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Intra-ocular Pressure After Overnight Orthokeratology

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Purpose

To investigate the influence of overnight orthokeratology on intra-ocular pressure (IOP). On one hand we could suppose an increase of IOP caused by the continue overnight pressure of the contact lens on the cornea, on the other hand we could have falsely low IOP readings due to the variation in corneal biomechanics¹ as observed in corneal refractive surgery.²⁻⁴

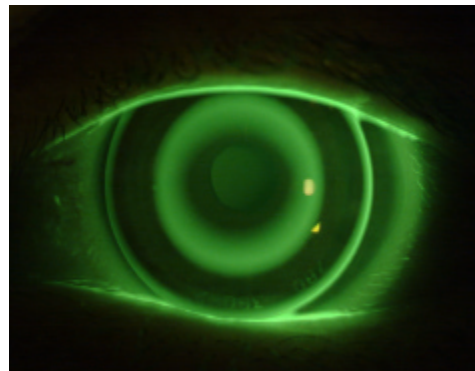


Fig.1 - A sample of the lens fitted in the study

Methods

We fitted 28 eyes of 14 myopic patients aged from 17 to 44 years with a baseline spherical equivalent ranging from -1.00 to -4.25 D, and astigmatism up to 1.00 D with an hexa-curve reverse geometry lens design (ESA ortho-6) in hyper-Dk gas-permeable material (Boston XO, hexafocon-A). Assessment criteria included UCVA, BCVA, manifest refraction, ultrasound pachymetry, corneal topography, biomicroscopy and Goldmann applanation tonometry. These data were collected at baseline, and then after one night, one week, two weeks, one month, and three months of overnight lens wear. All the examinations were performed in the morning immediately after lens removal and repeated in the evening of the same day.

Comparison Time	Mean Diff.	Crit. Diff.	P-Value
BL, 1D Morning	0,07	2,43	0,921
BL, 1D Evening	-0,21	2,43	0,765
BL, 1W Morning	1,29	2,43	0,075
BL, 1W Evening	1,57	2,43	0,030
BL, 2W Morning	0,21	2,43	0,765
BL, 2W Evening	1,14	2,43	0,112
BL, 1M Morning	1,00	2,43	0,164
BL, 1M Evening	0,64	2,43	0,370
BL, 3M Morning	1,43	2,43	0,048
BL, 3M Evening	1,36	2,43	0,060

Comparison Time	Mean Diff.	Crit. Diff.	P-Value
1D Morning, 1D Evening	-0,29	2,43	0,690
1W Morning, 1W Evening	0,29	2,43	0,690
2W Morning, 2W Evening	0,93	2,43	0,196
1M Morning, 1M Evening	-0,36	2,43	0,618
3M Morning, 3M Evening	-0,07	2,43	0,921

Tab. 1 – Bonferroni/Dunn post-hoc test for IOP. Significance Level: 5 %. Comparisons in this table are not significant unless the corresponding p-value is less than 0.0009

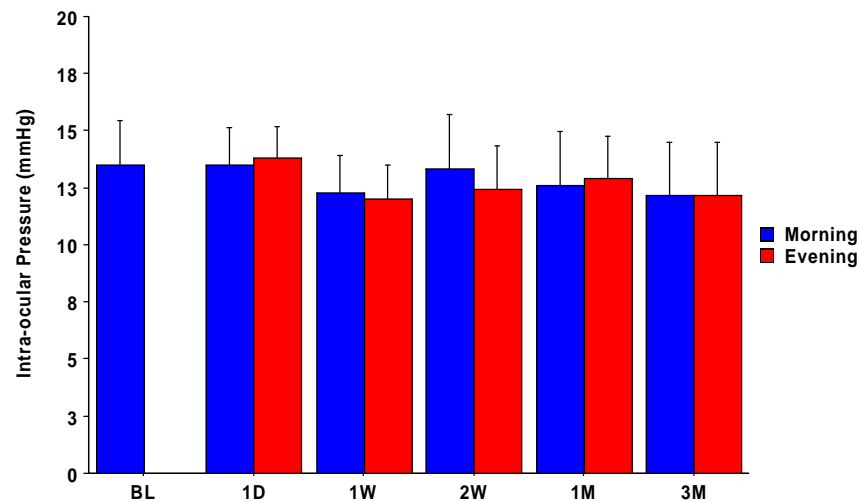


Fig. 2 – Changes in intra-ocular pressure over time

Results

The cornea responded rapidly with significant ($p < 0.05$) central corneal flattening and improvement in visual acuity after the first night of contact lens wear. By the end of one week, all corneal and visual changes had reached a maximal level and remained stable during the day. These changes were sustained at the following visits. Biomicroscopy showed no significant ocular adverse events. With this lens design, there was no significant change in central pachymetry. The average pre-treatment IOP was 13.6 ± 1.9 mmHg. The analysis of variance showed no statistically significant IOP variation during all the period of the study (repeated measures ANOVA: $p = 0.096$). After the first week of treatment Goldmann tonometry showed that IOP readings tend to be lower (1.57 mmHg), but this difference was not statistically significant (Bonferroni/Dunn post-hoc test). At each visit, there was no difference between the morning and evening IOP readings (Bonferroni/Dunn post-hoc test).

Conclusions

These minimum changes found in IOP reading during the period of the study suggests that this overnight contact lens design can successfully flatten the cornea without an increasing risk of glaucoma. The absence of significant change in IOP during the day seems to exclude a masking effect, due to the overnight compression of the cornea, on IOP measurement errors induced by corneal variation.

References

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