Mission Possible: Fitting Highly Distorted Post-LASIK Ectatic Corneas s/p Intacts with Impression-based and HOA-corrected Scleral Lenses

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Background

- Corneal ectasia is one of the most devastating postoperative complications of Laser In situ Keratomileusis (LASIK).
- **Pathophysiology**: Post-LASIK ectasia occurs when the posterior stroma behind the LASIK flap fails to support the structure of the cornea, leading to corneal protrusion and thinning.
- **Diagnosis**: Post-LASIK ectasia is typically diagnosed with the finding of asymmetrical inferior steepening on corneal topography (see Figure 1).
- **Symptoms**: Patients often suffer from poor best corrected visual acuity (BCVA), loss of contrast sensitivity and perception of higher-order aberrations (HOAs), such as glare and halos.
- **Treatment**: specialty contact lenses, intracorneal ring segments (ICRS), corneal collagen cross-linking (CXL), and penetrating keratoplasty in severe cases.

Case Description

- A 45-year-old Indian female presented to the Global Vision Rehabilitation Center for specialty contact lens fitting in May 2021
- **Timeline**: LASIK OU and conductive keratoplasty OU in India (2010) → diagnosis of post-LASIK ectasia OU in India (2015) → CXL OU and ICRS OU in the US (2018)→ scleral lens fitting OU in the US (2021)
- **Chief complaints**: blurred vision OU in glasses, constantly seeing halos and starbursts:
- **Scleral lens fitting:** EyePrint Prosthetics (EPP) scleral lenses with HOA correction (Figure 5 and 6)
  - Initially unsuccessful with conventional scleral lens designs, due to constant edge awareness
  - Eventually, the patient was fitted with **EyePrint Prosthetics (EPP)** scleral lenses: this impression-based technology mapped out the details of the corneal and scleral surfaces and provided a precise fit upon first dispense.
  - An **OVITZ aberrometer** was used to quantify the HOAs through each eye. A pair of EPP lenses with HOA correction was custom made for the patient.

Differences Before and After Scleral Lens Fitting

- **Best Corrected Visual Acuity**
  - **Before**: 20/100 OD & OS
  - **After**: 20/20 OD & OS
- **HOA Complaints**
  - **Before**: constantly seeing starburst and halos. Very poor contrast sensitivity
    - The patient reported that she re-painted her kitchen countertops from a dark color to a light color, as she had difficulty finding her kitchen tools on the countertop surfaces when cooking
  - **After**: complaints mostly resolved with HOA correction in scleral lenses.

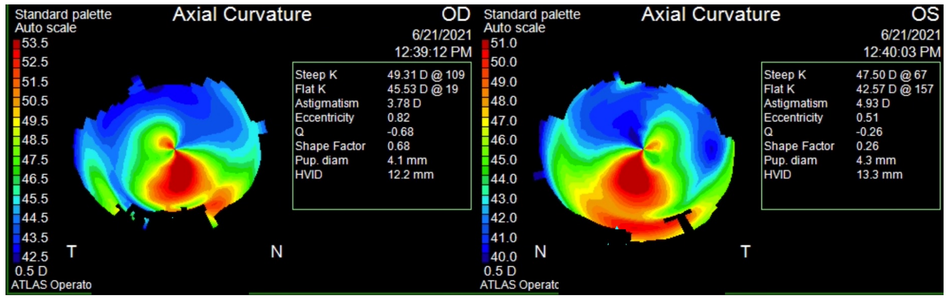

Figure 1: Corneal topography of both eye at the initial visit, showing asymmetric inferior steepening OU

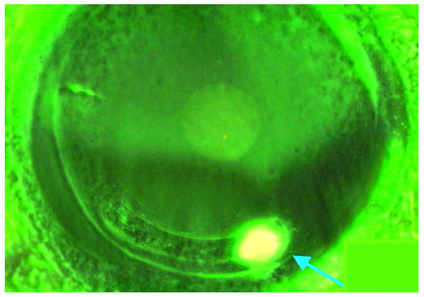

Figure 2: Fluoro-image of right eye showing epithelial erosion over Intact ring

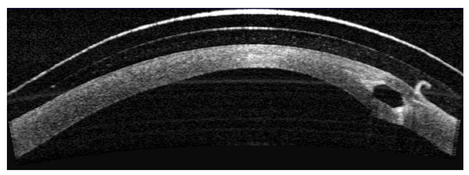

Figure 4: AS-OCT image of right eye showing epithelial erosion over Intact ring

Figure 5: Taking an impression of the right eye to design an EyePrint Prosthetics scleral lens

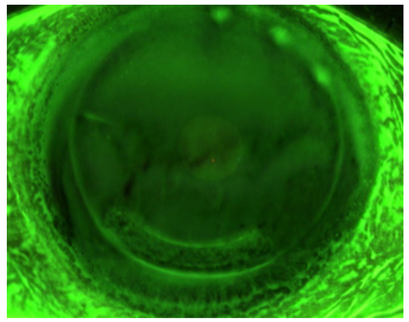

Figure 3: Fluoro-image of right eye showing no epithelial defects over Intact ring

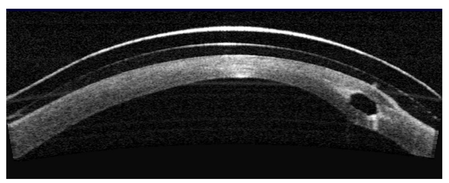

Figure 4: AS-OCT image of right eye showing no epithelial defects over Intact ring

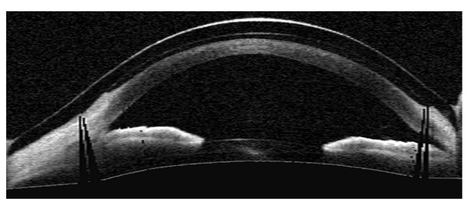

Figure 6: AS-OCT image of right eye wearing an EyePrint Prosthetics scleral lens with excellent fitting relationship

Differences Before and After Scleral Lens Fitting – Cont'd

- **Comfort**
  - **Before**: constantly dry and itchy eyes OU
  - **After**: comfortable lens wear all day OU
- **Corneal Health**
  - **Before**: sporadic epithelial erosions over Intacts OU (Figure 2 and 4)
  - **After**: scleral lenses healed epithelial defects (Figure 3 and 5), no new episodes of epithelial erosions since the patient started scleral lens wear
- **Mental health**
  - **Before**: the patient was a gallbladder surgeon back in India, but she was not able to operate for many years due to post-LASIK complications. The patient was undergoing depression treatment before scleral lens fitting
  - **After**: improvement in depression symptoms; the patient is now motivated to apply for a fellowship to become a surgeon again in the US

Discussions and Conclusions

- Post-LASIK ectasia can affect not only a patient's visual acuity and visual quality, but also a patient's mental health and overall well-being
  - Scleral lenses as a tool of vision rehabilitation can significantly improve a patient's quality of life
- Emerging scleral lens technologies, such as impressions and HOA corrections, can increase fitting success in complex cases involving highly distorted corneas

References

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