Evaluation of Soft Lens Fit in Relation to Corneal Topography

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Introduction

The traditional approach of selecting soft lens base curves based on keratometry (i.e. central corneal curvature) has largely been discarded. The ocular profile and sagittal height is dependent on a number of additional parameters such as corneal asphericity and corneal diameter.[1,2] With the widespread use of corneal topographers, the question arises whether the information provided by these instruments can be used to predict the fit of soft contact lenses?

Purpose

To determine which ocular topography variables affect soft contact lens fit.

Methods

- Fifty subjects each wore three soft lenses in random succession:
  Vistakon ACUVUE® *2* [A2],
  Vistakon ACUVUE® *ADVANCE*™ [AA]
  Ciba Focus® NIGHT & DAY™ [N&D])
- The steeper base curve (BC) of each type was worn in one eye and the flatter base curve in the other eye.
- Corneal topography data were collected using a Medmont E300 corneal topographer (Camberwell, Australia):
  Central corneal curvature (CC), K-reading (K), corneal shape factor (SF), corneal height (CH) measured over a 10mm chord and also maximum measurable diameter. These were measured in the horizontal (h), vertical (v), steepest and flattest meridians – see Fig. 1.

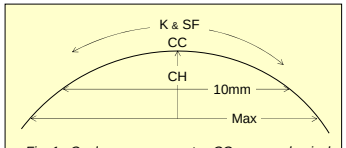


Fig. 1: Ocular measurements: CC = corneal apical radius; K = K-reading, SF = shape factor; CH = corneal height

- Various aspects of lens fit were evaluated: vertical & horizontal centration (mm), post-blink movement (mm), tightness on push-up (0-100), overall fit acceptance (0-5).
- Spearman's rank correlation coefficient was used to test for associations between lens fit and ocular variables. A *P*-value of 0.01 or less was taken to indicate a statistically significant correlation.

Results

BEST FITTING BASE CURVE

- With each lens type, the steeper BC provided the best fit on the greatest proportion of eyes (Fig. 2).
- For each lens type, there was no significant difference in mean K-reading between those eyes best fit with the steeper BC and those eyes best fit with the flatter BC (e.g. see Fig 3).

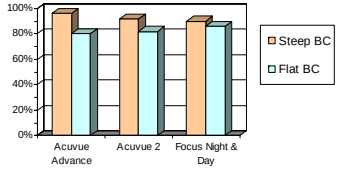


Fig. 2: Proportion of each lens type showing acceptable lens fit

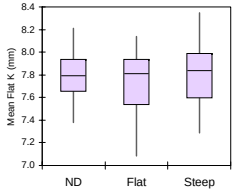
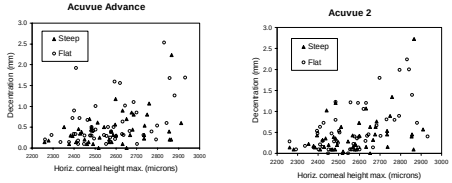


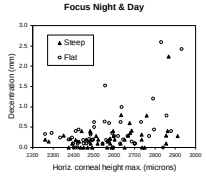
Fig. 3: Box & whisker plot (median, inter-quartile range and range) of mean K for eyes showing best fitting with steeper versus flatter Focus Night & Day base curve; also those showing no difference.

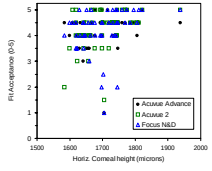
LENS FIT CORRELATIONS

- All three lens types showed significant positive correlations between lens centration and both vertical and horizontal CH (maximum) - greater decentration was associated with greater CH (Figs. 4a-c).
- With A2, there were also some negative correlations between centration and some of the SF measurements. Greater decentration was associated with lower corneal asphericity.
- No correlations were noted between corneal topography and tightness on push-up or post-blink movement.
- The assessment of overall fit correlated with CH, and SF - better lens fit was associated with greater CHh and lower corneal asphericity, i.e. greater SFv & SFh (e.g. Fig. 5).



Figs. 4 a-c: Scatterplots of decentration vs. horizontal corneal height (maximum) for each lens type (n=50).





Figs. 5: Scatterplots of overall fit acceptance vs. horizontal corneal height (10mm) for steeper BC lenses

COMFORT CORRELATIONS

- A correlation with comfort was noted with only one lens type. Poorer comfort with N&D was associated with greater CH: Steep BC: r= -0.40, *P*=0.004 & Flat BC: r= -0.31, *P*=0.01 (Fig. 6).

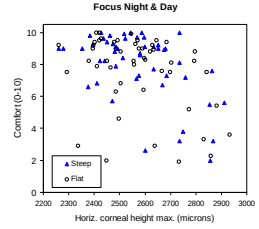


Fig. 6: Scatterplot of comfort versus horizontal corneal height (maximum) for Focus Night & Day (n=50

Conclusions

The best-fit base curve is not predicted by keratometry. The most consistent correlation between lens fit and corneal topography is that between centration and corneal sagittal height.

References

1. Garner L. Sagittal height of the anterior eye and contact lens fitting. *Opt & Phys Opt* 1982; 59: 301-305.
2. Young G. Ocular sagittal height and soft contact lens fit. *J Brit Cont Lens Assoc* 1992; 15:45-49.

Acknowledgements & address for correspondence

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