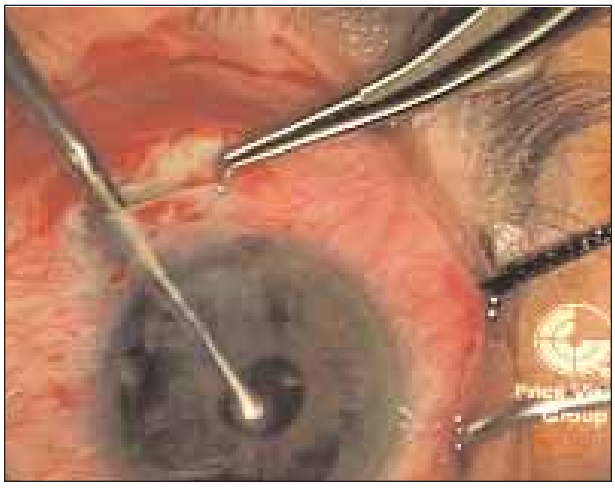
Preoperative considerations for the assessment of posterior corneal diseases and strategies for management following endothelial keratoplasty.

BY PATRICIA SIERRA, MD

Keratoplasty for endothelial dysfunction has evolved from full thickness penetrating keratoplasty (PK) to more advanced techniques of selective endothelial replacement.

Posterior lamellar keratoplasty was first described by Melles et al[1] in 1998 and later modified and introduced to the United States by Terry[2] as *deep lamellar endothelial keratoplasty*. This surgery required manual lamellar dissections within the deep corneal stroma of both the recipient and the donor corneas. Melles later formulated an improved technique termed *Descemet's stripping endothelial keratoplasty*, which replaced the laborious method of lamellar dissecting the recipient cornea simply by stripping Descemet's membrane and endothelium.[3] Preparation of the donor endothelial graft was then simplified by the use of an automated microkeratome on a corneal button. This new variant has been termed *Descemet's stripping automated endothelial keratoplasty* (DSAEK). The surgery involves stripping Descemet's membrane with dysfunctional endothelium from the recipient cornea and implanting a donor disc consisting of posterior stroma and healthy endothelium (Figure 1).[4,5] Relatively quick visual rehabilitation, fewer induced refractive errors, minimal postoperative discomfort, and better biomechanical tensile strength compared with PK are among the reasons DSAEK is gaining popularity.[4-6]

This article shares tips on assessing patients with corneal disease as well as strategies for the postoperative management of those who have undergone DSAEK.



(Courtesy of Francis Price, MD.)

Figure 1. Graft insertion with forceps during DSAEK.

PREOPERATIVE CONSIDERATIONS

Location and Degree of Disease

Surgeons need to determine the extent and location of corneal disease. Ideal candidates for DSAEK present with endothelial dysfunction and associated corneal edema and/or decreased visual acuity. The best postoperative visual results are obtained in eyes with corneas that exhibit minimal or no stromal opacification, haze, irregularity, or scarring. The most common indications for the procedure are Fuchs' corneal dystrophy and bullous keratopathy, but surgeons can perform DSAEK on edematous corneas due to other conditions, including failed grafts and iridocorneal endothelial syndrome.

Visual Needs

Ophthalmologists must consider both the degree of visual impairment and the patient's eyesight requirements. A majority of patients achieve 20/40 BCVA or better 3 to 6 months following DSAEK.[4-7] Unlike PK, surgeons no longer have to wait until patients' visual acuity is severely impaired before recommending surgical intervention. In some patients with Fuchs' corneal dystrophy, decreased visual acuity and/or contrast sensitivity may be related to the thickening of Descemet's membrane and dense guttata. If the patient is symptomatic, surgery can be recommended before advanced stromal or epithelial edema is present.

Which Procedure?

Although DSAEK can be performed in phakic eyes, it is usually recommended that phakic patients undergo cataract surgery or refractive lens exchange prior to, or in combination with, DSAEK (triple procedure).[8] Phakic eyes have a narrower anterior chamber and present with the potential risk of lens and graft endothelial trauma during the insertion and manipulation of the allograft. Similarly, patients with ACIOLs should undergo staged procedures to fixate the IOL to the iris or sclera prior to DSAEK.

Measuring Corneal Thickness

It is important to obtain preoperative corneal pachymetry measurements in patients with Fuchs' corneal dystrophy prior to cataract surgery. Pachymetry can help predict which corneas might decompensate postoperatively. A recent study of patients with Fuchs' dystrophy (136 eyes) who underwent cataract surgery at the Wilmer Eye Institute in Baltimore revealed that those with a preoperative corneal thickness of less than 640 µm with no evident corneal edema had an average postoperative visual acuity of 20/32 and a 2.4% rate of keratoplasty within the first year after cataract surgery. In contrast, patients with preoperative corneal thickness greater than 640 µm had an average postoperative visual acuity of 20/50 and a 22.2% rate of requiring a corneal transplant.[9] The latter group therefore might be better served by undergoing cataract surgery first followed by DSAEK or a triple procedure, particularly if they have high visual demands.

> "Surgeons should shift IOL calculations to a myopic refractive target."

IOL Calculations

Surgeons should shift IOL calculations to a myopic refractive target, because a hyperopic shift in the range of +0.50 to +1.50 D has been documented following DSAEK.[6,7,10,11] This shift is caused by changes in the posterior corneal curvature. First, a negatively powered lens is being placed on the posterior surface of the cornea. Second, according to the thick-lens equation, the increased thickness of the cornea causes a decrease in the radius of curvature of the refractive surface and contributes to the hyperopic shift.[10]

(Courtesy of Francis Price, MD.)

Figure 2. Postoperative day 1 following DSAEK.

Refractive outcomes may improve when surgeons target IOLs to between -1.00 and -1.50 D. Placing a lens of greater power will compensate for the reduction in corneal power by DSAEK. Because patients with Fuchs' dystrophy who are undergoing cataract surgery may need DSAEK in the future, targeting an IOL power for slight myopia will likely be beneficial. Surgeons should resist the temptation to perform a YAG laser capsulotomy in patients with corneal edema. Instead, ophthalmologists should perform corneal pachymetry and obtain an endothelial cell count to determine if corneal edema is the main cause of the patient's visual complaints. Performing DSAEK in patients with open capsules can be complicated by vitreous prolapse during the insertion of the graft, which increases the risk of postoperative problems.

PEARLS FOR POSTOPERATIVE MANAGEMENT

The most common complication following DSAEK is dislocation of the graft. During the postoperative examination, surgeons should use a thin slit beam to look for fluid trapped in the interface (this will appear as a gap or space between the host and graft). If the graft appears to have dislocated, a repeat air bubble should be performed.

A feared complication associated with DSAEK surgery is postoperative pupillary block due to the residual intraoperative air bubble. Such cases require immediate intervention, either the surgical removal of air or the placement of an inferior laser peripheral iridotomy.[6] Surgeons can prevent a pupillary block by dilating the pupil at the end of the DSAEK procedure, ensuring that the air bubble moves freely in about 80% of the anterior chamber's diameter, and by clearing the inferior edge of

the pupil while the patient is in a seated position (Figure 2).

Surgeons need to wait patiently for the graft to clear, which usually occurs within the first 2 to 8 weeks following the procedure but may take longer if intraoperative manipulation was excessive. In rare cases, the graft may not clear despite adequate attachment. This event is considered a primary graft failure and is generally an indication for a repeat procedure.

Only a small percentage of patients recover 20/20 UCVA following DSAEK. BCVA is usually between 20/25 to 20/50 in 80% of eyes. This mild loss of BCVA is probably due to persistent optical aberrations at the graft/host interface.[12]

Surgeons can prevent graft failure following rejection by administering topical steroids. Postoperatively, steroids are usually prescribed q.i.d. and tapered every 2 to 4 weeks. Surgeons should closely monitor patients' IOP and consider using milder forms of steroids in steroid responders. Graft rejection following endothelial keratoplasty has been reported to be 50% lower than after PK in the first 2 postoperative years. It is not yet clear if these differences are simply a product of relatively prolonged postoperative topical steroid cover in endothelial keratoplasty patients.[13,14]

> "Surgeons can prevent graft failure following rejection by administering topical steroids."

IN SUMMARY

Performing DSAEK in patients with endothelial disease can be rewarding for surgeons and patients. Unlike PK, DSAEK offers a more rapid and better visual recovery as well as a lower risk of intraoperative, perioperative, and postoperative complications. The procedure, however, is not perfect. It produces a mild postoperative loss of BCVA and a hyperopic shift. In addition, current DSAEK techniques cause significant trauma to the donor endothelium during manipulation and insertion. As a result, postoperative endothelial cell survival is lower with DSAEK than with conventional PK.[6,15] New techniques to minimize damage to the endothelial cells during insertion are needed.

The next evolution of endothelial transplantation may come from a procedure called *Descemet's membrane endothelial keratoplasty*, which involves the implantation of Descemet's membrane and endothelium without posterior stroma. Selective transplantation of only Descemet's membrane and endothelium may be expected to provide the best possible visual restoration of a cornea with endothelial disorder. The main advantage of this procedure is that postoperative visual potential and recovery is probably better and faster than with DSAEK. In their preliminary clinical results of 10 eyes following Descemet's membrane endothelial keratoplasty, Melles et al reported six eyes with BCVA of 20/40 or better and three eyes with 20/20 1 month after the procedure.[16] The surgery is challenging, however, because the graft is very thin and difficult to handle.

The use of femtosecond laser technology for the preparation of the posterior corneal tissue may provide a thinner graft, although the effect of the laser in close proximity to the endothelium and postoperative results are still under investigation. ■

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