

CK for Presbyopia: A Useful Tool

How we're ensuring that virtually all of our patients are achieving J2 reading vision or better.

BY ALAN KOZARSKY, M.D.

At Piedmont Better Vision in Atlanta, where I'm one of three fellowship-trained corneal surgeons, we acquired Refractec conductive keratoplasty (CK) equipment almost a year ago. This was prior to the specific FDA approval for presbyopia, but we were aware that the most effective use of the technology was "off label" for the monocular treatment of presbyopia.

Through our affiliated medical center, Piedmont Hospital, we received favorable media coverage, generating an abundance of interest from potential CK patients.

We were told by the excellent refractive surgeons who were the original CK investigators that the most useful and frequent indication for CK treatment was presbyopia in the setting of emmetropia or minimal hyperopia. Thus, our treatments have been primarily unilateral with the induction of "blended monovision" in the nondominant eye of presbyopic individuals.

We've occasionally performed bilateral CK for mild hyperopia and presbyopia, typically with a more aggressive treatment in the nondominant eye for induction of the blended monovision. In addition, we've performed "hybrid" treatment for mild hyperopia in the distance eye with CK treatment for mild hyperopia in the dominant distance eye and laser vision correction in the fellow eye to induce monovision. In such cases, the amount of hyperopia/presbyopia treatment required in the near eye was well beyond CK capability. Finally, we've treated a few previous LASIK patients who had become presbyopic in the years following their myopic refractive procedure, and we've helped two radial keratotomy patients with consecutive hyperopia, obtaining good results using CK as a secondary surgery.

In this article, I'll explain how we use CK for presbyopia in our practice, both in terms of how we select, educate and support patients who are appropriate candidates for CK, and how we perform the actual procedure.

Evaluating CK Candidates

We learned that a CK evaluation, which requires topography, multiple refractions, a biological exam, as well as the "loose lens" simulation of blended monovision, easily consumes the same amount -- or more -- time, technician and physician time as our laser vision correction evaluations.

Despite the availability of highly experienced ophthalmic technicians who are proficient in refractive measurements, with CK it's the surgeon who performs the eye dominance test and loose lens CK simulation. The loose lens test is the most important element of the CK evaluation and is best performed and experienced by the surgeon in determining candidacy of the patient. With equivocal results of the loose lens test, we refer patients for a monovision contact lens trial to determine tolerance of monovision.

We noted some obvious trends during our initial screening and preoperative CK exams. Patients were told before their exams that good uncorrected distance visual acuity with failure of reading vision was optimal for CK presbyopia treatment. Nonetheless, dozens of patients came to our office professing great distance acuity and were found to have 20/50 or worse uncorrected distance acuity with one or more diopters of hyperopia. Indeed, for some of these individuals, we employed CK to improve distance acuity in the dominant eye and a hyperopic laser ablation to create near capability in the nondominant eye.

We also noted in screening patients who claimed "great distance acuity" that there was a relatively high incidence of astigmatism, which precluded the use of CK as a primary procedure. And we often observed the unrealistic enthusiasm and expectations of prospective CK patients.

We now explain to patients that CK is a procedure that can potentially result in a "capability" for near vision that didn't exist prior to surgery. We tell patients that CK doesn't result in perfect reading vision, and that they may require the use of reading glasses postoperatively, particularly for prolonged reading effort and smaller print. We also emphasize the several-month adaptation period that may follow even the most successful treatment. The adaptation includes interference with distance vision, low light aberration, and fluctuating near vision. For some patients, the adaptation period is a nonevent; other patients require significant amounts of support and encouragement during this time, with almost all patients becoming highly satisfied with visual function within 3 months of treatment.

Performing the Procedure

Preoperatively, our patients are given proparacaine, Acular LS and Alphagan P, with the three and nine o'clock positions indicated with a skin marker. The CK treatment is performed with the Refractec marker, using our Autonomous laser microscope for the surgical procedure. We target 0.75, 1.25, and 1.75D of hyperopic correction with 8-, 16-, and 24-spot treatments respectively.

Following 16- and 24-spot treatments, we measure the operative eye with a conventional Bausch & Lomb keratometer, which is located in the operating suite. This measurement provides both qualitative and quantitative indication of induced astigmatism and can accurately guide an extra spot of treatment in the flat axis to minimize postoperative astigmatism.

The three and nine o'clock spots placed preoperatively in conjunction with a Mendez marker allow the accurate placement of an additional, anti-astigmatism spot, if required. The ring lights used by many other surgeons can't be easily mounted on an Autonomous microscope. The manual keratometer has proven superior in our hands to the Orbscan or automated keratometer in the immediate postoperative setting.

We put patients on Zymar and Acular LS four times a day for a week. We also direct them to call us on the first postoperative day and return to our office 1 to 2 weeks after the procedure. During the postoperative period, we monitor near-vision capability, subjective visual experience, and obtain an Orbscan on each visit to check for induced astigmatism. The intraoperative keratometer-guided treatment of induced astigmatism has substantially reduced the number of imperfect results. Nonetheless, if near vision hasn't reached the desired levels and is associated with 1.5D or more induced astigmatism, a treatment spot is placed as soon as possible.

Surgical Tips for Optimizing CK Results

1. Centration. Under the operating microscope, we start with low illumination and slowly, for patient comfort, increase to maximum intensity, thereby constricting the pupil and allowing the Sinskey corneal mark to be accurately placed over a small pupil. I find it helpful to alternately close each of my eyes and make sure that the applied mark is halfway between the indicated center mark for either viewing eye.

2. Immediate postoperative astigmatism measurement and treatment. Precisely placed three and nine o'clock limbal marks are made with a skin marker immediately before surgery. Then, we measure each patient at a conventional Bausch & Lomb keratometer immediately after the CK procedure.

Indeed, we have placed the keratometer in the operative suite. After installation of artificial tears of moderate viscosity, keratometer mires are easily seen and can be used qualitatively and quantitatively. If astigmatism measures more than 2.5D, we place a single "bonus" spot in the flat axis at the 6.5-mm zone. The pre-placed marks in the 180-degree axis in conjunction with a Mendez marker allow the exact axis placement of the bonus spot. The keratometer mires are used qualitatively and if they show a teardrop shape the bonus spot is placed on the side of the flat meridian coinciding with the long axis of the teardrop.

We Like the Results

As of this writing, we've treated nearly 400 eyes and we've achieved the goal of J2 or better near vision at normal viewing distance on virtually all patients. In general, despite a substantial incidence of early postoperative visual aberration, these patients achieve visual stability with a major improvement in uncorrected near vision and minimal loss of distance acuity, compared with the same level of monovision provided with contact lens or laser vision correction.

Regarding complications, we have had one patient with a 16-spot treatment who had virtually no refractive benefit. One patient overresponded to treatment with nearly 3D of postoperative myopia, when half that amount was desired. We used myopic surface laser ablation on this patient and achieved the desired level of myopia.

Initially, we had a 10% rate of induced astigmatism, requiring an additional spot of treatment. Intraoperative keratometry and placement of a "balance spot," if required, has substantially decreased the incidence of visually significant postoperative astigmatism. We've treated a number of undercorrected patients with an additional ring of 8 spots at the 6.5-mm zone, achieving the desired correction.

CK Gives Us Another Tool

Overall, we've found CK to be an important additional tool in the armamentarium of our refractive practice. It allows the treatment of low hyperopia and especially emmetropic presbyopia in the setting of decreased invasiveness, without laser ablation and without risk of dry eye.

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