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Ocular coma and pupil offset relationship

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Purpose: Horizontal coma is highly influenced by the decentration of the pupillary vertex with respect to the corneal apex. The objective of this work was to assess the relationship between the pupil offset versus the corneal axis and the ocular coma values.
Method: This was a prospective randomized study. A total of 14 healthy astigmatic patients were recruited. 35 ocular Zernikes and decentration of the pupil vertex were measured. The measurements were carried out with naked eye and with two toric hydrophilic contact lenses with different stabilization systems (control and test), after 10 minutes of wear. The procedure to detect statistical significance was carried out using an ANOVA test ($p<0.05$) and the correlation was analysed with a Pearson correlation analysis ($p<0.05$).
Results: No statistically significant difference was found analysing vertical coma vs pupillary decentration in X and Y, or its combination; nor between patients, considering right or left eye, nor considering the measurement conditions (no-lens, control, test). Statistically significant differences were detected in horizontal coma comparing naked eye with wear (0.196 and -0.201 microns for control and test respectively). Horizontal coma was closer to zero with contact lenses and had lower standard deviation, being this difference greater for right eye. Correlation analysis for naked eye values showed a statistically significant correlation between X-decentration and horizontal coma in both eyes ($r=0.71;p<0.05$); however, during contact lens wear this correlation was not statistically significant. Furthermore, this correlation was less relevant for control toric contact lenses ($r=0.09;p>0.05$ for control lens and $r=-0.44;p>0.05$ for test lens).
Conclusions: There was a correlation between the amount of horizontal coma and pupillary decentration in healthy patients. The most positive offset, the higher coma aberration was found. This difference was less noticeable in the presence of contact lenses mainly with prism ballast toric contact lenses.
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