Corneal GP Lenses for Management of Irregular Astigmatism Secondary to Ocular Chemical Burn

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Introduction

Chemical injury of the ocular surface can lead to significant visual impairment and disfigurement. Chemical burns are considered an ocular emergency that require prompt irrigation and immediate treatment. We present a case highlighting corneal lens management of a patient with a history of ocular basic pH chemical burn.

Case History

55 year old Hispanic male

CHIEF COMPLAINT
- Blur and ocular dryness right eye following chemical burn

OCULAR HISTORY

January 2022	October 2022	2023	July 2023
• Ocular chemical burn OD > OS with 50% sodium hydroxide	• Ocular surface reconstruction for pseudo-pterygia OD	• Dry eye and limbal stem cell deficiency (LSCD) OD	• Referred for specialty contact lens fitting

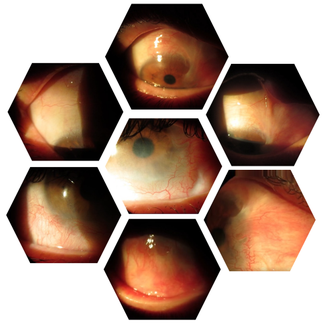
MEDICATIONS
- Prednisolone acetate 1% QID OD
- Cyclosporine 0.09% QID OU

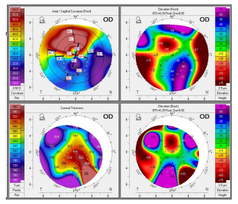
Examination Findings

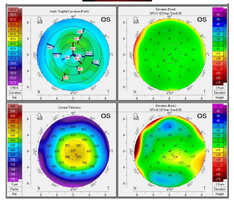
	OD	OS
Unaided DVA	20/500, PH 20/200	20/20-2, PH 20/20
Manifest Refraction DVA	+10.25-0.50x105 20/100	-0.25 DS 20/20
Keratometry	38.50@036 39.75@126	45.50@174 46.25@084
Tomography	Neither oblate nor prolate; steeper superiorly and flatter inferiorly	Mild regular astigmatism
Pachymetry	373um to 864um	574um to 681um
Conjunctiva	1+ diffuse hyperemia Superior nasal symblepharon Inferior scarring and shortening of fornix	Normal
Cornea	1mm keratinization with corneal neovascularization 2:00-7:00 2+ stromal opacity, concentrated inferiorly 1+ SPK inferior and nasal	0.5mm pterygium nasal Tr-1+ SPK inferior nasal
Iris	Avascular, brown	Avascular, brown

Slit Lamp Exam

OD	OS



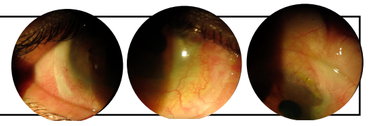




To fit a corneal lens or scleral lens?

Corneal GP Lens
- Bypasses conjunctival irregularities (e.g. symblepharon)
- Centration controlled by upper eyelid
- Ability to dose ocular medications without removing contact lens
- Tear and oxygen exchange underneath lens with blink

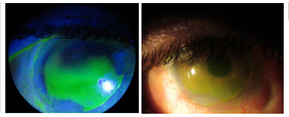
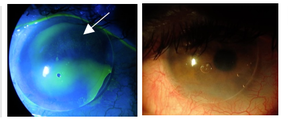
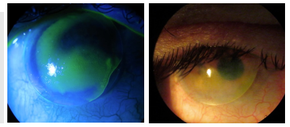
Scleral Lens
- Protective shield for ocular surface
- Therapeutic fluid reservoir between lens and eye



Both
- Neutralize corneal irregularities and improve vision
- Similar comfort and vision experienced by this patient

Management

Contact Lens Fitting Process
- OD: Corneal GP lens chosen due to improved centration vs. scleral lens and in consideration of patient's QID ocular medication schedule
- OS: no lens fitting warranted due to uncorrected 20/20-2 DVA

	Diameter	Base Curve	Power	Optical Zone Diameter	Secondary Curve	Tertiary Curve	Material / Color
	10.0	41.00 (8.23)	+6.50 DS	8.20	9.20x0.7 (modified in-office to 9.60)	12.00x0.2	Optimum Extra / Blue
1				First Modification			DVA
				• Bound after 10 minutes of wear (despite in-office modification to flatten peripheral curve) • Small bubble inferior nasal • ↓ diameter and optical zone, flatten BC			20/60-1
	9.40	40.75 (8.28)	+5.87 DS	7.60	9.70x0.7	12.00x0.2	Optimum Extra / Blue
2				Second Modification			DVA
				• Adequate movement with 2hr WT, bound after 4hr WT → corneal staining • Steepen BC, flatten peripheral curve, change color to grey			20/40-2
	9.40	41.25 (8.18)	+5.37 DS	7.40	10.20x0.8	12.00x0.2	Optimum Extra / Grey
3				Final Contact Lens Rx			DVA
				• Mild apical clearance, mid peripheral bearing 1:00-3:00, no peripheral clearance except wide at 4:00-5:00, good movement w/ blink			20/40-2

Discussion

- Chemical burns are amongst the most common workplace-related injuries.[3]
- Alkali is a more common cause of severe ocular chemical burns than acid.[1]
- Alkali chemicals have a higher penetration rate than acids.[1]
- Ocular chemical burns can cause loss of goblet cells and conjunctival inflammation, leaving the ocular surface prone to dryness.[2]

Conclusions

- Specialty contact lenses can improve vision by neutralizing irregular topographical changes on the corneal surface
- Consider a corneal GP for eyes where scleral irregularities > corneal irregularities
- Specialty lenses can improve vision and potentially delay the visual need for a corneal transplant, but they do not improve nor prevent progression of LSCD
- Close monitoring and co-management with a corneal specialist is important
- An impression-based scleral lens (e.g. Eye Print Pro) could be considered in the future for this patient, to better mold to the irregular scleral surface and improve lens centration

References

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2. Singh, P., Tyagi, M., Kumar, Y., Gupta, K., & Sharma, P. (2013). Ocular chemical injuries and their management. Oman Journal of Ophthalmology, 6(2), 83. https://doi.org/10.4103/0974-620x.116624
3. Xiang, H., Stallones, L., Chen, G., & Smith, G. A. (2005). Work-related eye injuries treated in hospital emergency departments in the US. American Journal of Industrial Medicine, 48(1), 57–62. https://doi.org/10.1002/ajim.20178
4. Icons by Flaticon