CLINICAL GUIDE FOR SCLERAL LENS SUCCESS

AILeS Accademia Italiana Lenti Sclerali

Scleral | Scleral Lens Education Society

1 Total Diameter Selection

The total diameter (TD) of a scleral lens depends significantly on the horizontal visible iris diameter (HVID) and the landing zone width (Figure 1) and may be calculated following this formula:

TD = HVID + limbal zone width X 2 + landing zone width X 2 + last peripheral zone width X 2

- Corneal zone:
  - The width of this zone is determined by the HVID.
  - When the limbus exhibits a pronounced oval shape, also consider the vertical visible iris diameter (VVID) (Figure 2).
  - The optical zone should cover the entire dilated pupil in scotopic vision, taking in consideration lens decentration.
- Limbal zone: The width of this zone is typically about 1.00mm.
- Landing zone: The extension of this area may range from roughly 0.80-3.00mm. It depends on several factors and is larger in cases with:
  - High corneal sagittal height,
  - Therapeutic indications,
  - Discomfort caused by conjunctival compression/impingement.
- Last peripheral zone: The width of this zone may range from 0.20-0.40mm.

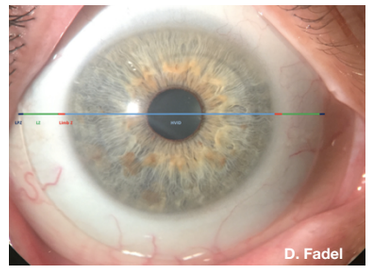


Fig. 1: Scleral lens TD parameters. HVID: Horizontal visible iris diameter; Limb Z: Limbal zone; LZ: Landing zone; LPC: Last peripheral curve.

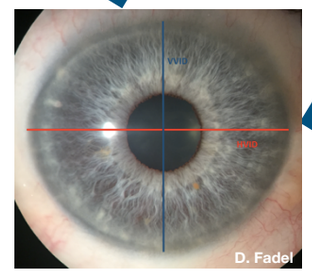
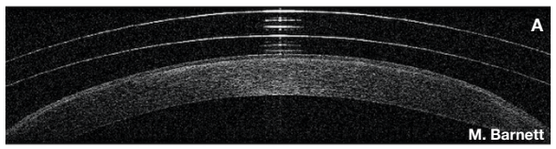


Fig. 2: HVID and VVID are significantly different.



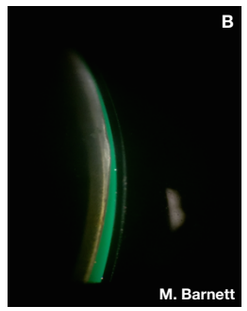


Fig. 3: Evaluation of corneal central clearance. A: Using an OCT. B: Using a slit lamp.

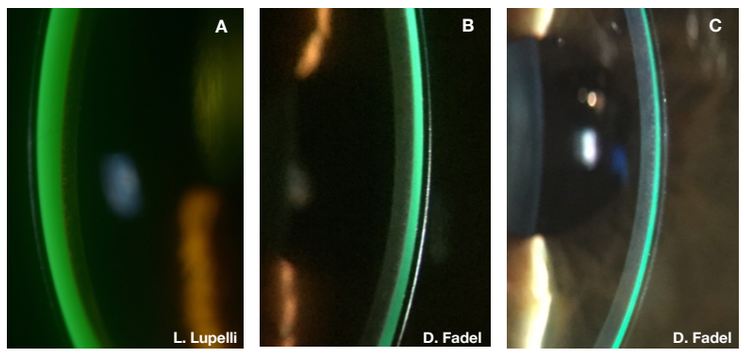


Fig. 4: Evaluation of corneal central clearance. Post lens fluid stained with fluorescein A: Excessive clearance . B: Moderate clearance. C: Good clearance.

2 Corneal Central Clearance

- Central clearance thickness may range from 200-300µm before lens settling and 50-250µm after lens settling.
- The amount of settling depends on individual variance and it may be up to 200µm. 80% of settling occurs during the first 4 hours.
- In eyes with keratoconus, consider an additional 100µm to avoid corneal apical touch in case of possible future progression of the ectasia.
- Evaluate the clearance at lens application, after 4 hours and one to two weeks, after months, and at every follow-up visit.
- The evaluation of corneal clearance may be performed using:
  - Ocular coherence tomography (OCT): with the lens fit on the eye, measuring the height of the post lens fluid layer (Figure 3A).
  - Slit lamp: with the slit beam rotated approximately 45 degrees, comparing the thickness of the fluid with the known scleral lens thickness (Figure 3B). Staining the post lens fluid with fluorescein prior to lens application will facilitate its observation (Figure 4). A useful tool for clearance evaluation is the Michigan College of Optometry Scleral Lens Fit Scale.

3 Peripheral Corneal Clearance

- Peripheral corneal clearance may be regulated changing the base curve of the lens.
- Consider that modifying the base curve of the lens will influence the lens sagittal height.

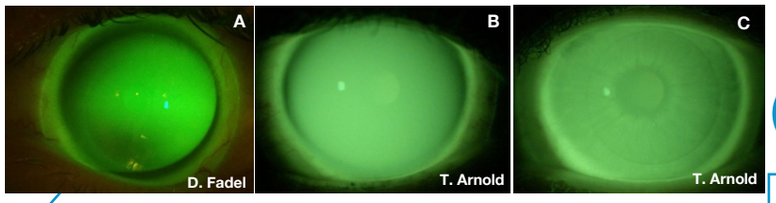


Fig. 6: Evaluation of limbal clearance. A: Inadequate limbal clearance; excessive limbal touch. B: Acceptable limbal clearance; moderate limbal touch horizontally. C: Good limbal clearance; without limbal touch.

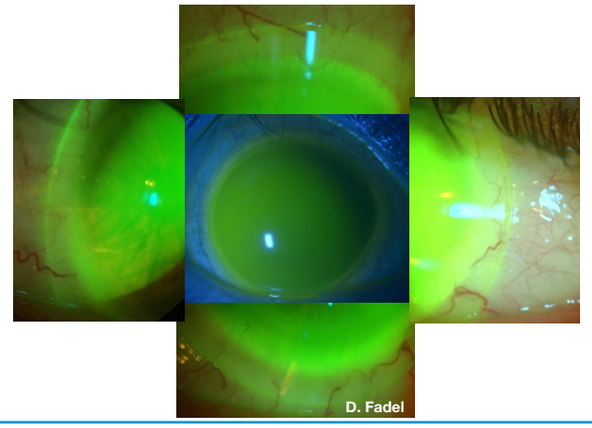


Fig. 5: Evaluation of limbal clearance in the 5 directions of gaze.

4 Limbal Clearance

- The amount of limbal clearance depends on the scleral lens TD and is higher in larger lenses. Generally it is about 60-80µm.
- Limbal clearance should be verified in the 5 directions of gaze (Figure 5).
- Reduced limbal clearance is recommended (Figure 6). Reducing the tangential angle or choosing the base curve value flatter than the flattest keratometry reading may alleviate the pressure in the peripheral and limbal area.

5 Landing Zone

1. Spherical
   - Small scleral lenses, having a TD less than 15.00mm, may be fit spherical and often avoid the interaction with a toric and/or asymmetric sclera.
   - Circumferential conjunctival blanching is caused by a landing zone which may be too steep, too flat or from excessive lens pressure on the conjunctiva.
   - Modifying the angle or curvature in this area, reducing the lens sagittal height or increasing the landing zone width may be beneficial.

2. Toric or asymmetric
   - Fitting a spherical lens on a significant toric or asymmetric sclera (≳ 100µm), the lens will touch the conjunctiva in a meridian, or area, and will lift in the opposite area.
   - A significant toric or asymmetric sclera needs a toric lens or a quadrant specific lens design.
   - Scleral toricity may be detected by OCT or scleral topographer. It is also possible to assess scleral toricity by observing the scleral lens fitting with the slit lamp:
     a) Fitting a spherical scleral lens and observing the clinical signs:
        - Sectorial blanching (Figure 7).
          - The occurrence in the horizontal meridian means that the sclera presents with-a-rule toricity.
          - It may also be present in a single quadrant, the flattest quadrant.
          - The amount of blanching is directly proportional to the amount of scleral toricity.
          - Blanching may be present in a different area of the landing zone, the inner area near the limbal zone.
          - Rebound hyperemia may occur after lens removal in an area where the landing zone restricts the blood vessels (Figure 8).

        - Lens impingement of the conjunctival tissue.
          - When the lens edge is too steep, impingement into the conjunctiva will occur in the flattest meridian or area.
          - At lens removal, arcuate conjunctival staining will appear (Figure 9).

        - Excess edge lift-off.
          - Lens edge may lift-off in the steeper meridian or area showing scleral toricity or asymmetry.
          - Mild fluorescein stained tear pooling may show underneath the lifted edge (Figure 10).
          - Steepening the lens edge in the area where it is lifting may be necessary to decrease edge lift and increase comfort.

        - Fluorescein influx into the fluid reservoir.
          - Apply fluorescein dye into the eye to determine the location and amount of scleral toricity during a spherical scleral lens fit or to increase scleral lens toricity.
          - The pathway occurs in the steeper meridian where the lens is lifted off (vertical, if the sclera exhibits with-a-rule toricity).
          - The higher the influx, the higher the scleral toricity (Figure 11).

     b) Fitting a toric scleral lens.
     Toric scleral lenses are distinguished with a laser mark or black dot.
        - Rotate the toric scleral lens with a finger. The recovery of its initial position indicates a toric sclera.
        - Rotate the beam of the slit lamp to the laser marks to determine the axis of the meridian (Figure 12).

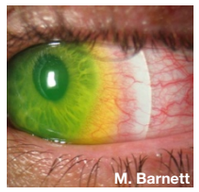


Fig. 7: Sectorial blanching.

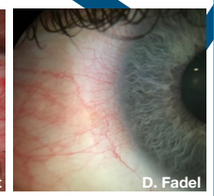


Fig. 8: localized hyperemia.

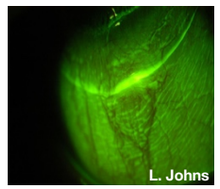


Fig. 9: Arcuate conjunctival staining.

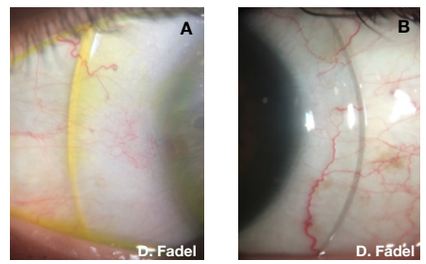


Fig. 10: Edge relationship. A: lifted edge. B: good edge alignment.

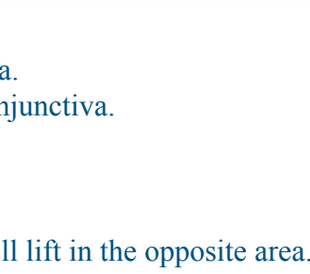


Fig. 12: Rotation of the slit lamp beam to determine the axis.

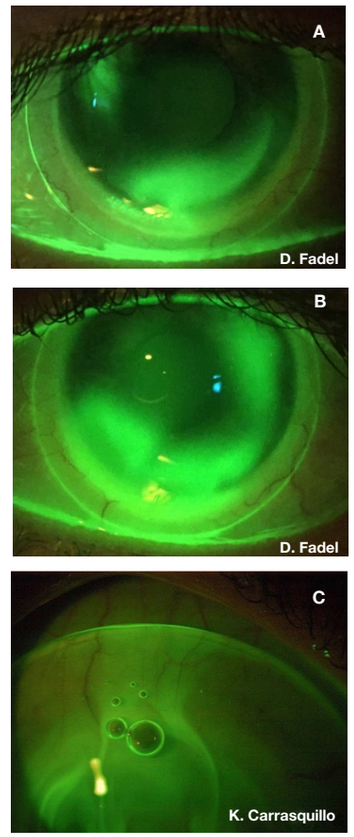
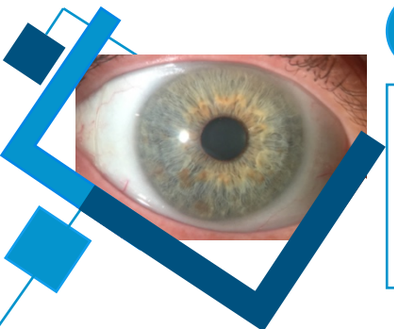


Fig. 11: Influx of the fluorescein into the reservoir.
A: Mild influx.
B: Moderate influx.
C: Excessive influx with bubbles.

- If scleral toricity is evident, indicate the meridian where clinical signs occur or indicate the axis that is identified with a toric lens.
- If more than one quadrant needs to be modified, steepen and/or flatten another quadrant.
- The modification of the landing zone influences the lens sagittal height which will need to be adjusted.



6 Over-refraction

- Over-refraction should be performed before ordering the lens (at lens settling and after one week).
- If a toric over-refraction is evident, it may be due to internal lens astigmatism, scleral lens decentration or scleral lens flexure on the eye.
- Topography or keratometry may be used over the scleral lens to detect lens distortion. When the anterior surface of the lens shows toricity, the lens is flexing.
- Inform the lab if over-refraction was vertexed.
- If the laser mark on the lens does not match with the axis of the over-refraction, than calculate the axis to order following the left add/right subtract (LARS) technique.

Adapted from “Clinical Guide for Scleral Lens Success”, Melissa Barnett & Daddi Fadel.