Fitting Keratoconic Patients with Rigid Gas Permeable Contact Lenses Using Topography

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ABSTRACT: PURPOSE: This study measures the accuracy fitting keratoconic patients with rigid gas permeable (RGP) contact lenses using topography. METHODS: The desired end point for fitting these lenses is a three-point-touch pattern. The values from topography were taken from the yellow values and compared to the base curve of the lenses determined by fitting with a trial lens set. RESULTS: When compared to the base curves of RGP lenses fit by trial, the lenses fit with topography showed no significant statistical difference. CONCLUSION: Topography is a useful tool helping with the initial base curve selection when fitting keratoconic patients with contact lenses, although the lenses must be fit and evaluated on an individual bases.

PURPOSE: The purpose of this study is to determine the clinical feasibility of using corneal topography in the fitting of rigid gas permeable (RGP) contact lenses with keratoconic patients. Although the exact cause of progressive ectasia of the cornea in keratoconus is not known, we do know that the progression of keratoconus leads to an uncorrectable, decrease in vision.[1] The decreased vision is due to the thinning, scaring and increased irregularity of the cornea. We also know that the best modality for vision correction of an irregularly shaped cornea is via a RGP contact lens. The RGP allows for tears to fill in behind the lens creating a more regular interface for light rays to refract.

METHODS: Since we know which modality is indicated for the correction of irregular, keratoconic corneas, now the challenge is getting one to fit. With the steepening of the cornea (the cone) the fit of an RGP lends unique criteria. Historically RGP lenses were fit extremely flat with the thought that the lens may help decrease or slow the progression of the cone. This seemed to cause only discomfort, scarring and a subsequent decrease in vision. One current thought is to provide three-point-touch with a well centered lens without bubbles. According to the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) study, which compared RGP contact lenses fit with slight apical touch to those with minimal apical clearance, there was no significant increase in the incidence of scaring with a lens fit with slight apical touch.[2] Aided by the use of fluorescence dye, the pattern of tears for a three-point-touch show slight touch centrally on the cone with two other points of mid-peripheral bearing and adequate (.5 to 1mm) edge lift, hence the tree-point fit.[3]

To determine the effectiveness of fitting keratoconic lenses using topography as the guide this retrospective study of 17 keratoconic patients evaluates 29 lenses fit with a trial set compared to what would be ordered empirically using topography. The "yellow rule" was used for determining the initial base curve. Topographies were taken with a Humphries topographer ATLAS Version A12 using a normalized scale and taking the dioptric value of the lower limit of the yellow value from the axial map.

RESULTS: Resulting base curves are as fallows:

Trial Fit Values	Calculated from Topography
6.80	6.70
7.50	7.50

7.30	7.20
7.10	6.90
6.80	6.80
6.90	7.00
7.45	7.60
7.00	6.75
6.90	7.12
6.70	6.90
6.35	6.25
6.13	6.10
6.75	6.75
7.00	7.05
6.75	6.65
7.14	7.28
7.25	7.35
6.49	6.38
6.49	6.30
6.05	6.00
6.35	6.31
6.50	6.49
6.49	6.50
6.80	6.78
6.50	6.60
7.90	8.06
7.40	7.40
6.10	6.10

Upon statistical analysis the data yields no statistical difference (P = .9126 paired two sample t-Test).

CONCLUSIONS: When fitting any RGP lens many practitioners rely on the consultation departments of their contact lens labs. One consultation department in particular relies on topography for the initial lens selection when fitting keratoconic patients for her customers. According to this lab the theory was developed about eight years ago while putting together a lecture. Noticed was the fact that the base curves of the lenses fit fell within the yellow values on topography. Now the consultation department uses this "tried and true" method for designing their lenses. The topographical analysis is done from the axial map with a normalized scale. The dioptric value is taken from the value at the lower end of the yellow values and the higher end of the lime green. This lab uses their own overall design in which the optic zone diameter is equal to the base curve and the overall diameter typically runs small (approx. 8.5mm). According to the lab, "…topography will provide a better starting point than central keratometer readings due to the inability of the keratometer to pick up the curvature at the apex of the kone."[4] While this method of fitting these lenses is tried and true, no formal study has been preformed.

Just looking at the raw data it is reasonable to believe that this is a viable method for determining the initial base curve to use when selecting an RGP for keratoconic patients. While the statistical analysis tells us that the numbers are not significantly different, a clinician knows there is a significant difference. In just over half of the cases demonstrated here there is a difference between the lens ordered empirically and the lens fit by trial and the difference is significant. On the other hand those who fit these lenses everyday, like a consultation department, use and are successful fitting lenses with this method. Factors that must be taken into consideration when ordering a lens in this fashion include not only the initial base curve but the overall design of the lens, which this study did not take into account. The type of topographer being used and the person doing the testing and calculations may also account for differences. You must remember too that the type of fit this study aimed for is that of a three-point-touch, some practitioners may feel that a lens demonstrating minimal apical clearance is more appropriate.

Topography is a very useful tool not only to diagnose and fallow corneal changes but to aid in the fitting of contact lenses. While the topographic map of a cornea can help us fit lenses to keratoconic eyes, and possibly even other irregularly shaped corneas, the lenses still needs to be put on the eye and an evaluation of the tears beneath the RGP lens is necessary. At this point adjustments can then be made. In some cases the experienced practitioner may still desire the use of trial lenses from a fitting set. In other cases ordering the lenses through a labs consultation department should allow most practitioners the ability to successfully fit patients with keratoconus. Meeting the needs of these challenging patients, by any method, is well worth the time and effort.

References

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