OPEN ACCESS
Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjmps/

Original Research Article

Central corneal thickness in Moroccan patients with primary open-angle glaucoma

Zerrouk Rachid*, Khmamouch Mehdi, Chatoui Said, Reda Karim, Oubaaz Abdelbarre

Service Ophtalmologie, Hospital Militaire Mohamed V, Faculté De Medicine Et De Pharmacie, Rabat, Morocco

DOI:10.21276/sjmps.2019.5.7.20 | **Received:** 16.07.2019 | **Accepted:** 23.07.2019 | **Published:** 30.07.2019

***Corresponding author:** Zerrouk Rachid

Abstract

Objective: To evaluate the characteristics of central corneal thickness (CCT) in glaucoma patients followed a military hospital in Rabat. ***Patients and methods*:** This is a retrospective study of glaucoma patients followed in the military hospital ophthalmology flap service between January and December 2018. All subjects underwent a complete ophthalmic examination that included measures of CCT with an ultrasonic pachymeter. ***Results:*** A total of 205 patients (123 men and 82 women) were included in this study corresponding to 410 eyes. The age of patients ranged between 19 and 79 years. The average central corneal thickness was 519.54 ± 27.52µm in the right eye and 520.71 ± 27.99 µm in the left eye. Comparing the CCT between men and women and between the right eye and the left eye the other hand finds no statistically significant difference. Thus, the average age of the patients was 50.74 ± 12.7 years, with a mean central corneal thickness of 520.12 ± 27.75 microns. ***Discussion and conclusion:*** Compared to the Caucasian patient, our glaucoma patients differ in the early glaucoma and the thinness of the cornea, and are close to black African patients. This may induce a potential error in the measurement of intraocular pressure in glaucoma patients where our interests of Forever correlate intraocular pressure with pachymetry.

Keywords: central corneal thickness; glaucoma; Pachymetry.

INTRODUCTION

Primary open angle glaucoma (POAG) is an optic neuropathy of multifactorial origin, its main known risk factor for the development and progression of this disease is high intraocular pressure (IOP). Central corneal thickness (CCT) can significantly affect the intraocular pressure (IOP) measured with Goldmann aplanation tonometry, which is considered the gold standard for IOP measurement [1, 2].

The reference values of the central thickness of the cornea are between 527µm and 560µm [3]. Significant deviations in pachymetry from corneal thickness standards can lead to significant errors in IOP measurement at Goldmann applanation [1, 4, 5,6].

Many factors can affect the central thickness of the cornea in the general population, such as age, gender, and race [2]. In the literature there are no studies on CCT among the Moroccan population. The objective of this study was to describe the distribution of CCT in patients with primary open-angle glaucoma in a Moroccan population using ultrasound pachymetry.

MATERIALS AND METHODS

This is a descriptive study conducted in glaucomatous patients followed in the ophthalmic department of the Military Teaching Hospital Mohamed V of Rabat (Morocco), over a period of 12 months, between January and December 2018.An ultrasonic pachymeter OcuScan® RxP Ophthalmic Ultrasound System from Alcon Laboratories was used for the measurement of ECC.

All examinations were performed in the mornings between 9 and 10 am by the same doctor, using a probe placed perpendicular to the center of the cornea after corneal anesthesia with oxybuprocaine. The value used for each eye was the average of the 5 values obtained with a small difference, less than 5. The exclusion criteria were: corneal dystrophies, central corneal opacity, corneal ulcers and keratoconus, ocular surface pathologies including dry eye, chronic limboconjunctivitis, spherical equivalent greater than five diopters, three or more dioptres d astigmatism, a surgical procedure in the studied eye.

We considered glaucomatous any patient with an intraocular pressure greater than 21 mmHg, obvious signs of glaucomatous damage, determined by the appearance of the optic nerve head and perimetric deficits with open angle to gonioscopy and absence of exfoliative material or pigment. Quantitative variables studied in our patients are central corneal thickness and age. The qualitative variable studied in our patients is sex.

Statistical analysis The data was captured and analyzed using SPSS 13.0 software. Quantitative variables were expressed in means ± Standard deviation and qualitative variables in numbers and percentage. The comparison of the quantitative variables was carried out by Student's t-test. Linear regression was performed to assess the effect of age on CCT, with CCT as the dependent variable. A value of p less than 0.05 was considered significant.

RESULTS

We included 205 patients with 410 eyes, including 123 men (60%) and 82 women (40%). The mean age of patients was 50.74 ± 12.3 with extremes ranging from 19 to 79 years. In men, the mean age was 49.90 ± 11.84 years, while for women the average age was 51.99 ± 12.94 years. The mean central corneal thickness was 520.12 ± 27.75 µm (Table I).

Table-1: Descriptive statistics

	Right eye (n=205)	**Left eye (n=205)**
CCT mean ± CT extreme	519,54 ± 27,52 433-590	520,71±27,99 433-609
CCT in men. mean ± CT	518,91±24,98	519,93±25,09
CCT in woman. mean ± CT	520,49±31,09	521,89±31,98
Mean age ± CT extreme	50,74 ±12,319-79	
Men / Women	123/82	

There was no statistically significant difference in average central corneal thickness between the man and the woman in the right eye (p = 0.689), nor in the left eye (p = 0.624) .

Thus, the mean age of the patients was 50.74 ± 12.7 years, with a mean central corneal thickness of 520.12 ± 27.75 µm. The central corneal thickness was between 527µm and 560 µm in 28.3%, greater than 560 µm in 8.8% of patients and less than 527 µm in 62.8% (Figure 1).

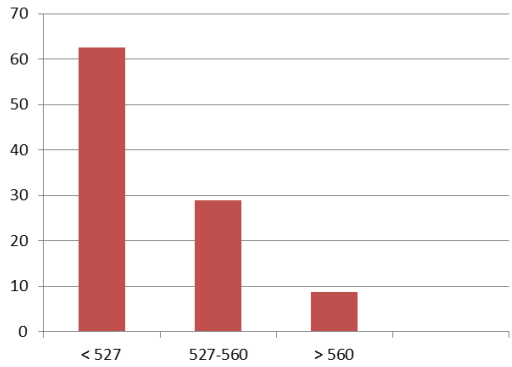

Fig-1: Distribution of corneal thicknesses

In our study; the correlation between CCT and age was statistically significant (p = 0.001) with a progressive decrease in CCT after age 35 (Figure 2).

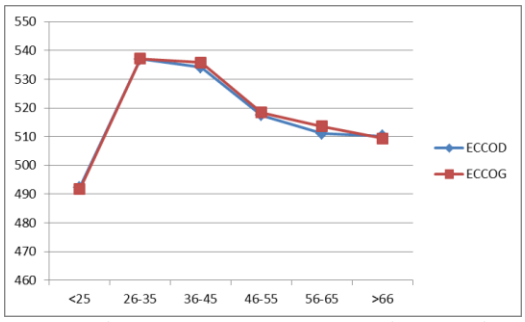

Fig-2: Evolution of central corneal thickness as a function of the elderly

DISCUSSION

This study, to our knowledge, is the only series studying pachymetry in glaucomatous patients in Morocco, which belongs to the African continent. The age of our patients ranged from 19 to 79 years old. We also noted that subjects aged 36-55 accounted for more than half (56.1%) of the total sample. In general, our sample seems relatively young. Regarding sex, there is a male predominance (60%). In our study, the mean age of patients was 50.74 ± 12.3 years. The comparison of the mean age of our series and the literature data shows that glaucomatous black Americans and Caucasians show a higher average age. Thus, Bron *et al.* [7] (France), Rogers *et al.* [8] (United States) have an average age greater than 65 while Singh *et al.* [9] (Australia) find an average age of 59 ± 16 years. On the other hand, the average age of our patients is close to that of black African patients, which is 44.4 ± 12.7 years old [1]. POAG is therefore more precocious in our patients and in Black African patients than African-American, Caucasian patients. Concerning the central corneal thickness, the results of our study are superimposable between man and woman, and between right eye and left eye. These results are corroborated by other authors [1, 2, 4, 7,10].

Our results show an CCT average of 520.12 ± 27.72µm for all eyes. Based on baseline values between 527m and 560m [3], the patient distribution shows that 62.8% have a thin cornea, 8.8% have a thick cornea and 28.3% have a normal cornea. The Goldman aplanation tonometer measurement would therefore be erroneous in 71.6% of patients; underestimated in 62.8% and overestimated in 8.8% of cases.

The review of the literature allowed us to identify several studies on corneal thickness in patients with POAG (Table II). Elsa Aghaian, et al reported CCT in glaucoma patients of different races. The results of this study indicate that the Japanese have thinner corneas than the Chinese and Filipinos. Caucasians, Chinese, Hispanics, and Filipinos have comparable CCT measures, while African Americans' corneas are significantly thinner [11].

Comparing the CCT our patients with Caucasian patients and black African patients shows that our glaucomatous patients have a finer cornea than Caucasian patients and a corneal thickness identical to that of black glaucomatous patients. African. These differences in corneal thickness could be related to genetic and environmental factors.

	central corneal thickness *(µm)*	
	Mean CCT ± ET	*Extrêmes [Min-Max]*
Our study	520.80±27.9	433-609
african	519,6 ± 32,6	427-633
Caucasian	542.2±35.7	532.4–551
African American	515.6±40.5	500.6–529
Chinese	553.3±35.9	540–565
Filipino	547.3±37.9	537–554
Japanese	522.7±36.6	505–542

We observed a correlation between CCT and age (p = 0.001). This has been reported by other authors [1, 2,4, 12]. The trend towards a progressive decrease in CCt with age is mainly observed after the age of 35 and this varies according to the studies: between 2.8 µm and 3.1 µm per decade According to Lee *et al.* [12] and between 6 and 10µm per decade [4]. The measurement of central corneal thickness is an essential factor to consider in patients with ocular hypertension and / or chronic glaucoma, the corneal pachymetry makes it possible to reclassify the real risk incurred in these subjects and to highlight an error of measurement of the IOP related to a cornea thicker (overestimated values) or finer (values underestimated) than the average of the normal population. The central corneal thickness varies according to race; the knowledge of its limits in a given population makes it possible to better target treatment.

CONCLUSION

Our study found a thinner central corneal thickness that could be correlated with the high prevalence of ocular hypertension and glaucoma described in our populations. A larger study is needed to confirm these results.

Legend:
Table 1: Descriptive statistics
Figure 1: Evolution of central corneal thickness as a function of the elderly Table II: Central corneal thickness in the patient with POAG reported in the literature.

REFERENCES

1. Fanny, A., Ouattara, A., Coulibaly, F., Nigué, L., Gbé, K., Bérété-Coulibaly, R., ... & Soumahoro, M. (2008). Central corneal thickness and potential error of Goldmann aplanation tonometry in black African patients with primary open-angle

glaucoma: About 340 eyes. French Journal of Ophthalmology , 31 (4), 405-408.

2. Saenz-Frances, F., Gonzalez-Pastor, E., Borrego-Sanz, L., Jerez-Fidalgo, M., Martinez-de-la-Casa, J., Mendez-Hernandez, C., ... & Garcia-Feijoo, J. (2012). Comparaison de l'épaisseur cornéenne centrale mesurée par pachymétrie ultrasonore et par Pentacam chez les patients sains et les patients avec glaucome primaire à angle ouvert. Journal Français d'Ophtalmologie, 35(5), 333-337.
3. Doughty, M. J., & Zaman, M. L. (2000). Human corneal thickness and its impact on intraocular pressure measures: a review and meta-analysis approach. Survey of ophthalmology, 44(5), 367-408.
4. Detry-Morel, M. (2004). Utilité de la pachymétrie cornéenne dans l'hypertension oculaire et le glaucome chronique. *Bull Soc Belge Ophtalmol*, *293*, 1-9.
5. Damji, K. F., Muni, R. H., & Munger, R. M. (2003). Influence of corneal variables on accuracy of intraocular pressure measurement. *Journal of glaucoma*, *12*(1), 69-80.
6. Doughty, M. J., & Zaman, M. L. (2000). Human corneal thickness and its impact on intraocular pressure measures: a review and meta-analysis approach. *Survey of ophthalmology*, *44*(5), 367-408.
7. Bron, A. M., Creuzot-Garcher, C., Goudeau-Boutillon, S., & d'Athis, P. (1999). Falsely elevated intraocular pressure due to increased central corneal thickness. *Graefe's archive for clinical and experimental ophthalmology*, *237*(3), 220-224.
8. Rogers, D. L., Cantor, R. N., Catoira, Y., Cantor, L. B., & WuDunn, D. (2007). Central corneal thickness and visual field loss in fellow eyes of patients with open-angle glaucoma. *American journal of ophthalmology*, *143*(1), 159-161.
9. Singh, R. P., Goldberg, I., Graham, S. L., Sharma, A., & Mohsin, M. (2001). Central corneal thickness, tonometry, and ocular dimensions in glaucoma and ocular hypertension. *Journal of glaucoma*, *10*(3), 206-210.
10. La Rosa, F. A., Gross, R. L., & Orengo-Nania, S. (2001). Central corneal thickness of Caucasians and African Americans in glaucomatous and nonglaucomatous populations. *Archives of ophthalmology*, *119*(1), 23-27.
11. Aghaian, E., Choe, J. E., Lin, S., & Stamper, R. L. (2004). Central corneal thickness of Caucasians, Chinese, Hispanics, Filipinos, African Americans, and Japanese in a glaucoma clinic. *Ophthalmology*, *111*(12), 2211-2219.
12. Lee, E. S., Kim, C. Y., Ha, S. J., Seong, G. J., & Hong, Y. J. (2007). Central corneal thickness of Korean patients with glaucoma. *Ophthalmology*, *114*(5), 927-930.