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IS CENTRAL CORNEAL THICKNESS A RISK FACTOR FOR PSEUDOEXFOLIATION GLAUCOMA?

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SUMMARY – The aim of the study was to compare central corneal thickness measurements among patients with pseudoexfoliation glaucoma, primary open angle glaucoma, and normal subjects. The study included 60 eyes divided into three groups: group 1 of 24 eyes pseudoexfoliation glaucoma; group 2 of 20 eyes with primary open angle glaucoma; and group 3 of 16 normal eyes. Central corneal thickness was measured using an ultrasound pachymeter, and intraocular pressure was measured by use of applanation tonometer. Statistical methods were employed on between-group comparison of the values obtained by central corneal thickness measurement. The mean central corneal thickness was similar across the three study groups, with no statistically significant difference among normal eyes, open angle glaucoma eyes and pseudoexfoliation glaucoma eyes (mean ± SD: 570±40, 558±41 and 564±25 mm, respectively). Accordingly, central cornea was not thinner in patients with pseudoexfoliation glaucoma than in either normal subjects or patients with open angle glaucoma. However, the possibility of differences that may have emerged in case of a larger sample size should also be taken in consideration. In conclusion, central corneal thickness was not demonstrated to be a risk factor for the development of pseudoexfoliation glaucoma in our patient series.

Key words: *central corneal thickness, glaucoma*

Introduction

Pseudoexfoliation syndrome is a generalized disorder of the extracellular matrix associated with excessive production and progressive accumulation of abnormal fibrillar material in intraocular and extraocular tissues[1]. In glaucoma patients, the prevalence of pseudoexfoliation is high, and elevated intraocular pressure occurs in 15%-50% of patients, about 6-10 times the rate in eyes without pseudoexfoliation[2,3]. The characteristics of pseudoexfoliation glaucoma are high intraocular pressures, fluctuation in diurnal curve of intraocular pressure, marked spiking and pressure peaks, pigment dispersion and trabecular pigmentation, and poor response to medical therapy. Smaller optic disc, and significant correlation between intraocular pressure level and the mean visual field defect suggest that intraocular pressure is the main risk factor for glaucomatous damage[4].

Several reports suggest that pressure independent risk factors may increase the risk of glaucomatous damage in pseudoexfoliation glaucoma, such as impaired ocular and retrobulbar perfusion and abnormalities of elastic tissues of lamina cribrosa. Central corneal thickness was found to be significantly higher in pseudoexfoliation glaucoma eyes than in control eyes, which may reflect decompensation of the barrier function of the corneal endothelial cells[5]. Thinner corneas were also found in pseudoexfoliation glaucoma in comparison with primary open angle glaucoma and normal eyes[6]. The aim of the study was to determine whether there is a difference in central corneal thickness between patients with pseudoexfoliation glaucoma and normal subjects and to evaluate central corneal thickness as a predictive risk factor for the development of glaucomatous damage in patients with pseudoexfoliation.

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Material and Methods

Sixty patients, 26 male and 34 female were included in the study. There were 20 patients with pseudoexfoliation glaucoma, 24 patients with primary open angle glaucoma, and 16 control subjects, examined at the Glaucoma Unit, University Department of Ophthalmology, Zagreb University Hospital Center in Zagreb, Croatia. All glaucoma patients were regular patients of this glaucoma unit with compensated glaucoma treated medically. All study subjects underwent central cornea thickness measurement on the same day. One eye *per* individual was randomly selected for investigation. Central corneal thickness was measured by an ultrasonic pachymeter (BVI Biovision, 20 MHz transducer). Standard measurement of central corneal thickness was as follows: 1 drop of 0.5% tetracaine was instilled in the eye for corneal anesthesia. The tip of the ultrasound pachymetry probe was cleaned with alcohol, dried and then applied lightly to the corneal surface. Four to 6 measurements were taken and the mean value was calculated. Measurements were recorded in a chart. Goldmann's applanation tonometry was performed in all patients.

Diagnostic criteria were as follows: primary open angle glaucoma had following inclusion criteria: glaucomatous optic nerve damage, glaucomatous visual field defect, intraocular pressure of ^{3}22 mm Hg without treatment, and open anterior chamber angle on gonioscopy.

The criteria for pseudoexfoliation glaucoma were as follows: intraocular pressure above 21 mm Hg without treatment, glaucomatous visual field defects, optic nerve head damage, open anterior chamber angle on gonioscopy, and the observation of the characteristic whitish pseudoexfoliative material on the surface of the anterior segment of the eye.

Statistical data analysis was performed using Student's t-test. Values lower than 0.05 were considered significant.

Results

Table 1 shows data on age, sex, central corneal thickness and intraocular pressure values in 20 eyes with pseudoexfoliation glaucoma, 24 eyes with primary open angle glaucoma, and 16 normal control eyes. A total of 60 eyes were included in the study. Between-group mean age difference was not statistically significant. The male to female ratio was comparable in the three study groups. The mean (±SD) central corneal thickness was similar in all three study groups, without statistically significant difference among normal eyes (570±40 μm), open angle glaucoma eyes (558±41 μm) and pseudoexfoliation glaucoma eyes (564±25 μm).

Discussion and Conclusion

There is a considerable body of published data suggesting a relationship between intraocular pressure and the risk of glaucoma, and between central corneal thickness and the risk of glaucoma[7,8]. In the OHT study, the risk of glaucoma development increased 1.88 times with every 0.004-mm decrease in central corneal thickness[9]. The importance of central corneal thickness in the discrimination between low tension glaucoma, primary open angle glaucoma and ocular hypertension has been recognized[10-12]. A statistically significant reduction of central corneal thickness was found in pseudoexfoliation glaucoma, both when compared with primary open glaucoma patients and control group[6]. Herndon *et al.* report

Table 1. Data on central corneal thickness measurements, intraocular pressure values, age and sex in groups of eyes with pseudoexfoliation glaucoma, primary open glaucoma, and control group (mean ± SD)

Eye group	Central corneal thickness (μm)	Intraocular pressur (mm Hg)	Sex M/F (n)	Mean age (yrs)
Pseudoexfoliation glaucoma (n=24)	564.60±25.38	16.7±6.30	10/14	64.2
Open angle glaucoma (n=20)	558.61±41.00	15.1±1.90	10/10	57.3
Control group (n=16)	570.47±40.90	14.9±2.30	8/8	62.4

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almost identical values of central corneal thickness in pseudoexfoliation glaucoma and primary open angle glaucoma, with pseudoexfoliation glaucoma patients as a subset of the primary open glaucoma group[5]. On the contrary, Aghaian *et al.* found the eyes with pseudoexfoliation, normal tension glaucoma, open angle glaucoma and angle closure glaucoma to have thinner corneas in comparison with normal eyes[13].

In our study, patients with pseudoexfoliation glaucoma did not have thinner central corneas than either normal subjects or individuals with open angle glaucoma, although we cannot exclude the possibility of manifest differences had the sample size been larger. In conclusion, central corneal thickness was not proved to be a risk factor for pseudoexfoliation glaucoma in our series of patients.

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Sažetak

JE LI SREDIŠNJA DEBLJINA ROŽNICE ČIMBENIK RIZIKA ZA PSEUDOEKSFOLIJATIVNI GLAUKOM?

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Cilj ispitivanja bio je usporediti središnju debljinu rožnice u bolesnika sa pseudoeksfolijativnim glaukomom, primarnim glaukomom otvorenog kuta i zdravih ispitanika. Studija je obuhvatila podatke o 60 očiju podijeljenih u tri skupine. Prva je skupina uključivala 24 očiju osoba sa pseudoeksfolijativnim glaukomom, druga skupina 20 očiju bolesnika s primarnim glaukomom otvorenog kuta, a treća skupina 16 očiju zdravih osoba. Središnja debljina rožnice mjerila se ultrazvučnim pahimetrom, a očni tlak aplanacijskom tonometrijom. Nije bilo statistički značajne razlike srednje vrijednosti (±SD) središnje debljine rožnice između triju skupina, koja je mjerila 570±40 mm u kontrolnoj skupini zdravih očiju, 558±41 mm u skupini očiju s primarnim glaukomom otvorenog kuta i 564±25 mm u skupini očiju sa pseudoeksfolijativnim glaukomom. Dakle, nije utvrđena manja središnja debljina rožnice u bolesnika s pseudoeksfolijativnim glaukomom u usporedbi s onom kod bolesnika s primarnim glaukomom otvorenog kuta i zdravih ispitanika. Nije dokazano da bi manja središnja debljina rožnice bila čimbenik rizika za nastanak pseudoeksfolijativnog glaukoma, iako se ne može isključiti mogućnost drukčijih rezultata uz veći broj ispitivanih bolesnika.

Ključne riječi: *centralna debljina rožnice, glaukom*

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