

Freeform scleral lenses, a great option for a highly complicated eye

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Introduction

Scleral lenses (SL) have a versatile set of clinical uses for anterior segment pathology, including, but not limited to, correcting corneal irregularities, severe dry eye, and high amounts of regular or irregular astigmatism. Gas permeable materials provide crisp vision for those with high refractive error demands. This poster highlights the use of corneo-scleral topography driven freeform SLs for a patient with degenerative myopia, dry eye, radial keratotomy (RK), binocular diplopia, and aphakia.

Case Presentation

Initial Visit: A 56-year-old Hispanic woman presented with the complaint of dry eye and blurred vision and desired to be fit in SLs for therapeutic and cosmesis purposes.

Ocular History:

- Retinal detachment OD
- Unstable, noncomitant hypertropia and exotropia OD with intermittent binocular diplopia
- Aphakia OS
- Primary Open Angle Glaucoma OU
- Degenerative myopia OU
- Post-RK OU
- Moderate-severe dry eye OU
- Surgically-fixed pupil OS

Medical History:

- Breast cancer in remission
- Shingles

Medications:

- Latanoprost
- Azopt
- Lumigan
- Acyclovir
- Alprazolam

Allergies: None

Subjective MRx:

- OD: -5.00-0.50 x060, 20/25-2
- OS: -8.50-2.25 x080, 20/30+
- Unstable binocular diplopia at all distances, unable to reach steady fusion with binocular vision specialist May 2022

Slit Lamp Exam:

- Lids/Lashes: Trace blepharitis OU
- Cornea: Diffuse gr 1 SPK and RK scars OU
- Lens: Mild nuclear sclerosis and anterior subcapsular cataract OD, aphakic OS

Assessment:

Decreased vision from degenerative myopia and irregular cornea secondary to post-RK scarring and dry eyes.

Plan:

Recommend scleral lenses OU, discussed patient expectations with goals of:

- Comfortable vision, diplopia management
- Dry eye relief

Table 1. Scleral lens fitting process of the right and left eye. * = Finalized lenses

OD									
Trial Lens #	Lens Design	Diameter (mm)	Base Curve (mm)	Sagittal Depth (um)	Power (D)	Visual Acuity Distance and Near		Subjective/Objective	Miscellaneous add-ons
1	Front Surface Toric	16.5	7.85	4780	-4.64 -0.62 x120	20/25-	20/100	Diplopia, scratching sensation	
2	Spherical Back Surface	16.5	8.23	4807	-2.87 sph	20/30	20/100	Diplopia, scratching sensation	
3	Back Surface Toric	16.5	8.23	4807	-3.00 sph	20/30	20/100	Good distance vision with intermittent diplopia, improved comfort	
4	Back Surface Toric	16.5	8.44	4698	-2.00 sph	20/30-	20/100	Constant diplopia, poor comfort	4pd BU prism
5	Back Surface Toric	16.5	8.23	4807	-2.50 sph	20/25	20/100	Good vision and comfort, intermittent diplopia	
6*	Back Surface Toric	16.5	8.23	4807	-0.75 sph	20/70	20/25	Good near vision and comfort	
OS									
Trial Lens #	Lens Design	Diameter (mm)	Base Curve (mm)	Sagittal Depth (um)	Power (D)	Visual Acuity Distance and Near		Subjective/Objective	Miscellaneous add-ons
1	Front and Back Surface Toric	16.5	7.89	4673	-14.89 -1.25 x176	20/30	20/100	Diplopia, scratching sensation	
2	Front and Back Surface Toric	16.5	7.89	4751	-14.89 -1.25 x176	20/30	20/100	Poor comfort and vision with diplopia	
3	Front and Back Surface Toric	16.0	7.54	4477	-17.25 -0.75 x023	20/25-	20/100	Intermittent diplopia, improved vision, moderate discomfort	
4	Back Surface Toric	16.0	7.71	4331	-17.50 sph	20/50+	20/100	Constant diplopia, moderate lens awareness	3pd BD prism
5	Freeform Landing Zone	16.0	8.25	4913	-13.25 -0.75 x023	20/40-	20/100	Intermittent diplopia, slight eyelid awareness	
6	Freeform Landing Zone	16.5	8.25	5045	-12.75 -0.75 x023	20/25-	20/100	Intermittent diplopia, slight eyelid awareness	
7	Freeform Landing Zone	16.5	8.25	5120	-12.75 -0.75 x023	20/25-	20/100	Intermittent diplopia, improved comfort	Hydra-PEG
8*	Freeform Landing Zone	16.5	8.26	5126	-11.75 -0.75 x023	20/25	20/100	Good distance vision and comfort	Hydra-PEG

Discussion

This patient presented with a highly complex ocular history in both eyes. She was unhappy with the cosmesis of her glasses due to her high myopia and anisometropia, alongside complaints of dry-eye. While traditional soft contact lenses or gas permeable lenses may have provided her with relief of visual symptoms and cosmesis, her highly irregular cornea and dry eye symptoms would likely cause discomfort in any of the above options. Corneo-scleral topography driven freeform scleral lenses is a favorable option that may provide clear vision and optimized comfort.

While her right eye had no comfort issues with a standard back surface toric lens, her left eye struggled with lens awareness despite utilizing the same lens design and having made multiple adjustments. It was only after switching to a freeform lens design that she reported significantly improved comfort in the left eye.

Although freeform scleral lenses are usually considered for patients with severe corneal irregularities or other ocular surface elevations, the unique and highly customized scleral lens designs can benefit those that suffer from scleral lens awareness.

Adding optical prism to the scleral lenses for diplopia management was attempted, but this led to compromised vision and comfort, and was ultimately abandoned. After visiting a binocular vision specialist, it was determined that fusion would be unlikely given the unstable, noncomitant hypertropia and exotropia of the right eye. Her symptoms of binocular diplopia were avoided by utilizing monovision scleral lenses where the right eye was set for near and the left eye set for distance. Avoiding the incorporation of optical prism greatly improved her lens awareness.

Despite her complex ocular history, the end results for the patient in these highly customizable lenses included clear, single and comfortable vision, adequate management of her dry eye symptoms, and significant improvement in cosmesis.

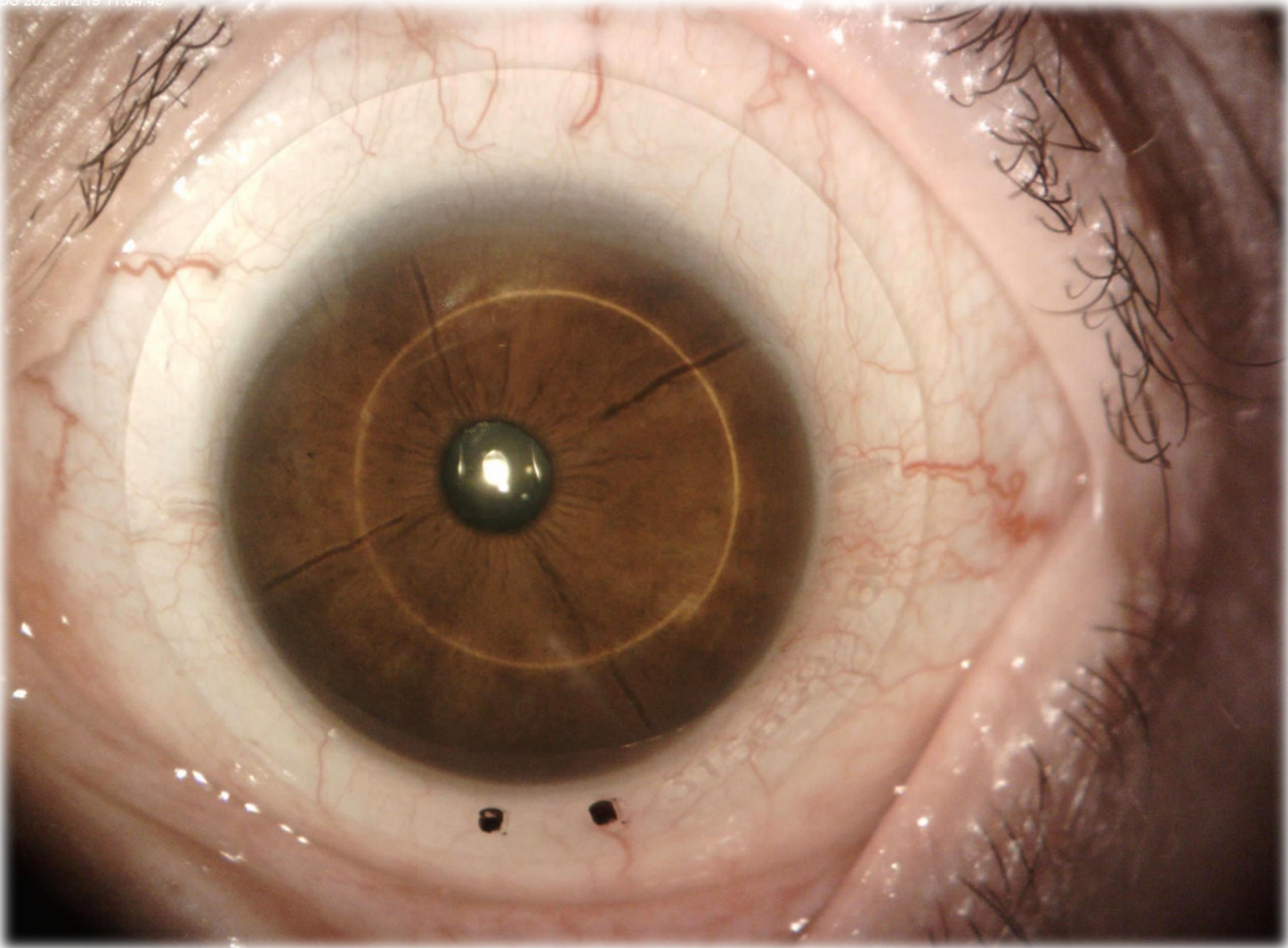


Figure 1. Left eye with freeform scleral lens. Note RK scars, minimal lens rotation and lack of intraocular lens implant.

Conclusion

The versatility of scleral lenses offer advanced designs with a myriad of optical combinations to aid patients with complex of ocular systems. Lenses that are designed through scleral topography provide a highly customized fit and can address a wide range of patients and symptoms. Although time consuming, practitioners truly are empowered to tackle the most complicated of cases with the progress of scleral lens design and scleral shape mapping technologies.

References

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