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## PURPOSE

Scleral lenses are unique in their ability to maintain a post-lens fluid reservoir. However, the depth of that reservoir may change with wear. A significant reduction in lens clearance after evaluation may compromise the cornea.

In this study, we examined the change in spacing between the lens and cornea during the first two hours of wear.

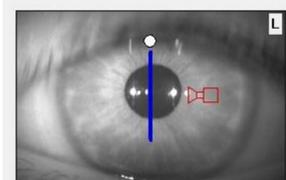
## METHODS

### Subjects

- 13 healthy subjects (4 men, 9 women)
- 22 to 44 years old ( $30 \pm 8$  years, mean  $\pm$  SD)
- Normal eye exam, no history of eye disease
- Refractive correction +0.25 to -3.50 D
  - ❖ Mean spherical equivalent: -1.50 D
  - ❖ Less than 1.50 D of cylinder
- History of contact lens wear
  - ❖ 5 subjects: no previous contact lens wear
  - ❖ 8 subjects: current soft lens wearers
- No contact lens wear the day of the study

### Study Design

- One eye of each subject randomly selected for scleral lens wear
- Lens selected from 15-mm Jupiter Scleral diagnostic fitting set (Visionary Optics, Front Royal, VA) to fit with an estimated 200-300  $\mu$ m central corneal lens clearance
- Lens placed on eye by investigator
- Image of lens on eye recorded by Pentacam (OCULUS Optikgeräte GmbH.)
  - ❖ Within 5 minutes of lens placement
  - ❖ After 2 hours continuous lens wear

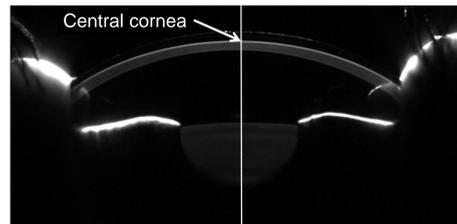


**Figure 1.** 15-mm Jupiter scleral lens on cornea. Vertical Scheimpflug images (blue line) were analyzed to estimate space between the lens and cornea.

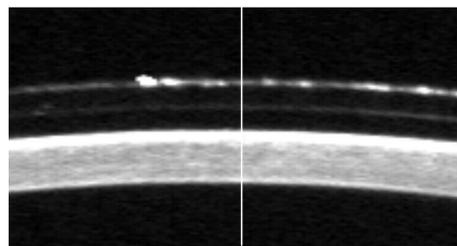
## METHODS

### Measurements at 5 minutes and 2 hours

- Recorded 2 to 3 examinations with Pentacam.
- Posterior surface of lens and anterior cornea surface were identified in vertical Scheimpflug images from two examinations (Figure 2).
  - ❖ Position of the central cornea was identified by using the pupil margins and the crystalline lens as landmarks (vertical white line, Figure 2).
  - ❖ Zoom and contrast were adjusted to enhance surfaces (Figure 3).



**Figure 2.** Scheimpflug image from vertically oriented scan.



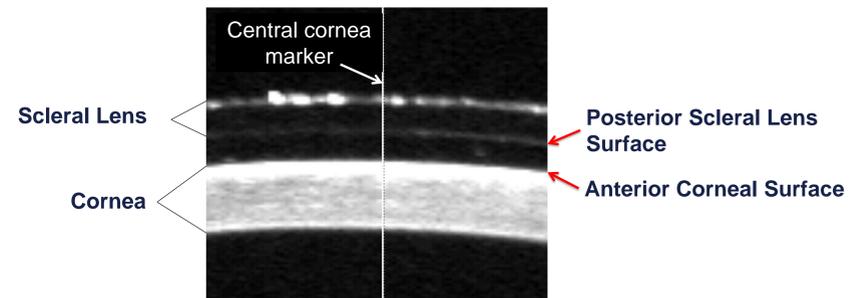
**Figure 3.** Cornea and scleral lens (after zoom and adjusted contrast).

- The distance from the central corneal surface to the lens was measured within 200  $\mu$ m of the corneal center by using the caliper tool in the Pentacam software (Figure 4).
- The mean clearance from two images was recorded.

### Statistical Analysis

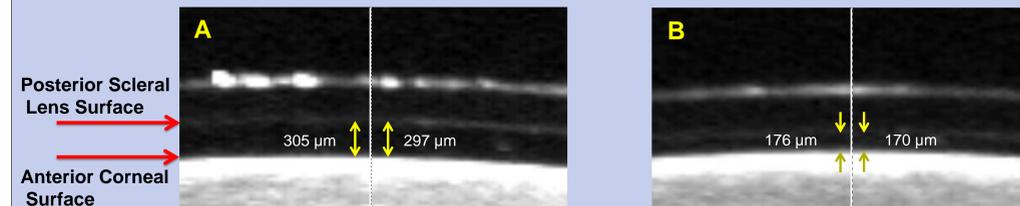
The central corneal clearance at two hours was compared to the initial clearance by using a paired t-test.

## RESULTS



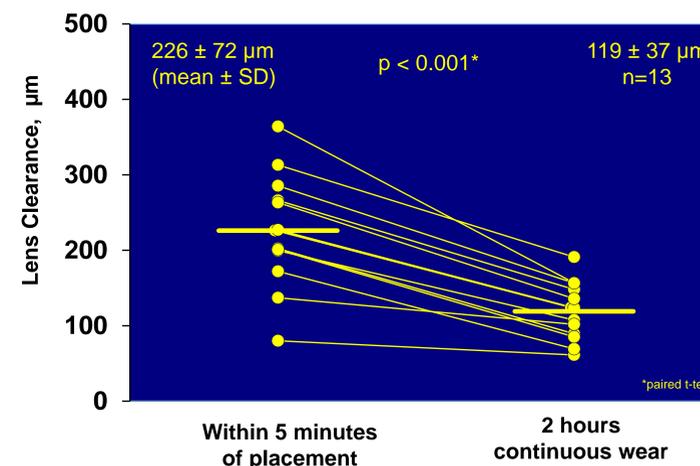
**Figure 4.** Enhanced Scheimpflug image. Lens clearance was measured from the posterior surface of the scleral lens to the anterior surface of the cornea.

### Example of Scleral Lens Clearance after Two Hours of Wear



**Figure 5.** A. Example of clearance immediately after placing scleral lens. B. The same lens 2 hours after continuous wear. Clearance decreased from an average of 301  $\mu$ m to an average of 173  $\mu$ m in this example.

### Reduction of Scleral Lens Clearance after Two Hours of Wear



**Figure 6.** Mean lens clearance decreased by 107  $\mu$ m at two hours after lens placement, 50% of the initial clearance. The change in clearance of individual lenses varied from 19  $\mu$ m to 207  $\mu$ m.

## CONCLUSIONS

- 15-mm scleral lenses settle by 50% after two hours of continuous wear.
- Adequate time must be allowed to let the lens settle on the eye before making an accurate assessment of the fit.
- Excessive settling of the lens could greatly reduce the fluid reservoir volume and increase contact with the cornea. This would limit the value of using these lenses in patients with severe ocular surface disease.
- The time required for adequate lens settling has yet to be determined.

## SUPPORT



## DISCLOSURE

None (All Authors)