Double-Stacked Formation of Intacs

Two intrastromal corneal ring segments enhanced corneal architecture and improved visual quality in a patient with keratoconus.

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As we reported in the Journal of Cataract and Refractive Surgery,1 use of a thick intrastromal corneal ring segment (ICRS) may enhance the surgical effect in patients with keratoconus. Although commercially available ICRSs are limited in thickness, one can achieve the effect of thicker segments by stacking two within a single intrastromal tunnel. The case study presented below suggests that considerably thicker segments may be a beneficial treatment for keratoconus and that a double-stacked configuration of two thin segments may be better tolerated than a single, thick segment.

In October 2008, a 45-year-old man with keratoconus presented to our clinic complaining of poor BCVA and contact lens intolerance. His BCVA at that time was 20/200 in the right eye and 20/20 in the left. Slit-lamp examination of the right eye revealed central thinning, Vogt striae, and inferior corneal steepening without scarring, consistent with a diagnosis of asymmetric keratoconus. Topography, pachymetry, and posterior elevation maps of the right eye (Pentacam; Oculus Optikgeräte GmbH, Wetzlar, Germany) revealed an inferotemporally displaced cone with central keratometry (K) readings greater than 65.00 D (Figure 1).

SURGICAL COURSE

Two 0.35-mm Intacs (Addition Technology, Inc., Des Plaines, Illinois), the largest size commercially available in the United States,2 were placed in the superior and inferior quadrant, respectively, using a femtosecond-laser–created tunnel. The incision axis was created at 90°, near the steep axis of the patient’s manifest refraction, and tunnel cuts were made with inner and outer diameters of 6.8 and 7.7 mm. Both ICRSs were centered along the horizontal axis, and the superior incision was sutured.

OUTCOMES

The postoperative course was initially uneventful. At the first postoperative visit, the patient’s UCVA was 20/200, and the rings were in stable position. Three weeks later, the patient returned with a UCVA of 20/80 and a BCVA of 20/60. Slit-lamp examination revealed that the upper ring segment had migrated, stacking itself on top of the inferior segment within the single lamellar pocket (Figure 2). Pentacam imaging showed a marked flattening of the paracentral cone (Figure 3). The patient acknowledged that he had aggressively rubbed the eye at some point since the preceding visit.

UCVA improved further to 20/60 after removal of the suture at week 6. At this point, the rings were in stable position; however, the eye had developed subepithelial dots, indicating corneal stress—similar to what is seen in cases of tight graft sutures (ie, Kaye dots). The patient was satisfied with his visual improvement, and therefore we did not repo-

TAKE-HOME MESSAGE

• Commercially available ICRSs have limited thickness; however, stacking two in the same intrastromal tunnel may be advantageous for keratoconus treatment.
• Two stacked thinner segments may be better tolerated than one thicker segment.
sition the segments. We now have followed this patient for 1 year, and to date his course has been uncomplicated with a stable corneal appearance, no further movement of the segments, and a UCVA of 20/60.

CONCLUSION

The remarkable improvement in this patient’s corneal architecture and, more important, in his vision, suggests that segments thicker than 0.45 mm may be a beneficial treatment for keratoconus. There are no commercially available segments thicker than 0.45 mm. The potential risks of thicker ICRSs include segment extrusion and corneal breakdown, which must be considered as we push the limits of segment size.

The effective size of our double-stacked formation was 0.7 mm—much larger than many would expect the cornea to tolerate with a single thick segment, suggesting that there may be an advantage to incorporating a stacked or spaced strategy to thicken the effective segment size.

Figure 2. (A, B) Slit-lamp exam at 3 weeks showed both segments stacked on top of one another.

Figure 3. (A, B) The double-stacked ICRSs caused marked flattening of the paracentral cone.