Treatment of Keratoconus
ICRS and CXL

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Nofinancial interest to disclose
KERATOCONUS

Irregularity of the corneal surface
(steeeping of the cornea, irregular astigmatism, HOAS)

Reduction of biomechanical strength of the cornea

Refractive defect (Toric Phakic IOLs, Toric IOL &CLE)
KERATOCONUS

Should be treated only with ICRS or CXL?

It is necessary to combine techniques?

Better results: combination of both techniques (Kiliç JCRS 2011)
Treatment of KC with ICRS

Regularize corneal anterior surface
(Increase in UDVA and CDVA, decrease in SE, manifest cylinder and mean K value, decrease in HOAS)

But maintain the previous biomechanical status of the cornea

Conkunseven AJO 2009
Alió Ophthalmol 2009
CXL

Increases the strength of the cornea

Using Riboflavine as a fotosensitizer and UVA to increase the formation of new collagen bonds

CXL stabilizes the corneal biomechanics

Seiler Experimental Eye Research 1998
Seiler Ophthalmology 2003
Kohlhaass JCRS 2006
Caporossi, Mazzota et al AJO 2010
CXL TECHNIQUES

Standard CXL (Dresden protocol 3mW/cm², 30’)

Accelerated CXL (AVEDRO 30mW/cm², 3’)

Demarcation line removing epithelium 250–320 µ
Corneal exposure to UVA 5.4 mJ/cm²
Decrease in corneal thickness during long exposures
Complications related to re-epithelization

TE CXL (enhanced RF with Trometamol + EDTA)

TE CXL+ Iontophoresis (to enhance RF penetration)

Demarcation line in TE CXL 120–150 µ (Filipello JCRS 2012)

ORA: Biomechanical strength is in 150µ anterior stroma (Marshall JRS 2008)

Iontophoresis improves RF penetration (Mancucci 2012)
Ideal CXL technique

**Accelerated:** Less time of exposure
- Less possibilities of damaging endothelium

**Trans-Epithelial:** Less post-op discomfort.
- Faster recovery
- Less % of complications
- 150 µ anterior stroma
  - (less potential endothelial damage in thin corneas)

**Iontophoresis:** Better RF penetration
Treatment of KC ICRS and CXL

CXL (classic technique)

Confocal Biomicroscopy

Activated keratocites in anterior stroma
Absence of sub–basal nerve plexus
Demarcation line in corneal stroma (fibrosis)
No endothelial damage
TE CXL with Iontophoresis
Confocal microscopy
Activated keratocytes in anterior stroma
Presence of Sub-basal nerve plexus

Prof. Benitez del Castillo
Treatment of KC ICRS and CXL

What sequence?

CXL + ICRS/ICRS + CXL

Best sequence ICRS+ CXL
(Conkunseven JCRS 2009)
CONCLUSIONS

Treatment of KC

Decreasing corneal surface irregularity  
ICRS

Increasing strength of the cornea  
CXL
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