

A novel method to measure the biomechanical property of orbital soft tissue using a corneal dynamic scheimpflug analyzer

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Aim: A dynamic scheimpflug analyser (Corvis ST, Oculus, Wetzler, Germany) is a instrument for biomechanical property of cornea. In this study, we will present that Corvis can measure biomechanical property of orbital soft tissue by comparing the eyeball movement in healthy subject group and thyroid ophthalmopathy group whose orbital soft tissue are expected to be changed.

Material & Methods: This study included 78 eyes of 44 healthy subjects and 52 eyes of 28 thyroid ophthalmopathy patients. After Corvis ST test, we analyzed the movies and measured the eyeball movement by air puff with ImageJ. We calculated the average and standard deviation of eyeball movement in healthy subjects. We performed correlation analysis between age and eyeball movement and compared the eyeball movement between male and female in healthy subjects. We performed correlation analysis between eyeball movement and exophthalmometry, proportion of extraocular muscle in orbit CT and stage of thyroid ophthalmopathy.

Results: The mean eyeball movement was 485 ± 124 μm and it increased according to age in healthy subjects group (Spearman rho $r=0.418$, $p=0.000$). The eyeball movement was 423 ± 121 μm in 24 eyes of men and 513 ± 117 μm in 54 eyes of female ($p=0.003$). The eyeball movement in thyroid ophthalmopathy was 368 ± 128 μm and showed a significant difference ($p=0.000$) from that of healthy subjects group. In thyroid ophthalmopathy, the eyeball movement didn't show significant relations with exophthalmometry or stage of thyroid ophthalmopathy ($p=0.298$, $p=0.372$). But, the eyeball movement showed significant negative correlation with proportion of extraocular muscle in orbit CT ($R=-0.382$, $p=0.018$).

Conclusion: The eyeball movement measured by Corvis was larger in old age and female subjects than young and male subjects. In thyroid ophthalmopathy patients, the eyeball movement was smaller than those in healthy subjects group. These eyeball movement can be used to measure orbit biomechanical property.