Triple DMEK vs. Separate Surgeries

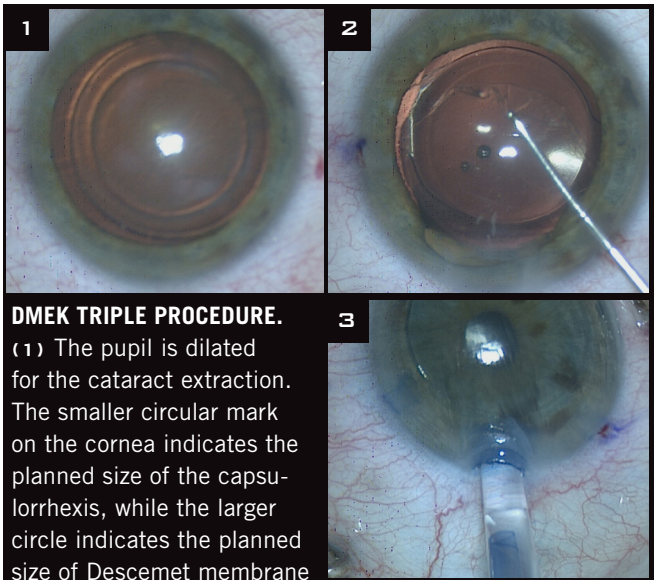
Even as evidence supporting the newest version of endothelial keratoplasty mounted over the last few years, it became apparent that Descemet membrane endothelial keratoplasty (DMEK) shares a postsurgical drawback with its predecessors: accelerated cataract progression.

But an Indianapolis corneal research group, led by cornea surgeon Francis W. Price Jr., MD, thinks it has identified a safe and effective solution to the problem. Instead of allowing early cataracts to progress and eventually require a secondary surgery—potentially putting the transplanted endothelial cells at risk—surgeons can perform the phacoemulsification and lens replacement concurrently with the DMEK without increasing the risk of complications.

Combined "triple DMEK" works as well as solo DMEK, they concluded in a trio of recent studies.[1-3]

Post-DMEK cataract progression. "We found a substantial rate of cataract progression after DMEK, particularly in patients over 50 years old," said Marianne O. Price, PhD, epidemiologist on the research team. Specifically, a series of 49 consecutive transplants in phakic eyes found that during the first year after DMEK, 76 percent of the eyes experienced cataract progression, and 33 percent underwent cataract surgery.[1]

"So," she continued, "our surgeons recommend replacing the lens at the time of the DMEK procedure if you see any trace of cataract, especially if the patient is over 50 years old."



DMEK TRIPLE PROCEDURE. (1) The pupil is dilated for the cataract extraction. The smaller circular mark on the cornea indicates the planned size of the capsulorrhexis, while the larger circle indicates the planned size of Descemet membrane (DM) removal. (2) After cataract removal and IOL implantation, dysfunctional DM and endothelium are stripped from the host cornea; viscoelastic is still in the anterior chamber from the cataract procedure. After the membrane is stripped and the viscoelastic completely removed, the pupil is constricted with Miostat. (3) The healthy donor DM and endothelium are stained with trypan blue, placed into an IOL inserter, and injected into the eye through the same 2.8-mm incision used for cataract extraction.

Triple-DMEK outcomes. Results thus far support the combined surgery. Triple-procedure patients (n = 200) had surgical and visual outcomes equivalent to those achieved with DMEK alone in eyes that were already pseudophakic (n = 292). There was no additional

FRANCIS W. PRICE JR., MD / MCKEE & PRICE, DMOST IBOOK

risk of complications, and endothelial cell loss between three and six months postoperatively was the same for both groups (26 percent). Six months after surgery, the median corrected distance visual acuity (VA) was 20/20 in the triple-procedure eyes and 20/25 in the DMEK eyes (ranges: 20/16-20/100 and 20/16-20/80, respectively).[2]

Speeding visual recovery. In another paper, the group reported on rapid sequential DMEK, with or without combined cataract surgery, in a case series of 12 patients with bilateral Fuchs corneal dystrophy. The procedure on the fellow eye was scheduled one to two weeks after each patient's initial DMEK, with phaco and IOL implantation included as needed. According to the authors, the rapid recovery in the first eye (median uncorrected distance VA at one week, 20/60) allowed patients to have adequate visual functioning with that eye when they had surgery in the second eye.[3]

"When you put these papers together, they create a really nice clinical picture. It's actually quite revolutionary," Dr. Price said. "People are now able to have their cataracts and their cornea problems treated in both eyes in just a couple of weeks." —*Linda Roach*

1 Burkhart ZN et al. *J Cataract Refract Surg.* 2014;40(3):430-434.
2 Chaurasia S et al. *Ophthalmology.* 2014;121(2):454-458.
3 McKee Y et al. *J Cataract Refract Surg.* 2013;39(9):1372-1376.

***Dr. M. Price** is a consultant for Alcon, Allergan, Lenstec, Ophtec, and Staar; has received lecture fees from Bausch + Lomb, Kedrion, Oculus, and Santen; and has equity interest in Calhoun Vision, RevitalVision, and TearLab.*

Neuro-Ophthalmology News

Window for Visual Plasticity Wider Than Expected

Challenging previous orthodoxy, researchers at the Massachusetts Institute of Technology (MIT) and the Schepens Eye Research Institute at Harvard Medical School have shown that the human visual system can retain remarkable plasticity after early and extended blindness.[1]

Through a joint humanitarian and scientific venture called Project Prakash, led by MIT professor Pawan Sinha, PhD, researchers studied a unique population of 11 Indian children treated for bilateral congenital cataracts. These children had lost vision within the first year of life but did not have cataract surgery until late childhood or adolescence—past the threshold where visual development was traditionally thought possible. Nevertheless, some of these patients achieved substantial improvement in vision.

Contrast sensitivity. The researchers used a newly developed iPad-based tool to evaluate contrast sensitivity functions. "Although the clinical world often focuses on measuring acuity, the contrast sensitivity function provides more detailed information about a person's vision and is more closely related with the ability to perform a variety of everyday activities," said Amy Kalia, PhD, coauthor and research scientist in the Sinha Lab.

Impressive gains. Contrast sensitivity typically stops developing around age 7. However, gains in contrast sensitivity in five patients, ranging in age from 11 to 15 years, demonstrated the potential for development of sight after early and extended deprivation, said Dr. Kalia. In a pool of patients with a presurgical acuity equivalent to 20/1,200 or worse, two had improvements of 1.5 log units in contrast threshold relative to the first postsurgical assessment. One patient continued to improve a year after surgery, and two exceeded the typical rate of development seen in infants.

DEVELOPING VISION. Researchers used images on an iPad-based tool to evaluate contrast sensitivity after surgery for bilateral congenital cataracts.

PAWAN SINHA, PHD

"These findings suggest that, for some, the changes have a neural origin," said Dr. Kalia, "and are not simply due to the immediate effect of cataract removal." Additionally, improvements in some patients surpassed those seen in individuals with amblyopia who sometimes gain acuity and contrast sensitivity through perceptual learning.

Big variations. Why some patients continued to develop vision five to six months after surgery while others did not remains a puzzle, said Dr. Kalia. The researchers found no correlation with the four variables they examined: age at time of surgery, time since surgery, presurgical acuity, or type of cataract.

Dismantling dogma. The study's findings have implications that are both immediate and potentially far-reaching. For children with bilateral cataracts, late treatment may no longer be considered an exercise in futility. Although these patients may not develop normal levels of vision, Dr. Kalia said, "it's likely they will gain significant vision that can definitely improve their quality of life."

Moreover, recognition of greater neural plasticity may inform the development of technologies for the blind, such as retinal prostheses or gene therapy, she said.

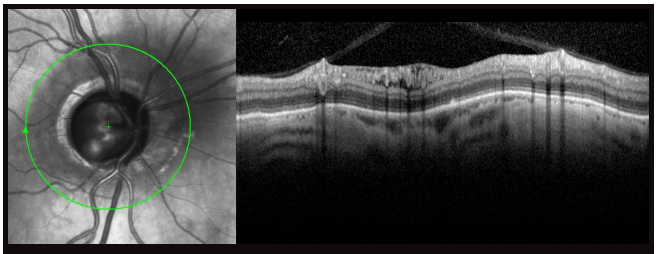
—*Annie Stuart*

1 Kalia A et al. *Proc Natl Acad Sci U S A.* 2014;111(5):2035-2039.

***Dr. Kalia** reports no related financial interests.*

Glaucoma Report

Beware of OCT Artifacts In Assessing Glaucoma



OCT ARTIFACT. Vitreous traction and nerve fiber layer schisis create an artificially thick-appearing nerve fiber layer.

Researchers at Duke Eye Center have warned that exclusive reliance on optical coherence tomography (OCT) to diagnose and evaluate glaucoma may lead to errors in clinical judgment.[1]

"Artifacts need to be ruled out before giving any consideration to the results of OCT," said lead author Sanjay Asrani, MD, clinical director and professor of ophthalmology, Duke Eye Center of Cary, N.C. "Unless the doctor looked at the raw images acquired by the machine, artifacts could be easily overlooked. This could lead to erroneous decisions in patient care."

The retrospective cross-sectional study examined SD-OCT images of 277 patients with a diagnosis of glaucoma or glaucoma suspect. Most OCT artifacts were obvious on the final printout. But 15.2 percent of the retinal nerve fiber layer scans and 36.1 percent of the macular thickness scans revealed artifacts not obvious on the final printout.

Although operator error and software glitches contributed to artifacts, the most common cause was ocular pathology. For example, the researchers were surprised to find that epiretinal membranes occur in the peripapillary area, leading to significant errors in nerve fiber layer measurement. Another surprise: Posterior vitreous detachment affects nerve fiber layer thickness.

The images were captured by the Spectralis SD-OCT, but Dr. Asrani said the take-home message applies to all instruments: When looking at the raw images, ensure that the data have been correctly acquired and that the software correctly identified the layers.

"OCT results should be used to support your diagnosis. They should not be used in isolation to determine treatment."

—Miriam Karmel

1 Asrani S et al. *JAMA Ophthalmol.* 2014 Feb. 13. [Epub ahead of print.]

***Dr. Asrani** receives lecture honoraria from Heidelberg.*

Eye on Nutrition

Multivitamins and Age-Related Eye Disease

Results of the multivitamin component of the Physicians' Health Study II indicate that long-term daily multivitamin use in men significantly, albeit modestly, decreased the risk of cataract but had no significant effect on visually significant age-related macular degeneration (AMD).[1]

Researchers at Brigham and Women's Hospital and Harvard Medical School in Boston conducted a large-scale randomized, placebo-controlled trial to test a multivitamin in the primary prevention of cataract and AMD. The study analyzed data from 14,641 male physicians aged 50 years or older (mean, 64.3 years). Half took a daily multivitamin (Centrum Silver); half took placebo. Participants were also randomly assigned to supplements of vitamin C, vitamin E, beta-carotene, or placebo. Follow-up rates exceeded 98 percent over an average of 11.2 years, and self-reports were confirmed by medical record review. What the results lost in generalizability because of the physician population, they gained in higher internal validity, said the lead author, William Christen, ScD, associate professor of medicine at Harvard.

In the placebo group, 945 cases of cataract developed, versus 872 cases in the multivitamin group, representing a 9 percent reduction in risk. For nuclear cataracts, risk reduction was 13 percent. "Even this modest reduction would have a large public health impact," said Dr. Christen.

"Our finding of a modest but significant benefit is in line with two prior trials of multivitamins: the Linxian Cataract Studies[2] and the Italian-American Clinical Trial of Nutritional Supplements and Age-Related Cataract Study.[3] Taken together, these trials all suggest a benefit from multivitamins, specifically on the nuclear subtype," he said.

The study also found that the multivitamin group had 33 additional cases of AMD. Dr. Christen said that though not statistically significant, this finding raises some concern, and he called for further research in other populations.

—Gabrielle Weiner

1 Christen WG et al. *Ophthalmology.* 2014;121(2):525-534.
2 Sperduto RD et al. *Arch Ophthalmol.* 1993;111(9):1246-1253.
3 Clinical Trial of Nutritional Supplements and Age-Related Cataract Study Group. *Ophthalmology.* 2008;115(4):599-607.

***Dr. Christen** receives research funding from the NIH.*

SANJAY ASRANI, MD