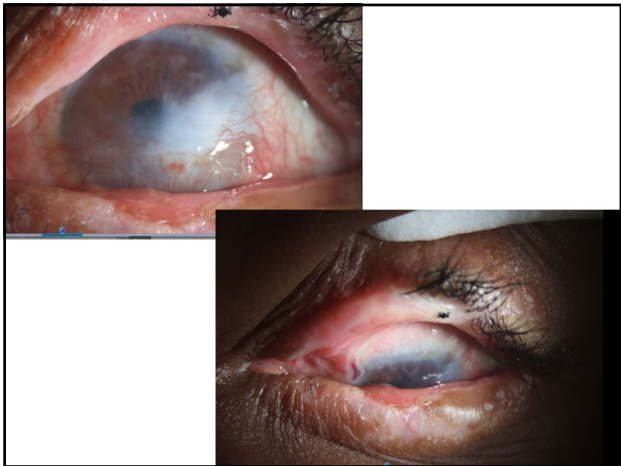
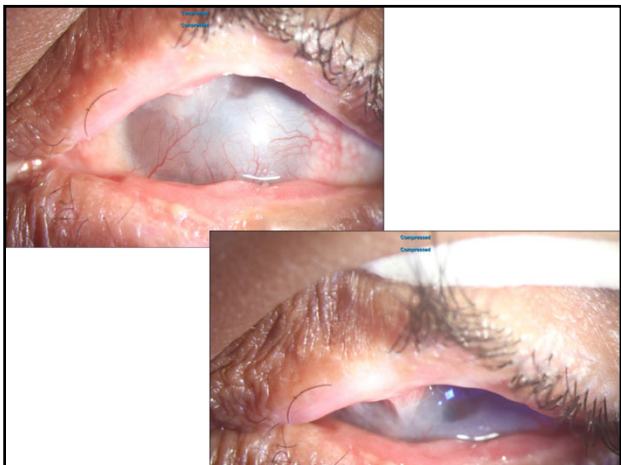


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2



3

Introduction

- The popularity of scleral lenses has significantly grown over the last decade and has continued to steadily increase in popularity
- Familiarity of aspects of these lenses will assist in better patient care and proper referral when appropriate
- Despite fantastic advances in lens design and material there are still many aspects of scleral lenses that are still unknown
- Goal: Improve familiarity of indications and contraindications of scleral lenses to assist in identifying patients that may improve quality of life with their use. To introduce unique ways to use scleral lenses for therapeutic purposes and discuss pitfalls and recommendations on how to approach them

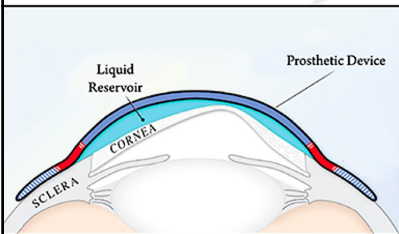
4

Reasons for growth over the last decade

- Improved oxygen permeability of lens materials
- Improved technology allowing better/healthier fits on anatomical challenges
- Multifocals
- Decentered Optics
 - Superimpose the line of sight with the optical center of the eye
- Prism
- Higher Order Aberrations
 - Front surface correction
 - Will correct total HOA of the ocular system
 - Ideal for Keratoconus with clear cornea and back surface cornea bowing

5


3 Zones





- Independently of each other
- Optical zone
 - Base curve
 - Set diameter
- Transition/limbal zone
 - Critical area
- Scleral/peripheral zone
 - Rests on conjunctiva/scleral complex
 - Lays on sclera with all lens and lid pressure
 - Should match scleral shape as closely as possible to maximize surface area of contact and distribute pressure evenly

6

Indications






- Based on ocular condition and health, clinical history, and visual and comfort expectations
- Let's quickly review the most common indications....

7

Indications

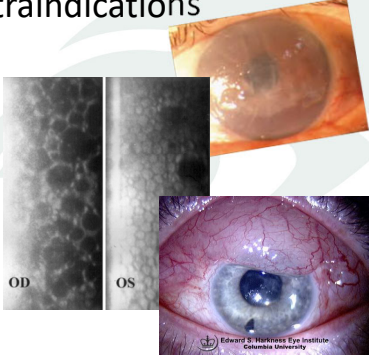
- Primary Ectasia
 - KCN
 - Keratoglobus
 - PMD
- Secondary Ectasia
 - H/O LASIK
 - H/O RK
 - H/O PRK
 - H/O PKP
- Corneal Scars
- Neurotrophic keratopathy
- Neuropathic keratopathy
- Severe dry eye
- Corneal degeneration/dystrophies
 - Salzmann's nodular degeneration
 - Terrien's marginal degeneration
 - ABMD
- Severe Exposure Keratopathy
- Auto-immune disease resulting in cicatrizing conjunctivitis
 - SJS
 - OCP
 - GVHD








8

Contraindications

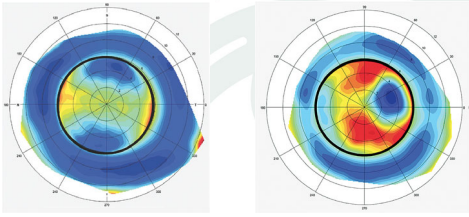
- Pre existing corneal edema
- Low endothelial cell count*
 - Fuchs' corneal dystrophy
 - Post PKP
- Uncontrolled glaucoma
- Large overhanging blebs
- Location of glaucoma drainage device
- Active infection or inflammation*



9

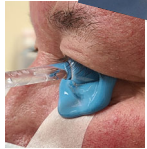
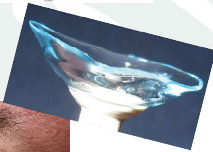
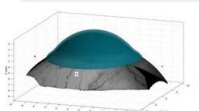
First patient examination



Smap3D Corneoscleral Profilometry

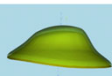
10

- Conventional approach
 - Zentlens, PROSE, Synergize
 - trial lens
 - Labor intensive, increased chair time, usually require several lens modifications
- Corneoscleral topography
 - Latitude, Europa
 - Limited by nystagmus, prominent forehead, deep set eyes
- Impression technology
 - EyePrint Pro
 - Must be able to fixate with contralateral eye during impression

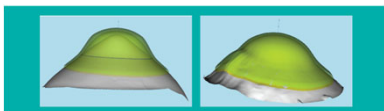


11

The science of Elevation Specific Technology



360° matching of the scleral profile



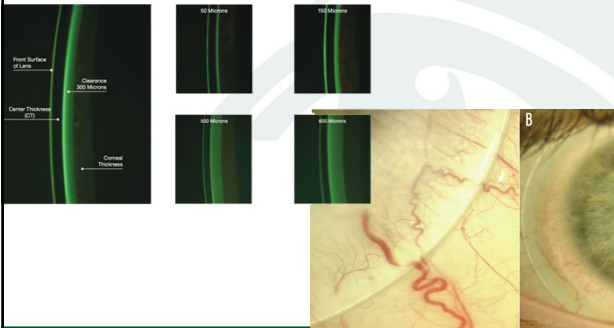
12

What am I looking for if I have a patient with a scleral lens?

- Diameter
 - Should be at least 4-5 mm larger than the horizontal visual iris diameter
- Lens should vault entire cornea
 - Important not to touch limbus
 - Limbal Stem Cell Deficiency
- Central corneal vault should be between 150-300 microns
 - Excess vault will lead to increase in lymphocytes in tear reservoir
- The edge should sit flat across the sclera and should not cause impingement/blanching or compression of the conjunctival vessels
 - Assess for edge lift
 - Use NaFl if having difficulty
- Always remove scleral lens and assess cornea and conjunctiva for NaFl staining

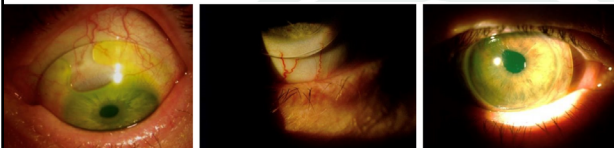
13

Assessing the fit



14

Flat peripheral alignment



15

Tight peripheral alignment



16

- Video/photo of assessing NaFl flow with a flat scleral lens edge

17

Scleral lens fitting conundrums

- Mid-day fogging
- Difficulty with lens removal
 - Very ectatic corneas
- Corneal edema
- How to avoid large anatomical boundaries
 - i.e. pterygium, blebs, large pinguecula, glaucoma drainage tubes
- small lid apertures
 - i.e. lateral tarsorrhaphy, cicatrizing entropion

18

Scleral lens Conundrum

- Mid-day Fogging
- Gradual disruption of vision requiring lens removal, cleaning, re-filling and re-insertion
- Particulate matter should be identified in fluid reservoir
 - Consider edema or pre-lens debris if no matter is identified in post lens reservoir

19



Debris in the interface

20

Why does this happen?

- Associated with poor alignment at the scleral zone
 - Assess for edge lift in particular
- Reported in an estimated 26% to 46% of SL wearers (McKinney A, et al. IOVS 2013;54(15):ARVO E-Abstract 5483)
- Increased epithelial cell sloughing
 - Natural tear film:
 - 10 μm thick
 - contains proteins, lipids, electrolytes, gases, and metabolites in a primarily aqueous solution
 - concentrated nonpolar lipids superficially reduce evaporation at the air interface

21

How to address mid-day fogging

- Assess for any degree of edge lift
 - Can use NaFI test
- Decrease overall corneal vault
 - Decrease SAG to allow for about 100 microns after hours of settling
- Change filling solution to one more parallel to the natural tearfilm
 - i.e. Nutrifil, add autologous serum to bowl, add insulin to the bowl, add amniotic fluid drop to the bowl
- Address meibomian gland dysfunction

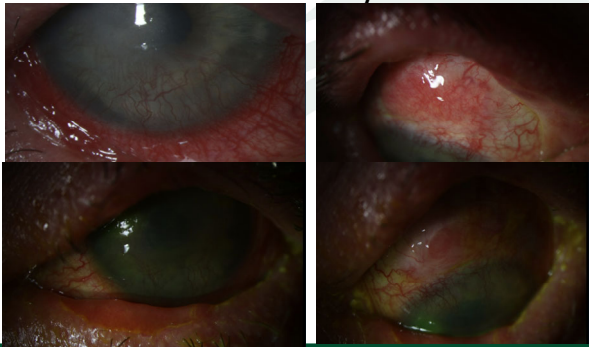
Scleral Lens Cundundrum

- Anatomical Challenges
 - Bleb
 - Glaucoma filtering tube
 - Large pinguecula or pterygium
 - Symblepharon/scarring

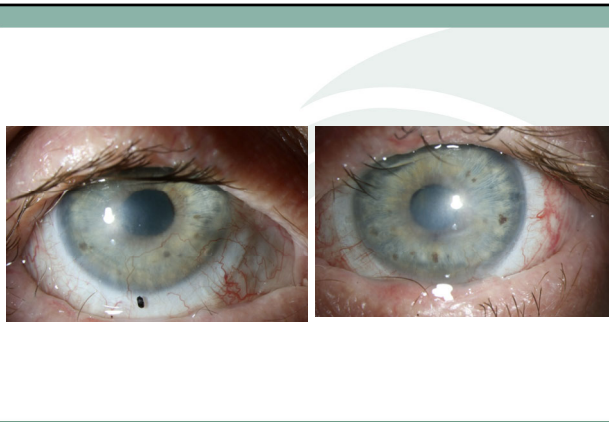
How to address anatomical boundaries

- Consider a more customizable design
 - Image-guided
 - Impression-based
- Consider microvaulting
 - Start with "3's" rule
- Consider notching

Steven Johnson Syndrome



25



26



27



28

Scleral lens fitting conundrum

- Patients can acquire corneal edema shortly after lens wear
- Should be considered if complaints sound like mid-day fogging but not particulate matter is identified in the fluid reservoir
- Most common if patient has low endothelial cell count or old corneal transplant
 - Helpful if baseline pachymetry is taken prior to lens fitting

29

How to address corneal edema

- Decrease central corneal vault
 - Bring very close to cornea after several hours of lens wear
- Change lens material to a higher Dk
 - Always consider adding Hyra-peg
 - Dk is inversely proportional to wettability
- Use one drop of hyperosmotic solution to lens bowl prior to insertion
- Add fenestration to limbal zone adjacent to area of most edema
- If all fails, consider DSEAK or DMEAK and refit

30

Scleral lens Ocular Health Conundrum

- Worsening of superficial corneal neovascularization or scarring with scleral lens wear
- May be secondary to
 - Compression of limbal zone
 - Exposure with lens removal while sleeping or if pt is inconsistent with lens wear
 - Nature of the disease process

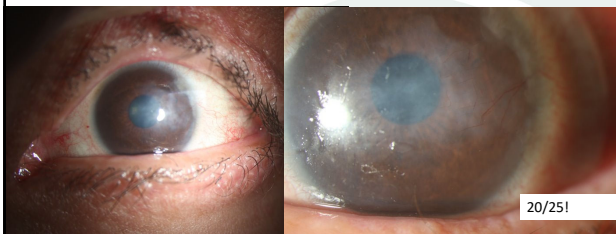
31

Lipid Keratopathy



32

Post fine needle diathermy + subconjunctival bevacizumab and subtenons Kenalog, then 1 gtt topical 1% bevacizumab into bowl of scleral lens BID. Scleral worn all day



33

5/2019: Fine Needle Diathermy, subconj Bevacizumab, superficial keratectomy, AMG

3/2020: DALK + AMG

8/2020: Recurrence of vessels argon laser photocoagulation BCVA 20/100

12/2021: CE/IOL, MMC Chemoembolization w/ mitomycin, BCVA 20/60

12/21: 20/40

3/2022: 20/50

34

> *Ocul Surf.* 2019 Jan;17(1):134-141. doi: 10.1016/j.jtos.2018.11.008. Epub 2018 Nov 20.

Long-term outcome of using Prosthetic Replacement of Ocular Surface Ecosystem (PROSE) as a drug delivery system for bevacizumab in the treatment of corneal neovascularization

Jia Yin ¹, Deborah S Jacobs ²

- Retrospective, non-comparative, interventional case series
- 13 patients
 - SJS, GVHD, PKP, LSCD, familial dysautonomia
- 1 gtt 1% bevacizumab in bowl of lens then topped with saline BID
- Follow up b/t 6 mos and 11 years
 - Mean follow up 5 years
- Mean duration of treatment 6 mos
 - Ranged from 3 mos to 10 yrs
- 92% had regression of KNV
- 77% improved vision
- KNV progressed in one eye
- No ophthalmic or systemic complications

35

20/400 → 20/30 (7 years since treatment) and no recurrence.

20/40 → 20/20 (9 years since treatment) and no recurrence.

36

> Ophthalmic Surg Lasers Imaging. 2010 Mar 9;1-3. doi: 10.3928/15428877-20100215-07.
Online ahead of print.

Corneal Melt While Using Topical Bevacizumab Eye Drops

Anat Galor, Sonia H Yoo




PMID: 20337362 DOI: 10.3928/15428877-20100215-07

Abstract

A 75-year-old man presented with an idiopathic central corneal perforation and was treated with cyanoacrylate glue and a bandage contact lens. The stromal bed healed but the patient was left with 360 degrees of corneal neovascularization. Bevacizumab eye drops (25 mg/mL) were prescribed for 1 month which caused marked regression of the blood vessels. A penetrating keratoplasty was performed and the patient continued to use the bevacizumab eye drops for 6 weeks after surgery. The patient noted decreased visual acuity 5 weeks after surgery and was found to have a melt in the stroma of the donor graft necessitating repeating therapeutic penetrating keratoplasty and Gundersen flap. This case highlights that whereas topical bevacizumab may aid in regression of acute corneal neovascularization, caution should be employed with its use in patients with a history of corneal melt.

Copyright 2010, SLACK Incorporated.

25 mg/mL = 2.5%




37

> Transl Vis Sci Technol. 2021 Jul 1;10(8):32. doi: 10.1167/tvst.10.8.32.

Effect of Bevacizumab on the Viability and Metabolism of Human Corneal Epithelial and Endothelial Cells: An In Vitro Study

Shayan Shokoohi ¹, Alfonso Iovieno ¹, Sonia N Yeung ¹

Human corneal epithelial and endothelial cell viability was unaffected up to a concentration of 2.50 mg/mL (significant decrease at 5.00 mg/mL)



38

> J Coll Physicians Surg Pak. 2019 May;29(5):430-434. doi: 10.29271/jcpsp.2019.05.430.

Efficacy of Subconjunctival Injection of Bevacizumab in Regressing Corneal Neovascularisation

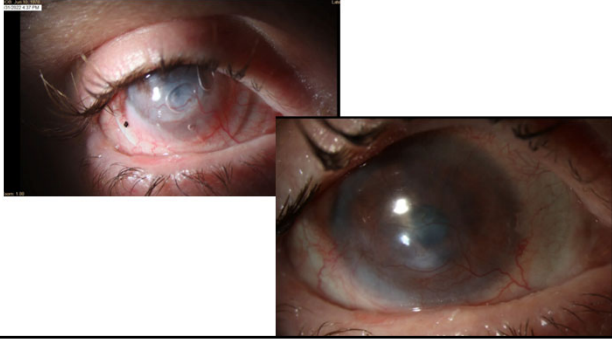
Syed Shujaat Ali Shah ¹

95 patients w/ KNV x 3 months
no history of previous or current anti-VEGF treatment
Subconjunctival injection of bevacizumab 0.05 ml (1.25 mg) was given near the limbus where maximum neovascularization was seen.
14.7% patients showed regression in corneal neovascularization.


39

Ideal fit may result of clearing of the cornea of scarring and neovascularization



40

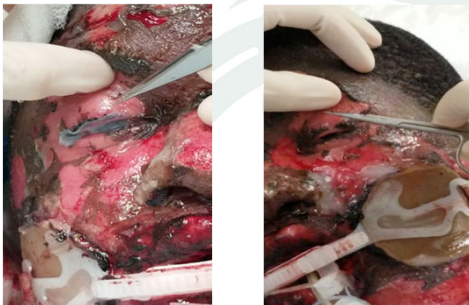
Scleral Lens Conundrum

- Infectious Keratitis
 - High risk patient
 - Poor Hygiene
 - Poor contact lens compliance



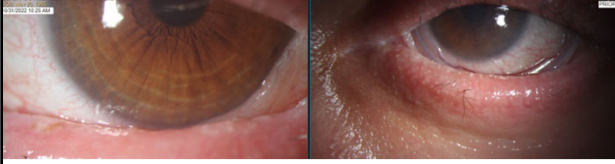
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Steven Johnson Syndrome

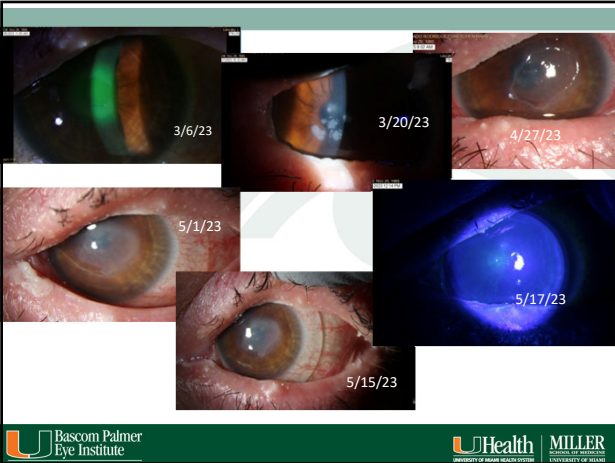


42

Steven Johnson Syndrome/TENS



43



44

Treatment of Severe Infectious Keratitis With Scleral Contact Lenses as a Reservoir of Moxifloxacin 0.5

Eduardo J Polania-Baron¹, Omar Santana-Cruz, Alejandro Lichtinger, Enrique O Graue-Hernandez, Alejandro Navas

Affiliations + expand
PMID: 32833847 DOI: 10.1097/ICO.0000000000002482

Abstract

Purpose: To report the outcomes of using scleral contact lenses as antibiotic reservoirs as a therapeutic approach in a case series of severe infectious keratitis and to discuss the clinical potential.

Methods: This was a prospective consecutive case series study of 12 eyes treated for infectious keratitis at the "Conde de Valenciana" Institute of Ophthalmology. A scleral lens (SL) filled with 0.5% moxifloxacin was used as a reservoir and replaced every 24 hours until epithelialization was complete or the culture report and/or antibiogram demonstrated either a microorganism not susceptible to or resistant to moxifloxacin.

Results: The study included 12 eyes of 12 patients (7 women; 58.33%; average age of 63 ± 20.11 years). All patients completed at least 1 month of follow-up. Patients had a diagnosis of infectious keratitis, and the SL was fitted on initial consultation. Of the 12 eyes, 7 had culture-positive bacterial infection, 2 eyes were mycotic, and 3 eyes had no culture growth. In 3 eyes, SL was discontinued because of the lack of response (one eye) and to the presence of mycotic infection (2 eyes). All infections resolved favorably at the final follow-up.

Conclusions: The use of SLs could be an alternative for antibiotic impregnation and treatment of infectious keratitis. No complications or side effects were observed related to the use of the scleral contact lens as a reservoir for the antibiotic. This treatment modality could offer a comfortable treatment for the patient, ensuring good impregnation and maintenance of antibiotic concentrations during the 24-hour wear periods.

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45

- Who can you use this on
- KCN already fit with scleral
- PKP already fit in scleral

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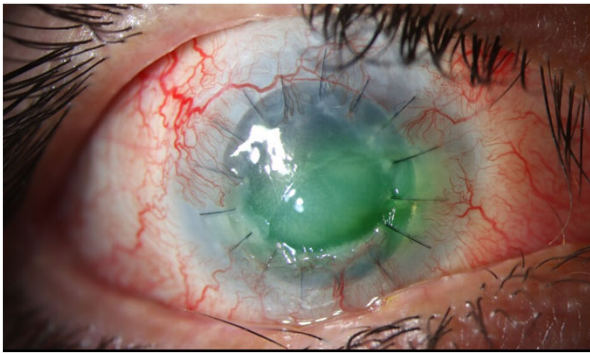
Scleral lens Conundrum

- Non-healing Corneal Epithelial Defect
- Nature of the ophthalmic condition
 - Neurotrophic keratitis
 - Limbal Stem Cell Deficiency
- Poor Scleral lens fit
 - Posterior lens touch

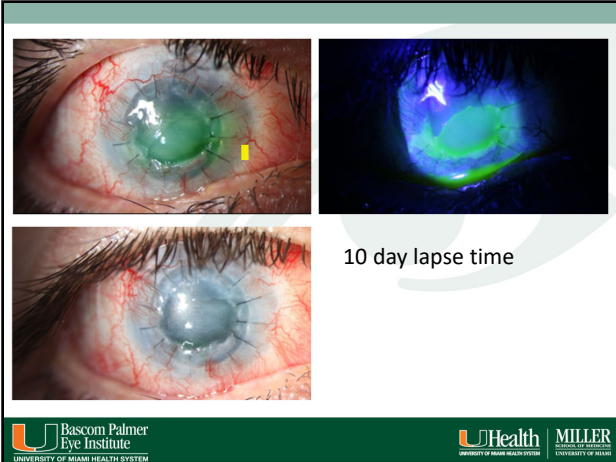


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Chemical Burn with non-healing epithelial defect



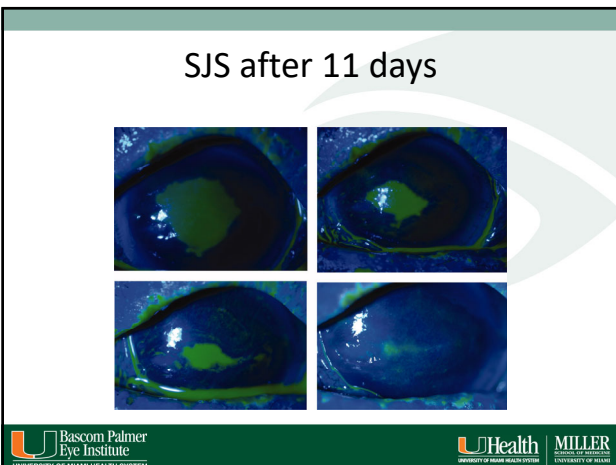
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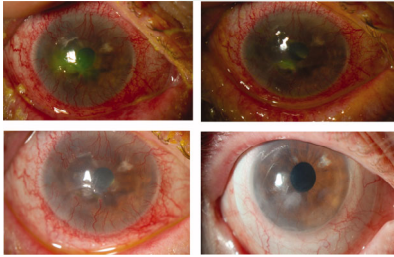


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51

GVHD after 4 days



6 mos
chronic
scleral lens
wear

Conclusion

- Scleral lenses are a great option for patients with corneal pathology with a high success rate
- Scleral lenses can be used as a novel drug delivery system
- Warrants further investigation
- Scleral lenses can offer a therapeutic option in non-healing epithelial defects, corneal neovascularization, and infectious keratitis
