Intracorneal ring segments
for the correction of keratoconus

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I have no financial interest
ICRSs are placed in the mid-corneal peripheral stroma at approximately two-thirds of depth outside the central optical zone to reshape the anterior corneal surface while maintaining the prolate profile (positive asphericity) of the cornea.
Indications for ICRS implantation

- Keratoconus
- Pellucid Marginal Degeneration
- Iatrogenic Ectasia
  - Ectasia (Post Lasik, PRK)
  - Irregular astigmatism after PKP
  - Irregular astigmatism after RK
- Treatment of post-trauma corneal irregularities
Indications for ICRS implantation in patients suffer from keratoconus

- Unsatisfactory VA with glasses
- Contact lens intolerance
- Mild and moderate keratoconus
- K reading less than 58D
- Clear cornea and optical zone with no corneal scarring
- Corneal thickness greater than 450μm in the area of the proposed tunnels

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Contraindications

- Acute keratoconus (K 70D) – possibly poor visual outcome
- Hydrops
- Corneal scarring
- Endothelial cell count 1000cel/μm
Severe atopic patients – eye rubbing can cause complications e.g. ring migration

Decentered PKP – complications during surgery

Recurring Corneal Erosion Syndrome – possible melting and infection
Types of Intrastromal Corneal Ring Segments (ICRS)

- **Intacs**
- **Ferrara** (Ferrara Ophthalmics, Inc, Belo Horizonte, Brazil)
- **MyoRing** (Dioptex GmbH, Linz, Austria)
- **Kerarings** (Mediphacos, Inc, Belo Horizonte, Brazil)
Intacs Corneal Implants

- Are designed for the reduction or elimination of myopia and astigmatism in patients with keratoconus.

- Are designed to be placed in the periphery of the cornea, at approximately two-thirds depth, through a small radial incision in the corneal stroma.

- Are manufactured from polymethylmethacrylate.

- Are available in different thicknesses, ranging from 0.210mm to 0.500mm.

- Have a hexagonal transverse shape with 8.1 mm external diameter and 6.8 mm internal diameter.
Ferrara ring segments

- Available in two diameters (6.0 mm for myopia up to 7.00D, 5.0 mm for higher degrees of myopia)
- Thickness varying from 150 to 350μm
- Made of PMMA CQ-acrylic
- The internal and the external diameters are 4.4 mm and 5.4 mm for the 5.0 mm optical zone and 5.4 mm and 6.4 mm for the 6.0 mm optical zone respectively.
- The segment cross-section is triangular
- Constant 600μm base for every thickness and diameter.
- An arc of 160°
MyoRing Corneal Implant

- 360° continuous full-ring implant for myopia and keratoconus.

- Its diameter ranges from 5-8 mm and the thickness ranges from 200-320 microns.
Keraring Intraestromal Ring

- Specially designed for the treatment of corneal ectasia and reduction of refractive errors associated with keratoconus.
- 5 types of kerarings
- 1 asymmetrical (keraring AS)
Keraring Intraestromal Ring

Keraring is available in two models (SI-5 and SI-6) for implantation in optical zones of 5.0, 5.5 and 6.0mm, adapting to the preference of the surgeon and the need of each case.

**Optical Zones**

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<th>Model</th>
<th>Description</th>
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| SI-5  | 5mm optical zone (original Keraring)  
High degrees of cylinder + myopia |
| SI-6  | 6mm optical zone (manual surgery)  
6mm or 5.5mm optical zone (femto)  
High degrees of cylinder  
Moderate degrees of myopia |

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Keraring AS’s progressive thickness profile produces a progressive flattening effect, allowing better customization of the corneal remodeling according to the needs of each individual case.

**Optical Zone:** 5mm  
**Arc Length:** 160°  
**Base width:** 600µm  
**Triangular** (prismatic) cross section  
**Progressive thickness:** 150/250 or 200/300µm  
Direction of thickness increase:  
**Clockwise** or **counterclockwise**
Main keratoconus phenotypes indicated for Keraring AS

- Asymmetric Bow tie (Snowman)
- Oval (Duck)
- Pellucid- like (lobster claw)
Surgical Planning

- Topography (sagittal curvature map, axial map, anterior elevation map)
- Pachymetry map (large and detailed)
- Manifest Refraction (subjective)
- BCVA
- LO, HO, Coma map/axis
Surgical Planning

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Conclusion

- Keraring implantation guided by femtosecond laser is a safe and a high efficacy method.

- It is provided significant improvement in visual acuity, spherical equivalent, and keratometry results.

- The CRS is an effective treatment for managing keratoconus and might delay or even avoid the need for penetrating keratoplasty.
Thank you for your attention!