Corneal curvature and aberration changes after scleral lens wear in keratoconus patients

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INTRODUCTION

Scleral contact lens efficacy in visual rehabilitation is well known, but it is also important to understand their effect on the ocular surface such as anterior and posterior corneal curvature changes and aberrations after scleral lens wear. With scleral lens wear, corneal curvature changes have been reported in healthy patients [2] and in keratoconus patients.[3] But, previous studies have not specifically quantified the corneal changes in keratoconus patients and patients with intrastromal corneal ring segments (ICRS) implanted with scleral lens wear.

The aim of this study was to investigate the changes in anterior and posterior corneal curvature and aberrometric parameters across the corneal surface before scleral contact lens wear and immediately after eight hours of wearing scleral contact lens in keratoconus subjects with and ICRS[4,5].

METHODS

Twenty-six subjects diagnosed with keratoconus were selected to participate in the study. The mean age of subjects was 36.95±8.95 years. Subjects were divided into two groups, those with Intra-Corneal Ring Segments (ICRS) (KC-ICRS group) and those without ICRS (KC group).

Subjects were instructed to wear 16.5 mm scleral lenses for eight hours. Topographic and aberrometric parameters were evaluated before lens wear and immediately after lens removal. Corneal thickness evaluated in different quadrants, anterior and posterior corneal curvature were evaluated at corneal diameters of 2, 4, 6 and 8 mm and corneal aberrations were measured at 4, 6 and 8 mm pupil diameters.

CONCLUSION

Short-term scleral lens wear showed a thinning of the cornea and flattening of the anterior corneal surface in all subjects. In the KC group, the flattening was more pronounced in the nasal quadrant while changes were more pronounced inferiorly in KC-ICRS group. Moreover, changes in the posterior corneal curvature affects different regions in keratoconus patients with and without ICRS

RESULTS ANTERIOR CORNEAL CURVATURE

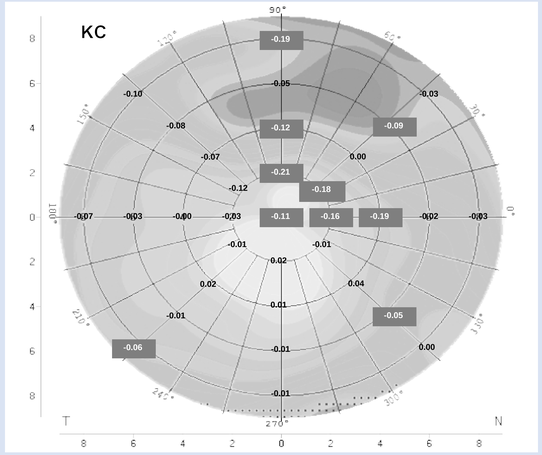

FIG. 1. Anterior corneal curvature difference between before and after scleral contact lenses wearing in keratoconus patients at different positions on the cornea. Negative values indicate flattening curvature after scleral lens wearing. Values into black boxes are statistically significant P,0.05, Student t test for related samples

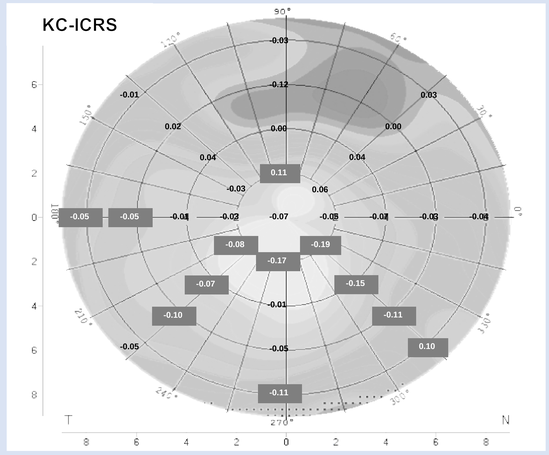

FIG. 2. Anterior corneal curvature difference between before and after scleral contact lenses wearing in KC -ICRS patients at different positions on the cornea. Negative values indicate flattening curvature after scleral lens wearing. Values into black boxes are statistically significant P,0.05, Student t test for related samples

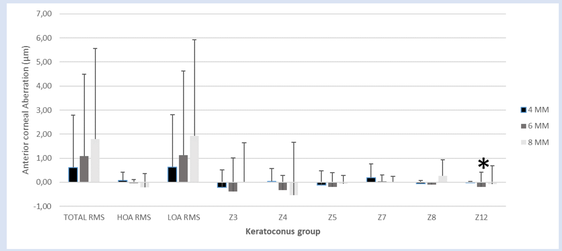

FIG. 3. Anterior corneal high-order aberrations changes during scleral contact lenses wearing in the keratoconus group for 4, 6, and 8 mm of pupil diameter. Error bars represent 6SD. *P,0.05, Wilcoxon test

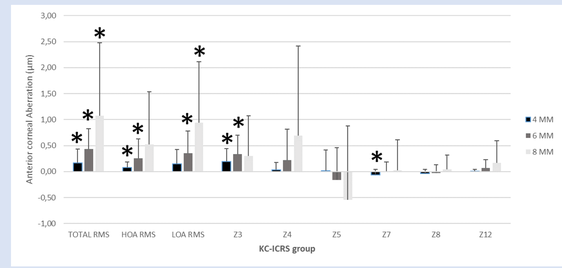

FIG. 4. Anterior corneal high-order aberrations changes during scleral contact lenses wearing in the KCICRS group for 4, 6, and 8 mm of pupil diameter. Error bars represent 6SD. *P,0.05, Wilcoxon test

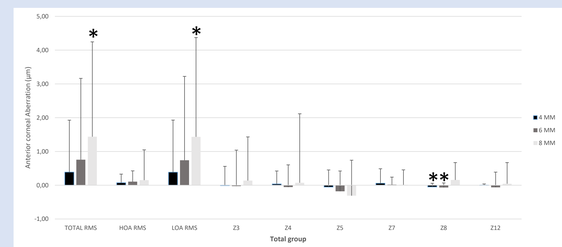

FIG. 5. Anterior corneal high-order aberrations changes during scleral contact lenses wearing in the total group for 4, 6, and 8 mm of pupil diameter. Error bars represent 6SD. *P,0.05, Wilcoxon test

RESULTS POSTERIOR CORNEAL CURVATURE

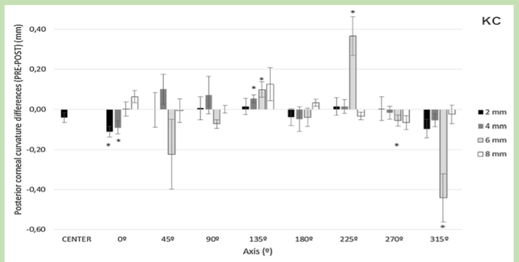

Fig. 6. Posterior corneal curvature difference between before and after scleral contact lens wear in KC group at different positions on the cornea. Positive values mean steepening curvature after ScCL wear and negative values mean flattening curvature after ScCL wear. Error bars represent mean ± SEM (n=13). *P value < 0.05, Student's t-test for related samples.

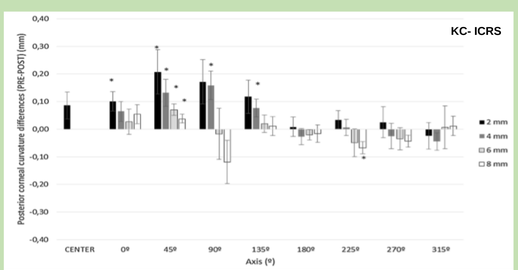

Fig. 7. Posterior corneal curvature difference between before and after scleral contact lens wear in KC-ICRS patients at different positions on the cornea. Positive values mean steepening curvature after ScCL wear and negative values mean flattening curvature after ScCL wear. Error bars represent mean ± SEM (n=13). *P value < 0.05, Student's t-test for related samples

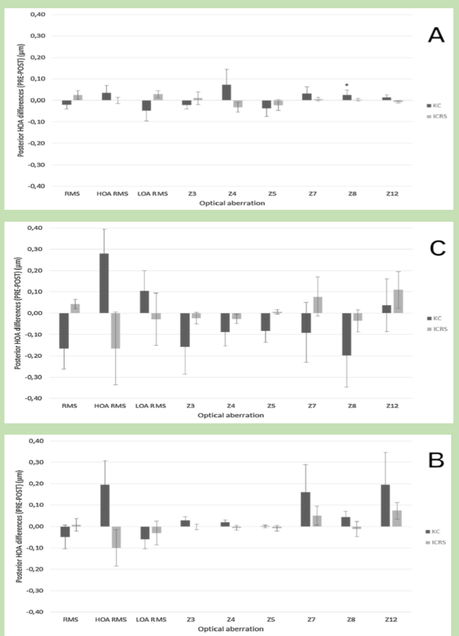

Fig. 8. Posterior corneal high-order aberrations changes during scleral contact lens wear in the KC group and ICRS group for 4 (A), 6 (B) and 8 (C) mm of pupil diameter. Positive values mean decreased aberrations after ScCL wear and negative values mean increased aberrations after ScCL wear. Error bars represent mean ± SEM (n=13). *p < 0.05, Wilcoxon test

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