Central Corneal Thickness in Primary Congenital Glaucoma

Primer Konjenital Glokomda Santral Kornea Kalınlığı

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ABSTRACT

Purpose: To compare the central corneal thickness (CCT) in patients with congenital glaucoma and nonglaucomatous controls.

Materials and Methods: Thirty eight eyes of 22 primary congenital glaucoma (PCG) patients were included in the study. The patients were divided into two groups according to their ages. The mean age was 12.2 years (range 7-16) in the first group and 26 years (range 19-42) in the second one. Both groups were compared with each other as well as age-matched nonglaucomatous subjects. CCT measurements were performed with ultrasonographic pachymetry (Ocuscan PxP, Alcon, USA).

Results: There were no significant difference between groups and their controls in terms of CCT. In the first group, the mean CCT value was 556.4 µm on right eye and 562.7 µm on left eye, while the mean CCT of the control group was 552.7 µm on right and 553.7 µm on left. In the second group, the mean CCT was 551.6 µm on right and 553.2 µm on left, while the mean CCT of the control was 550.5 µm on right and 544.9 µm in left. There was no significant difference between groups.

Conclusion: In present study, CCT measurements of PCG patients did not differ from each other as well as healthy controls. However, CCT measurement is an essential part of glaucoma examination.

Key words: Central corneal thickness, primary congenital glaucoma, pachymetry.

ÖZ

Amaç: Konjenital glokomu olan olgular ve sağlıklı kontrol grubunda santral kornea kalınlığını karşılaştırmak.

Gereç ve yöntemler: Yirmi iki primer konjenital glokom olgusunun 38 gözü çalışmaya dahil edildi. Olgular yaşlarına göre iki gruba ayrıldı. Birinci grupta yaş ortalaması 12,2 (7-16) ve ikinci grupta 26 (19-42) yıl idi. İki olgu grubuna ait veriler kendi aralarında ve yaş eşleştirilmiş nonglokomatöz kontrol grubuyla karşılaştırıldı. Santral kornea kalınlığı (SKK) ölçümleri ultrasonografik pakimetri ile kaydedildi (Ocuscan PxP, Alcon, USA).

Bulgular: Olgu grupları ve kontrol grubu arasında SKK açısından fark yoktu. İlk grupta SKK ortalaması 556,4 µm sağ gözde ve 562,7 µm sol gözde idi. İlk grubun kontrol grubunda SKK sağ gözde 552,7 µm ve sol gözde 553,2 µm idi. İkinci grubun sağ gözünde SKK 551,6 ve sol gözünde 553,2 idi. İkinci gruba ait kontrol grubunda ise SKK sağ gözde 550,5 ve sol gözde 544,9 idi. Gruplar arasında anlamlı farklılık saptanmadı.

Sonuç: Primer konjenital glokom olguları ve sağlıklı kontrol grupları arasında SKK ölçümleri arasında farklılık saptanmamıştır. Ancak, SKK ölçümü glokom muayenesinin temel parçalarından biridir..

Anahtar kelimeler: Santral kornea kalınlığı, primer konjenital glokom, pakimetri.

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INTRODUCTION

Primary congenital glaucoma (PCG) is one of the rare and heterogeneous ophthalmic diseases of the childhood. It is thought that isolated developmental abnormalities in trabecular network leads intraocular pressure (IOP) rise.[1] The diagnosis and the management of the disease are fraught with pitfalls and challenges. The classic triad of the symptoms includes epiphora, photophobia and blepharospasm.[2] One of the biggest challenges in the management of glaucoma remains the early recognition of the disease. Generally, 80 % of the cases are diagnosed in the first year of life. However, in parallel to the severity of the symptoms, it is possible to be diagnosed in older ages.

Central corneal thickness measurement is an essential part of the glaucoma examination in adult patients.[3] However, the role of the CCT measurements in the diagnosis and follow-up of the congenital cases has not yet been clarified.[4-7]

The aim of the present study is to compare the central corneal thickness (CCT) in patients with congenital glaucoma and nonglaucomatous controls and to investigate the changes in CCT with increasing age.

MATERIAL AND METHODS

This is a retrospective, comparative study including 38 eyes of 22 consecutive primary congenital glaucoma patients who underwent glaucoma surgery. The study adhered to the tenets of Declaration of Helsinki. The patients who had corneal surface abnormalities were not involved. Six eyes of the 22 patients were excluded from the study because of band keratopathy in two eyes, phthisis bulbi in two eyes and operatory absence of eye in 2 patients.

PCG diagnosis was done by a glaucoma specialist considering IOP measurements, optic disc changes, corneal diameters, and biomicroscopy findings. Patients were divided into two groups according to their ages (< 18 years and ≥ 18 years). An age and sex-matched nonglaucomatous control group was generated from the patients admitting outpatient clinic.

A full-ophthalmic examination was performed in each patient including visual acuity, biomicroscopy, applanation tonometry, pachymetry, measurement of corneal diameters, and dilated fundus examination. All measurements were performed by the same glaucoma specialist. Pachymetry was performed with an ultrasonic pachymeter (Ocuscan Pxp, Alcon, USA). IOP measurements of the all patients were performed with Goldmann applanation tonometer.

All data were collected in an Excel database and independent sample t test was performed to analyze the difference of CCT in PCG patients and nonglaucomatous controls. Data are presented as mean ± standard deviation (SD). The normality of the data was determined with Kolmogorov-Smirnov test. All statistical analyses were performed using SPSS version 15 software (SPSS Inc.,Chicago, IL). A p value of less than 0.05 is set for statistical significance.

RESULTS

Both study groups (< 18 years, ≥ 18 years) included 19 eyes of 11 subjects. The mean age of first group was 12.2 years (range, 7-16 years) and the mean age of second group was 26.0 (range, 19-42 years). Both study groups were compared with each other as well as age and sex matched control groups in terms of CCT and laterality. All patients were under good IOP control (≤ 12 mm Hg) with or without topical antiglaucomatous therapy.

The first control group included 53 subjects with the mean age of 10.1 years and second one included 20 subjects with the mean age of 29.8 years. The mean CCT values were summarized in Table 1. CCT measurements of PCG patients did not differ from each other as well as from healthy controls.

DISCUSSIONS

The importance of the CCT measurements in diagnosis and follow up of adult patients is well documented issue. A positive correlation was described between IOP values and CCT measurements by several publications. IOP values could be underestimated in thinner corneas while thick CCT values result in overestimation.[3] Also, it was shown that CCT is a powerful clinical factor in determining glaucoma severity even at the initial examination.[8] Moreover, the OHTS study defined decreased CCT as a risk factor for ocular hypertensive to develop manifest glaucoma.[9]

However, in PCG cases, the importance of the CCT measurements has not been clarified.[10] The data in the literature about CCT in PCG is inconclusive.[4-7] Several publications reported higher CCT values in PCG [4], while the others reported unchanged or decreased values.[5,6] This situation may be explained by several hypotheses. Firstly, stretching in the collagen fibers due to increased IOP values could result in corneal enlargement and buphthalmic appearance and may also cause reduced central corneal thickness. On the other hand, corneal stretching could lead to breaks in descement membrane and aqueous influx into the stroma resulting in

Table 1: *Mean central corneal thickness (µm) and standart deviation values in groups of primary congenital glaucoma and nonglaucomatous controls.*

Central corneal thickness	Right ± SD (µm)	Left ± SD (µm)
Group 1	556.4 ± 33	562.7 ± 32.6
Group 2	551.6 ± 60.9	535.2 ± 75.3
Control 1	552.7 ± 45.1	553.7 ± 43.7
Control 2	550.5 ± 35.1	544.9 ± 36.7
p value	> 0,05	

corneal edema. Chronic edema may cause permanent scarring and vascularization. As a result, higher CCT values may be recorded due to stromal edema and scar formation. In the present study, there was no statistically significant difference between subjects with PCG and nonglaucomatous subjects.

Premature infants have higher CCT values.[11,12] Then a gradual decrease occurs and cornea reaches adult thickness at age 3.[13] In this study, the mean CCT values of patients < 18 years were 556.4 ± 33 on right side and 562.7 ± 32.6 on left side. Muir et al. reported this value as 563 ± 33 in glaucoma patients and 555 ± 37 in normal controls under 18 years.[14] In another report, CCT values were compared to each other in PCG cases under 10 years of age before and after trabeculectomy. While the mean CCT measurement was 614.38 ± 89.41 before surgery, a significant decrease in CCT was observed with IOP control after trabeculectomy (548.56 ± 63.12).[4] Central corneal thickness may be affected by other parameters like aphakia, microcornea and aniridia. Lopes et al reported that the mean CCT was 543.3 ± 66.9 µm for eyes with primary congenital glaucoma, 662.7 ± 68.7 µm for those with aphakic glaucoma, 754.5 ± 92.6 µm for those with aniridia, and 820.6 ± 133.7 µm for those with microcornea. The possible explanation of the CCT increase in aphakic eyes could be occurrence of endothelial damage during cataract surgery.

The major limitation of the study was the relatively small number of patients. Also corneal diameter and axial length measurement were not performed. A significant correlation between corneal diameter and central corneal thickness and also between central corneal thickness and axial length was defined in congenital glaucoma.[5] In addition, in bilateral congenital glaucoma cases, the more affected eye categorized as the eye with higher IOPs, larger corneal diameter, a longer axial length, a larger cup/disc ratio, or more myopic refraction was reported to have thinner CCT.[6] Further studies that include a large number of patients, corneal diameter and axial length measurement and refraction values are needed to clarify the relationship between CCT and congenital glaucoma.

In conclusion, any significant difference in subjects and PCG patients was not detected in study. Although, there is no significant difference between the study groups, it is important to remember that the CCT measurement is an indispensible part of the ophthalmic examination for estimation of the real IOP values, in either adult or congenital cases.

Competing interests

No conflicting relationship exists for any author.

Authors' contributions

All authors conceived of the study, participated in its design and coordination, and revised the manuscript critically for important intellectual content. All authors read and approved the final manuscript.

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REFERENCES / KAYNAKLAR

1. Levy J, Tessler Z, Tamir O, Lifshitz T. [Primary congenital glaucoma]. Harefuah 2004;143:876-80, 910.
2. Barsoum-Homsy M, Chevrette L. Incidence and prognosis of childhood glaucoma. A study of 63 cases. Ophthalmology 1986;93:1323-7.
3. Kniestedt C, Lin S, Choe J, Nee M, Bostrom A, Sturmer J, et al. Correlation between intraocular pressure, central corneal thickness, stage of glaucoma, and demographic patient data: prospective analysis of biophysical parameters in tertiary glaucoma practice populations. J Glaucoma 2006;15:91-7.
4. Cronemberger S, Calixto N, Avellar Milhomens TG, Gama PO, Milhomens EG, Rolim H, et al. Effect of intraocular pressure control on central corneal thickness, horizontal corneal diameter, and axial length in primary congenital glaucoma. J AAPOS 2014;18:433-6.
5. Henriques MJ, Vessani RM, Reis FA, de Almeida GV, Betinjane AJ, Susanna R, Jr. Corneal thickness in congenital glaucoma. J Glaucoma 2004;13:185-8.
6. Wygnanski-Jaffe T, Barequet IS. Central corneal thickness in congenital glaucoma. Cornea 2006;25:923-5.
7. Lopes JE, Wilson RR, Alvim HS, Shields CL, Shields JA, Calhoun J, et al. Central corneal thickness in pediatric glaucoma. J Pediatr Ophthalmol Strabismus 2007;44:112-7.
8. Herndon LW, Weizer JS, Stinnett SS. Central corneal thickness as a risk factor for advanced glaucoma damage. Arch Ophthalmol 2004;122:17-21.
9. Coleman AL, Gordon MO, Beiser JA, Kass MA. Baseline risk factors for the development of primary open-angle glaucoma in the Ocular Hypertension Treatment Study. Am J Ophthalmol 2004;138:684-5.
10. Amini H, Fakhraie G, Abolmaali S, Amini N, Daneshvar R. Central corneal thickness in Iranian congenital glaucoma patients. Middle East Afr J Ophthalmol 2012;19:194-8.
11. Kirwan C, O'Keefe M, Fitzsimon S. Central corneal thickness and corneal diameter in premature infants. Acta Ophthalmol Scand 2005;83:751-3.
12. Gunay M, Celik G, Gunay BO, Dogru M, Gursoy T, Ovali HF. Central corneal thickness measurements in premature infants. Int J Ophthalmol 2014;7:496-500.
13. Ehlers N, Sorensen T, Bramsen T, Poulsen EH. Central corneal thickness in newborns and children. Acta Ophthalmol (Copenh) 1976;54:285-90.
14. Muir KW, Jin J, Freedman SF. Central corneal thickness and its relationship to intraocular pressure in children. Ophthalmology 2004;111:2220-3.