

REFRACTIVE REHABILITATION OF KERATOCONIC PATIENTS

WALEED A ALLAM, MD.

Assist. Professor, Ophthalmology
Tanta University



EOS 2019



KERATOCONUS MANAGEMENT

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)



VISUAL REHABILITATION

Glasses

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



VISUAL REHABILITATION

Glasses

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



VISUAL REHABILITATION

Contact lenses

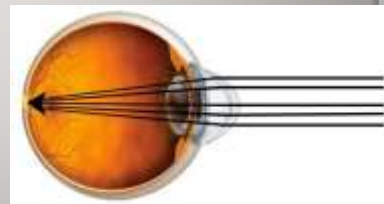
- Silicone hydrogel soft contact lenses
- Rigid gas permeable contact lenses (RGPs)
- Piggy-back contact lenses
- Hybrid contact lenses
- Scleral contact lenses



VISUAL REHABILITATION

Contact lenses

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



VISUAL REHABILITATION

Contact lenses

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



VISUAL REHABILITATION

Laser vision correction (LVC)

- Combined CXL and topography-guided surface ablation either simultaneous (Athen's Protocol) or sequential



VISUAL REHABILITATION

Laser vision correction (LVC)

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



VISUAL REHABILITATION

Laser vision correction (LVC)

- 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



VISUAL REHABILITATION

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)



VISUAL REHABILITATION

Phakic Intraocular Lenses (p-IOLs)

- Permit correction of high refractive errors
- Correct for anisometropia in patients with asymmetric KC



VISUAL REHABILITATION

Phakic Intraocular Lenses (p-IOLs)

- Intraocular surgery
- Flat learning curve
- Expensive



VISIAN ICL

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



VISIAN ICL

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



VISIAN ICL

Candidate selection (KC patients)

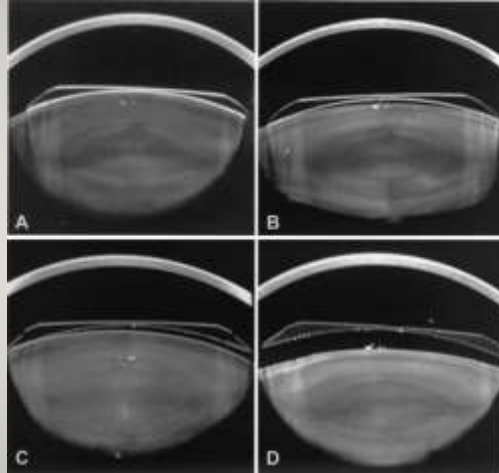
- Stable refraction following CXL and/or Intacs
- "Satisfactory" CDVA
- Stable corneal topography



VISIAN ICL

ICL vaulting

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



VISIAN ICL

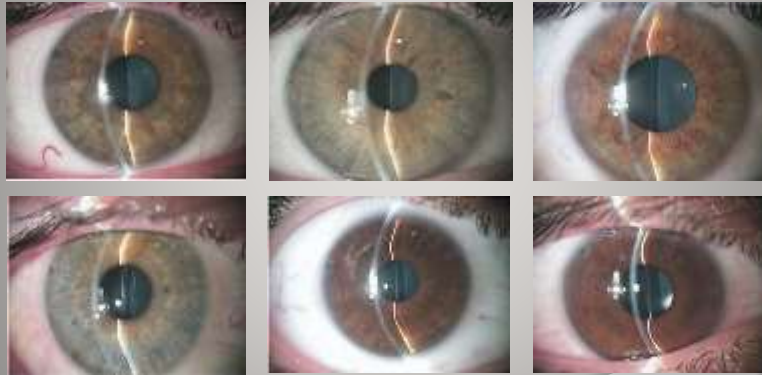
ICL vaulting vs central corneal thickness

- 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



VISIAN ICL

ICL vaulting vs central corneal thickness



VISIAN TORIC ICL

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



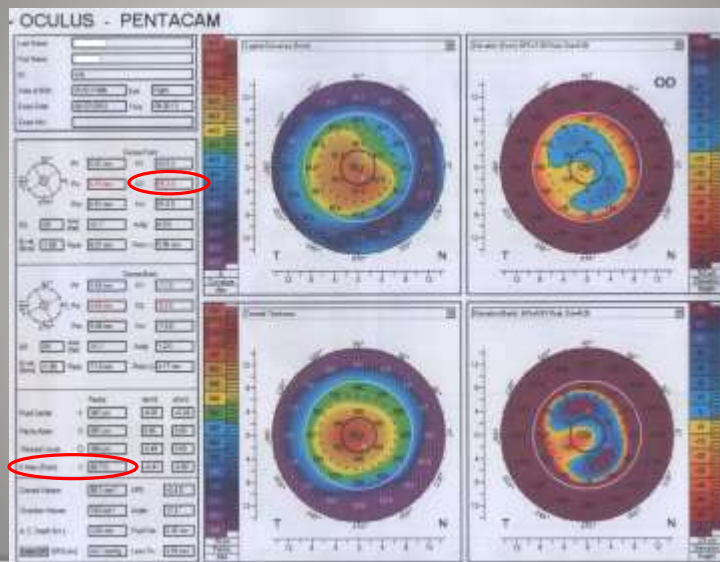
VISIAN TORIC ICL

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



VISIAN TORIC ICL

Case presentation

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



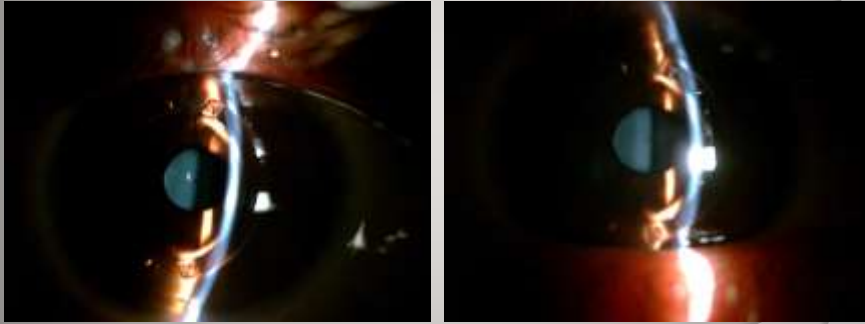
VISIAN TORIC ICL

Case presentation



VISIAN TORIC ICL

Case presentation



VISIAN TORIC ICL

- 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
- Abdelmassih Y et al. Toric ICL Implantation after Sequential Intracorneal Ring Segments Implantation and Corneal Cross-linking in Keratoconus: 2-Year Follow-up. *J Refract Surg* 2017;33:610-616
- Coskunseven E et al. Four-Stage Procedure for Keratoconus: ICRS Implantation, Corneal Cross-linking, Toric Phakic Intraocular Lens Implantation, and Topography-Guided Photorefractive Keratectomy. *J Refract Surg* 2017;33:683-689
- Hashemian SJ et al. Long-term Outcomes of Posterior Chamber Phakic Intraocular Lens Implantation in Keratoconus. *Clin Exp Optom* 2018;101:652-658

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

