INTRODUCTION

• A stable tear film is necessary to protect against ocular surface damage.
• Reductions in tear film lipid layer thickness during the daytime wear of soft and rigid contact lenses lead to an increase in aqueous tear layer evaporation and dry-eye symptoms.1,2
• A recent study showed that overnight wear of reverse-geometry lenses (RGL) did not produce signs or symptoms of dry eye.3 In addition, patients suffering from mild dry eye report anecdotally the relief of symptoms following the overnight wear of RGLs.

• Amelioration of dry eye symptoms might be the result of reduced corneal sensitivity during RGL wear.4 Alternatively, lens-induced changes to tear film composition during and immediately following the removal of lenses worn overnight4,5 may produce improvements in tear layer stability and hence reduction in dry eye symptoms.

PURPOSE

• To examine the changes to the human tear film after a single overnight wear of RGLs, compared to conventional rigid gas-permeable (RGP) and soft (SCL) contact lenses.

METHODS

SUBJECTS

• 18 adult subjects (8M, 12F; mean age: 22 yrs, range 18-33yrs) with good ocular health.
• ROP lenses were excluded, SCL lenses worn for 7 days prior to study participation.

STUDY PROTOCOL

• Corneal topography and tear film parameters measured at baseline and after a minimum 8 hours of closed eye wear. Measurements taken 2 hours after eye opening and lens removal.

• Each subject wore 3 lens types (RGP, ROP, SCL) in random order on 3 separate occasions, in the non-dominant eye only.

• Minimum of 7 nights wash-out period between wear of each lens type.

LENSES

• RGL: BE reverse geometry lenses (Boston XD material, plano, Capricornia Contact Lenses, Brisbane, Australia), fitted according to manufacturer’s guidelines to target approximately 2.00D reduction in myopia.
• RGP: J-Contour quadrature spherical lenses (Boston XD material, -3.00D BVP; Capricornia Contact Lens), fitted alignment with cornea using standard techniques.
• SCL: Acuvue Advance (G&L), +3.00D BVP, J&J Vision Care, Jacksonville, USA), fitted using standard techniques.

• Lens center thickness ordered to achieve a similar lens Dk of ~50 ISO units across all 3 lens types.

RESULTS

• There was a significant change in corneal topography following lens wear (p=0.002, RM-ANOVA) (Figure 1). Corneal apical radius increased from baseline (0.10±0.11mm, p=0.014, post-hoc paired t-test) following overnight wear of RGLs.
• There was no significant change in baseline in lipid layer thickness (Figure 2) or lower tear meniscus height (Figure 3) following the overnight wear of each lens type (all p>0.05, RM-ANOVA).

• Analysis of non-invasive keratograph tear break-up time measurements from all visits showed the first reading was significantly lower than the second (p=0.02, paired t-test; bias = 1.55 seconds). The correlation of repeatability for within-visit measurements was ±10.6 seconds using Bland-Altman analysis (Figure 4). Consequently, only the first measurement was used for subsequent analysis. There was no significant change from baseline in non-invasive keratograph tear break-up time (Figure 5).

• There was a significant correlation between changes in baseline in corneal apical radius and non-invasive keratograph tear break-up time, and between changes in baseline in corneal apical radius and lower tear meniscus height, following overnight wear of RGLs (Table 1).

CONCLUSIONS

• A single overnight wear of contact lenses does not significantly alter the lipid layer thickness, non-invasive keratograph tear break-up time, or lower tear meniscus height in the human tear film.

• Limitations in the instrumentation may have contributed to large variability in primary results, leading to non-significant findings.

• Correlations between corneal topography change and both non-invasive keratograph tear break-up time and lower tear meniscus height change may indicate enhanced tear film stability following overnight wear of RGLs.

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