REFRACTIVE REHABILITATION OF KERATOCONIC PATIENTS

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The ultimate goal

- Halt the progression
- Improve the visual potential
KERATOCONUS MANAGEMENT

How to halt KC progression

• Corneal collagen crosslinking (CXL)
• Intracorneal ring segments (ICRS) combined with CXL
• Corneal transplant

Keratoconus Management

How to improve the visual potential

• Glasses
• Contact lenses
• Laser vision correction (LVC)
• Phakic intraocular lenses (p-IOLs)
Glasses

• Early visual rehabilitation in all cases
• Mild cases with central cones
• Cheap and non invasive

• DO NOT correct for irregular astigmatism (eccentric cones)
• Anisometropia in patients with asymmetric KC
• Poor quality of night vision
• Cosmetic concerns
Contact lenses

• Silicone hydrogel soft contact lenses
• Rigid gas permeable contact lenses (RGPs)
• Piggy-back contact lenses
• Hybrid contact lenses
• Scleral contact lenses

Contact lenses

• Excellent visual results (both quantitative and qualitative)
• Non-invasive
• Affordable by many patients (? Hybrid and scleral lenses)
Contact lenses

- CL tolerability issues
- Patients’ hygiene
- CL related complications

Laser vision correction (LVC)

- Combined CXL and topography-guided surface ablation either simultaneous (Athen’s Protocol) or sequential
Laser vision correction (LVC)

- Relatively less invasive
- Familiar to most refractive surgeons
- Correction of HOAs, namely coma

- Limited ablation depth (50 µm)
- Long-term stability of the cornea
- The impact of CXL-induced corneal flattening on the excimer laser induced refractive effect
- The ability of excimer laser to ablate the crosslinked corneal tissue
Phakic Intraocular Lenses (p-IOLs)

- They all make benefit of the deep anterior chamber in most KC patients
- Visian ICL (STAAR Inc.) and Verisyse (AMO)
- Both lenses are FDA approved for refractive corrections (not in KC)

Phakic Intraocular Lenses (p-IOLs)

- Permit correction of high refractive errors
- Correct for anisometropia in patients with asymmetric KC
Phakic Intraocular Lenses (p-IOLs)

- Intraocular surgery
- Flat learning curve
- Expensive

ICL biocompatibility

- It incorporates a material with high biocompatibility known as Collamer (0.2% collagen and 60% hydroxyethyl methacrylate copolymer)
- This material attracts deposition of a monolayer of fibronectin on the IOL surface that inhibits aqueous protein binding and makes the IOL invisible to the immune system
VISIAN ICL

Specifications and availability

- The available power ranges from -3.0 to -23.0 D and from +3.0 to +22.0 D
- Added power in toric ICLs ranges from 1 to 6 D in plus cylinder notation

VISIAN ICL

Designs

- Prototypes V2 and V3 (late anterior subcapsular lens opacities in 5 to 30% of cases after 3 years)
- Model V4 (higher vaulting)
- Model V4c with CentraFLOW technology. A central artificial hole called KS-AquaPORT was added to the center of the ICL optic to improve aqueous humor circulation in the eye
- Preloaded system
Candidate selection

- Manifest and cycloplegic refractions
- Keratometry
- ACD ≥ 3.0 mm (endo)
- Pachymetry
- Endothelial cell count (0 to 12.3 % annual loss)
- White to white measurement
- Detailed slit-lamp and dilated fundus examinations
- IOP check

Candidate selection (KC patients)

- Stable refraction following CXL and/or Intacs
- “Satisfactory” CDVA
- Stable corneal topography
**VISIAN ICL**

**ICL vaulting**

A. No central no peripheral
B. Low central, no peripheral
C. Moderate central, asymmetric peripheral
D. Marked central, complete peripheral

**ICL vaulting vs central corneal thickness**

- Vault 0: the ICL apparently touches the anterior lens capsule
- Vault 1: separation less than half of corneal thickness
- Vault 2: separation equal to corneal thickness
- Vault 3: separation more than the corneal thickness
- Vault 4: separation twice the corneal thickness
Case presentation

- 24 yo male patient
- Bilateral KC
- Initial presentation
  - UDVA 20/400 OU
  - CDVA 20/100 OU
  - OD -8.0 X -6.0 @ 180
  - OS -9.0 X -6.0 @ 10
VISIAN TORIC ICL

Case presentation

- Sequential Intacs and CXL OU
- One year later
  - UDVA 20/70 and 20/80 (OD and OS respectively)
  - CDVA 20/40 OU
  - OD Plano X -3.0 @ 35
  - OS -2.0 X -3.0 @ 65
VISIAN TORIC ICL
Case presentation

- 3 months after toric ICL implantation
- UDVA 20/40 OU
- OD Plano
- OS -0.25 X -0.5 @ 50
VISIAN TORIC ICL

Case presentation

Shaheen M et al. Evaluation of a Toric Implantable Collamer Lens after Corneal Collagen Crosslinking in Treatment of Early-Stage Keratoconus: 3-Year Follow-up. Cornea 2014;33:475-480


**TAKE-HOME MESSAGE**

- Visual rehabilitation of keratoconic eyes is as important as the cone stabilization

- There are many options available out there

- Careful assessment of each case, namely ophthalmologic evaluation as well as the patients’ life style, is the key factor for selection of the appropriate method

**THANK YOU**