Mechanism of Action

- Corneal remodeling and topography regularization
- Displacement the corneal apex towards the center
- Refractive correction:
  - Preserving the natural prolate profile.
  - Reduce optical aberrations and improving visual acuity / CL tolerance
Blavatskaya’s Law

• The larger the ring the lesser the correction
• The thicker the ring the greater the correction

The larger the ring the lesser the correction.

The thicker the ring the greater the correction.

Thicker intracorneal segment produces more flattening of the cornea compared to thinner segment. Hence, thicker intracorneal segments are placed inferiorly to reduce the asymmetry between the superior and inferior cornea.

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Ring

• Inner and Outer Diameter
• Cross Section
• Arc
• Thickness

The DESIGN: Is Dome Shape

No negative side-effects of halos, glare, and/or sparkles reporting.

Hard sharp edges make long term damage to the cornea.
ICRS

- Keratoconus
- Post LASIK Ectasia

Diagnosed by unstable topographic steepening, progressive corneal thinning on both ultrasound pachymetry/schimfluge camera, decreased visual acuity and unstable refraction.

- High myopic correction

Femtosecond LASIK Flap creation

Intra Corneal Ring Segments “ICRS”
Patient Cornea

- Topographic Map
- Cone Location
- Refraction (Sph/Cly)
- (subjective)
- Clear Cornea
- Previous Cross Linking

Pachymetry Map

As segment thickness + minimum 80 micron

References

**Ectasia Type 1:**
100% of the corneal ectatic area (red) is located on one side of the steepest cornea meridian. Use Nomogram A.

**Ectasia Type 2:**
Approximately 1/3 of the ectatic area (red) is located on one side of the steepest corneal meridian and 2/3 located on the opposite side. Use Nomogram B.

**Ectasia Type 3:**
The ectatic area (red) is almost evenly distributed on both sides of the steepest corneal meridian. Use Nomogram C.
Patient Cornea

- Topographic Map
- Cone Location
- Refraction (Sph/Cly)
- Clear Cornea
- Previous Cross Linking

Pachymetry Map

- Inner and Outer Diameter
- Cross Section
- Arc
- Thickness

Ring

- Inner and Outer Diameter
- Cross Section
- Arc
- Thickness

INTACS SK

KERA, IMPERIAL, FERRARA
Manual Tunnelization

Pros Vs Cons

- Less cost
- Easy introduction of ICRS
- Need learning curve
- High risk AC opening
- Unpredictable tunnel level
- High risk of post operative extrusion
- Mostly need suture
Femto LASER Tunnelization

Pros Vs Cons

• No need for long learning curve
• Less incidence for AC penetration
• High accuracy of tunnel level
• Less incidence of postoperative extrusion
• No need suture
• Easily done on top of Cross Linking

What is your femtolaser?

What is your femtolaser?

Femtosecond Tunnelization

Manual

tarekwah@gmail.com
What is your femtolaser?

Vacuum Assisted Tunnelization

- Less cost
- Can be used after/with Cross Linking treatment
- Easy introduction of ICRS
- Short learning curve
- No need for post op. suture.
**Cross linking**

- When?....Same setting or later?
- If the patient cross linked before?

**Patient follow up**

- Give the segment 3 months before decide, you got bad or good result.
- You have to take topographic photo 3, 6 and 9 months post operative.
- If you found the K readings (K1, K2) is rising, you have to do Cross Linking IMMEDIATELY, .......Age !!!!

**Myopic Correction In Thin Cornea**

**Thin Cornea**

- Intra Ocular
- Cornea 1

???
Thin Cornea

- Topography/Elevation Map (Ant/Post)
- BCVA
- Refraction (Sph/Cly)
- Pachymetry map (thinnest location)
- Corneal opacities.
- Age, other eye, refraction history and other disorders

Thin Cornea

- No Keratoconus
- SE < -3 D
- No Scar
- Thinnest location > 450 mic

Topography guided PRK with Cross linking

Thin Cornea

- No Keratoconus
- SE > -3 D
- No Scar
- Thinnest location < 450 mic

ICRS
Mayo
ReLEx

Thin Cornea

- Keratoconus
- SE > -3 D
- No Scar
- Thinnest location < 450 mic

ICRS
Mayo
Thin Cornea

Surface
- No Keratoconus
- SE < -3 D
- No Scar
- Thinnest location > 450 mic

Pocket
- No Keratoconus
- SE > -3 D
- No Scar
- Thinnest location < 450 mic

Tunnel
- No Keratoconus
- SE > -3 D
- No Scar
- Thinnest location < 450 mic

Topography guided PRK with Cross linking
- ICRS

• Less post op. Pain
• No incidence of haze, stria, epith. ingrowth and other flap complication
• Correct high myopia (no transition zone)
• Irreversible

ReLEx smile
Refractive Lentecule Extraction
Mayo ring

- Flattening the corneal center
- Correct myopia
- Removal ........not easy
- Pocket can be manual or by Femtolaser
- Dissection at Corneal center (Thinnest location)

Tunnel

ICRS

- Keratoconus
- SE > -3 D
- No Scar
- Thinnest location < 450 mic

Intra Corneal Rings

A small incision made in the periphery of the cornea, a trephine is used to form a tunnel (manual technique) or (Femtolaser). The segments push against the curvature of the cornea, causing global flattening of the cornea. Flattens the peak of the cone allowing a more natural shape.

Intra Corneal Ring Segment

- It allows the surgeon to remodel the cornea through central corneal flattening.
- It improves optics, corneal topography and refractive performance.
- Longer the arc: Regular flattening of corneal surface treat MYOPIA
- Shorter the arc: Flattening of the steepest meridian treat ASTIGMATISM
NEW ICRS 355 D

- Easily insertion
- Central corneal flattening.
- Correct high myopia up to -8 D
- Reversible
- Can be combined with Cross Linking
- Manual Or femto tunnel
Take Home Messages

• K value not true
• Un-predictable
• ICRS tunnel level
ICRS tunnel can be done manually, Femtolaser or Vacuum assisted

Femtolaser is the most accurate one to make the tunnel at same plain from the post.corneal surface.

ICRS + Cross linking, is a better combination to increase post operative results predictability.

ICRS has refractive myopic correction through preserving the natural prolate profile of the cornea & reduce optical aberrations in order to improve VA/CL tolerance.

Femtosecond technology is better than manual tunnelization for implanting ICRS as the manual method may lack sufficient precision which leads to reduced post operative optical performance.

ICRS (NEW 355 D) has refractive myopic correction through corneal re-modeling & reduce optical aberrations specially at nipple cone keratoconus.

ICRS tunnel level

Un-predictable

ICRS + Cross linking, is a better combination to increase post operative results predictability.

Cross Linking

Its better to do it if there is rising in K readings (3, 6 and 9 months)

You should increase the ring height if the cornea is previously cross linked.
Controlled Vacuum Ring Vejarano Delaminating System™, is a safe choice method for Intra Corneal Segment implantations without resorting to high coast femtosecond laser to create the tunnels.

NEW ICRS 355 D

- A safe option in high myopic correction with thin corneas.
- Femto, manual or vacuum assisted
- Reversible
- Can be combined with other techniques
- No touch to corneal center
- Remodeling of the cornea

Thank you