Corelation between Central Corneal Thicknes, Gender and Age in Bulgarian Children

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Abstract : *Introduction: The rapid growth and development suggest dynamics in various biometric indicators. Knowing the laws in their changes, as well as their relationship to and impact of other factors contribute to a thorough, fast and accurate interpretation during the diagnostic and treatment process*

Purpose: *Determination of the statistically significant link between the biometric indicator central corneal thickness, gender and age in Bulgarian children. Material and Methods: The research covers 248 patients / 496 eyes / divided into four age groups: first / 0 to 1 years old / 70 children / 140 eyes / -32 girls and 38 boys; second / 1 to 3 years old / - 57 children / 114 eyes / - 31 girls and 26 boys; third / 3 to 7 years old / - 81 children / 162 eyes / - 40 girls and 41 boys; fourth / 7 to 15 years old / - 40 children / 80 eyes / -18 girls and 22 boys. The examinations were conducted for a period of 24 months with Ultrasonic pachimetry with PacScan300AP.*

Results: *First group - test of Mann-Whitney/U = 1543, p = 0.694> 0.05/, no statistically significant difference between the average levels of CCT between genders. Second group - test of Mann-Whitney/U = 3001.5, p = 0.35 > 0.05/, no statistically significant difference between the average levels of CCT between genders. Third group - test of Mann-Whitney/U = 1543, p = 0.694 > 0.05/, no statistically significant difference between the average levels of CCT between genders. Fourth group - Independent Samples Test /t = 0.571, p = 0.571> 0.05/, no statistically significant difference between the average levels of CCT between genders. Kruscal-Wallis test shows that there is a statistically significant increase with increasing age in bought gender: Boys /X2 = 24.02, p<0.001/, Girls /X2 = 24.534, p <0.001/.*

Discussion: *In the four groups of the study was not found statistically significant link between average central corneal thickness and gender. A correlation was found between central corneal thickness and age of the patients. CCT indicator in Bulgarian children increases from the age of six months to fifteen years.*

Keywords: *age, gender, central corneal thickness, children.*

I. Introduction

Health care for children is a demanding task and requires a detailed study of the characteristics of their body. The rapid growth and development suggest dynamics in various biometric indicators. Knowing the laws in their changes, as well as their relationship to and impact of other factors contribute to a thorough, fast and accurate interpretation during the diagnostic and treatment process.

A number of studies have been conducted to analyze the central corneal thickness/CCT/ in adults with and without concomitant ocular pathology. The possibilities for large-scale studies are limited because of the necessity of anesthesia while examining children. A vast research about the connection between CCT, race and age of patients was made (1).This relationship is analyzed in other studies (2), (6). The central corneal thickness was measured in term and preterm infants (7), (9), in children with growth hormone deficiency, (10) with Down syndrome (12), glaucoma and its connection with intraocular pressure (3), (4) (5) (11). The correlation between the indicator and gender is researched and reported, but in adult patients (8).

II. Purpose

Determination of the statistically significant link between the biometric indicator central corneal thickness, gender and age in Bulgarian children.

III. Material and Methods

The research covers 248 patients / 496 eyes / divided into four age groups: first / 0 to 1 years old / 70 children / 140 eyes / -32 girls and 38 boys; second / 1 to 3 years old / - 57 children / 114 eyes / - 31 girls and 26 boys; third / 3 to 7 years old / - 81 children / 162 eyes / - 40 girls and 41 boys; fourth / 7 to 15 years old / - 40 children / 80 eyes / -18 girls and 22 boys. The examinations were conducted for a period of 24 months with Ultrasonic pachimetry with PacScan300AP under anesthesia due to operative treatment for diseases not connected with CCT /palpebral, nasolacrimal/. The refraction is typical for the age: Infant – 3.0-4.0dpt

hyperopia; 1-2 years of age – 2,5-3,0dpt hyperopia; 3-5 years of age - 2.0dpt hyperopia; 6-8 years of age - 1,3dpt hyperopia; 9-12 years of age- 0,3dpt hyperopia; 15 years of age and more – emetropia. Patients with glaucoma, corneal cicatrices, ectopias, distrophies and other diseases connected to CCT aren't included. For statistical processing of the resulting material are used standard descriptive methods for quantitative variables and nonparametric methods for testing hypotheses.

IV. Results

Due to the unevenness in the distribution of the values of the CCT in all groups, which was proved statistically by the test of Kolmogorov-Smirnov, we used the average level of the index / media / and not its average.

First group / 0 to 1 years old /: 70 children / 140 eyes / -32 girls and 38 boys.

The Kolmogorov-Smirnov test for normality of the distribution of variable CCT in boys $Z = 0.141$, $p = 0.001$ < 0.05. , in girls $Z = 0.119$, $p = 0.026 < 0.05$

The results of descriptive statistics for quantitative changes are in **Table** :

Descriptive Statistics			Statistics	Standard error
	Gender		Statistics	Standard error
CCT /мм/	Boys	Arithmetic mean	0,55045	0,004367
		95% Confidence interval for the mean value	0,54175	
			0,55915	
		Median	**0,53750**	
		Standard deviation	0,038071	
		Minimum	0,485	
		Maximum	0,640	
		Asymmetry	0,445	0,276
		Excess	-0,831	0,545
	Girls	Arithmetic mean	0,54661	0,004097
		95% Confidence interval for the mean value	0,53842	
			0,55480	
		Median	**0,54250**	
		Standard deviation	0,032778	
		Minimum	0,485	
		Maximum	0,616	
		Asymmetry	0,251	0,299
		Excess	-0,884	0,590

For comparison was used nonparametric test of Mann-Whitney: $U = 1543$, $p = 0.694 > 0.05$, according to which there was no statistically significant difference between the average levels of CCT between girls and boys.

Second group / 1 to 3 years old /: 57 children / 114 eyes / - 31 girls and 26 boys.

The Kolmogorov-Smirnov test for normality of the distribution of variable CCT in boys $Z = 0.128$, $p = 0.128$. , in girls $Z=0.161$, $p = 0.0001 < 0.05$

The results of descriptive statistics for quantitative changes are in **Table** :

Descriptive Statistics			Statistics	Standard error
	Gender		Statistics	Standard error
CCT /мм/	Boys	Arithmetic mean	0,55940	0,005668
		95% Confidence interval for the mean value	0,54802	
			0,57078	
		Median	**0,56700**	
		Standard deviation	0,040876	
		Minimum	0,468	
		Maximum	0,661	
		Asymmetry	0,096	0,330
		Excess	0,162	0,650
	Girls	Arithmetic mean	,55950	,004790
		95% Confidence interval for the mean value	,54992	
			,56908	
		Median	**,56700**	
		Standard deviation	,037718	
		Minimum	,494	
		Maximum	,637	
		Asymmetry	-,014	,304
		Excess	-1,268	,599

For comparison was used nonparametric test of Mann-Whitney: U = 3001.5, p = 0.35 > 0.05, according to which there was no statistically significant difference between the average levels of CCT between girls and boys.

Third group/ 3 to 7 years old /: 81 children / 162 eyes / - 40 girls and 41 boys.

The Kolmogorov-Smirnov test for normality of the distribution of variable CCT in boys Z=0.119, p = 0.006 < 0.05, in girls Z=0.107, p = 0.025 < 0.05.

The results of descriptive statistics for quantitative changes are in **Table ☐ ☐ ☐**

Descriptive Statistics				
	Gender		Statistics	Standard error
CCT /мм/	Boys	Arithmetic mean	0,56724	0,003677
		95% Confidence interval for the mean value	0,55993	
			0,57456	
		Median	**0,56800**	
		Standard deviation	0,033294	
		Minimum	0,485	
		Maximum	0,649	
		Asymmetry	-0,133	0,266
		Excess	-0,036	0,526
	Girls	Arithmetic mean	0,56413	0,004155
		95% Confidence interval for the mean value	0,55585	
			0,57240	
		Median	**0,56700**	
		Standard deviation	0,037167	
		Minimum	0,485	
		Maximum	0,657	
		Asymmetry	0,371	0,269
		Excess	-0,188	0,532

For comparison was used nonparametric test of Mann-Whitney: U = 1543, p = 0.694 > 0.05, according to which there was no statistically significant difference between the average levels of CCT between girls and boys.

Fourth group / 7 to 15 years old /: 40 children / 80 eyes / -18 girls and 22 boys.

The Kolmogorov-Smirnov test for normality of the distribution of variable CCT in boys Z=0.077, p = 0.2 > 0.05, in girls Z=0.103, p = 0.2 > 0.05.

The results of descriptive statistics for quantitative changes are in **Table ☐V.**:

Descriptive Statistics				
	Gender		Statistics	Standard error
CCT /мм/	Boys	Arithmetic mean	0,58466	0,004915
		95% Confidence interval for the mean value	0,57475	
			0,59457	
		Median	**0,58400**	
		Standard deviation	0,032601	
		Minimum	0,518	
		Maximum	0,649	
		Asymmetry	0,075	0,357
		Excess	-0,375	0,702
	Girls	Arithmetic mean	0,59028	0,008534
		95% Confidence interval for the mean value	0,57295	
			0,60760	
		Median	**0,60150**	
		Standard deviation	0,051202	
		Minimum	0,469	
		Maximum	0,682	
		Asymmetry	-0,634	0,393
		Excess	0,246	0,768

Analysis by Independent Samples Test showed no statistically significant difference in average levels of CCT in boys and girls in this group, t = 0.571, p = 0.571> 0.05.

Compared to the average level of CCT for boys of all ages and non parametric test Kruscal-Wallis shows that there is a statistically significant increase with increasing age: X2 = 24.02, p<0.001. Similarly analyzed following levels of indicator in girls - non parametric test Kruscal-Wallis shows that there is a statistically significant increase in the average levels of CCT with increasing age: X2 = 24.534, p <0.001.

V. Discussion

In the four groups of the study was not found statistically significant link between average central corneal thickness and gender.A correlation was found between central corneal thickness and age of the patients. The study is the first in Bulgaria to explore biometric index central corneal thickness in children. Its results show an increase in the value of the CCT indicator in Bulgarian children from six months of age to fifteen years. The further results are further evidence of the necessity for targeted and thorough study of the children and getting to know their specifics.

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