



REFRACTIVE SURGERY

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Physicians have options for correcting presbyopia at the corneal plane

The recent focus of presbyopia management has been lenticular correction, but corneal correction still maintains a critical role in the management of accommodative loss.

IOLs have proven in clinical trials and in practice to improve near, distance and intermediate vision while providing fairly high rates of spectacle independence. Improving lens technology portends further improvements in the ability to surgically manage presbyopia.

However, some experts contend that refractive corrections and corrections based at the corneal plane should still play a role in correcting presbyopia, especially in patients who are younger, prefer a less invasive surgical approach or are at risk for aberrant optical phenomenon after lens implantation.

"In theory, one might look at corneal procedures as a bridge between early presbyopia and later presbyopia more in your 60s, where one might start turning to intraocular implants," explained Peter S. Hersh, MD, FACS, director of cornea and refractive surgery at the University of Medicine and Dentistry of New Jersey.

"I think in general, for the plano presbyope that is in the earlier presbyopic age range, I would prefer a corneal approach," he said. "If we are starting to look at patients in their 60s or 70s, then we are starting to prefer intraocular approach."

Corneal inlay

According to Vance Thompson, MD, FACS, of Vance Thompson Vision, Sioux Falls, S.D., lens-based correction theoretically offers the optimal blend of vision across all three optical zones, and yet, some patients either may be unwilling or unable to receive such a correction. In these types of patients, there are a variety of corneal options currently available and others being studied in clinical trials that offer reasonable to good correction of near vision without overly compromising distance vision.

Specifically, monovision laser correction potentially blurs distance vision the most, followed by conductive keratoplasty, according to Dr. Thompson. A newer product currently in clinical study, the AcuFocus corneal inlay, "blurs distance the least of the corneal corrections. If you want to blur distance less than the AcuFocus corneal inlay, you have to go to a lens system," he said. Dr. Thompson is an investigator for the inlay.

"When we talk about corneal correction, we are having a different discussion," Dr. Thompson said. "We are now embarking on a discussion on an exercise in compromise: What are you willing to give up on distance to get this near function?"

An issue closely related to compromise is how reversible or adjustable the correction is. Dr. Thompson said he is uncomfortable with procedures that do not allow room for later fine-tuning or revision.

"It is powerful to me that if someone doesn't tolerate the corneal correction of presbyopia, I can fine-tune or correct their vision," he said.

In such situations, a corneal inlay such as the Acufocus system may be advantageous in that it can be removed with minimal or no permanent change to corneal architecture.

"We have to qualify that it is in FDA monitored trials, and it's an investigational device, but to me it's going to be a very important part of our presbyopia armamentarium," Dr. Thompson said.

Multifocal risks

Laser-based corrections such as monovision and CK also offer space for later revision. However, newer laser-based patterns, such as creating a hyperprolate cornea or multifocal viewing system on the cornea, still pose unanswered questions.

In addition, Dr. Thompson said, creating multifocality on the cornea potentially increases the risk for glare, halo and reduced image quality in a population already at a higher risk for other causes of multifocality in their optical system from such things as dry eye or aging lens changes. Additionally, there may be little room to undo multifocal ablations on the cornea.

“Multifocality can be really powerful to improve depth of focus and to improve our near vision at minimal expense to distance. But you start adding multifocality to itself (for example, a laser created multifocal cornea in a patient with a multifocal irregular tear film and a multifocal early nuclear sclerotic lens change) and it starts to act like irregular astigmatism, which can impressively deteriorate our image quality,” Dr. Thompson said. “If you start adding these multifocal sources together in the presbyopic age range, you can end up with a pretty impressive deterioration of image quality, and you need to keep these things in mind if you are doing the corneal correction of presbyopia, especially if you are inducing a multifocal cornea.”

Laser options

Aside from corneal inlays, laser-based procedures may offer a suitable option for correcting presbyopia. Creation of a multifocal cornea may induce the best vision across the three viewing zones, but some patients are intolerant of potential side effects or cannot neuroadapt.

According to Dr. Hersh, monovision is still a viable option that has the advantage of being a binocular correction. Patients can go through a trial with either monovision or multifocal contact lenses to assess the optical situation with which they are most comfortable.

Another presbyopia approach is CK, which combines multifocality and monovision.

“You are getting a monovision effect, but you are also getting some multifocality, because those types of procedures give you a hyperprolate corneal contour afterwards,” Dr. Hersh said. “Rather than giving you strict multifocality, it is giving you a more highly prolate asphericity, which is tending to give you a greater depth of field, with less compromise of distance acuity.”

Efforts are also ongoing to develop presbyLASIK, which is similar to multifocality in that the cornea is ablated to create distance in the center with near vision in the periphery or vice versa. Unlike multifocal corrections, however, it is not a bulls eye-like pattern, but rather a hyperprolate cornea shape that extends depth of field through spherical aberration, Dr. Hersh said.

Results from presbyLASIK trials have been variable, and no evidence yet exists to say which pattern — near center vs. distance center — is preferable or whether one may be a better option depending on presurgical refractive error.

“I think the two main reasons people are dissatisfied with presbyopic procedures are, number one, they don't get close enough to read the newspaper; and, number two, they detect some negative change in their distance visual function. It's not that one eye is blurrier than the other, but they might notice more of an ocular imbalance, or a perceived bit of diminished stereopsis,” Dr. Hersh said. — *by Bryan Bechtel*

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