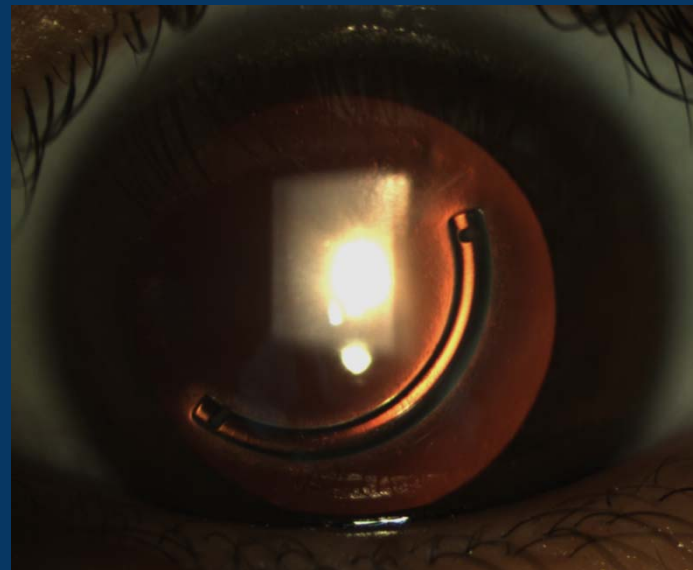
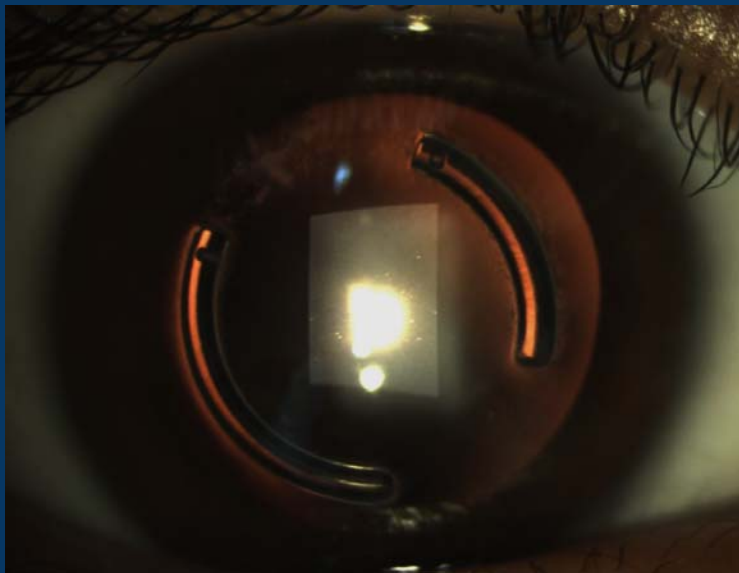




Asymmetrically Shortened Intacs SK Segments in the Management of Decentered Keratoconus: Preliminary Results

ASCRS Poster
P-225
Abad et al.

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Dr. Abad has received travel honoraria from Addition Technology



PURPOSE

To compare a novel Intacs insertion technique (Two asymmetrically shortened SK segments) versus a control group of a single SK segment in patients with DECENTERED native keratoconus.

METHODS

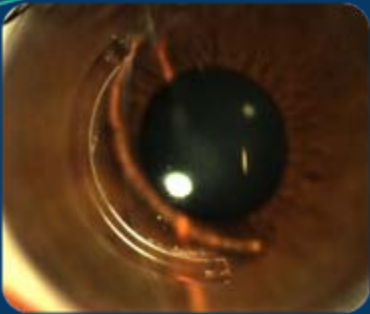
- The INTACS SK segments were inserted using the Prolate[®] system by making the incision at the steep corneal meridian.
- In the single segment group, the segment was placed in the most elevated corneal area.
- In the two shortened-segments group the longest segment (120° in length and 450 μm thickness) was placed in the most elevated corneal area (usually inferior or inferotemporal), and the shorter segment (90° and 400 μm thick) was placed opposite to the first segment.
- Refractive data including UCVA, BCVA, spherical equivalent, cylinder, keratometry, and corneal wavefront (total aberrations (RMS) and coma – Scout, Optikon, Italy) were collected preoperatively, at one month and six to nine months after the surgery.
- The eyes were cross-linked after the one month visit with ultraviolet A and riboflavin.
- A two-tailed Student T Test (StatGraphics Centurion version XV, Herndon, VA) was performed to compare the two groups preoperatively and the pre- to postoperative change in the described variables between the two groups.

GROUPS

| | One Standard 150° SK Segment | Two shortened (120°/90°) SK segments |
|------------------------|--|---|
| Eyes / Patients | 19 / 18 | 12 / 10 |
| Male / Female | 8 / 10 | 5 / 5 |
| OD / OS | 8 / 11 | 7 / 5 |
| Age | 26 ± 10.3 years-old (Range: 13 to 53) | 27 ± 10.6 years-old (Range: 11 to 46) |
| Special events | 1 segment was rotated | 1 patient with two 120° SK segments had one of them shortened to 90° |

There were no statistically significant differences (T Test >0.05) between the two groups in any of the variables.

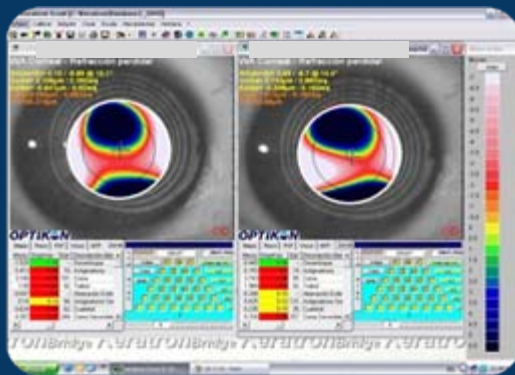
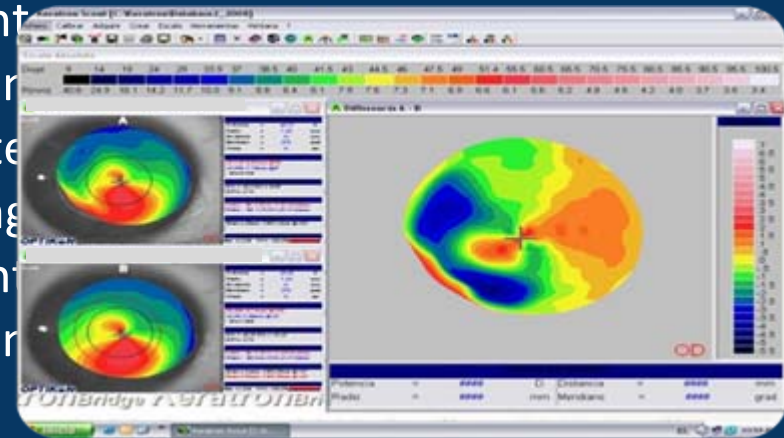
Case in point: A Single SK Segment



Preop: UCVA: 20/60 -0.25 – 8.00 x 20 = 20/60

6 months Postop: UCVA: 20/50 -1.50 – 5.00 x 15 = 20/25

The topographic differential map on the right shows the segments' body pushing the cornea in with compensatory steepening of the opposite part of the cornea. There is steepening perpendicular to the incision but only slight flattening along the incision meridian (green color)



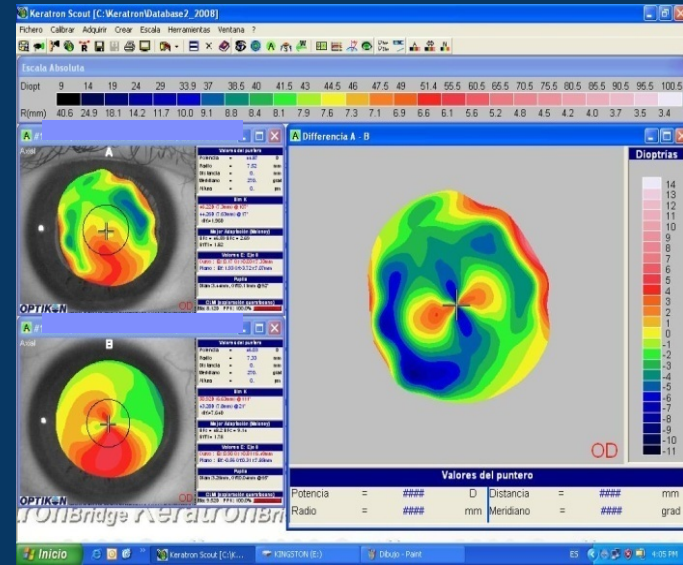
The corneal wavefront map shows a more regular cornea without the temporal "peninsula" (postop on the left)

Case in point: Two shortened segs



Preop: UCVA: 20/60 Plano – 7.00 x 35 = 20/25
6 months Postop: UCVA: 20/30 +0.25 – 1.00 x 44 = 20/20

The topographic differential map on the right shows steepening along the segments' body meridian and flattening along the incision meridian. There is also more "pushing in" of the corneal tissue induced by the thicker and longer segment in the inferotemporal region



The corneal wavefront map shows more centered corneal apex with less aberrations (postop on the left)

One-month Results

| | One standard 150° SK Segment | Two shortened (120°/90°) SK segments |
|-------------------|------------------------------------|--|
| # Eyes (%) | 19 (100%) | 12 (100%) |
| Δ lines UCVA | 5.5 ± 2.5 lines (1.8 to 10) | 5.3 ± 3.2 lines (0.8 to 13) |
| Δ lines BCVA | 1.1 ± 1.9 lines (-2.2 to 4.0) | 2.4 ± 2.5 lines (-1.2 to 7.7) |
| Δ Sph. Eq. | 2.16 ± 2.96 D (-2.50 to 10.25) | 2.5 ± 2.4 D (0,7 to 9.25) |
| Δ steep K | 2.67 ± 3.6 D (-3.1 to 9.14) | 4.67 ± 1.54 D (2.9 to 8.0) |
| Δ Man. Cyl. | 1.81 ± 2.7 D (-2.27 to 7,64 D) | 4.75 ± 2.49 D (*) (-0.50 to 8.50 D) |
| Δ K. Cyl. | 1.72 ± 2.47 D (-2.05 to 6.73 D) | 4.72 ± 3,68 D (*) (0.63 to 12.4 D) |
| Δ Corneal coma μm | -0,31 ± 0,94 μm (-2,19 to 0,58) | -1.98 ± 2,42 μm (-4,39 to 2.34) |

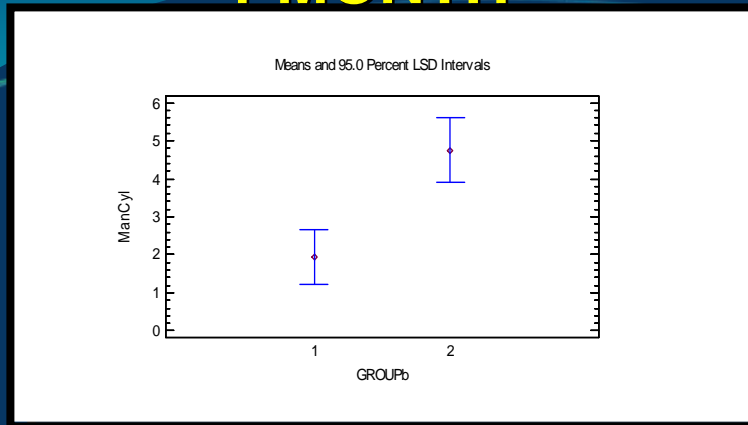
(*) Ttest <0,001

Six-month Results

| | One standard 150° SK Segment | Two shortened (120°/90°) SK segments |
|-----------------------------------|---|---|
| # Eyes (%) | 15 (78%) | 12 (100%) |
| Crosslinked from 1 to 3 months PO | 11 / 15 (73%) | 10 / 12 (83%) |
| Δ lines UCVA | 4.5 \pm 3.1 lines (0 to 9) | 5 \pm 2.9 lines (1 to 10) |
| Δ lines BCVA | 2.0 \pm 1.6 lines (0 to 4.8) | 2.5 \pm 2.3 lines (0 to 6) |
| Δ Sph. Eq. | 2,25 \pm 2.76 D (-1,5 to 8.75) | 0,98 \pm 3.7D (-8 to 5.4) |
| Δ steep K | 3.25 \pm 2,38 D (0 to 8.39) | 3.8 \pm 3.16 D (-3.84 to 8.0) |
| Δ Man. Cyl. | 2.43 \pm 1.26 D (0 to 4.50) | 3,96 \pm 1.9 D (*) (1 to 6.75 D) |
| Δ K. Cyl. | 2.09 \pm 2.20 D (-1.89 to 6.09 D) | 2,9 \pm 2.22 D (-1.75 to 6.0 D) |
| Δ Corneal Coma | -0,43 \pm 0,95 μ m (-1,44 to 0,63) | -2.32 \pm 2,0.9 μ m (-4,4 to 0,45) |

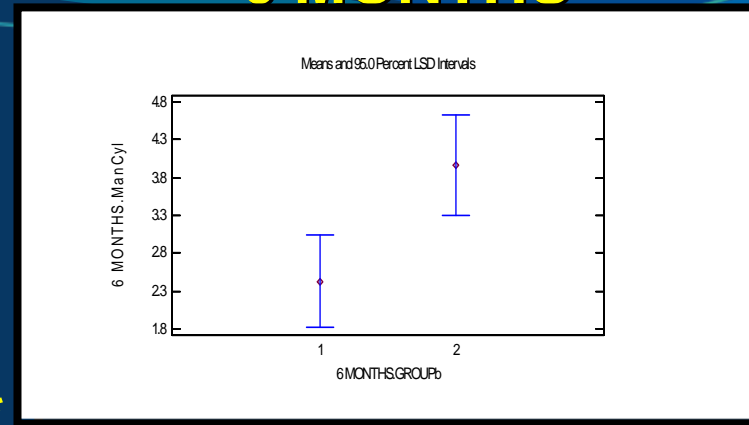
(*) Ttest <0,001

1 MONTH



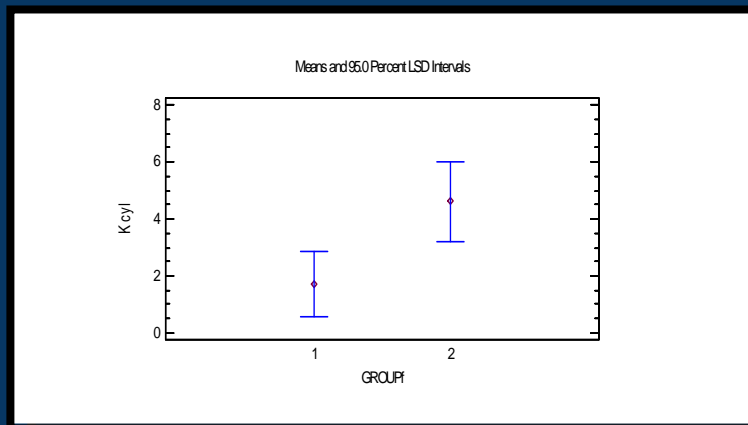
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6 MONTHS

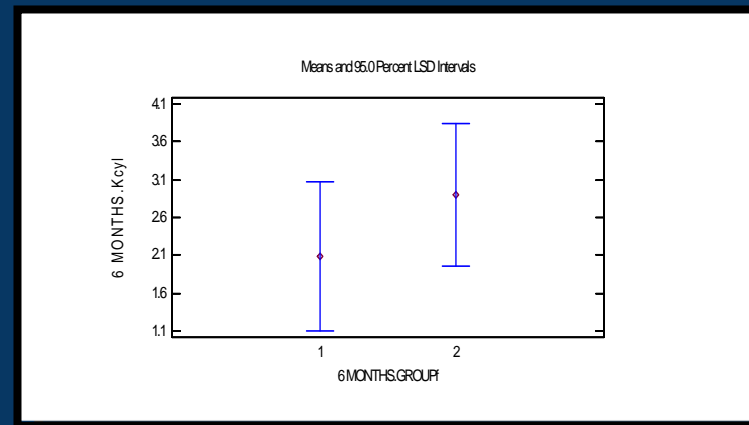


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Change in manifest cylinder Single Segment vs. Two shortened segments



*



Change in keratometric cylinder Single Segment vs. Two shortened segments

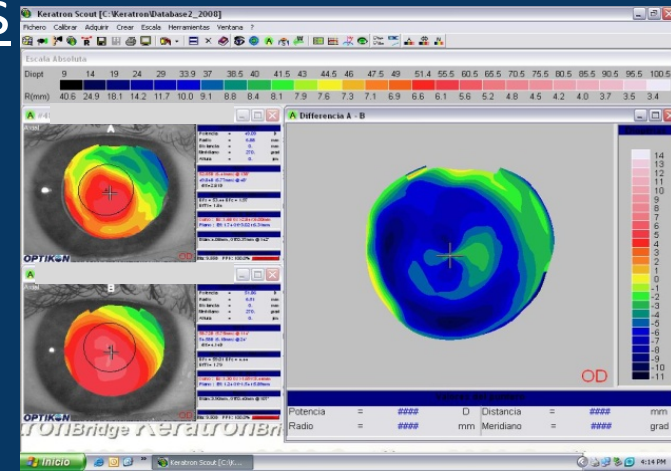
There was no statistically significant variation between the one and the six-month visits in any of the measured variables

*: Since the P-value is less than 0.05, there is a statistically significant difference between the mean of the two groups at the 95.0% confidence level.

Management of Decentered Cones DISCUSSION

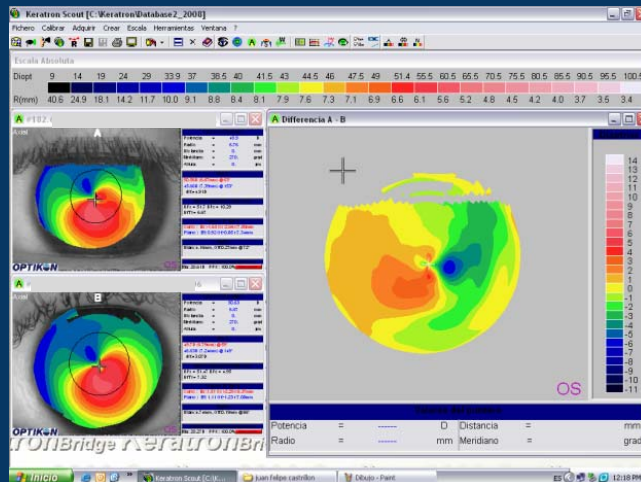
1. Two 150° segments of uneven thickness

The use of two 150° segments of uneven thickness has been an approach to the treatment of decentered cones. It corrects only marginal amounts of astigmatism (up to 1.5 D – personal observations) and perpetuates the pre-existing corneal asymmetry. It usually corrects mostly myopia.



2. One 150° segment

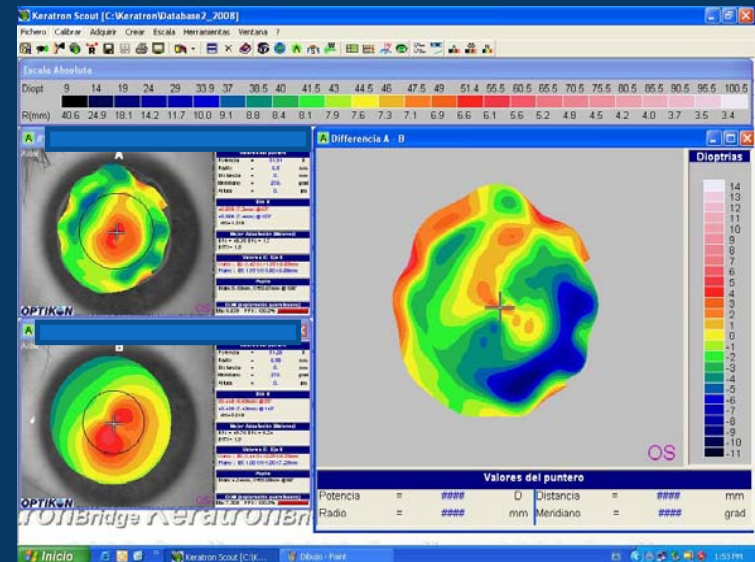
A single 150° segment has been proposed for the management of decentered cones.¹ Its effect has been enhanced by combining it with corneal collagen cross-linking.² This strategy is effective addressing the corneal asymmetry, but does not treat corneal astigmatism completely (mean correction 2.73 D)². It corrects myopia and coma.



- (1) Sharma M, Boxer Wachler BS. Comparison of Single-Segment and Double-Segment Intacs for Keratoconus and Post-LASIK Ectasia. *Am J Ophthalmol* 2006; 141: 891 – 895
- (2) Chan CCK, Sharma M, Boxer Wachler BS. Effect of inferior-segment Intacs with and without C3-R on keratoconus. *J Cataract Refract Surg* 2007; 33:75 -80

3. Two shortened segments of uneven length/thickness

Shorter segments correct more astigmatism.¹ The use of two segments of uneven length and thickness is a step towards regularizing an asymmetric corneal surface. It corrects not only myopia and coma but also astigmatism.



(1) Ruckhofer J, Stoiber J, Twa MD, Grabner G. Correction of Astigmatism with Short-Arc Length Intrastromal Corneal Ring Segments. Preliminary Results. *Ophthalmology* 2003; 110: 516 - 524

Management of Decentered Cones

Two Intacs SK segments of uneven length / thickness compared with a single 150° SK segment:

- Significantly better astigmatism control
- A trend towards better UCVA and BCVA
- Similar myopia and asymmetry (coma) improvement
- We chose to cross-link patients younger than 40 (in both groups) once a satisfactory result was achieved to “lock in” the ring segments’ effect