Aspheric Optics in Scleral Lenses for Normal and Diseased Eyes

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Course Description:

This course will discuss aspheric optics can be used in scleral lenses order to improve the visual quality and quantity of those with regular and irregular astigmatism.

Learning Objectives:

- 1. Learn how to create asphericity in normal corneas and its importance.
- 2. Understand the benefits of adding eccentricity to scleral lenses in improving vision for patients with corneal irregularities such as keratoconus.

Outline:

I. Introduction

- Definition of aspheric optics
- Importance of asphericity for high astigmatism and presbyopic correction in scleral lens optics
- Importance for asphericity in diseased eyes

II. Asphericity and its components

- Definition of asphericity (Q)
- Eccentricity (e) and shape factor (q) as components of asphericity

III. Understanding Corneal Shape

- Normal Corneal shape and its asphericity
 - a. Description of corneal shape as a concoid ellipse
 - b. Eccentricity value of the cornea (~0.55)
 - c. Aspheric (Not a Sphere)
 - i. Derivative of Shape Factor and Eccentricity
- Irregular Cornea
 - a. Prolate
 - i. Keratoconus
 - ii. PMD
 - iii. Keratoglobus
 - iv. Secondary ectasias
 - b. Oblate
 - i. Post Refractive Surgery
 - ii. Post keratoplasty
- Normal Cornea Correction with Aspheric Optics
 - a. High Astigmatism
 - b. Presbyopia
- Irregular Cornea Correction with Aspheric Optics
- Considerations for aspheric correction with Other Ocular Disease States Posterior to Cornea
 - a. Cataract
 - b. Central Retinal Disease
 - i. Macular Degeneration
 - c. Peripheral Retinal Disease
 - i. Glaucoma

IV. Asphericity for multifocal correction in scleral lenses

- Adding asphericity to create multifocal correction for presbyopia
- Value of eccentricity for creating add power
- Center near multifocal design and its effect on accommodation and miosis

V. Literature review on eccentricity values in scleral lenses

- Effect on vision in patients with irregular astigmatism
- Findings on the effectiveness of different amounts of eccentricity in scleral lens optics
- Comparison between high-order aberration, baseline, and over the scleral lens
- Correlation between corneal irregularity and effectiveness of asphericity in improving vision

VI. Case study on the use of eccentricity in scleral lenses

- Description of cases with corneal irregularity
 - Keratoconus
 - Secondary to limbal stem cell deficiency
- Improvement in vision with the use of a certain amount of eccentricity in a scleral lens design
 - \circ Discussion on the findings

VII. Lens Centration Features

- Impact of lens decentration with aspheric scleral lenses
- Methods to measure the decentration of the optic zone
- Decentration of optic zone for better performance

VIII. Conclusion

- Importance of asphericity in improving vision in patients with normal corneas and those with corneal irregularity
- Potential for further research and development in the use of aspheric optics in corrective lenses.