When is a Toric Orthokeratology Lens Design Indicated?

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Introduction

The success of Orthokeratology (OK) treatment is dependent upon the maintenance of the tear reservoir beneath the reverse curve of the lens. Fluid channels are often present when spherical OK lenses are placed on toric corneas. This indicates an incomplete seal along the steep meridian of the cornea.

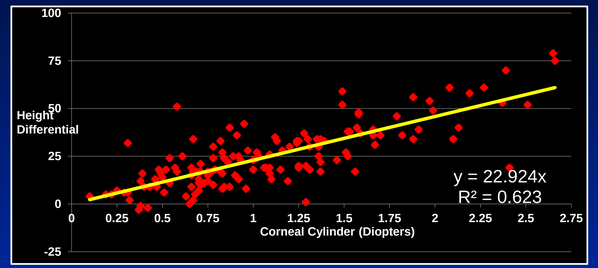
In these cases, a back surface toric OK lens (deeper tear reservoir and steeper alignment curve) are used to create an appropriate "seal off" in the steep meridian (often 12 and 6 on a WTR cornea). The question then becomes, "who needs a toric OK lens?"

Traditionally, keratometry values (corneal cylinder >1.25 D) were used to determine toric OK lens candidacy. More recently, height differential (corneal height difference between the steep and flat corneal meridians) has become the "gold standard" measurement to determine when a toric lens is appropriate. The goal of this study was to examine the relationship between corneal cylinder and height differential.

Methods

73 subjects (146 eyes) were retrospectively analyzed using the Medmont E300 corneal topographer. Sim K values were collected on both the steep and flat corneal meridians. Corneal height values were collected on both the steep and flat meridians as well. Corneal cylinder (determined by sim K values) was compared the height differential of the cornea at a chord of 8 mm (typically where the lens lands along the steep corneal meridian).

Results



Corneal height differential is significantly correlated with corneal cylinder. On average, 1.00 D of corneal cylinder is equal to approximately 23 microns of height differential.

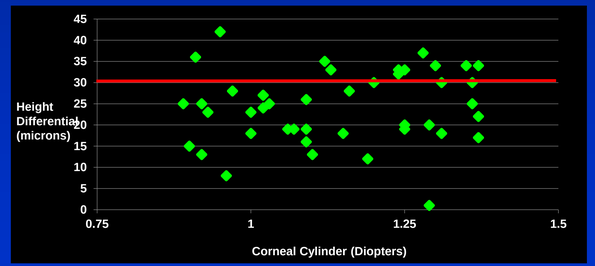


Figure 3 shows the 44 eyes with corneal cylinder between 1.00 and 1.25 D. 32 percent of eyes (14 eyes) had a height differential of 30 microns or greater.

Results (continued):

Corneal Cylinder	% of eyes >30 microns of Height Differential
Low ≤0.75 D	8%
Mid : -1.00 to -1.25 D	32%
High:≥-1.50 D	87%

Discussion:

Clinic experience has demonstrated that when a spherical OK lens is fit on a corneal with a 30 micron height differential or less, an adequate seal is created along the steep meridian. However, when the height differential is greater than 30 microns, fluid channels along the steep meridian are present. This indicates a toric OK lens is required.

Using 30 microns as our cut off value, our data indicate that roughly:

- 10% of patients with ≤0.75 D of corneal cylinder require a toric OK design
- 90% of patients with ≥ 1.50 D of corneal cylinder require a toric OK design
- 33% of patients with 1.00 - 1.25 D of corneal cylinder require a toric design

This study illustrates the importance of corneal topography in OK fitting. Corneal height differential is the most critical measurement for determining when a toric OK lens may be indicated. Our data indicate that for patients with 1.00 to 1.25 D. of corneal cylinder, there is no accurate way to determine if toric design is required based solely on K readings. In one of our previous height differential studies, we observed that 52% of individuals <16 years of age required a toric OK lens designs.