Posterior corneal shape changes with orthokeratology lens wear and its recovery

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PURPOSE: Technological difficulty limited the measurement of posterior corneal shape. With modern instrumentation, posterior corneal shape could be measured clinically. This study reported changes of this parameter from a 6-month orthokeratology lens wear, daily changes after immediate lens removal, and its recovery up to 2 months after cessation of lens wears.

METHOD: Twenty-eight (12 male and 16 female) healthy adult Chinese (aged 19 to 30 years) were recruited. After ethical clearance and informed consent, both eyes were fitted with orthokeratology lenses (a 5-curve design making with Boston XO material). Baseline measurements included posterior corneal power using a rotating Scheimpflug imaging system (Pentacam, Oculus Inc.). Follow-up visits were scheduled after one overnight wear, 1 week, 1, 2, 3 and 6 months of lens wear. Recovery visits were scheduled after immediate lens removal, 2, 4, and 8 hours after lens removal, 1 week, 2 weeks, 1 month and 2 months after cessation of lens wear.

RESULTS: There was no significant difference in baseline spherical equivalent refraction (SER) between the two eyes, or any significant difference in both anterior flattest and steepest simulated keratometry readings (Sim Kflat and Sim Ksteep) at
baseline. Only the right eye results were reported. SER significantly reduced from $-2.95 \pm 0.88\text{D}$ at baseline to $0.08 \pm 0.43\text{D}$ in the 6th month. Significant anterior corneal flattening occurred from $42.70 \pm 1.38\text{D} / 43.72 \pm 1.45\text{D}$ (Sim Kflat / Sim Ksteep) at baseline to $41.67 \pm 1.29\text{D} / 42.85 \pm 1.50\text{D}$ after one overnight wear. Compared with baseline, posterior corneal shape ($-6.09 \pm 0.23\text{D} / -6.48 \pm 0.23\text{D};$ Sim Kflat / Sim Ksteep) demonstrated significant steepening after one overnight lens wear ($-6.15 \pm 0.24\text{D} / -6.55 \pm 0.24\text{D}$) but not at other visits. In the daily recovery visit, the posterior corneal shape was observed steepest ($-6.12 \pm 0.25\text{D} / -6.55 \pm 0.25\text{D}$) after immediate lens removal but significantly flattened after 2 hours lens removal ($-6.08 \pm 0.24\text{D} / -6.48 \pm 0.25\text{D}$). No significant change was found in posterior corneal shape in the recovery period up to 2 months.

**CONCLUSIONS:** Orthokeratology has a steepening effect on the posterior corneal shape. It is a transient change, which disappeared after 2 hours lens removal and was not observed in the 2-month recovery period.