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SHORT COMMUNICATION

Hyperthyroidism and severity of orbital disease do not change the central corneal thickness in Graves' ophthalmopathy

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PURPOSE. *To investigate whether the central corneal thickness (CCT) shows alterations in Graves disease and Graves ophthalmopathy (GO) cases according to the disease severity and hormonal status of the patients.*

METHODS. *A total of 150 patients (62 male, 88 female) with Graves disease and 32 control subjects (11 male, 21 female) were included in the study. The patients were divided into six groups according to the severity of orbital involvement and thyroid hormone status. Best-corrected visual acuity, pupillary responses, color vision, biomicroscopy, CCT, intraocular pressure, and funduscopy were performed, and proptosis was measured with Hertel exophthalmometry in all patients.*

RESULTS. *CCT values of patients with Graves disease and patients with GO with hyperthyroid or euthyroid hormonal status showed no statistical difference among themselves and versus control subjects ($p>0.05$).*

CONCLUSIONS. *Hyperthyroidism or severity of orbital disease does not affect the CCT. (Eur J Ophthalmol 2008; 18: 125-7)*

KEY WORDS. *Central corneal thickness, Graves disease, Graves ophthalmopathy*

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INTRODUCTION

Eyelid retraction, exophthalmos, strabismus, and optic neuropathy are the characteristic clinical features of Graves ophthalmopathy (GO). Elevated intraocular pressure (IOP) and visual field defects may also be encountered in cases demonstrating severe GO. These clinical findings are common both in primary open angle glaucoma and GO causing diagnostic and therapeutic challenges between the two diseases (1). Restriction and compression of the globe by enlarged extraocular muscles, elevated episcleral venous pressure due to orbital congestion and venous outflow obstruction, and accumulation of mucopolysaccharide deposits in the trabecular meshwork were proposed causes of elevated IOP in patients with GO (2-4). Therefore, IOP should be a part of routine ophthalmologic examination in all GO cases.

Central corneal thickness (CCT) has been shown to play a role in the interpretation of IOP and there have been attempts to develop tonometers that are less dependent on CCT than Goldmann applanation, which is considered to be the gold standard for measuring IOP (5, 6). Although ophthalmologists usually predict the effects of many ocular disorders or procedures on CCT, the effects of systemic disorders on CCT should also be taken into consideration during the evaluation of IOP (7, 8).

The effects of thyroid disorders on CCT are not well studied in the literature. Bahceci et al (9) demonstrated a significant increase in CCT in hypothyroid patients that could be reversed with thyroxine replacement treatment. Additionally, they concluded that the prevalence of glaucoma in hypothyroidism may not be as high as previously re-

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ported when IOP was corrected for CCT. In the current study, we hypothesized that CCT might show alterations in Graves disease and GO cases according to the disease severity and hormonal status of patients.

MATERIALS AND METHODS

We measured CCT in 150 patients (62 male, 88 female) with Graves disease and 32 control subjects (11 male, 21 female). In all patients, a full ophthalmic examination, including pupillary responses, visual acuity, refraction, color vision, biomicroscopy, CCT, IOP, and funduscopy were performed; axial proptosis was measured with Hertel exophthalmometry. The severity of GO was evaluated according to the EUGOGO criteria (10) and the patients were divided into six groups according to the severity of orbital involvement and thyroid functions as follows: hyperthyroid patients with no ocular involvement (Group 1, Graves disease), hyperthyroid patients with mild ocular involvement (Group 2), hyperthyroid patients with moderate or severe ocular involvement (Group 3), euthyroid patients with mild ocular involvement (Group 4), euthyroid patients with moderate or severe ocular involvement (Group 5), and healthy control subjects without any systemic or ocular disease (Group 6). Hormonal status of the patients was evaluated with both clinical and laboratory examinations, and euthyroid status was regarded as free T_3 and free T_4 were within normal range, and TSH was low or within the normal range for at least the last 6 months. In all cases, IOP was measured by the same investigator in primary position of gaze with the same Goldmann applanation tonometer at 9.00 AM before the measurement of CCT with ultrasonic pachymetry (Quentel Medical, Clermont-Fernand, France). Topical proparacaine 0.4% was used for corneal anesthesia just before CCT measurement, and at least three readings were obtained at the same sitting, and the average measure was regarded as the final value. Cases with history of ocular, orbital, or extraocular muscle surgery history and diagnosis of primary or secondary glaucoma were excluded from the study. The difference regarding CCT values between Groups 1–5 and the control group was determined by using analysis of variance. The comparisons between groups including hyperthyroid patients (Groups 1–3) and euthyroid patients (Groups 4 and 5) were made among themselves by using Mann-Whitney *U* test. The level of statistical significance was determined as $p<0.05$.

RESULTS

Demographic data of the cases are given in Table I. There was no significant difference regarding the age, sex, or IOP values of the patients (p=0.425). CCT values of cases with Graves disease and patients with GO with hyperthyroid or euthyroid hormonal status showed no statistical difference versus control subjects (p=0.098). Differences regarding CCT values between Groups 1–2, 1–3, and 2–3 were not found to be statistically significant (p=0.065, p=0.169, and p=0.249, respectively). There was also no significant difference between Groups 4 and 5 (p=0.409).

TABLE I - DEMOGRAPHIC DATA OF THE STUDY GROUPS

	Group 1*	Group 2*	Group 3*	Group 4*	Group 5*	Group 6†
Age, y, mean±SD (range)	42.9±11.8 (21–64)	43.5±11.6 (23–61)	43.1±10.6 (23–67)	38.7±11.7 (23–63)	43.2±11.2 (24–66)	42.7±12.5 (22–65)
IOP, mmHg, mean±SD (range)	14.7±2.5 (9–20)	14.7±2.0 (10–19)	15.0±2.3 (10–19)	14.6±2.5 (10–20)	15.7±2.2 (11–20)	14.2±2.6 (9–20)
CCT, µm, mean±SD (range) (95% CI)	553±22.8 (512–619) (547–559)	544±34.1 (495–619) (535–553)	554±39.4 (499–636) (544–564)	541±30.4 (497–605) (534–549)	546±44.0 (462–636) (535–558)	555±20.6 (511–590) (550–560)

*30 cases, 60 eyes.
†32 cases, 64 eyes.
IOP = Intraocular pressure; CCT = Central corneal thickness

DISCUSSION

Similar clinical features between primary open angle glaucoma and GO may cause diagnostic challenges between these two diseases, and alterations in CCT according to the hormonal status and severity of orbital disease would further deteriorate the diagnosis. In our routine practice, the cases demonstrating thyroid gland dysfunction present with variable hormonal and clinical features as grouped in this study. To our knowledge, this is the first study that evaluates CCT in Graves disease and GO cases demonstrating hyperthyroid or euthyroid hormonal status with different stages of orbital involvement. This study demonstrated that hyperthyroidism or severity of orbital disease in GO do not change CCT. In conclusion, corrections on IOP according to the CCT in Graves' disease or GO cases should be calculated as normal subjects, and hyperthyroidism or the severity of orbital disease should not change the follow-up protocols for IOP.

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