A 52-year-old woman presented with symptomatic presbyopia and a desire for near vision correction. After a discussion of the risks and benefits of a corneal inlay as well as alternatives, the patient chose to receive the Kamra (AcuFocus). She has a history of fibromyalgia and was recently diagnosed with celiac gluten sensitivity.

Preoperatively, the patient had a distance UCVA of 20/15, a manifest refraction of plano, a cycloplegic refraction of +0.25 D, and a near UCVA of 20/400 in her right eye. In her dominant left eye, she had a distance UCVA of 20/15, a manifest refraction of plano, a cycloplegic refraction of plano, and a near UCVA of 20/400. Corneal pachymetry readings were 582 µm OD and 587 µm OS.

A presurgical evaluation with the AcuTarget HD (Visiometrics) was unremarkable, with an angle kappa of 91 µm, a mean ocular scatter index (OSI) of 0.38, and Optical Quality Analysis System accommodative range of 0.50 D.

The surgeon used the iFS Laser (Abbott) to create a 260-µm corneal pocket (44% of corneal depth) with a spot separation and line separation of 4 µm in the patient’s nondominant right eye. The plan was to place the corneal inlay on the Purkinje axis (within 300 µm). A postoperative evaluation with the AcuTarget HD showed that the implant was 115 µm nasal to the Purkinje light reflex.

One week after surgery, the patient began complaining of extreme photophobia in her right eye and poor near visual acuity (20/100). An examination at that time was unremarkable except for mild corneal edema. The doctor prescribed prednisolone acetate (Pred Forte; Allergan) six times per day. At the 2-week postoperative visit, the patient reported no improvement in her symptoms as well as continued photosensitivity and poor near vision. In addition, the IOP had risen to 25 mm Hg, and her distance manifest refraction was +0.75 = 20/25. The surgeon prescribed a fixed combination of brimonidine tartrate and timolol maleate (Combigan; Allergan), and the steroid was continued at six times per day.
Six weeks after surgery, the patient reported a slight improvement in vision and decreased photosensitivity. Near UCVA measured 20/60. The steroid was tapered over 3 months. At the 3-month postoperative visit, the distance UCVA was 20/30, the manifest refraction was +1.00 D = 20/20, the near UCVA was 20/70, and the IOP measured 22 mm Hg. The patient started cyclosporine ophthalmic emulsion 0.05% (Restasis; Allergan) to treat potential occult dry eye. Four months postoperatively (1 month after steroid cessation), the manifest refraction was +1.50 D, correctable to 20/20, and near UCVA had dropped to 20/80. The examination was unremarkable. The patient continued the cyclosporine, but steroids were not restarted for fear of a steroid-induced pressure response.

Five months after surgery, the patient presents with a distance UCVA of 20/70 and a near UCVA of 20/100. The manifest refraction is +2.25 D sphere = 20/20 OD. An examination is unremarkable, with no signs of corneal inflammation or thinning. An assessment with the AcuTarget HD shows a well-centered corneal inlay. The OSI measures 1.3, and the Optical Quality Analysis System accommodative range is 1.00 D. Corneal pachymetry by tomography measures 602 µm (Figures 1-4).

What is the etiology of the refractive shift, and what are your thoughts on preventative measures based on the patient’s preoperative presentation? What would your next step be in terms of medical and/or surgical therapy? If medical therapy were not effective, how would you proceed?

—Case prepared by William F. Wiley, MD.
R. Luke Rebenitsch, MD
This is an interesting case of a usually treatable complication during the postoperative period following implantation of the Kamra. Hyperopic shifts are thought to be the result of keratocyte activation behind the inlay, resulting in a “red ring” on Placido disc topography. They typically occur at least a month after the procedure during the steroid taper, however, rather than within the first few weeks. This patient had a much more robust response to the device, which caused early photophobia and a hyperopic shift.

This patient would have appeared to be an excellent candidate for the Kamra. She had an OSI that was very low at 0.2, exhibited no significant ocular dryness, had lost most accommodative amplitude, and possessed a cornea thick enough for implantation. My initial strategy for management would have been the same as described in the case presentation: increase topical steroids and use serial topographies and midpoint refractions to monitor the response. Unfortunately, this patient was a steroid responder, complicating postoperative management. Given the progressive hyperopic shift and increased IOP, I would recommend explantation of the device and would expect no significant long-term sequelae.

Preventative measures for this ideal candidate are limited. New research, however, suggests that deeper implantation of the Kamra may mitigate some of the risk of a hyperopic shift from the decreased density of keratocytes in the posterior cornea. For a patient with a cornea as thick this patient’s measured with the Pentacam (Oculus Surgical), a pocket of approximately 50% depth may prevent some—or possibly all—of the hyperopic shift she experienced.

George O. Waring IV, MD
This patient appears to be a great candidate for a Kamra inlay given the refraction and excellent retinal image quality, both statically and dynamically, as determined by double-pass wavefront imaging. These findings are consistent with a diagnosis of stage 1 dysfunctional lens syndrome and a healthy ocular surface.

Her past medical history may give some clues to a nonspecific pro-inflammatory state that we might appreciate retrospectively. Small-aperture inlays tend to perform best with a -0.75 D spherical target, which optimizes near performance without sacrificing distance vision and “cushions” near vision in the event of refractive fluctuation such as is seen here.

Tight spot and line femtosecond laser settings and an adequate low-dose steroid taper over 3 months help to minimize refractive fluctuations; both were used in this case. Careful attention should be paid to IOP for a steroid response, as was observed in this case, resulting in early cessation of the steroid. In most cases, appropriate dosage and duration of a mild steroid will normalize a refractive shift over time.

If a hyperopic shift worsens despite appropriate steroid dosing and duration, thus affecting the patient’s near and distance UCVA and satisfaction, or if the IOP is intractably high for the optic nerve status due to a steroid response, then the inlay should be removed. The removability of the Kamra in the rare event that it is indicated is a true benefit of this “additive” technology. In the US FDA investigational device exemption trial, all eyes that underwent inlay removal retained BCVA.

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