

Background

A firework-filled holiday often represents celebration and rejoice; however, firework-related trauma represents 2% of all ocular injuries yearly and can lead to burns, lacerations, corneal defects, and complete limbal stem cell deficiency (LSCD)¹. Corneal transparency and epithelial integrity require normal-functioning limbal stem cells. LSCD can progress to frequent epithelial breakdown, scarring, neovascularization, and corneal blindness². Treatment options for LSCD include artificial tears, topical corticosteroids, autologous serum tears, limbal stem cell transplant, and scleral lenses (SL)¹⁻³. SLs has the potential to create a smooth, protective surface over the cornea, improve vision, and maintain ocular surface integrity.

Case Presentation

Visit 1:
11-year-old male with complete LSCD OS secondary to a firework injury presented for a doctor-referred scleral lens fitting.

Chief Complaint: mom reported patient had never worn contacts before, currently not wearing any glasses due to breaking them, mom wanted to get him fitted for a scleral lens as recommended by his pediatric ophthalmologist

Ocular History:

- Firework injury OS a year ago with multiple subsequent procedures:
 - Corneal debridement
 - Symblepharon lysis
 - Amniotic membrane transplants (multiple)
 - Temporary tarsorrhaphy
 - Symblepharon ring
 - Limbal stem cell transplant
- Symblepharon OS
- Complete LSCD OS

Presenting VAs (sc): 20/15 OD, 20/125-1 OS (PH VA: 20/50 OS)

Slit Lamp Exam Findings (OS):

- Lids: thickened, irregular lid margins with inspissated glands S and I
- Conjunctiva: re-remerging symblepharon superior nasal, 1-2+ diffuse bulbar injection
- Cornea: neovascularization with moderate peripheral haze 360, irregular epithelial surface with cloudiness, +tear film debris

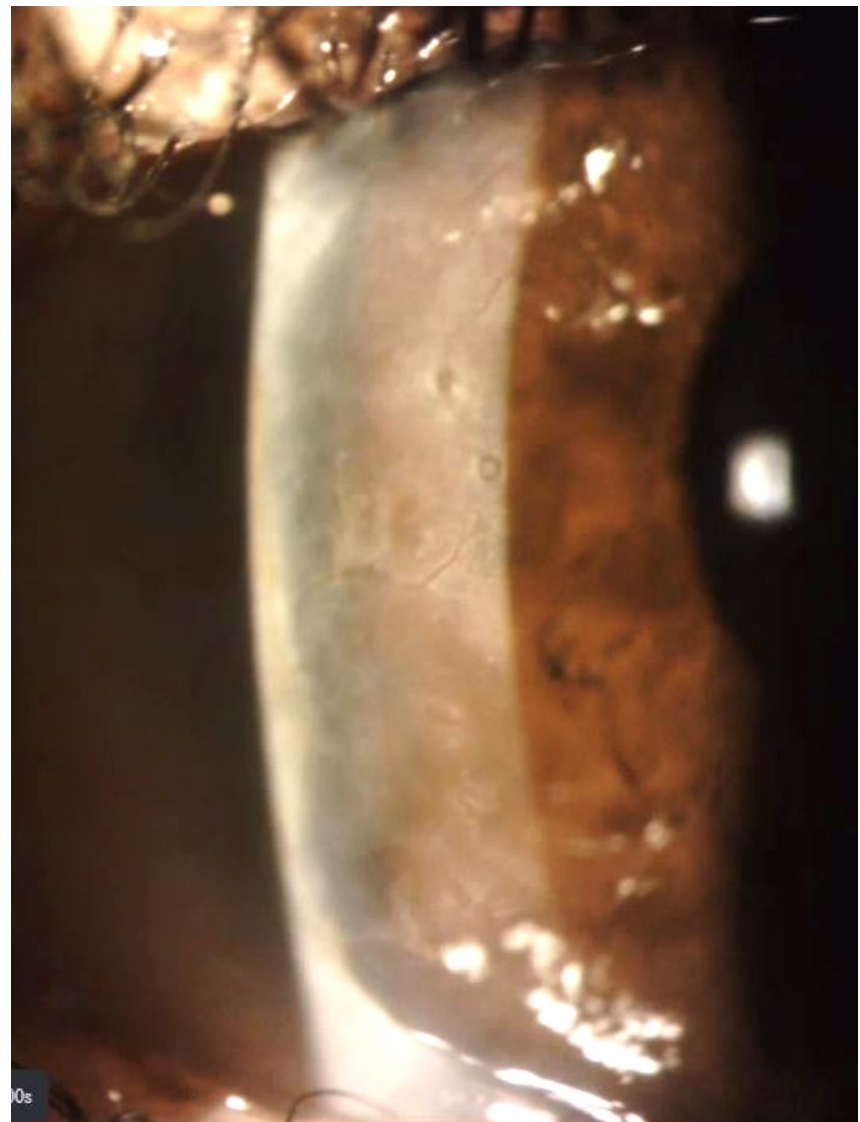
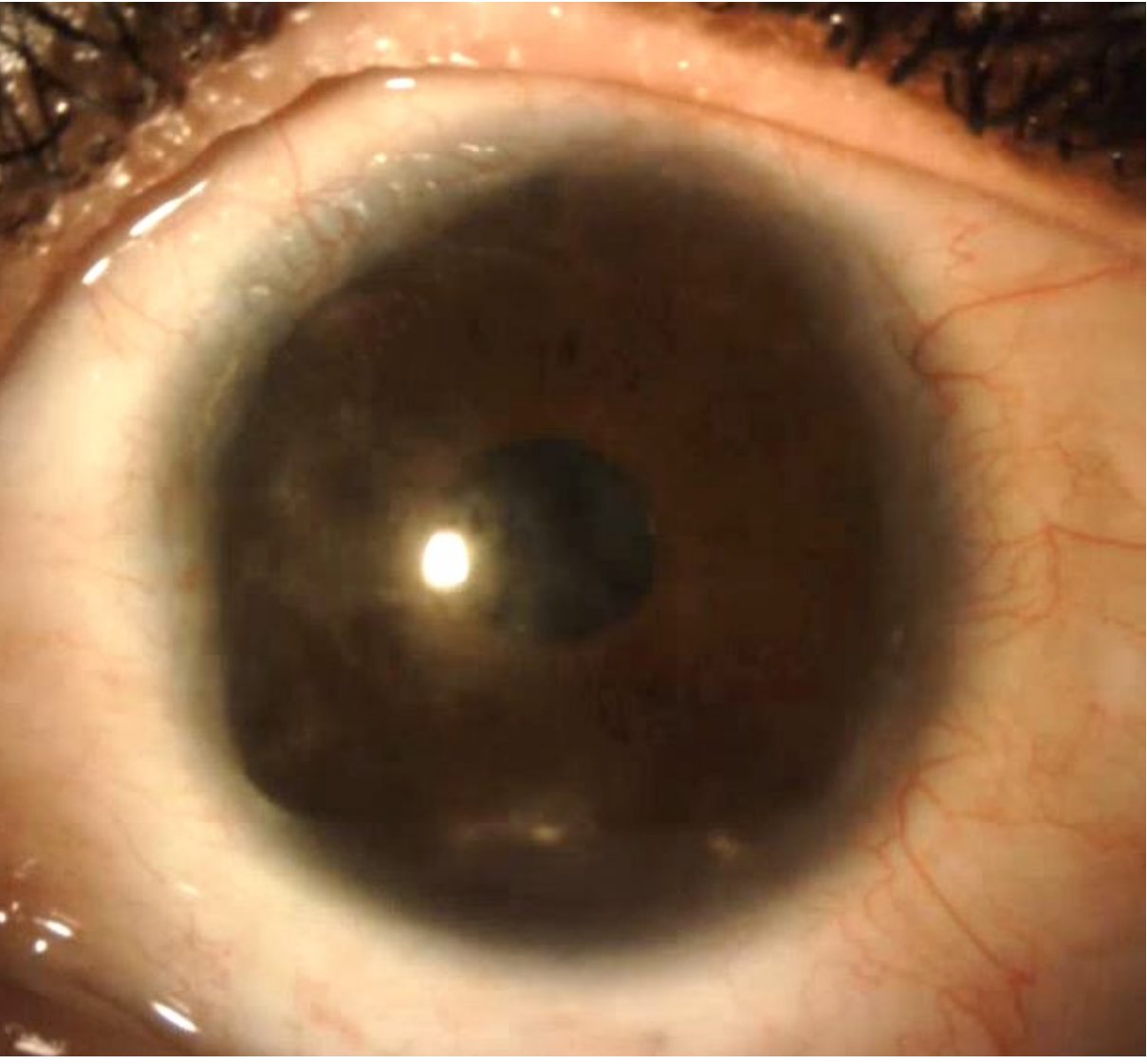


Figure 1a (left). Anterior segment photo of cornea with neo and peripheral haze secondary to LSCD.
Figure 1b (right). Parallelepiped scan of irregular corneal epithelial surface.

Freeform Scleral Lens Fitting

Corneo-scleral Topography:

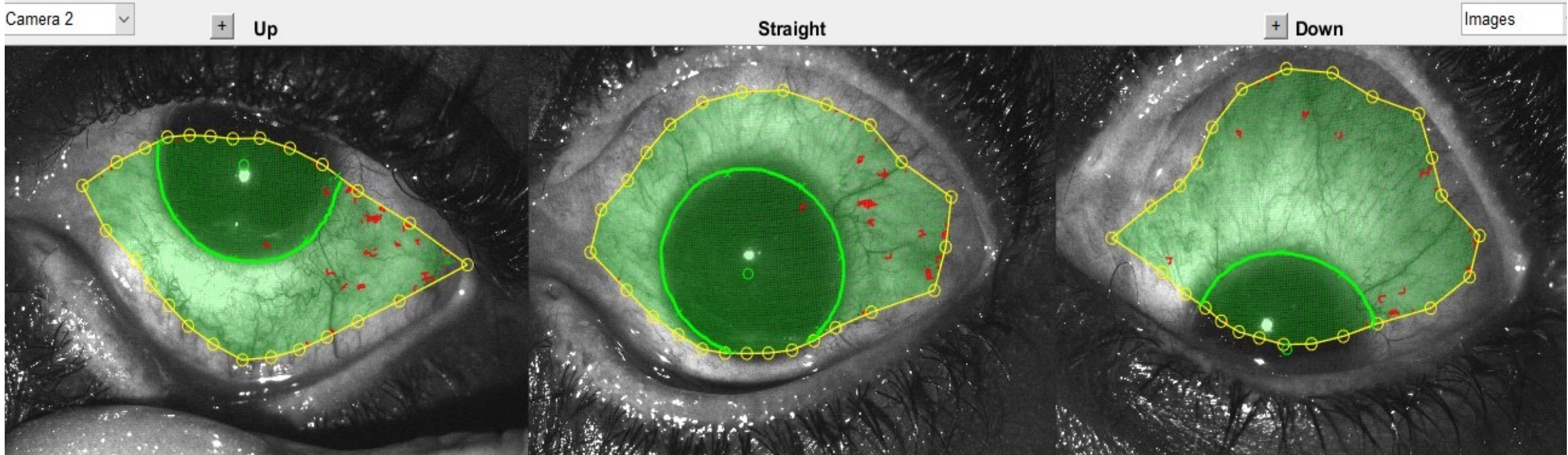


Figure 2. Scleral lens profilometry scan OS in primary, up, and down gazes with fluorescein sodium benoxinate drops instilled.

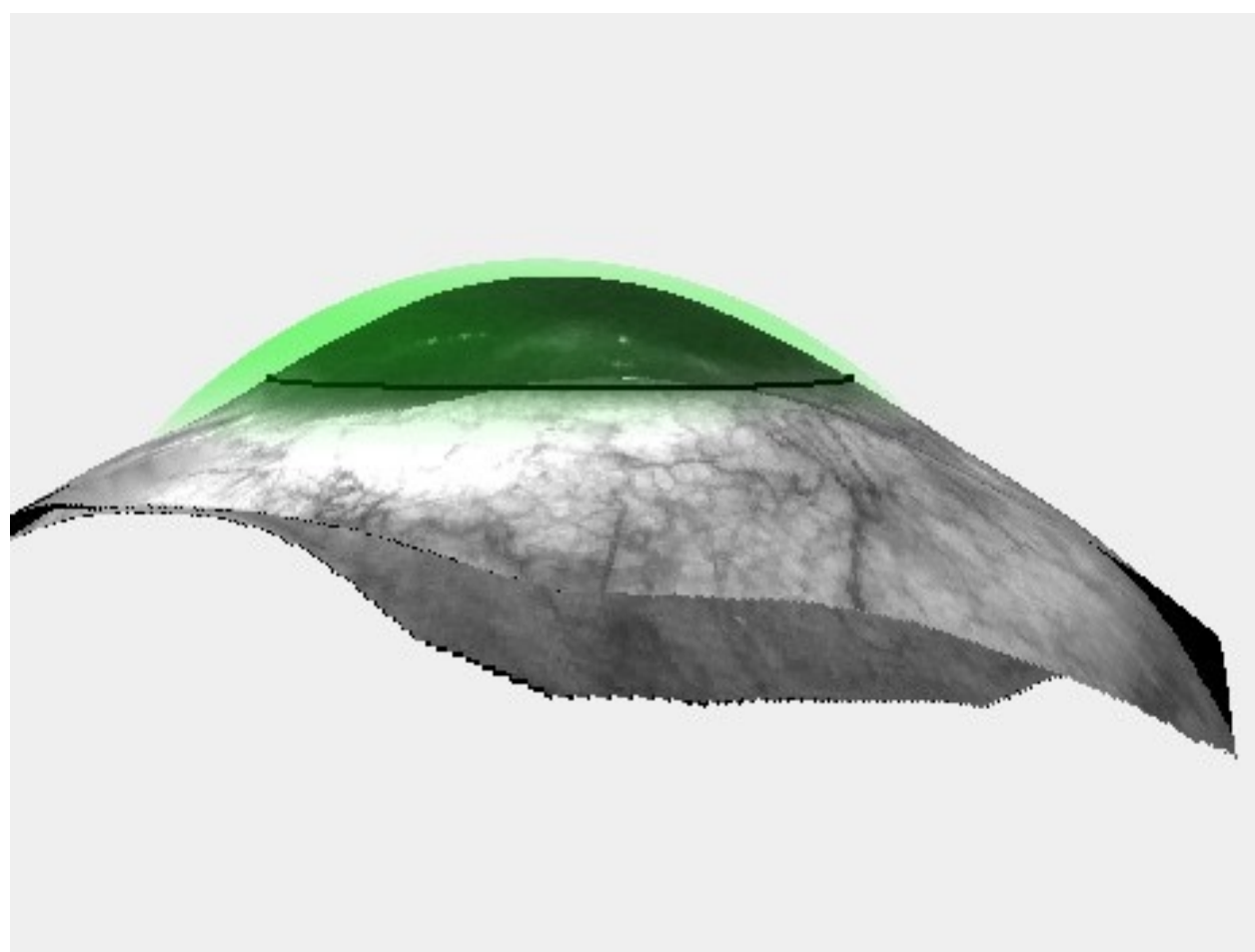
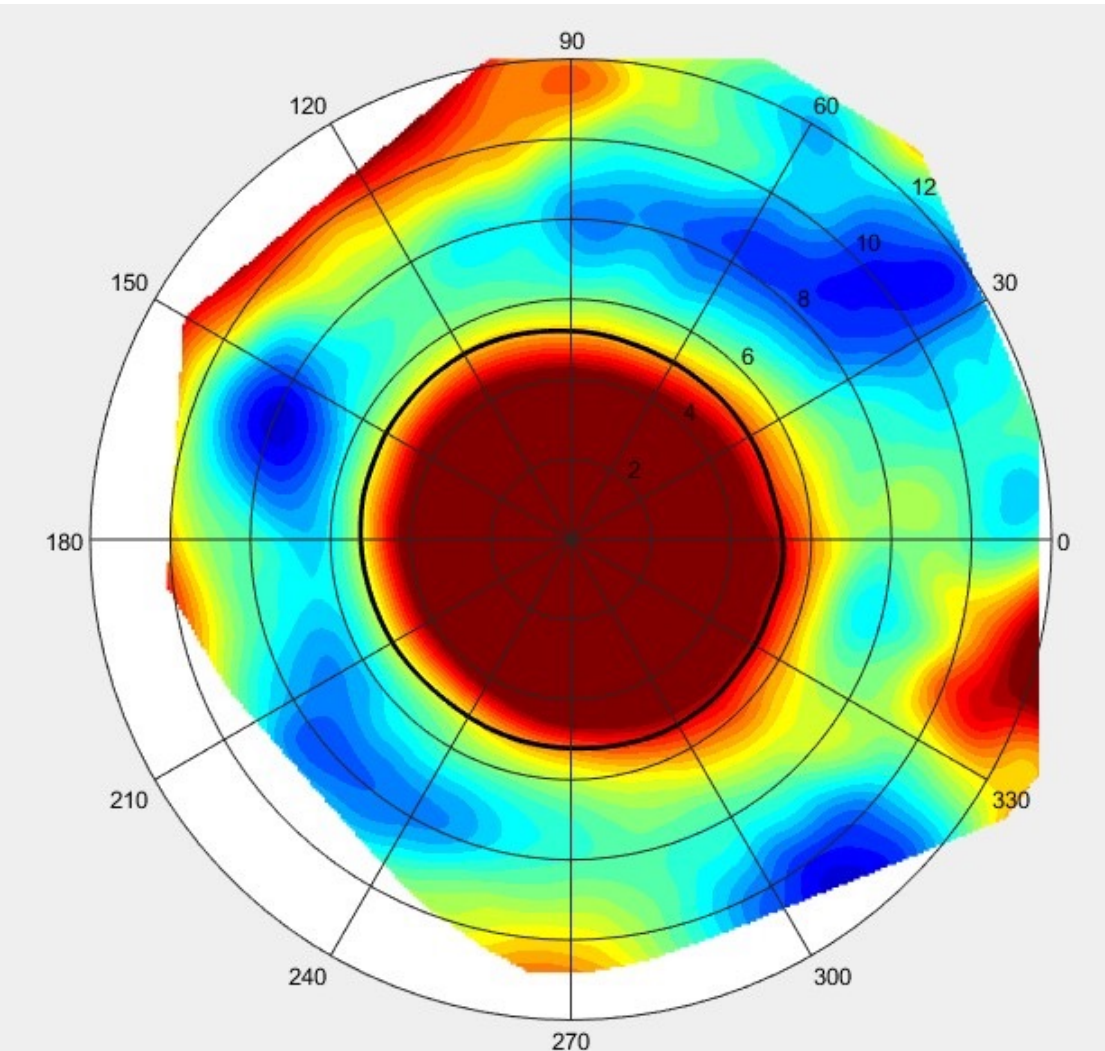


Figure 3a (left). 2D scleral elevation map showing areas of elevation (red) and depression (blue). **Figure 3b (right).** 3D scleral elevation map with a SL vaulting over the cornea and sclera.

Trialed diagnostic SL:

- OS: 7.34 BC / 16.5 DIA / 3820 SAG / plano / 200um toricity
- Sphere over-refraction (ORx): +6.50 (20/40)

Assessment:

- LSCD and symblepharon secondary to corneal transplant and firework injury OS
- Significantly improved vision with SL OS

Plan:

- Ordered a freeform scleral lens via corneo-scleral topographer
- RTC 2 weeks for SL dispense and I&R training

Following Visits:

Visits:	Trial Lenses	VA (OS)	Subjective Report & Fit Evaluation
VISIT 2	Trial 1	20/30 OS	Ok comfort, improved vision
	OS: 7.37 BC / 16.5 DIA / 4233 SAG / -2.75 SPH	-0.50 SPH (20/25)	400um central clearance (CC), good limbal clearance, 10deg R rotation, moderate nasal EL with bubbles entering
VISIT 3	Trial 2	20/20- OS	Improved vision & comfort
	OS: 7.37 BC / 16.5 DIA / 4233 SAG / -3.25 SPH *tucked in nasal edge and incorporated ORx	+0.50 (NI)	350um CC, good limbal clearance, 0deg rotation, mild blanching nasal and inf temp

Table 1. Description of each lens trialed including VAs, ORx and fit description.

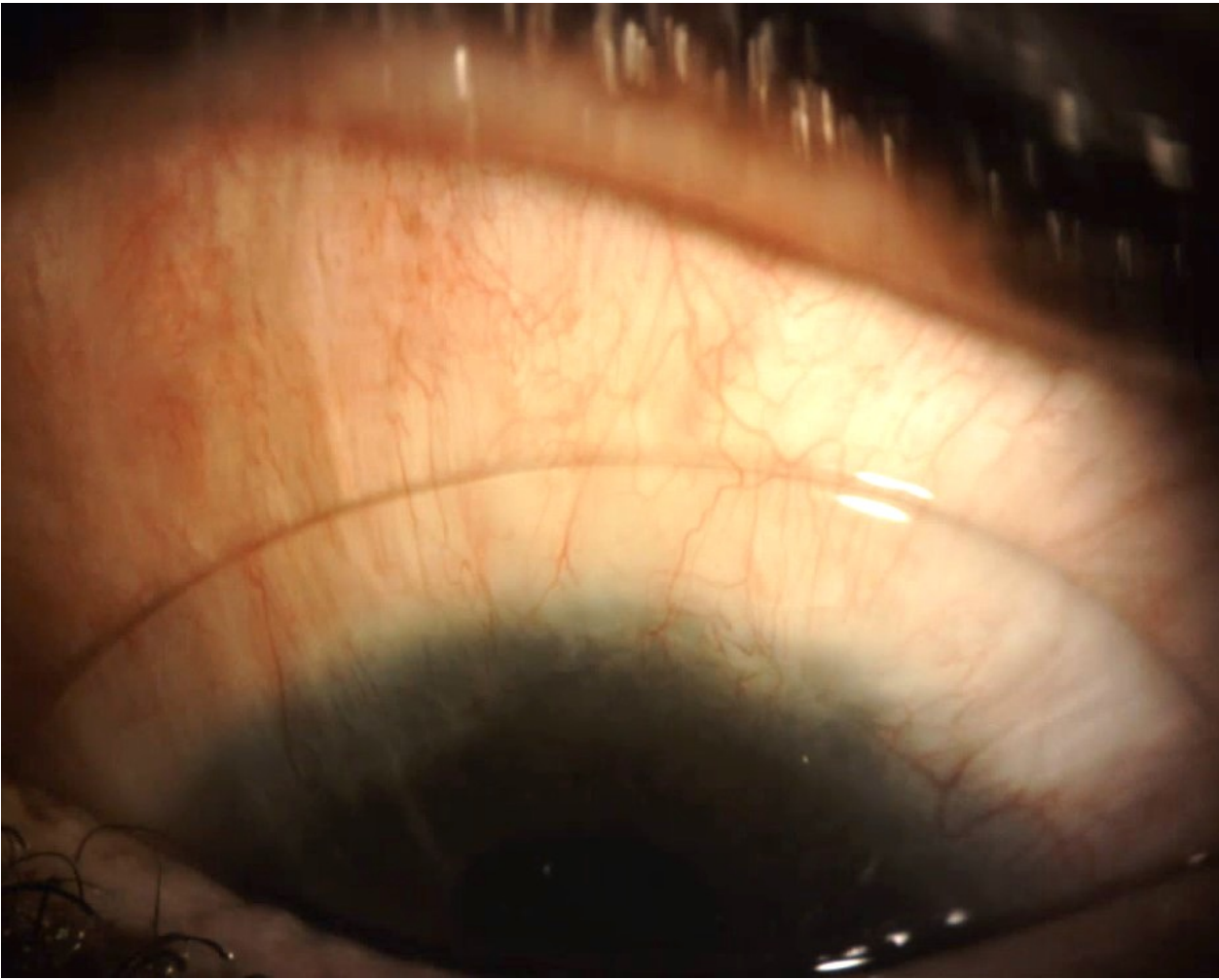


Figure 4a (left). Superior nasal symblepharon post-firework injury with freeform scleral lens.
Figure 4b (right). Gross photo of left eye with freeform SL.

Clinical Insights

Scleral profilometry:

- Indicated in patients with significantly irregular cornea and sclera
- Detailed scans and data points can be used to create a highly customized SL
- May decrease amount of trial lenses and chair time needed for a complex specialty lens fit

Freeform SLs:

- Provide increased clarity and quality of vision by creating a more uniform refractive front surface
- May improve comfort of advanced ocular surface diseases
- Maintain ocular health by creating an optimum environment and protecting the eye from mechanical trauma

Conclusions

Surgical treatment options may be necessary in firework-related ocular injuries; however, decreased VAs can persist because of associated LSCD and other complications. Freeform SLs are a beneficial tool eye care practitioners should consider when faced with the challenges of fitting a highly asymmetric scleral shape and complete LSCD, as it can enhance vision, comfort, and maintain ocular health^{3,4}.

References

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