VARIATION OF CENTRAL CORNEAL THICKNESS IN DIABETIC PATIENTS AS DETECTED BY ULTRASONIC PACHYMETRY

VARIACIÓN DEL ESPESOR CORNEAL CENTRAL EN PACIENTES DIABÉTICOS MEDIANTE PAQUIMETRÍA ULTRASÓNICA

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ABSTRACT

Objective: To prove the existence of a correlation between central corneal thickness and diabetes.
Methods: Ultrasound pachymetry measurements were made in 1,000 patients. The sample was divided into two groups of patients: 953 of them were non-diabetic patients, and 47 were diabetic patients.
Results: The average central corneal thickness in diabetic patients was 571.96 ± 26.81 microns with a range between 514 and 626. The average central corneal thickness found in non-diabetic patients was 544.89 ± 35.36 microns with range of 448 to 649. The increase in central corneal thickness found in diabetic patients compared to non-diabetic patients was statistically significant ($p<0.001$, Student «t» test).
Conclusions: We found that diabetic patients had an increased central corneal thickness when compared with non-diabetic patients *(Arch Soc Esp Oftalmol 2006; 81: 523-526).*

Key words: Pachymetry, diabetes, central corneal thickness.

RESUMEN

Objetivo: Demostrar la existencia de una relación entre el espesor corneal central y los pacientes diabéticos.
Métodos: Se utilizó un paquímetro ultrasónico para medir el espesor corneal en 1000 pacientes. Dividimos los pacientes en dos grupos: 953 no diabéticos y 47 pacientes diabéticos.
Resultados: La paquimetría central media encontrada en los pacientes diabéticos fue 571,96 ± 26,81 micras con un rango comprendido entre 514 y 626. La paquimetría central media hallada en el grupo de no diabéticos fue 544,89 ± 35,36 micras con un rango desde 448 hasta 649. Encontramos un aumento del espesor corneal central estadísticamente significativo ($p<0,001$, test «t» student) en el grupo de pacientes diabéticos al compararlos con los no diabéticos.
Conclusiones: Hemos encontrado que los pacientes diabéticos presentan un espesor corneal central medio mayor frente a los pacientes no diabéticos.

Palabras clave: Paquimetría, diabetes, espesor corneal central.

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INTRODUCTION

Mellitus diabetes is a very frequent disease worldwide, having a considerable impact on society, not only due to its high prevalence but also because of its chronic complications and high mortality rate (1,2), affecting approximately 180 million people around the world (3). Diabetes (type I and II) is found in 13% of patients over 60 years of age (4). In Spain, diabetes prevails in 10.3% of patients between 30 and 89 years old (1).

Occasionally, symptoms may or not appear from the onset, and thus go completely unnoticed (5). This is the reason why it is necessary to take into account statistics pointing at the existence of around 50% of undiagnosed diabetics (3). Early diagnosis of diabetes allows prescribing an adequate treatment and avoiding potential complications, which is a key element in the development of this disease (5).

At the ocular level, main indicators of diabetes are diabetic retinopathy, cataracts (3) and glaucoma (6); diabetic retinopathy being the most frequent cause of blindness for working age individuals and the second cause of blindness for the whole population after age-related macular degeneration (7). Diabetic keratopathy is a frequent disease that entails several alterations, specially in the epithelium and endothelium. Corneal epitheliopathy appears as punctate keratitis, decreased adherence to the basal membrane and corneal hyposthesia. Alterations on the endothelium result in a deficient pumping function, as well as cell alterations, and possibly endothelial thickening and folds. From the clinical perspective, diabetic keratopathy is interesting due to its associated nuisances, since they may become more severe in contact lens holders (6), and translates into a decreased corneal transparency and fluctuating vision (8).

The purpose of the present study is to determine whether there are any differences in the central corneal thickness of diabetic and non-diabetic patients.

SUBJECTS, MATERIAL AND METHODOLOGY

In 2001, one thousand patients attended for the first time the *Instituto Oftalmológico de Alicante-Vissum*; 47 were diabetics and 953 were healthy. All patients who had already undergone intraocular or corneal surgery were excluded, as well as all those patients previously diagnosed with any corneal (degenerations, keratoconus, ...) or systemic (collagen-related) disease. Furthermore, patients who wore rigid contact lenses during the month prior to ophthalmic examination and those who had worn soft contact lenses seven days before were both excluded from the study as well.

A «Pachette™» ultrasonic pachymeter (DGH Technology Inc., Exton, USA) was used to measure central corneal thickness. Both the Student's t-test and the SPSS PC+ statistical software for MS-2 (version 4.0, SPSS Inc., 1990) were used to perform statistical analyses.

FINDINGS

The average age of diabetic patients was 57.1 ± 7.44 years ranging between 10 and 88 years. 55.3% of these diabetic patients were males (n=26), while the remaining 44.7% were females (n=21). Among the non-diabetic patients, we found that average age was 45.35 ± 19.36 years ranging between 6 and 89 years. Out of those 953 patients, 398 were males (41.8%) and 555 were females (58.2%). Among diabetic patients, average central pachymeter was 571.96 microns ± 26.81, ranging between 514 and 626 microns compared to 544.89 ± 35.36 microns (ranging between 448 and 649 microns) for non-diabetics, a significant statistical difference ($p<0.001$, Student test «t») (fig. 1).

A significant statistical difference was found between the age of diabetics (57.1 years) and non-diabetics (45.35 years) ($p<0.001$, Student test «t»).

DISCUSSION

Data regarding age was contradictory. Some authors do not see a significant statistical correlation between age and central corneal thickness (9-11), while others report age-related corneal thinning (12,13) and subsequently support present findings, since diabetic patients with a higher statistically significant average age ($p<0.001$) show greater central corneal thickness than non-diabetics.

Nomura et al (14) reported increasing age-related corneal thinning only for males, but none for females. Similarly, in a study focused on post-menopause females, Sanchís et al (15) stated that central cor-

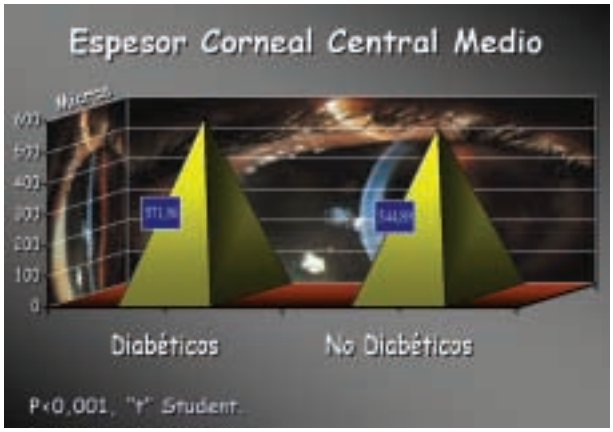

Fig. 1: Average central pachymetry found in diabetic and non-diabetic patients reveals a greater statistically significant average corneal central thickness in diabetics.

neal thickness for these women was lower if they were diagnosed with dry eye syndrome in comparison with undiagnosed post-menopause females.

In our series, average central corneal thickness in non-diabetic patients was 544.89 microns, similar to the data reported by other authors (11,16).

McNamara et al (17) pointed that corneal structures are altered in diabetic patients, suggesting that hyperglycemia affects control over corneal hydration, thus varying corneal thickness in diabetic patients. Sonmez et al (18) argued that hyperglycemia is the main factor involved in refractive changes for diabetic patients and keratometric changes detected by corneal topography. In this line, Weston et al (19) report a decreased endothelial permeability in diabetic corneas during the different stages of hypoxia, though Keoleian et al (20) found no differences of the sort in the absence of hypoxia. Weston et al (21) link these effects of diabetes in endothelial cells to the severity of diabetes itself. Other authors reject a statistical correlation between corneal thickness and glycemia, insulin doses and glycosylated hemoglobin (21,22).

Some researchers describe in literature how corneas in diabetic patients exhibit a tendency towards greater statistically significant central thickness (23,24) due to pleomorphism and polymegatism compared to non-diabetic corneas (22), similar results to those found in the present series. It is worth mentioning certain works in literature proving that patients suffering from diabetes type II show damaged corneal endothelial structures, but found no increase in central corneal thickness for those patients (25). Other authors have found a correlation between the duration of diabetes and changes in the cornea, suggesting that such changes, specially at the endothelium level, should be assessed and confirmed before performing intraocular or corneal surgery in chronic diabetics (26), a hypothesis that justifies the relative contraindication to corneal refractive surgery in diabetes (27).

With respect to central corneal thickness in diabetic patients, Busted et al (23) interpreted that corneal thickness is present during the early stages of the disease and may be one of the most noticeable clinical changes in diabetic patients. Lee et al (28) stated in a very recent paper that diabetic patients with a history of more than 10 years showed corneal morphological abnormalities compared to non-diabetics, specially in terms of variability coefficients in cell size, thus finding a correlation between central corneal thickness and the duration of diabetes.

The present study excluded patients who had undergone intraocular surgery due to increased corneal thickness described by several authors (29-31). A number of contact lens holders was also excluded due to variations in corneal thickness published by several authors (32-35).

In our milieu, diabetic patients exhibit a greater statistically significant average central corneal thickness than non-diabetics. It is necessary to complement these findings with a parallel study of the corneal endothelium in these patients in order to assess whether there is a correlation between corneal thickness and conditions of the endothelium in diabetic patients.

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