

Cataracts After Conductive Keratoplasty

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CASE PRESENTATION

A 63-year-old woman desires improved uncorrected distance and near visual acuity. She has a history of multiple conductive keratoplasty (CK) treatments on both eyes (no records available).

Her distance UCVA is 20/60 OD and 20/40 OS. Her refraction is +1.50 D OD and +0.75 D OS, netting a visual acuity of 20/25 OD and 20/30- OS. There are 1+ to 2+ nuclear sclerotic cataracts in both of the patient's eyes. A slit-lamp examination shows multiple CK markings, greater in the left than right eye. The markings in the patient's left eye are nasally decentered (Figure 1). Topography (Figure 2) is mostly spherical in her right eye and shows 1.00 D of astigmatism in her left eye.

The patient currently uses readers and is highly motivated to be free of glasses. How would you treat her? In general, what is your go-to approach to a cataract patient after refractive surgery?

—Case prepared by Tal Raviv, MD.

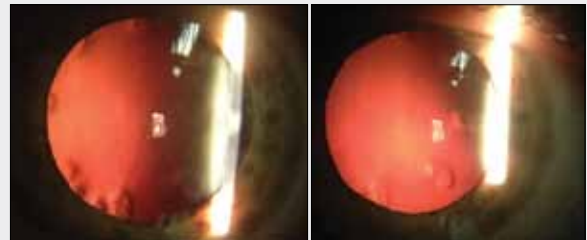


Figure 1. Slightly decentered corneal marks from prior CK treatment are visible in the patient's left eye.

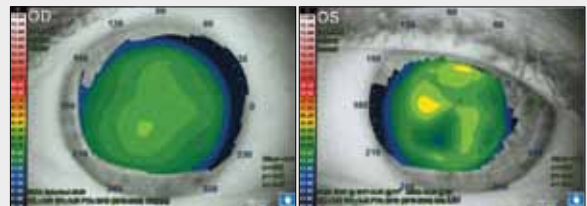


Figure 2. Corneal topography shows some irregular astigmatism in the left eye.

JASON P. BRINTON, MD, AND DANIEL S. DURRIE, MD

In our practice, approximately half of our cataract surgery and refractive lens exchange (RLE) patients have had prior keratorefractive surgery, including CK, RK, PRK, and LASIK. There are several effective options for achieving spectacle independence for these patients.

Most postrefractive surgery patients in the presbyopic age range have already adapted well to monovision or modified monovision, so our preferred procedure would be RLE with refractive targets that preserve this correction. If the patient does not recall which eye was set for near vision, clues such as manifest refraction (-0.75 D more myopic in the left eye in this case) and the presence of extra CK markings in the left eye are suggestive. The irregular topography of the left eye also makes it less suitable for use as a distance eye; excellent distance UCVA in the distance eye is essential for successful monovision whether or not a patient has undergone refractive surgery.

We perform eye dominance testing on all patients and usually correct the dominant eye for distance vision, but some patients function better with their nondominant eye set for distance vision. The clinical history can provide valuable direction in this case.

First, we would perform RLE on her right eye using a monofocal or accommodating IOL and a plano target. Subsequently, we would perform RLE on her left eye using a monofocal or accommodating IOL and a target of -1.50 or -0.75 D, respectively. Intraoperatively, we would place limbal relaxing incisions to control astigmatism.

When selecting the IOL power, we would err on the side of myopia, particularly in the distance eye. If an enhancement were required, this patient's corneas would be better served by a myopic rather than a hyperopic treatment. We would use a femtosecond laser (LenSx Laser; Alcon Laboratories, Inc.) and intraoperative wavefront aberrometry (ORA System; WaveTec Vision), as with all of our lens surgeries. Our enhancement procedure of choice would

be PRK or topography-guided PRK, depending on whether irregular corneal topography were an issue.

It would be possible to use diffractive multifocal IOLs in this patient's eyes. The chances of a successful visual outcome would be lower, however, because she has a history of a decentered keratorefractive procedure.

A. JAMES KHODABAKHSH, MD

CK steepens the cornea to reduce hyperopia and increase reading vision in presbyopic emmetropic eyes and mildly presbyopic hyperopic eyes. The procedure uses radio waves to make the eye essentially nearsighted so that the patient may view objects up close more easily. CK has fallen out of favor with some surgeons in the past few years due to high rates of regression.¹

Postrefractive surgery patients pose a great challenge to today's cataract surgeon. Patients who have had either prior laser refractive surgery or thermokeratoplasty procedures for their presbyopia have a strong desire not to wear correction for any distance. My initial approach to these individuals is to set the proper expectation for their postoperative outcome. In the initial part of my consultation with them, therefore, I explain that there is no guarantee of spectacle independence and that more than one procedure may be needed to achieve our intended goal. That said, with today's implant technology, I routinely achieve excellent outcomes in these patients.

Despite the lack of prior records, a review of the provided figures indicates to me that this woman was most likely a mild hyperope who had monovision CK in which her nondominant (left) eye was treated with more spots to increase its near reading ability. Based on her current refraction, she probably has experienced full or partial regression along with cataract development. I would try to elicit these facts from her through thorough questioning about her experience after CK and history of contact lens wear.

My next step would be the measurements. Unlike in eyes that have had laser refractive surgery, the IOL calculations after thermokeratoplasty are much easier. In my experience with post-CK eyes that have cataracts, I have been able to use my IOLMaster measurements (Carl Zeiss Meditec, Inc.) as they are, because thermal waves steepen the cornea at almost full corneal thickness. More importantly, CK does not disrupt the relationship between the anterior and posterior curvatures of the cornea, as do LASIK and surface ablation. The corneal measurements will thus be the true and actual corneal powers. No formulas or further adjustments have to be made. I routinely use the Holladay I or II formulas.

I do not consider multifocal lenses for these patients, because they usually have some degree of irregular astigmatism, as evident in this case. Depending on the patient's preference and history, I would offer two courses of action: (1) monofocal lenses with blended vision or (2) accommodating lens implants with a mini-monovision offset of approximately -0.75 D in the nondominant eye. In either case, I would operate on the nondominant eye first and then make the necessary adjustments for the dominant eye.

In my experience, these patients normally have excellent results. Any residual astigmatism can be corrected 6 to 8 weeks after cataract surgery using wavefront-guided PRK.

WILLIAM F. WILEY, MD

I find that most patients who underwent CK have a form of modified monovision, with one eye corrected more for distance and the other corrected more for near. If the patient enjoyed this type of correction, I would attempt to re-create it with monofocal IOLs, and I would target plano for the distance eye and approximately -1.50 D for the near eye. Because the post-CK cornea may behave similarly to a posthyperopic LASIK eye in regard to IOL selection, I would use the ORA System to help predict the IOL power.

In most eyes, CK induces an aspheric effect into the cornea, so I might consider optimizing the optics by choosing a nonaspheric IOL. (Corneal mapping with a corneal wavefront could help guide the choice of ideal IOL for the patient.) Optimizing the asphericity through IOL choice, however, might decrease the depth of focus that CK provided for the patient. Thus, there is a balance of optimal optical quality and depth of focus that I would have to consider when choosing the IOL for this patient.

I am not too concerned about the decentered spots on the left eye, because I have found that, in general, post-CK eyes seem to tolerate decentration well. The decentered spots likely resulted in the astigmatism that appears to be relatively regular through the central visual axis. Based on this topography, the patient's left eye might benefit from a toric IOL. For the astigmatic treatment, I would rely on the ORA System's guidance (toric cylinder power selection and final position).

TAL RAVIV, MD: WHAT I DID

Due to the patient's prior refractive procedure and irregular astigmatism, I offered her monovision or "blended" vision with monofocals or a Crystalens (Bausch + Lomb). The patient opted for blended vision with the Crystalens AO. With this IOL, I am able to target a small refractive anisometropia; I typically aim for plano in the distance eye and, depending on the reading level achieved, adjust the

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Have you performed cataract surgery on an eye that previously underwent conductive keratoplasty?

- Yes
 No

goal to -0.75 D for the eye targeted for reading vision. The patient managed to track down her old records, and as predicted by the panel, her pre-CK keratometry (K) readings from 7 years earlier were exactly the same as her current K readings.

On dominance testing, her left eye was strongly dominant, so I operated on her right eye first with a goal of near vision. After bilateral surgery, the patient achieved the desired refractive endpoint and was satisfied. Of note, 0.75 D of astigmatism remained in her left eye consistent with the topography, although her UCVA was still excellent. One month postoperatively, the patient returned to my office with a complaint of decreased distance vision. An examination revealed myopic astigmatism and Z syndrome in the distance eye. A careful slit-lamp and dilated gonioscopic examination showed excellent in-the-bag placement of the haptics and footplates with coarse posterior capsular striae. I performed a YAG capsulotomy, first aimed at the vaulted proximal haptic and then more centrally behind the lens to break the capsular fibrosis. I was disheartened by the lack of immediate change in the lens' configuration. Fortunately, 2 weeks later, the patient returned with a restoration of her good distance vision and complete resolution of the Z syndrome. I performed a preemptive YAG capsulotomy on her other eye, and she has been happy with her vision for 6 months.

I drew a few take-home points from this case. First, CK does not alter K readings long term, and unlike after excimer laser surgery, the ophthalmologist can trust the K readings in these cases. Second, despite well-performed and seemingly identical, unremarkable surgeries on both eyes, Z syndrome still occurred. Although a YAG capsulotomy can often resolve this problem, surgical reintervention is sometimes warranted, and surgery after a YAG capsulotomy can present significant challenges.

Finally, ophthalmologists are seeing a flood of postrefractive surgery cataract patients who are highly motivated to achieve spectacle independence. Ironically, although I find that multifocal IOLs achieve better spectacle independence than today's accomodating IOLs, I typically dissuade

patients with a history of refractive surgery from choosing a multifocal IOL, as do the other authors of this article. It is harder to hit the necessary plano target in these eyes with today's technology, and enhancing these previously treated eyes presents greater challenges. For these reasons, my approach to 50-year-olds seeking refractive surgery has increasingly shifted from initial LASIK to a more permanent solution based on multifocal lenses. ■

Editor's note: topography-guided PRK is not FDA approved.

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1. Ehrlick JS, Manche EE. Regression of effect over long-term follow-up of conductive keratoplasty to correct mild to moderate hyperopia. *J Cataract Refract Surg.* 2009;35(9):1591-1596.