

CORNEA

Performing DSAEK: A Step-by-Step Guide

BY ANNIE STUART, CONTRIBUTING WRITER
INTERVIEWING MARK J. MANNIS, MD, ALLAN R. SLOMOVIC, MD,
AND LEEJEE H. SUH, MD

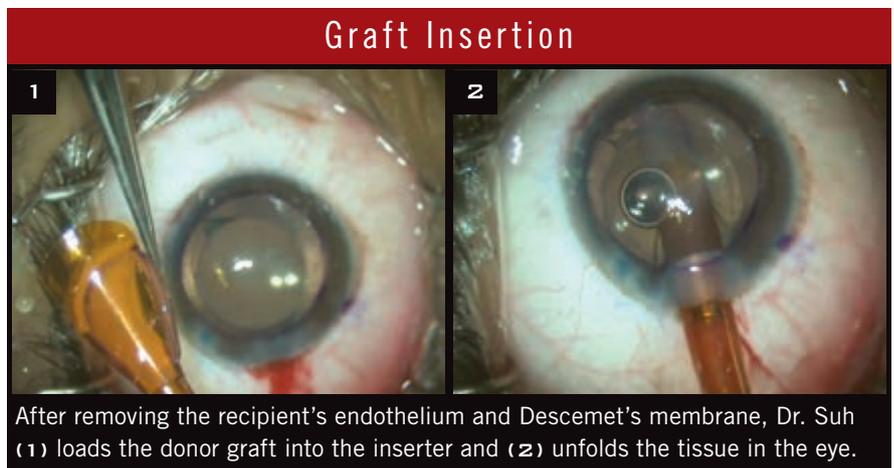
Descemet's stripping endothelial keratoplasty (DSEK) replaces diseased tissue with a thin donor graft of posterior corneal stroma, Descemet's membrane, and endothelium. In DSAEK, use of an automated microkeratome facilitates donor preparation and reproducible results.¹ This review covers the main steps of DSAEK, from patient selection to postop care.

Evaluating the Patient

First, diagnose. The leading indications for DSAEK are Fuchs dystrophy, pseudophakic corneal edema, failed corneal graft, and iridocorneal endothelial syndrome, said Allan R. Slomovic, MD, at the University of Toronto. But many other ocular conditions, including significant glaucoma, may also cause the cornea to decompensate, said Leejee H. Suh, MD, at Columbia University.

Choose candidates wisely. Patients who tend to do better with DSAEK, said Dr. Slomovic, are those in the early phase of the disease process—with early corneal edema and vision somewhere in the vicinity of 20/60. If there's significant or later-stage corneal edema, added Dr. Suh, stromal scarring can remain after DSAEK surgery and interfere with the patient's vision.

Screen for risks. Before DSAEK, look for conditions that may predispose patients to complications during surgery, said Mark J. Mannis, MD, with the University of California, Davis, Health System Eye Center. Ensure



that the eye is stable and free of active macular edema or elevated intraocular pressure, said Dr. Suh, who noted some conditions that may make the procedure more challenging, yet still possible: a shallow anterior chamber (more common in smaller eyes), glaucoma, presence of a filtering bleb or tube, presence of an anterior chamber lens, absence of a portion of the iris, floppy iris syndrome, or aphakia. (See "Tips for Higher-Risk Cases.")

Harvesting the Graft

Initially, few U.S. eye banks provided precut DSAEK tissue, said Dr. Mannis, but today it's more common than not, reducing the ophthalmologist's surgical time and need for capital equipment. "The literature also demonstrates that DSAEK tissue cut by eye bank technicians is just as effective as that harvested by a doctor," he said.

Precut. "If relying on precut tissue, take time to directly observe the eye

bank's processes and to familiarize yourself with the eye bank technician," said Dr. Mannis, explaining that the surgeon should feel comfortable with how the technician harvests the tissue.

DIY. If you must harvest your own tissue, he said, obtain reliable instrumentation and experience in cutting the tissue.

"Before making the lamellar cut," said Dr. Slomovic, "I first warm the tissue to body temperature for about 15 minutes, with the goal of making the endothelium more metabolically active." During harvesting, the tissue is kept in an artificial anterior chamber maintainer to preserve the corneal endothelium. Using a microkeratome, Dr. Slomovic slices off 300 to 350 μm of the anterior cornea about 9 mm in diameter, keeping the endothelium, Descemet's membrane, and about 100 μm of stroma. "Using a trephine, I then cut a DSAEK disc about 8 to 8.5 mm in diameter," he said.

Removing Diseased Tissue

Before you touch the patient's eye, said Dr. Suh, make sure the graft is in the operating room and in good shape.

Make the incisions. Some surgeons choose topical anesthesia, said Dr. Mannis, who generally uses a retrobulbar block instead to immobilize the eye and keep the patient completely pain free. The first step involves making a peripheral side-port incision (paracentesis), through which an anterior chamber (AC) maintainer is placed to keep the anterior chamber formed, said Dr. Slomovic. Surgeons will perform the descemetorhexis using either an AC maintainer or, especially if the procedure is combined with cataract surgery, cohesive viscoelastic. (See "Combination Surgery: Cataract and DSAEK.")

For a perilimbal incision, said Dr. Mannis, first create an L-shaped conjunctival flap temporally, then make a partial-depth incision about 5 mm in length, and then make a shorter incision into the anterior chamber.

Mark the epithelium. Using a circular trephine of the same size used to cut the DSAEK donor, Dr. Slomovic makes an impression on the recipient's corneal epithelium, indicating the area of Descemet's membrane that will be removed.

Score and strip. Before scoring the recipient's posterior corneal tissue, Dr. Suh may inject trypan blue into the eye to allow better visualization of Descemet's membrane and endothelium. "Although other surgeons prefer to use an irrigating stripper," she said, "I usually remove the Descemet's membrane under viscoelastic to enhance control." Dr. Suh described the steps involved in scoring and stripping.

1. Score Descemet's membrane 360 degrees at a diameter of about 8.5 mm with a reverse Sinsky hook, using the epithelial trephine groove as a guide.
2. Detach the tissue in a circular fashion, taking care not to use excessive force, which can irritate the stroma.
3. Use an endothelial stripper with a wider hook, facing upward, to lift tissue in a "united front" manner, a bit at a time. Then remove the membrane

Combination Surgery: Cataract and DSAEK

Cornea surgeons often perform cataract surgery in conjunction with DSAEK, said Dr. Suh. This is beneficial, said Dr. Slomovic, because the manipulation and fluid flow of the DSAEK procedure may otherwise make the cataract worse. "And if you go in later to remove the cataract, you have the potential of damaging the graft."

Refractive correction. "With DSAEK, you know in advance that you will have a hyperopic shift of approximately 1 to 1.5 diopters," said Dr. Slomovic. "Factor this into your preoperative biometry to get the patient as close to emmetropia as possible."

Surgical considerations. When combining DSAEK with cataract surgery, Dr. Suh creates a clear corneal (rather than scleral tunnel) incision to avoid making two incisions. "However, before opening the incision to 4 mm," said Dr. Slomovic, "I usually use a 2.75-mm keratome for the cataract." To ensure that the IOL has no chance to prolapse forward, added Dr. Mannis, don't make the capsulorhexis too large.

After removing the cataract, the surgeon fills the anterior chamber with viscoelastic, then implants the lens. "But before removing all the viscoelastic, I'll perform the descemetorhexis, which is much easier to do with viscoelastic than with fluid maintaining the anterior chamber," said Dr. Slomovic.

from the eye in one piece. This prevents strips of Descemet's membrane from being left in the recipient cornea.

4. Place the stripped Descemet's membrane on the corneal surface and examine it to ensure that you have removed all of it.

5. Evacuate *all* viscoelastic, if used, with an irrigation and aspiration unit to reduce the risk of graft dislocation and detachment.

Aid adherence. "To help with graft adherence, we roughen the peripheral stroma with a scraping device," said Dr. Mannis, who also makes four peripheral venting incisions in the stroma to help remove any fluid between the donor disc and recipient stroma.

Implanting the Graft

Maintain orientation. Before insertion, some surgeons mark the graft with a nonreversible letter, say, the letter R, to help with orientation. If the R shows up backward after insertion, the surgeon knows the graft is upside down. Due to concerns about potential toxicity of pen ink, Dr. Suh has stopped this practice. "To prevent inversion of the graft, I make sure my eyes never leave the scope."

Insert the graft. After enlarging the wound to between 4 and 5 mm, surgeons use one of a variety of techniques to insert the graft into the anterior chamber, often employing special-

ized instruments to help protect the endothelium, Dr. Slomovic said.

Following are some of the insertion tools and techniques commonly used by Drs. Slomovic, Suh, and Mannis.

- **Specialized forceps.** Dr. Slomovic uses either Busin forceps or Tan forceps to pull the donor disc into the anterior chamber through a paracentesis that is 180 degrees away from the donor insertion point. These forceps have been designed to minimize crush injuries, he said.

- **Tissue glides.** Dr. Suh initially used the Tan EndoGlide, then the Busin glide. "Today, I use the OSI EndoSerter—similar to an IOL inserter," she said. "You put the graft onto its spatula-like end, where it curls up, enabling insertion through a 4- to 4.5-mm incision." The EndoSerter also provides its own irrigation, avoiding the need for a separate AC maintainer and minimizing manipulation of the tissue, she added.

- **Folding.** Forceps insertion causes the greatest endothelial damage, said Dr. Mannis, who prefers a technique that he considers minimally traumatic and that does not require special instruments. It involves folding the graft in a 60/40 overfold, placing a small amount of Healon in the center of the "taco," and using a 30-gauge needle to push the graft into the anterior chamber along a sheath glide. After

closing the wound with a single butterfly stitch, he unfolds the graft with balanced salt solution.

Suture the wound. Once the graft is in the eye, the first inclination may be to reposition the tissue, said Dr. Suh, but it's important to quickly suture the wound so that the graft cannot escape.

Positioning the Graft

Inflate with full air bubble. Dr. Slomovic said that he inserts a full air bubble through a side port to push the donor disc up against the host posterior stroma. The air bubble also makes it easy to move the graft, said Dr. Suh. "You can tap it and make sure the graft is centered—some use a LASIK flap roller to do this." Once the graft is adherent, the air bubble is left in place for 10 minutes.

Evacuate part of the bubble. "Prior to leaving the operating room, we remove 20 to 25 percent of the bubble," said Dr. Mannis. "We also dilate the pupil with atropine." These steps help minimize the chance of pupillary block. Dr. Suh also evacuates the full air bubble to about a 70- to 80-percent bubble; applies Cyclogyl (cyclopentolate), topical antibiotics, and steroids; and shields the eye.

Following Surgery

Postop. Although not routine for DSAEK, a peripheral iridotomy may be done to help prevent angle closure. Immediately after DSAEK surgery,

the patient lies supine in the recovery room for about an hour, said Dr. Slomovic. Most surgeons examine their patients after an hour of recovery to ensure that the graft is apposed and the patient is comfortable. "If necessary, I take the patient back to the operating room and insert another air bubble and reposition the graft," said Dr. Suh.

At home. "We ask the patient to lie flat on his or her back for at least 24 hours—except when eating and using the bathroom—until the first follow-up visit the next day," said Dr. Slomovic. "We want to hear from the patient if there's discomfort," added Dr. Mannis, "as this can be a sign of pupillary block."

On the day of surgery or the next day, the patient starts topical steroids and antibiotics—both four times a day—and cycloplegics three times a day. Cycloplegics continue as long as the air bubble is present—about one to two days, said Dr. Suh. Antibiotics are continued for 10 days, and steroids are tapered at approximately a month to six weeks, said Dr. Mannis.

Dr. Slomovic tries to keep his postop steroid drop regimen simple and easy for patients to remember. "I use a full-strength topical steroid drop four times a day for one month, three times a day for the second month, two times a day for the third month, and then maintain the patient on one drop a day for an extended period of time,

sometimes indefinitely, if there are no contraindications," he said. "If there is a steroid-induced elevation in intraocular pressure, I will switch to a steroid drop less likely to cause a pressure rise, such as loteprednol."

Special instructions. Dr. Suh instructs the patient and family about:

- The purpose of the air bubble and what it looks like
- How to apply eyedrops, emphasizing the need to avoid pushing on or rubbing the eye
- Keeping the eye shielded until the first postop visit

Follow-up visits. A typical follow-up schedule is one day, one week, one month, and three months, said Dr. Slomovic. Early on, Dr. Suh monitors patients a bit more often. At the first follow-up visit, she documents the amount of air bubble remaining and then sees the patient every three days during the first week. If there's gross detachment, her patient returns for a new air bubble and repositioning of the graft. "If the dislocation or detachment is peripheral," said Dr. Suh, "we can often watch [the grafts] and they'll zip right back and reattach." ■

1 Maier P et al. *Dtsch Arztebl Int.* 2013;110 (21):365-371.

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MORE ONLINE. For a slideshow about the procedure, visit www.eyenet.org.

NEXT MONTH. Watch for a similar article about DMEK in February.

Tips for Higher-Risk Cases

Cases such as these may be especially challenging for the DSAEK surgeon.

Glaucoma patients with tube shunts. These patients have a higher risk of graft dislocation and rejection, said Dr. Slomovic. In these eyes, there is a risk of movement of the air bubble out of the eye and into a drainage device tube. "Err on the side of putting in a larger air bubble," said Dr. Suh, "and possibly close the tube temporarily with a suture." She also explained that it may be necessary to use a smaller graft because it is more difficult to unroll tissue in eyes that contain multiple tubes.

Aphakic patients. These patients are a challenge because the air bubble can escape to the back of the eye. Dr. Suh applies a little viscoelastic in the pupil as a tamponade. For aphakic patients, as well as those with iris abnormalities and filtering blebs, Dr. Mannis places a single suture at the superior rim of the donor graft through the recipient cornea to keep the graft in proper position.

Children. It's important not to disturb the eye's native lens, said Dr. Suh, so be vigilant about maintaining the anterior chamber.