

Beyond Corneal Transplants for Fuchs: Descemet Stripping Only

Although endothelial corneal transplants generally work well, they're certainly not perfect, said Christopher J. Rapuano, MD. As it is technically challenging, "endothelial corneal transplantation may require re-bubbling after a detachment or may fail altogether," he said. Accessibility of corneal tissue can be an issue; complications may include fungal infections and steroid-related glaucoma or cataracts in phakic patients; and transplants don't last forever, he added. Dr. Rapuano is at Wills Eye in Philadelphia.

"It would be great if a procedure could get the job done without using transplanted tissue," said Dr. Rapuano. Surgical removal of the Descemet membrane without subsequent endothelial transplantation—or Descemet stripping only (DSO)—may be an alternative, at least for some patients with Fuchs dystrophy.

Spontaneous Clearance

Around 2012, Kathryn A. Colby, MD, PhD, learned of case reports from Steven B. Koenig, MD, and J. Bradley Randleman, MD, showing spontaneous corneal clearance after graft detachment and after iatrogenic Descemet membrane stripping during cataract extraction.^{1,2} Also catching her eye were other case series of spontaneous clearance after failed Descemet membrane endothelial keratoplasty (DMEK) in

Fuchs dystrophy—but not in pseudophakic bullous keratopathy (PBK).³

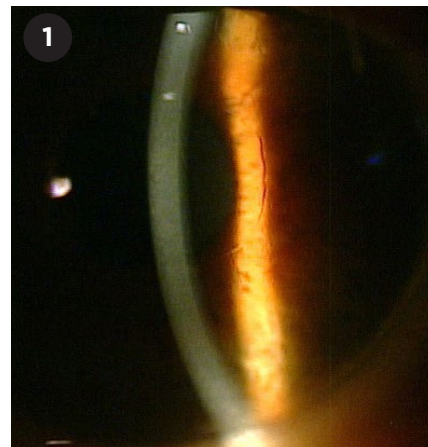
"I knew immediately this was important because it told me there was some regenerative capacity in the remaining endothelium in patients with Fuchs dystrophy but not in those with PBK," said Dr. Colby, at the University of Chicago.

She waited for the right patient and performed her first DSO. "At his one-month visit, the patient reported, 'I'm clear,'" she said. "Lo and behold, his cornea had cleared. After five years, the patient is still doing really well," said Dr. Colby, who has treated about 35 patients to date.

DSO success rates. Dr. Colby recently reviewed all DSO case series published as of 2018. She found an overall 82% corneal clearing rate in a total of 77 cases. Among other factors, patient selection, surgical protocol, or extent of disease likely influenced outcomes, she said.

In reviewing all of the published series, Dr. Colby noted a correlation between corneal clearance and size of the stripping. There's a point at which there's not enough peripheral endothelium to repopulate the central cornea, she said. One author also attributed lack of clearance to an abundant use of steroids after surgery, she said.

DSO versus DMEK. Deepinder K. Dhaliwal, MD, at the University



TECHNIQUE. Slit lamp shows edge of stripped area in a DSO patient.

of Pittsburgh Eye Center, recently conducted a retrospective case series comparing 12 patients who had DSO with 15 who had a DMEK.⁴

"We compared the two groups to see if there were any differences in complications, final visual acuity, and time to functional visual acuity," she said. "The average time to reach a 'functional' vision of 20/40 was 2.2 weeks in the DMEK group and 7.1 weeks in the DSO group (this was statistically significant). However, the average final best pinhole visual acuity was 20/25 in DMEK eyes and 20/30 in DSO eyes and was not statistically significant."

Best Candidates for DSO

DSO will not work for pseudophakic bullous keratopathy, said Dr. Colby.

Focal guttae. "A patient has to have Fuchs dystrophy with focal guttae affecting 4 mm to 6 mm of the central cornea, but not involving the peripheral

BY ANNIE STUART, CONTRIBUTING WRITER, INTERVIEWING KATHRYN A. COLBY, MD, PHD, DEEPIINDER K. DHALIWAL, MD, LAC, AND CHRISTOPHER J. RAPUANO, MD.

cornea,” she said. “Someone with guttae from limbus to limbus will not be a good candidate. You have to be able to remove most of the guttae but still have an adequate reserve of peripheral endothelium.”

Dr. Rapuano agreed that patients with mild or moderate, but very central, Fuchs dystrophy are the ideal candidates, especially if they have cataracts. “The surgeon is doing the cataract anyway and can also do the DSO and see how the patient does,” said Dr. Rapuano. He noted that he has not yet had what he considered an ideal candidate, although he’s offered the procedure to several patients.

One good eye. Dr. Dhaliwal also considers it important for patients to have one good eye to be considered for DSO. “If someone is marginally functional and you make their vision worse, that can be problematic,” she said. “Even rapid responders have poor vision right after surgery.” When she has a patient with bilateral decreased vision from Fuchs dystrophy, she does a DMEK because she wants the patient’s vision to recover quickly.

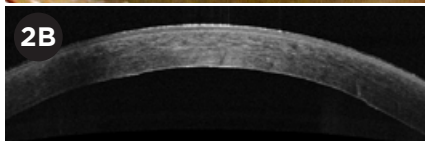
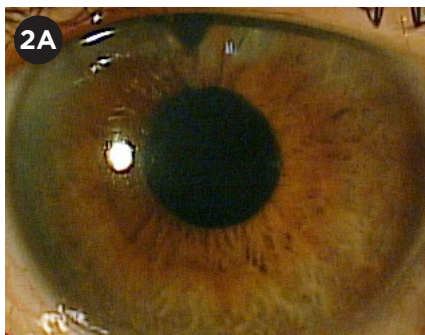
An Evolving Procedure

The DSO technique is in evolution, said Dr. Rapuano. “No one knows exactly how big a circle to take out,” he said. “Some take more with success, but the more you take out, the greater the risk of failure.”

Even as cornea surgeons are on a learning curve, they are taking steps to enhance the procedure.

Create smoother surfaces. Mark Gorovoy, MD, has created special forceps and refined the technique to help maximize DSO results, said Dr. Dhaliwal. “We used to score 360 degrees and then strip the membrane. Now, there’s a belief we should strip in one area and tear it around using forceps. Then, endothelial cells can migrate over a smoother edge with no stromal disruption.”

Dr. Colby also cited a study by Davies et al., in which 10 of 10 patients cleared when the authors used a peeling, rather than stripping, technique.⁵ “Does that mean peeling is better?” asked Dr. Colby. “I don’t know. My stripping technique



OUTCOMES. Five years after DSO (2A) external photograph and (2B) optical coherence tomography.

has worked pretty well, but it does make sense that a smoother edge provides less resistance to endothelial migration.”

No matter how you remove the membrane, she said, you need to use a gentle hand, avoid leaving tags of Descemet membrane, and make the cornea as smooth as possible. “In some unsuccessful cases, you can see scarring in the photos, which means the surgeon dug the Sinskey hook into the stroma during the stripping.”

Consider ROCK inhibitors. “What’s new since about 2016 is the adjuvant use of a topical rho kinase (ROCK) inhibitor to facilitate endothelial migration,” said Dr. Colby. “Ripasudil is not FDA approved, so we can’t prescribe it. But patients can order it online, and we can observe them using it.”

Although netarsudil (Rhopressa) is approved in the United States for glaucoma, said Dr. Rapuano, ripasudil (Glanatec) is theoretically more effective. “At the time of the Academy’s 2018 annual meeting, there were about 75 cases that had been published or presented at various meetings of supplementation with topical ripasudil after DSO,” said Dr. Colby. “It appears to speed the resolution of the corneal edema and to potentially increase the final endothelial cell count.”

Dr. Colby said plans are underway for a multinational clinical trial in the United States, Europe, and the United Kingdom that will assess ripasudil’s effectiveness when used after DSO.

Regulatory approval for the trial is in progress.

What to Expect After Surgery

Dr. Colby recommends postoperative care similar to that which follows a cataract surgery. This includes topical antibiotics for about a week after the procedure and topical steroids until corneal clearance.

Post-op patience required. “Patients have to understand that their cornea will be swollen afterward and their vision will be worse, not better, until it clears,” said Dr. Colby. This could take anywhere from three weeks to three months, she said. “The length of recovery is not predictable. If you remove a larger area, however, the cornea will take longer to clear.”

These patients have to be tolerant because the recovery will be a slow one, agreed Dr. Dhaliwal. “I always tell patients that their vision will get a lot worse before it gets better. If a patient is not prepared for that or not able to deal with worsened vision in one eye, DMEK is probably a better option.”

Access to care. Although a cornea surgeon does the DSO procedure, said Dr. Colby, the patient doesn’t need to be followed by the surgeon after the cornea has cleared. This may be beneficial for improving access to care.

When DSO Fails

Just because the cornea clears after DSO doesn’t mean it will necessarily stay clear, said Dr. Dhaliwal. “In our study, all the patients did quite well. However, since we published our case series in 2018, we have already performed DMEK on one patient in that cohort, and another is showing some recurrent edema.”

DMEK after DSO. The good news is there doesn’t appear to be any significant risk in doing a DMEK after a failed DSO, said Dr. Rapuano. DMEK after DSO is a straightforward procedure with good results, added Dr. Colby.⁶

Don’t delay. That said, it’s important to not wait too long to do a DMEK after DSO. If edema is severe and long-lasting in the front of the cornea—whether from Fuchs dystrophy or after DSO—it can decrease the success rate

of the DMEK because there is scarring that is not removed, said Dr. Rapuano.

“When a patient’s cornea stays swollen for a long time, we’re doing them a great disservice because the cornea may not become totally clear again,” agreed Dr. Dhaliwal. “To optimize outcomes, we need to know when to intervene surgically with DMEK.” And the ophthalmologist and patient need to be on the same page about this, she said.

Potential Implications of DSO

Dr. Rapuano said he thinks that most Fuchs dystrophy patients aren’t candidates for DSO given their extensive disease. However, he noted that some patients getting transplants now may have done very well if DSO had been performed earlier in the disease course.

Dr. Colby said she thinks as many as half of all Fuchs dystrophy patients may be candidates for DSO. “We know that up to 4% of people in the United States have an early form of Fuchs, which is a lot of people,” she said. “If we can

remove all the guttae with 4-mm stripping, put a ROCK inhibitor on for two months, and end up with a cell count of 1,000 or 1,500, I think we will be able to offer it to people earlier in the disease than would typically be done with a corneal transplant.”

How long lasting? Of course, the \$64,000 question is, how long will DSOs last? “We assume the cornea will get swollen at some point in the patient’s life,” said Dr. Rapuano. “If DSO only delays this by a year, it’s not a big help. However, if it delays it by five or 10 years, that’s a different story.”

If the endothelial stem cell niche has truly awakened and created new endothelial cells that migrate and cover that area, said Dr. Dhaliwal, then DSO should last a long time, and it thus might even be an option for many more patients. “But if this is just a migration of existing endothelial cells, I think the jury is still out on how long it will last. We simply don’t yet fully understand what is happening.”

- 1 Koenig SB. *Cornea*. 2013;32(6):886-888.
- 2 Shah RD et al. *Ophthalmology*. 2012;119(2):256-260.
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- 5 Davies E et al. *Cornea*. 2018;37(2):137-140.
- 6 Rao R et al. *Cornea*. 2017;36(7):763-766.

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