

# Intacs for a Keratocone: A Promising New Option?

Brian Chou, O.D.  
Brian S. Boxer Wachler, M.D.  
Los Angeles

A 49-year-old white man with a previous diagnosis of keratoconus came to our refractive surgery center hoping to improve the uncorrected vision in his right eye. He couldn't tolerate glasses or contact lenses, and had not worn either for the past 5 years. He felt his vision hadn't changed in 10 years. Otherwise his ocular and general health history was unremarkable.

## Diagnostic Data

The patient's uncorrected acuities were 20/160 O.D. and 20/30+1 O.S. Manifest refraction yielded -1.75 -2.25 x 005 O.D. with 20/60 acuity, and -0.50 -1.25 x 098 O.S. with 20/20 acuity. Infrared pupillometry measured pupil diameters of 4.7mm O.D. and 3.0mm O.S. in dim illumination and 3.8mm O.D. and 2.0mm O.S. in bright light. The left eye was dominant.

The slit lamp exam was unremarkable, with no evident corneal scarring, thinning, Fleischer's ring or Vogt's striae. Corneal topography showed inferior corneal steepening, more prominent O.D. than O.S. Intraocular pressures were 11mm Hg O.D. and 12mm Hg O.S. Central pachymetry gave 475 $\mu$ m O.D. and 503 $\mu$ m O.S. The dilated fundus exam was unremarkable in both eyes.

*In the first case of its kind in the United States, off-label implantation of KeraVision's intracorneal rings improved vision from 20/160 to 20/25 in the operative eye.*

## Diagnosis

We diagnosed stable asymmetric keratoconus, more advanced in the right eye than in the left. We also documented physiologic anisocoria, which the patient said was longstanding.

## Treatment and Follow-up

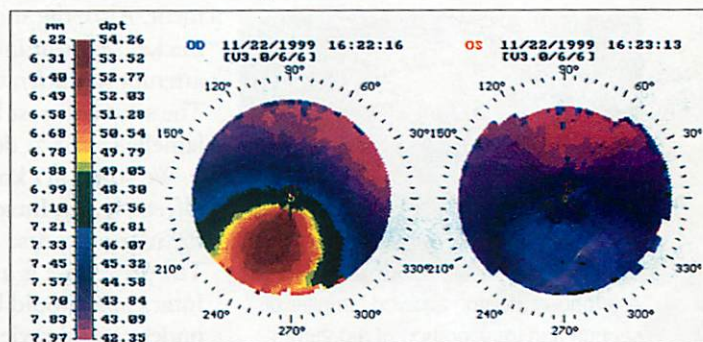
We performed a modified Intacs procedure on the right eye without incident. Peripheral pachymetry at the incision site was 554 $\mu$ m. The diamond blade was set for 68% (377 $\mu$ m) depth. A temporal incision allowed lamellar dissection and implantation of a 0.25mm-thick Intacs segment superiorly and a 0.35mm-thick segment inferiorly. We did not suture the incision.

One day after surgery uncorrected acuity was 20/30-2 O.D. Manifest refraction gave +0.25 -1.50 x 096, correcting to 20/25+1. At 1-week post-op, uncorrected acuity was 20/30-1 O.D. Manifest refraction was -0.50 -2.00 x 120, correcting to 20/20+1.

At 1 month post-op, uncorrected acuity was 20/25+2. Manifest refraction was 0.75 -0.50 x 133, correcting to 20/20. At 3 months post-op, uncorrected acuity was 20/25+2. Manifest refraction was still -0.75 -0.50 x 133, correcting to 20/20+2. Corneal topography pre- and postoperatively indicated that the Intacs procedure induced overall flattening, reduced the size of the cone, and migrated the cone apex centrally.

## Discussion

Keratoconus is a non-inflammatory corneal ectasia with an estimated prevalence of 1 in 1,800.<sup>1</sup> It typically begins during adolescence and progresses until the third or fourth decade of life, when it usually stabilizes.<sup>2</sup>



Preoperative corneal topography showed inferior corneal steepening, more prominent in the right eye than in the left.



Keratoconus is generally managed with rigid contact lenses. Glasses and soft contact lenses don't effectively compensate for the significant corneal irregularities. Some patients do find RGPs uncomfortable and cannot tolerate them. One study found that 27% (243 of 896) of keratoconic RGP wearers reported lens discomfort.<sup>3</sup>

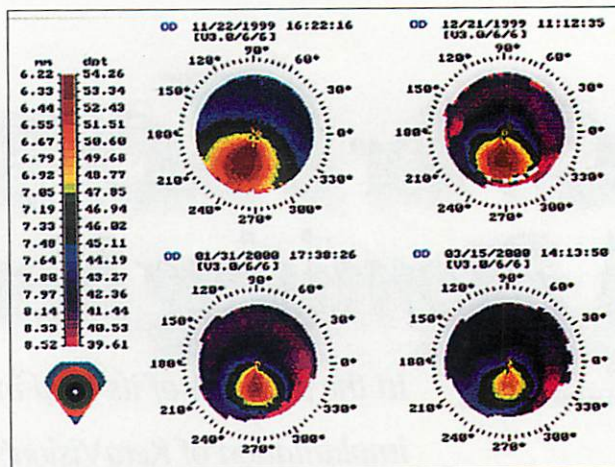
If comfort is an issue, consider other options. Try the SoftPerm (a soft-rigid hybrid) from Wesley-Jessen, the Flexlens Harrison (a thick soft lens) from Paragon Vision Sciences, or a piggyback design. These lenses can provide comfort while improving vision. You need to monitor patients for neovascularization because this would raise the likelihood of corneal graft rejection if the patient should have keratoplasty in the future.<sup>4</sup> For patients who can't wear glasses or contact lenses, penetrating keratoplasty traditionally has been the ultimate treatment. One study found that 21.6% of keratoconic patients required a penetrating keratoplasty to rehabilitate vision.<sup>5</sup>

It's not clear whether LASIK is appropriate in keratoconus. Even in non-keratoconic eyes, tissue removal during LASIK can lead to corneal ectasia.<sup>6-8</sup> Any procedure that thins the cornea may accelerate the progression of keratoconus.

This case shows that keratoconic patients who cannot tolerate con-



A temporal incision allowed lamellar dissection and implantation of a 0.25mm-thick Intacs segment superiorly and a 0.35mm-thick segment inferiorly.



Corneal topography pre-op (top left), 1-day post-op (top right), 1-month post-op (bottom left), and 3-months post-op (bottom right). The Intacs segments lie outside the color maps.

tact lenses may benefit from implantation of corneal ring segments. The KeraVision Intacs procedure is different from other refractive surgeries because it does not involve tissue removal, spares the central cornea, and segments are removable.<sup>9</sup> Our results mirrored those of an earlier report of six keratoconic eyes implanted with Intacs. Those patients had reduced corneal steepening and increased visual acuity.<sup>10</sup>

The Intacs procedure for keratoconus is similar to the traditional Intacs procedure for low myopia. However, in the former procedure, the surgeon made a lateral incision for inferior and superior segment placement vs. the usual superior incision for lateral segment placement. Also, the surgeon placed a thicker segment inferiorly in an attempt to flatten the cone apex. The segments rest between corneal lamellae at 68% depth.

We still don't know the long-term effects, if any, Intacs may have on the natural course of keratoconus. The procedure is an off-label use of Intacs and should be performed under careful review. We believe the ideal candidate is one who cannot wear glasses or fit contact lenses

optimally, and has little or no corneal scarring. The patient needs to be told that there are risks with the procedure.

These preliminary results are promising and invite further study. We're developing a case series to further characterize this exciting procedure for kera-

toconus. As this report goes to press, we've since implanted Intacs in five more keratoconic eyes with outcomes similar to this case. ♦

*Dr. Chou is the Refractive Surgery Management Fellow and Dr. Boxer Wachler is the director of the Laser Refractive Center at the Jules Stein Eye Institute, UCLA School of Medicine. Neither doctor has a proprietary interest in any products mentioned.*

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