

A Novel Imaging Analysis Tool to Predict Structural Functional Associations of the Orbit in Thyroid Eye Disease:

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ABSTRACT

Purpose: The purpose of our study is to investigate a method of automatically generating orbital metrics from CT imaging in subjects with thyroid eye disease.

Methods: 204 orbits of the 102 selected thyroid eye disease patients were analyzed. Twenty-five structural metrics for each eye were examined and 12 clinical markers were crossed with this imaging data for a total of 300 univariate correlation tests.

Results: Several extraocular muscle metrics including muscle volume, average diameter, and maximum diameter, demonstrated strong correlation (p-value <0.05) with the presence of ocular motility deficit for the superior rectus, inferior rectus, and lateral rectus. The inferior rectus (muscle volume, diameter average and maximum) had the strongest correlation with motility defect. The superior rectus volume, average diameter, and maximum diameter correlated most with the visual acuity metrics. Hertel measurements demonstrated strong correlation with nearly all optic nerve and orbital metrics and showed a negative correlation with the crowding index. Color vision measurements demonstrated strong correlations (p-value <0.05) with inferior rectus, medial rectus, and superior rectus muscle maximum diameters while demonstrating a mild, but nearly strong correlation (p-value = 0.056) with the lateral rectus maximum diameter.

Conclusion: This novel method of automated imaging metrics may provide objective, rapid clinical information. This data may be useful for prevention and recognition of risk for visual impairment in thyroid eye disease particularly dysthyroid optic neuropathy.

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