

Title: Corneal Inlays for Keratoconus: Past, Present, Future

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**Description:**

Corneal inlays were originally developed to treat refractive error and presbyopia. Subsequently these inlays were adapted to treat irregular corneal astigmatism, including keratoconus. The goal of this course is to review the evolution of these corneal inlays, and to discuss their clinical uses to treat keratoconus and ectasia after refractive surgery. Finally, this course will discuss the future of corneal inlay surgery, most recently the use of preserved corneal tissue inlays, to treat keratoconus and post refractive ectasia.

**Learning Objectives:**

1. Learn about the history of corneal inlays with the focus on their use for keratoconus.
2. Learn about currently used corneal ring segments for keratoconus and how they change corneal topography.
3. Learn about the outcomes of keratoconus patients treated with Intacs® segments. Visual acuity, topography, and complications.
4. Learn about the use of preserved cornea tissue inlays to treat keratoconus.

**Outline: 50 minutes**

1. Core Concepts in Modern Keratoconus Management ( 10 mins)
  1. Diagnose early, stop progression, rehabilitate vision.
    - i. Diagnose early
      1. Modern devices
    - ii. Stop Progression
      1. CXL
    - iii. Rehabilitate Vision
      1. Specialty Contact lenses
      2. Intracorneal ring segments
      3. Topography guided PRK
      4. ICL
      5. Cornea Transplantation
2. History of corneal inlays (10 mins)
  - i. Jose Barraquar
    1. History of corneal refractive surgery
    2. Proposed 2 concepts of lamellar refractive surgery
      1. Keratomileusis
      2. Keratophakia

### 1. Intralamellar

#### ii. Epikeratophakia

1. Werblin and Kaufman
2. How the procedure was performed
3. Using this procedure specifically for keratoconus
4. Complications of epikeratophakia

### 3. Current treatment of keratoconus with intracorneal ring segments (15 mins)

#### i. Types of intracorneal ring segments

1. Intacs (AJL Ophthalmic)
2. Ferrara rings (AJL Ophthalmic)
3. Keraring (Mediphacos)

#### ii. Will focus this lecture on Intacs segments.

1. Most commonly used in US
2. How Intacs work
  1. Elevate the cornea around the cone
  2. Flattening induced inside the cone
  3. Critical to be able to encapsulate the cone with the segment to get the most flattening
3. How is the procedure performed
  1. Channels created with Femtosecond laser
  2. Channel is dissected
  3. Segment placed in the channel
4. Outcomes
  1. Visual acuity (UCVA, BSCVA) improve after placement
  2. Topography flattens after placement
5. Further improvement after Intacs placement
  - i. Timing of performing with CXL
    1. Review data of sequential vs simultaneous Intacs and CXL treatment
  - ii. Topography Guided PRK over Intacs segments
  - iii. Conductive Keratoplasty after Intacs placement
6. Complications after Intacs
  - i. Review of needs for Intacs explanation
    1. 3.5% explanted for refractive concerns
    2. 2.6% explanted for medication complications

### 4. Future of corneal inlays (10 mins)

#### i. Use of preserved corneal tissue Inlays in keratoconus

1. Review of decellularization techniques
2. Review of potential advantages over traditional intracorneal ring segments

3. Discuss how the CTAK (Customized Tissue Addition for Keratoconus) procedure is performed

i. Tissue segment is shaped/customized with femtosecond laser

4. Review of early outcomes with CTAK segments

5. Conclusion (5 mins)

1. Intracorneal ring segments continue to play an important role in the treatment of keratoconus

i. improvement of visual acuity

ii. improvement of topography

iii. Part of a comprehensive treatment plan for keratoconus patients

2. Future of intracorneal ring segments with preserved cornea tissue is promising

1. More visual acuity improvement than Intacs

2. More topography flattening than intacs

3. Can potentially treat a wider variety of keratoconus patients