Short-term and Long-term Challenges associated with Inadequate Limbal Clearance in Scleral Lens Wear

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Introduction

- Inadequate limbal clearance in scleral lens wear can lead to short-term and long-term corneal complications
- Corneal microcystic edema (MCE) and neovascularization may occur in response to corneal hypoxia secondary to a poorly fitted scleral lens and/or overwear
- Chronic damage to limbal stem cells may lead to limbal stem cell deficiency (LSCD)
- Modifying the scleral lens parameters to provide a more optimal fitting relationship is necessary to achieve resolution of complications associated with limbal touch

Case Report

A 38-year-old Caucasian female presented to clinic to order new scleral lenses.

Ocular History:

- Keratoconus diagnosed in 2000 (June 2020 Pentacam scan stable to April 2019 scan)
- History of wearing various specialty lenses
- Epithelium-off corneal crosslinking OU (OD 2012, OS 2013)

Medications:

- None

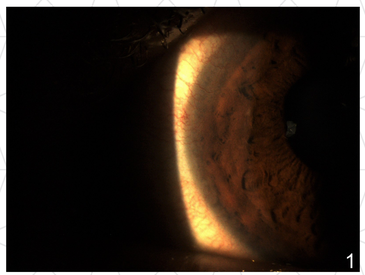
Medical History:

- Unremarkable

Entering Anterior Segment Evaluation

Significant Corneal Findings:

- **OD: Mild MCE inferiorly, mild PEE inferiorly**, stromal thinning, Vogt's striae, Fleischer's Ring
- **OS**: **Moderate MCE 360, moderate epithelial defects 360 near limbus, 1mm neovascularization 8-1:00 with whorl-staining superiorly**, mild apical haze (longstanding), 4mm superonasal subepithelial scar (longstanding), stromal thinning, Vogt's striae, Fleischer's Ring



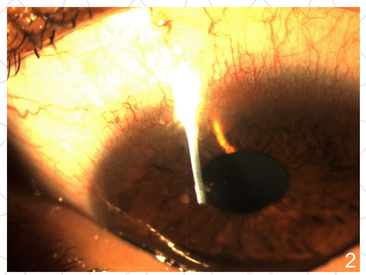


Figure 1. Left eye showing 1 mm nasal limbal neovascularization. **Figure 2.** Left eye showing 1mm superior limbal neovascularization and paracentral superonasal scarring from previous CXL.

Clinical Exam Findings

Best Corrected Visual Acuity:
(With scleral lenses)
OD: 20/20-2
OS: 20/25-2

Visual Acuity:
(With spectacles)
OD: 20/100
OS: >20/400

Posterior Segment Evaluation:
OD: Unremarkable
OS: Unremarkable

Pupils and Visual Fields:
OU: Within normal limits

Scleral Lens Modifications

Entering OS Lens Parameters: Metro Optics InSight Scleral Lens

BC:	Power:	Material:	Diameter:	CT:	Peripheral Curves:
6.25	-13.50	Optimum Extreme	15.2	0.25	9.70/0.70,10.25/0.30,12.60

Evaluation: Central clearance, limbal touch 360, haptic alignment

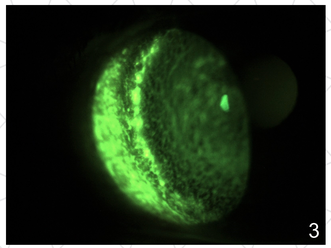
Modifications:
1. Steepen limbal and prescleral curves
2. Increase diameter by adding width to optic zone diameter and limbal curve
3. Change material from Optimum Extreme (dk = 125) to Optimum Infinite (dk = 180)

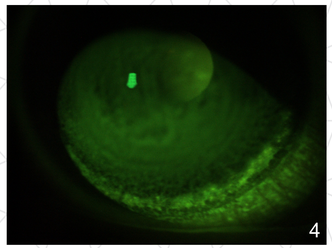
Final OS Lens Parameters: Metro Optics InSight Scleral Lens

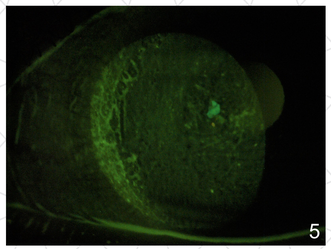
BC:	Power:	Material:	Diameter:	CT:	Peripheral Curves:
6.37	-12.50	Optimum Infinite	15.6	0.25	9.40/0.80,9.40/0.30,12.60

Evaluation: Central clearance, limbal clearance 360, thin superonasal, haptic alignment

Results: Minimal epithelial defects, but remaining neovascularization and limbal conjunctivalization







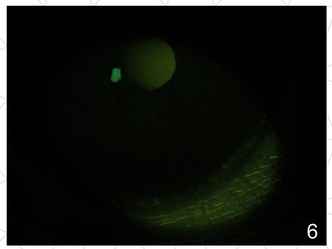


Figure 3. Left eye at initial presentation showing significant NaFl staining and MCE nasally due to scleral lens limbal touch.
Figure 4. Left eye at initial presentation showing significant NaFl staining and MCE inferiorly due to scleral lens limbal touch.
Figure 5. Left eye after scleral lens modifications showing significant improvement of NaFl staining and MCE nasally.
Figure 6. Left eye after scleral lens modifications showing significant improvement of NaFl staining and MCE inferiorly.

Discussion

Scleral lenses are corrective lenses that land on the sclera and vault the entire cornea and limbus.[4] They provide many benefits but must be properly fit to maintain adequate ocular health. For a lens with inadequate limbal clearance, several acute and chronic complications may occur.

Acute manifestations of inadequate limbal clearance:

Poorly fitted scleral lenses may lead to epithelial erosion and corneal hypoxia causing microcystic edema and peripheral neovascularization

Management: Reducing wear time and changing the lens parameters appropriately may improve or resolve the condition. Appropriate lens modifications include steepening the limbal curve, widening the limbal curve width, increasing optic zone diameter, and selecting a higher dk material.

Chronic manifestations of inadequate limbal clearance:

Limbal bearing causes mechanical trauma to limbal stem cells. Chronically, this may disrupt the limbal stem cell niche and lead to LSCD. This condition is characterized by conjunctivalization, neovascularization, and scarring.

Management: Close monitoring with ophthalmology and properly fitting scleral lenses to slow or prevent progression.[2] Other treatments for LSCD include palliative treatment for the ocular surface, anti-inflammatory agents, and/or amniotic membranes, autologous serum tears. In severe cases, limbal stem cell transplantation may be considered.[2]

This patient's ocular health improved significantly after the scleral lens modifications. However, because mild LSCD remained OS, she was referred for a more customized scleral lens with EyePrint. She was also referred to a corneal specialist to co-manage her LCSD.

Clinical Pearls

- Microcystic edema and limbal staining are early hallmark signs of inadequate scleral lens limbal clearance
- Patients may develop LSCD secondary to chronic limbal bearing of a scleral lens
- Prompt modification of scleral lenses to address inadequate limbal clearance is essential to prevent complications to the patient's ocular health

References

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