

COMFORT AND VISION WITH INVERTED SOFT CONTACT LENSES

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BACKGROUND

- Recent anecdotal reports from practitioners describing an “unintended Ortho-K” type effect with silicone hydrogels in a small percentage of patients.¹⁻³
- Refractive changes inconsistent (i.e. onset unpredictable, often unilateral) in affected patients.
- Reports of associated topographic changes (central corneal flattening and mid-peripheral steepening)² (Figure 1).
- Corneal topography changes and observed tear film profiles with inverted silicone hydrogel contact lenses appear qualitatively similar to reverse geometry lenses with orthokeratology (Figures 2-4).
- It is presumed that comfort and vision decrements associated with lens inversion would alert subjects to incorrect insertion.

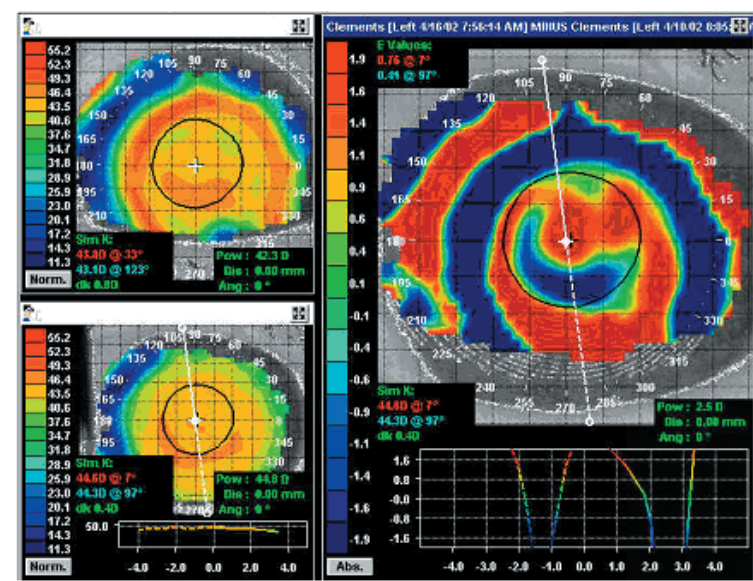


Figure 1. The top left plot shows the cornea following a period of lens wear with a +4.00 silicone hydrogel contact lens. Note the “red ring” of corneal steepening at the 6.00mm zone. The inferior left map shows the cornea after 1 week of no lens wear. The subtractive map (right) shows that the cornea steepened by 2.50D since lens wear was ceased. (Courtesy of John Mountford, Australian Optometric Practitioner).

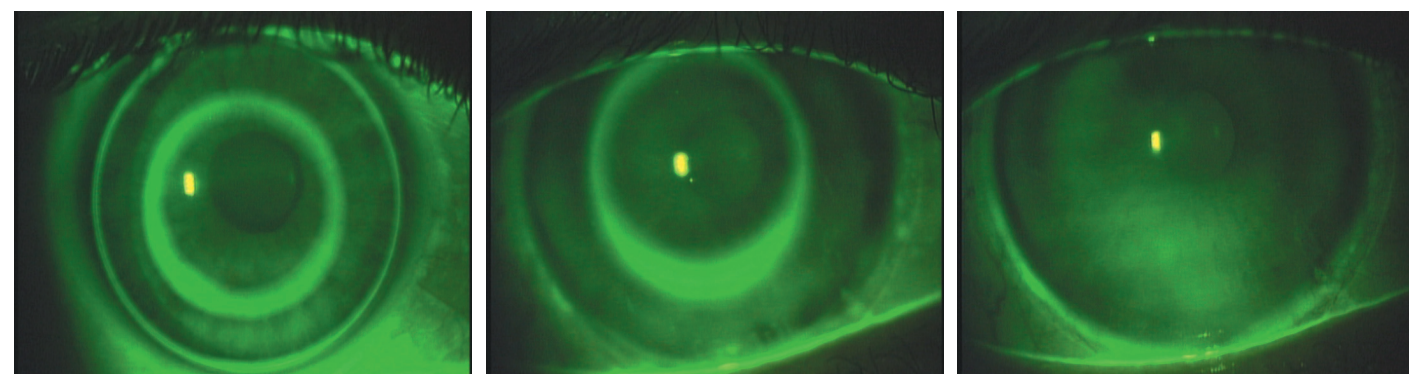


Figure 2: Fluorescein pattern of an R&R Reverse geometry orthokeratology lens from Danker Laboratories (USA).

Figure 3: Fluorexon pattern of an inverted Focus Night & Day lens.

Figure 4: Fluorexon pattern of a correctly inserted Focus Night & Day lens on the same eye as Figure 3.

PURPOSE

To investigate the effects of lens inversion on vision and subjective comfort in a short term, non-dispensing trial.

METHODS

- Ten subjects.
- Contralateral, double masked, randomised.
- In each trial, subjects wore an inverted lens in one eye and the same lens type, correctly inserted in the contralateral eye for 20 minutes.
- Four commercially available lenses were tested, each in +/- 3.00 dioptres; Focus Night & Day (Base curves: 8.4 and 8.6), Purevision and Acuvue 2 (Figure 5).



Figure 5: Lens types tested

- Subjective ratings of vision and comfort (scale 1-100 where 1 = poor and 100 = excellent) were recorded prior to lens wear and after 20 minutes of lens wear.
- Data were analysed using paired t-tests (level of significance; $p < 0.05$).

RESULTS

- Prior to lens wear, there was no significant difference between subject's right and left eyes for subjective ratings and vision ratings ($p > 0.05$).
- After 20 minutes of Acuvue 2 wear, vision and comfort ratings were significantly reduced for inverted lenses relative to those inserted correctly (all $p < 0.01$) (Figure 6).
- For Purevision, comfort but not vision ratings were significantly worse for inverted lenses ($p < 0.02$) (Figure 7).
- For Focus Night & Day 8.4/+3.00, 8.4/-3.00 and 8.6/-3.00 lenses, comfort and vision were similar between inverted and non-inverted lenses. For 8.6/+3.00 lenses, comfort but not vision was significantly reduced with inverted lenses ($p = 0.02$) (Figures 8 and 9).

Figure 6: Subjective Ratings for Acuvue 2 Lenses

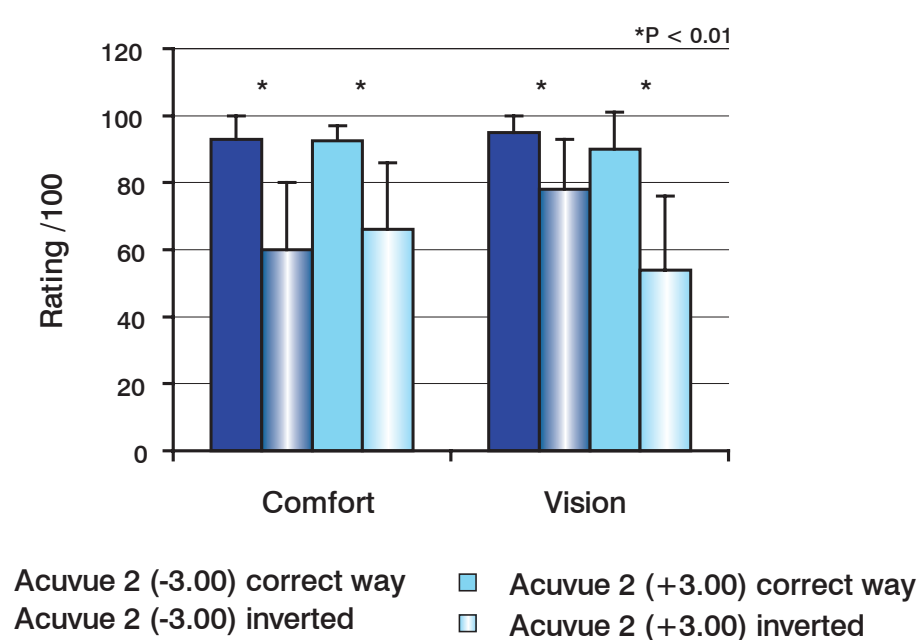


Figure 7: Subjective Ratings for Purevision Lenses

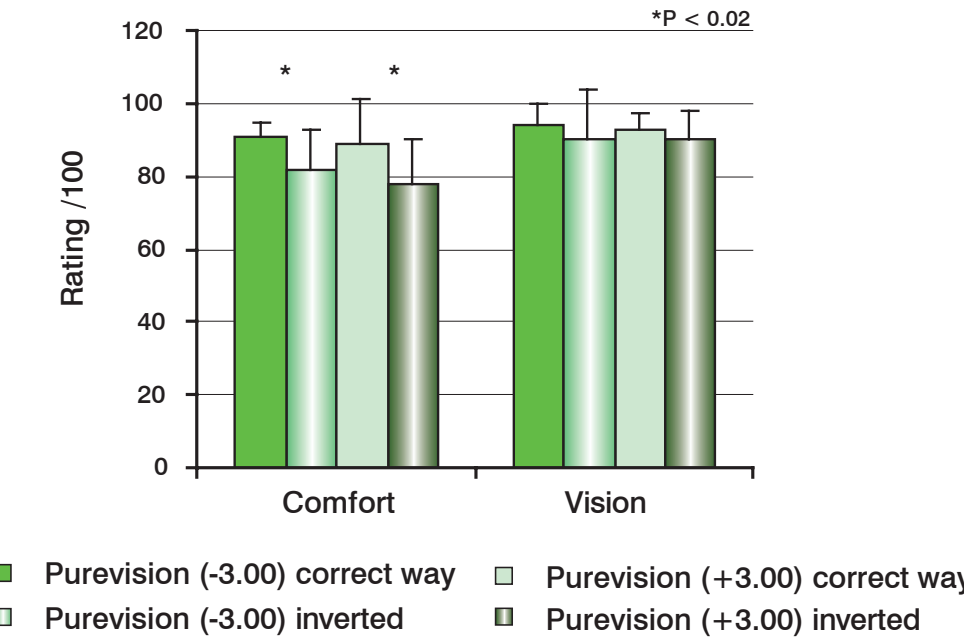


Figure 8: Subjective Ratings for Focus Night & Day (B.C. 8.4) Lenses

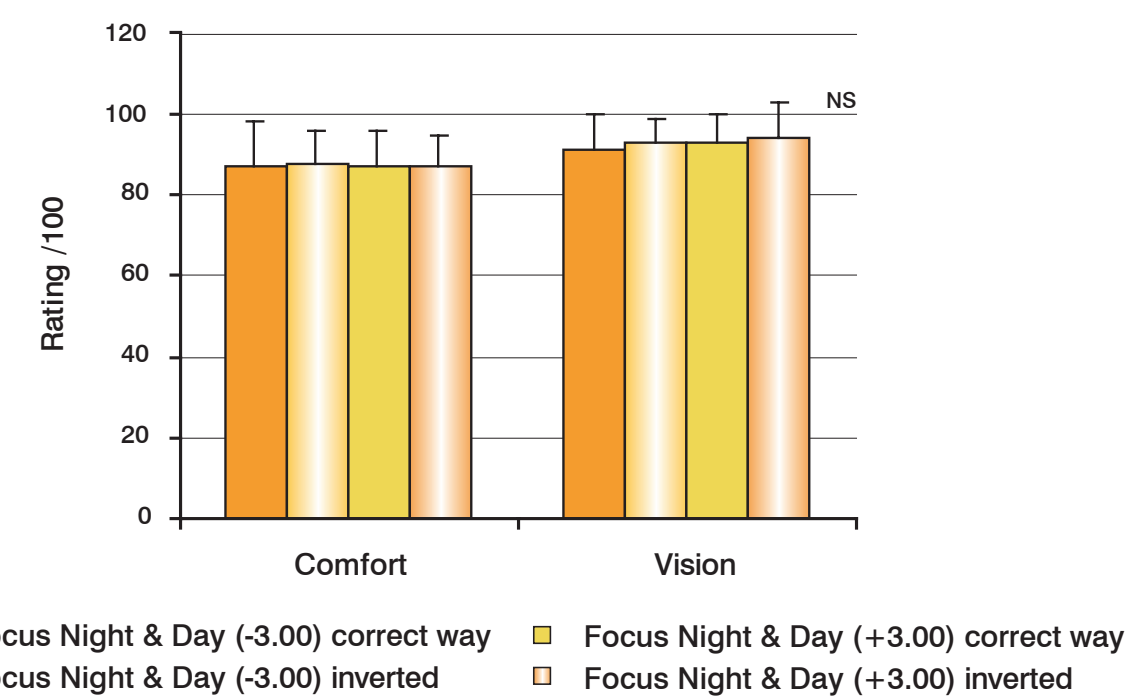
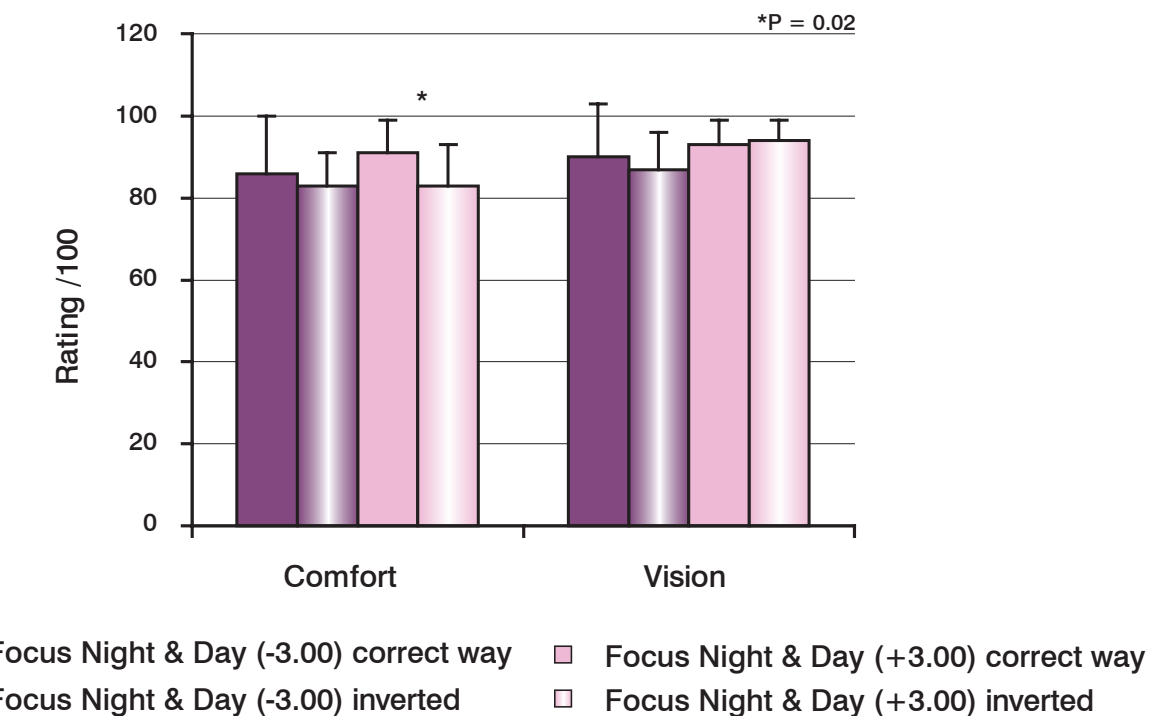


Figure 9: Subjective Ratings for Focus Night & Day (B.C. 8.6) Lenses



DISCUSSION

- Results suggest that when a conventional hydrogel (Acuvue 2) is worn inside-out, there is a reduction in vision and comfort. This therefore alerts the patient to the possibility of the lens being worn incorrectly.
- Our results demonstrate that when silicone hydrogel lenses are worn inverted, there is no decrement in either vision or comfort. This was true for both Focus Night and Day and Purevision lenses (for Purevision only a slight reduction in comfort was observed). Given such a situation, the patient is likely to continue to wear inverted lenses for extended periods of time.
- An inverted silicone hydrogel, being similar to reverse geometry lenses (Figure 3) may then possibly produce an “unintended Ortho-K” effect. The time taken for these changes to occur with the use of inverted silicone hydrogel lenses is not known.
- In summary, practitioners need to consider the possibility of an “unintended Ortho-K” effect in the list of differential diagnosis when a patient is observed to have an unexpected change in refractive error during silicone hydrogel lens wear. They also need to instruct and reinforce to their patient the need to correctly identify the right side of the lens for insertion.

CONCLUSION

- Unlike conventional hydrogels, silicone hydrogel lenses are not associated with any immediate decrement in vision and comfort when worn inverted. Therefore patients are likely to continue wearing their lenses incorrectly over extended periods of time. This could potentially lead to the “unintended Ortho-K” effect reported.

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