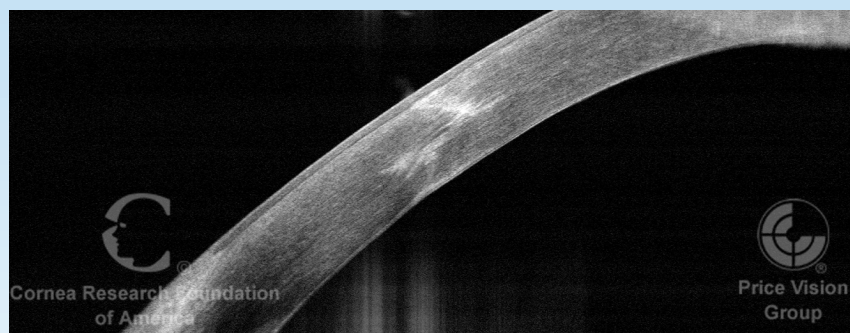
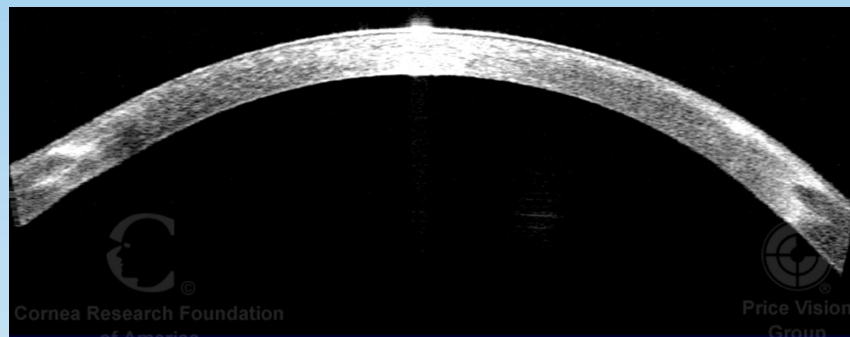


Shifting preferences in corneal transplantation

by Michelle Dalton EyeWorld Contributing Writer



Postoperative DMEK eye looks like a normal eye without the typical scarring or edge reflections seen with either PK or DSAEK.



Anterior segment OCT showing cross section of corneas after DALK with zig-zag incisions. Zig-zag incisions provide for stronger wounds due to increased surface area of wounds that are not in the lamellar planes of the cornea, as well as provide for smooth contours of the anterior corneal surface even when donor and recipient corneas are of different thicknesses.

Source: Francis Price, MD

The femtosecond laser and newer surgical techniques are changing how corneal surgeons perform keratoplasty

Penetrating keratoplasty (PK) used to be the go-to procedure for all corneal diseases, whether stromal, endothelial, or epithelial, but in the last 15 years or so surgeons have transitioned to anatomic-targeted procedures. Two of the more commonly performed posterior procedures are Descemet's stripping automated endothelial keratoplasty (DSAEK) and Descemet's membrane endothelial keratoplasty (DMEK), designed to replace damaged endothelium. The DMEK technique involves selective transplantation of Descemet's membrane through a self-sealing 2.8-mm or smaller clear corneal incision. Even during its introductory stages where surgeons admitted large learning curves, the visual rehabilitation was quick, and within 3 months, more than 90% of patients were already seeing 20/40 or better, said **Francis W. Price Jr., MD**, Price Vision Institute, Indianapolis.

But PK has not been abandoned altogether. In today's PK, the transition to femtosecond lasers to replace the trephine is preferred in most cases, said **Peter S. Hersh, MD**, in practice at the Cornea and Laser Eye Institute, Hersh Vision Group, Teaneck, N.J.

DMEK, DSAEK

At this point, Dr. Price said only 5% to 10% of his EK cases are DSAEK, and most are DMEK. He now reserves DSAEK for cases "that are really compromised and complicated," including patients with an artificial iris implant or a large iris defect "where the donor could go into the posterior chamber or into the vitreous." Patients who have an anterior chamber lens or those who have undergone pars plana vitrectomy can also be problematic, as the vitrectomy has created empty space, making it difficult to shallow the

anterior chamber, Dr. Price said. There are several techniques for performing DMEK, but "in one form or another, you're using the iris as a platform to unfold the donor tissue," Dr. Price said. "When you uncurl the donor, it will curl back up unless you shallow the anterior chamber to hold it open," he said.

Patients with previous glaucoma filtering surgery pose another concern—a low pressure (anything under 9 mm Hg, Dr. Price said) can allow the donor to detach when the eye is rubbed or even just closed with hard squeezing. During the procedure, when surgeons place air in the anterior chamber, previous filtration surgery may make it more difficult for the air to "stay put" as long as needed (a few days for DMEK and 10–15 minutes for DSAEK, Dr. Price said.).

"Those are cases where DSAEK may be a better option than DMEK," he said. "It's something we're trying to analyze and work out."

The key to a successful DMEK or DSAEK remains the surgeon—there's no difference in necessary instrumentation between a complicated case and a straightforward case. "You just manipulate the graft differently," Dr. Price said. In DSAEK, Dr. Price tends to use 9 mm grafts, while he prefers 8 mm grafts for routine DMEK.

Visual outcomes post-DSAEK are about 20/30 or 20/40, Dr. Price said, and some patients will still be unhappy with that visual acuity. Using DMEK, most patients are 20/15 to 20/20, he said. DMEK not only produces better visual outcomes, there is a much lower rate of rejection when compared to PK.

"That's been the game changer," he said. "The bottom line is that endothelial keratoplasty has revolutionized corneal transplants. It's absolutely amazing what we're seeing."

Femtosecond or manual trephination PKs?

The femtosecond laser is useful for 3 things, Dr. Hersh said. "It's good for penetrating keratoplasty, it's good for preparation of the donor

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for deep anterior lamellar keratoplasty (DALK) surgery, and it is useful for anterior lamellar keratoplasty (ALK)," he said.

For ALK, Dr. Hersh prefers the laser in patients with superficial corneal pathology and superficial corneal scars but that involve the anterior stroma.

"With femto ALK you want to keep the depth of your lamellar cut

less than 250–200 μm if you can because that ensures a smoother bed afterward," he said. Too deep of a cut risks the surgeon creating ridges on the stromal bed.

"We can remove an anterior lamellar 'pancake' of tissue containing the pathology and replace it with tissue from the eye bank of the same dimensions. In my mind, that makes the femtosecond laser

uniquely beneficial for patients with anterior stromal pathologies," Dr. Hersh said.

While Dr. Price prefers to use the femtosecond laser in big bubble surgeries, he said its true advantage is not in its ability to dissect, but in its ability to cut the most precise of edges. Manual trephination is limited in the complexity of the cuts, whereas the femto can produce

a zig-zag, mushroom, or top hat configuration at a variety of depths. Of these, Dr. Price tends to use the zig-zag pattern, since "the last part of the incision angles toward the center of the cornea and down," he said, so if surgeons need to convert to a hand dissection, they're at "the perfect angle."

Because the femtosecond cuts are so much cleaner and defined than manual cuts, both the zig-zag and mushroom configuration make it easier to define the plane of dissection to determine where to insert the needle for the big bubble, making dissection easier and giving these techniques better structural advantages, Dr. Hersh said.

Dr. Price thinks zig-zag has been a "huge" improvement for DALK or deep anterior lamellar cases because the resulting wound alignment of anterior surface of the donor/graft is very smooth as compared to trephined wounds where the donor and graft bed have differing thickness, often causing irregular topographies at the wound margins.

"That's a huge advantage for vision," he said.

"There seems to be a stronger wound healing with the zig-zag due to the stacked incisions that diagonally cut across the corneal lamellae. The scarring is much stronger than with a manual trephine," he said. But thin corneas (under 300 μm) are better served with top-hat configurations, he said.

Both the donor and recipient are "cut so meticulously" that "patients recover quite quickly," Dr. Hersh said.

But manual dissections have advantages over femto, too, Dr. Hersh said, especially in deep lamellar transplants where the femto has a more difficult time retaining a smooth stromal bed beyond about 200 μm .

"As you go deeper into the cornea, the micro architecture of the cornea is much more planar, that is the corneal lamellae act more like pancakes that are easily separated with dissection spatulas because they are less interwoven," he said. **EW**

Editors' note: Drs. Hersh and Price have no financial interests related to their comments.

Contact information

Hersh: phersh@vision-institute.com

Price: fprice@pricevisiongroup.net

Endothelial Insertion Instruments

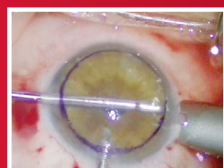
Pull Through Technique



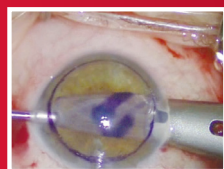
Tissue on platform (endothelial side up)



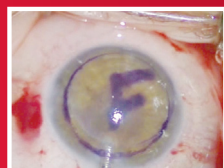
Gentle positioning toward tip



Forceps grasps edge of tissue

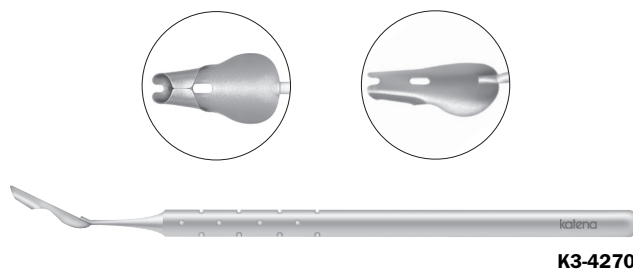


Tissue is "pulled through" into A/C



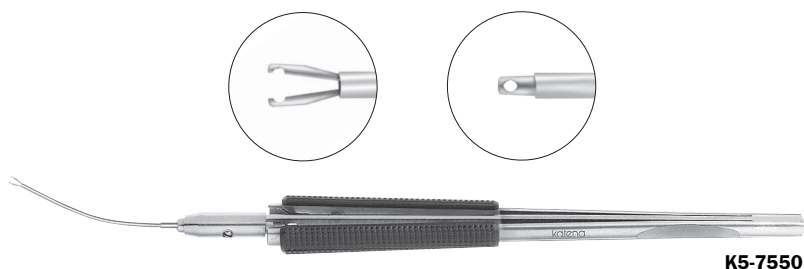
Tissue in place (endothelial side down)

Endothelial Glide



This unique instrument is used to atraumatically insert endothelial tissue. Its open design features a platform for tissue placement (endothelial side facing up) and a funnel-shape tapered tip which allows the surgeon to gently slide the tissue into position for the "pull-through" technique. Once the tissue is correctly seated, the instrument is inverted (endothelial side facing down) and the tip is placed at the edge of the primary incision. A special forceps is inserted through an opposing paracentesis incision and is used to grasp and pull the tissue into the anterior chamber.

Endothelial Grasping Forceps



This retinal-style forceps has been specifically designed for use with the Busin Glide during Endothelial Keratoplasty procedures. The slightly curved 23-gauge shaft allows the instrument to be used through a paracentesis incision while its delicate end gripping platforms gently grasp the edge of the endothelial tissue to facilitate the "pull-through" technique.

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