Motion sensitivity after orthokeratology

Eisenbarth W.[1], Strasburger H.[2]

[1]University of Applied Sciences, Dept. of Optometry/Ophthalmic Optics, Munich, Germany.
[2]Ludwig-Maximilians-Universität, Institut für Medizinische Psychologie, Munich, Germany.

Purpose:
Orthokeratology increases higher-order optical aberrations – especially in peripheral vision. Since motion perception, additional to other factors also depends on the latter it can be expected to decrease from the treatment. The aim of this study was to investigate changes of motion perception in the peripheral visual field after orthokeratology. This could have implications for driving safety.

Methods:
We investigated 7 subjects (13 eyes), both while wearing hydrogel contact lenses and after subsequent application of orthokeratology lenses (“sleep & see”, Techno-Lens, Switzerland). Motion stimulus was a plaid with spatial and temporal Gaussian envelope. Motion contrast thresholds were determined by a 4-afc staircase algorithm on the horizontal meridian at 10°, 20°, 30°, 40°, and 60° eccentricity. Foveal pattern contrast sensitivity was measured with the Pelli-Robson chart. All measurements were performed under photopic lighting conditions.

Results:
The initial refractive error decreased after orthokeratology within the 5-weeks monitoring period from an average of –1.66 dpt to –0.43 dpt ($p < 0.01$). Interestingly, the important change occurred already during the first night of lens use. Motion contrast sensitivity shows, up to 60° temporally and 40° nasally, almost no significant difference between the two versions of correction (variability over eccentricities: –0.16 to +0.08 log units; *p values:* 0.01 to 0.75). Only in the nasal visual field at 40° eccentricity did contrast sensitivity decrease significantly from orthokeratology, by about 0.16 log units ($p = 0.01$). Foveal static pattern contrast sensitivity decreased after orthokeratology by about 0.18 log units ($p = 0.006$).

Conclusions:
We conclude that under daylight conditions orthokeratology as a method of correcting myopia leads to no notable reduction of peripheral motion contrast sensitivity. On the other hand, static pattern contrast sensitivity shows slightly reduced values. It cannot be ruled out that contrast sensitivity of motion perception under mesopic or scotopic lighting conditions is similarly reduced, due to dilation of the pupil. This could influence driving performance under dim lighting conditions.