Process and Outcomes of Fitting Corneoscleral Profilometry-Driven Scleral Lenses for Patients with Ocular Surface Disease

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INTRODUCTION

Integrating custom technology with lens fabrication has been proposed to reduce chair time by eliminating the trial-and-error involved in the traditional approach to diagnostic scleral lens (SL) fitting[1].

Purpose: Assess the feasibility of obtaining corneoscleral profilometry measurements using the Cornea Scleral Profile (CSP) module on the Oculus Pentacam and report on the lens design and fitting process of image-guided, custom SLs.

METHODS

Study Design

- IRB approved, prospective study
- Consecutive patients being fit with SLs at the Illinois Eye and Ear Infirmary were identified as potential participants

Data Collected

- Indication for lens use
- CSP scan acquisition process, ie. scan duration, # of clinicians required for imaging, number of scans taken
- Topographical information from the CSP report Scleral lens fitting process, ie. number of office visits required, number of lenses ordered, reason for lens remake

Statistical analysis

- Descriptive statistics reported

RESULTS

Ocular surface disease was the indication for SL wear for all patients

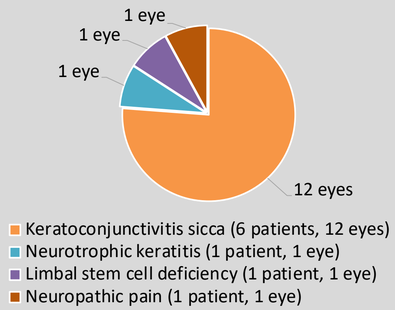
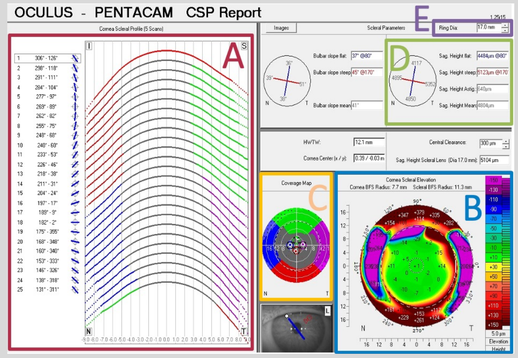


Figure 1. Pentacam CSP report



Printout showing **(A)** scans in 25 directions, **(B)** elevation map of the corneoscleral elevation, **(C)** scan coverage map for the data collected, **(D)** minimum and maximum sagittal heights for a **(E)** specific chord lengths (can be adjusted).

1. Scan Acquisition

- 9 patients (15 eyes) were scanned
- A single clinician alone was able to acquire scans
- Mean total scan time per eye:
  - OD: 10.7 ± 6.5 minutes (range 4 to 19)
  - OS: 9.7 ± 4.7 minutes (range 3 to 15)
- All eyes required manual lid retraction to obtain adequate superior and inferior scans
- Most common imaging errors: lid closure/blinking and unsteady fixation

2. Lens Ordering

- A diagnostic BostonSight SL was placed on the eye for over-refraction following imaging
- SL diameter selected based on practitioner experience, taking into account the data coverage map (Figure 1, C)
- BostonSight Smart360 image-guided SLs were ordered for 9 patients (14 eyes)
  - For 1 eye of 1 patient, lens could not be ordered due to insufficient data

3. Lens Fitting

- Fitting completed for 8 patients (13 eyes)
  - 1 patient (1 eye) was unable to tolerate scleral lens wear and fitting not completed
- Initial lens ordered for 7 eyes provided adequate central corneal fluid reservoir, limbal clearance, scleral landing zone alignment, and visual acuity
- Reasons for deferring initial lens dispense for the remaining 6 eyes included:
  - poor scleral landing zone (5/6 eyes)
  - excessive central corneal fluid reservoir (4/6 eyes)
  - poor visual acuity requiring refractive power change (2/6 eyes)

Topographical Data			
Mean Corneal Astigmatism (in diopters)	0.98 ± 0.88		
Mean Horizontal Visible Iris Diameter (in mm)	11.6 ± 0.4		
Mean Scan Coverage Area (in mm)	17.30 ± 0.26		
Mean Scleral Toricity at 3 Chord Lengths (in um)	15mm	16mm	17mm
	136.71 ± 132.96	208.64 ± 157.92	308.86 ± 175.40

Lens Fitting Data		
Mean SL Diameter (in mm)	17.75	
Mean # of Lenses Ordered	OD	OS
	2.14 ± 1.21	2.11 ± 1.17
Mean # of Visits	2.88 ± 1.31	
Mean Fitting Duration (in days)	71.44 ± 37.51	

DISCUSSION

- Despite using CSP data to design an initial image-guided SL, the # of lenses ordered, # of visits, and fitting duration to reach fit completion were consistent with current data[2,3] on the traditional, diagnostic approach to SL fitting.
- Existing customizations (ie. toric or quadrant-specific landing zones), available in standard lenses may be adequate to fit most eyes without using advanced imaging technology
- Eyes with highly irregular scleras secondary to conjunctival topographical abnormalities that cannot achieve success with standard scleral lenses may benefit from image-guided or impression-based SL designs[4,5]

CONCLUSION

In this series, there were no appreciable differences in efficiency of CSP-guided lens fitting and diagnostic SL fitting. However, comparisons between the two when fitting very complex ocular surface topographies may reveal greater differences in efficiency.

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