Does pregnancy influence eye parameters? Assessment of choroidal thickness using EDI-OCT before and after labour depending on the way of delivery method.

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Purpose: The aim of this study is to assess the choroidal thicknes (CT) with use of EDI-OCT in patients before and after delivery depending on the of delivery method.

Design: Observational cohort study

Methods:

Patients

This prospective research was conducted in the period from October 2015 to April 2019. Study involved 146 eyes of 73 patients aged 20-34 years, The study involved both pregnant women giving birth naturally (66 eyes of 33 patients) and women who underwent C-section (80 eyes of 40 patients).

Qualification

Women - patients of the Physiological Pregnancy Clinic of the 1st Departmevvnt of Obstetrics and Gynaecology of the Medical University of Warsaw, who gave their conscious consent to participate in the study - were admitted to the ophthalmological examination. Patients who met the criteria for inclusion were recruited to the research group - Table 1.

Inclusion criteria	*Exclusion criteria*
Informed consent to participate in the study	No informed consent to participate in the study
Age 18 - 35 years old	18 years> Age> 35 years old
Physiological delivery or cesarean section	Complicated pregnancy
Single pregnancy	Multiple pregnancy
Refraction error -4.00 to +4.00 D sph.	Gestational and gestational diabetes
Good cooperation during research	Hypertension in pregnancy
No eye diseases	Preeclapsja
No surgery and / or ophthalmic procedures in history	Defective spherical refraction outside of the scope of inclusion criteria
Childbirth after 36 weeks of gestation	Lack of cooperation from the patient
Distance BCVA: LogMAR=0.0, (V= 20/20)	Active disease of the anterior or posterior segment of the eye
Near BCVA: Sn=0.5/ 30cm	Condition after ophthalmic operations or surgeries, refractive procedure performed
	Premature delivery <36 weeks gestation
	Distance BCVA: LogMAR > 0.0, (V< 20/20)
	Near BCVA: > 0.5 /30cm

Table 1 - inclusion and eclusion criteria

Location (µm from fovea)	CS - group before delivery		CS - group after delivery					NL - group before delivery		NL - group after delivery				
	Mean (µm)	SD (µm)	Mean (µm)	SD (µm)	Mean difference (µm)	SD (µm)	p - value (t-student)	Mean (µm)	SD (µm)	Mean (µm)	SD (µm)	Mean difference (µm)	SD (µm)	p - value (t-student)
SFCT	**370,86**	**100,92**	**388,71**	**96,01**	**-17,86**	**40,95**	**0,0003**	303,27	88,09	308,34	112,62	-5,07	47,51	0,4800
Nasal 500 µm	**348,36**	**96,85**	**367,48**	**97,93**	**-19,12**	**32,73**	**0,0000**	**276,66**	**80,34**	**295,52**	**105,42**	**-18,86**	**47,62**	**0,0119**
Nasal 1000 µm	**325,25**	**92,73**	**340,6**	**95,27**	**-15,35**	**31,36**	**0,0001**	**256,52**	**78,69**	**275,2**	**100,67**	**-18,68**	**53,06**	**0,0243**
Nasal 1500 µm	**281,21**	**85,36**	**300,14**	**93,08**	**-18,94**	**92,07**	**0,0000**	**224,86**	**74,3**	**241,5**	**91,18**	**-16,64**	**35,14**	**0,0031**
Nasal 3000 µm	**156,75**	**56,92**	**171,68**	**79,11**	**-14,92**	**56,34**	**0,0228**	130,61	53,09	129,59	49,14	1,02	22,96	0,7690
Temporal 500 µm	**362,78**	**100,44**	**378,9**	**100,02**	**-16,12**	**53,87**	**0,0105**	291,23	83,29	302,93	108,38	-11,7	47,08	0,1064
Temporal 1000 µm	**352,58**	**96,54**	**363,97**	**99,448**	**-11,39**	**42,5**	**0,0213**	293,32	79,95	299,07	105,83	-5,75	41,29	0,3607
Temporal 1500 µm	340,09	96,71	344,87	101,55	-4,78	39,92	0,3003	297,68	81,67	300,59	96,08	-2,91	41,26	0,6424
Temporal 3000 µm	294,04	84,61	298,73	92,32	-4,7	53,83	0,4492	268,73	51,96	277,75	75,97	-9,02	43,48	0,1758

CS – group (cesarean section group), NL – group (natural labour group)

Table 2 - results

OCT examination

Patients qualified to participate in the project were examined twice: in 36 WoG and 6 weeks alter the birth.

The tests were carried out on the SPECTRALIS® OCT (Heidelberg Engineering) device. Optical coherent tomography of the choroid was performed. The measurement of the choroidal thickness was performed according to the protocol presented below:

Measurements were made manually each time by two independent researchers. Protocol included manuał measurements at 9 spots: subfoveal and 500 µm, 1000 µm, 1500 µm, 3000 µm temporally and nasally from the fovea, respectively The measurement diagram is illustrated in Figure 1.

The researchers were not informed about whether the result presents a measurement from the third trimester of pregnancy or from the period alter childbirth. All examinations were carried out in the morning between 8:00am and 10:00 am in order to avoid fluctuations related to the daily cycle.

Statistical analysis

Statistical analysis

For the analysis of the results, the values of parameters being the arithmetic mean of the measurements obtained by both researchers were used. Before starting the analysis, the conditions for parametric tests were checked. The Shapiro-Wilk test, Leaven and student's t-test tests were used.The $p<0.05$ was assumed to be statistically significant

Results

Table 2 presents detailed results of CT analysis in 9 areas: subfoveal, 500 µm, 1000 µm, 1500 µm, 1500 µm, 3000 µm tempora! and nasal from the fovea.

The results are presented as mean and standard deviation (µm). The table presents a comparison of CT between groups of women alter natural labor and caesarean section with the level of significance p of the Student's t-test able 1 presents detailed results of CT analysis.The table presents a comparison of CT between groups of women alter natural labor and caesarean section with the level of significance p of the Student's t-test.

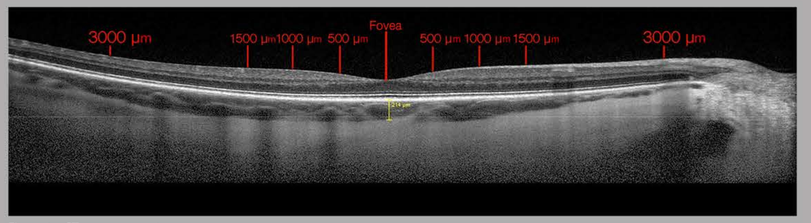

Figure 1 - CT measurements

Regardless of the delivery method and the analyzed area of the choroid, the mean and standard deviation of choroid thickness were lower in women in 36 WoG in comparison to 6th week alter birth. A significant difference in results was observed depending on the delivery method of pregnancy.

On the basis of t-Student's analysis it was shown that in Caesarean section CT changes are statistically significant ($p<0.05$) in 7/9 of the analyzed areas. In 2/9 areas despite the observed trend, the results were statistically insignificant ($p>0.05$).
In the case of women alter naturai labor, the results were statistically significant in 3/9 of the analyzed areas and in 6/9 $p>0.05$ was obtained.

The above results allow us to conclude that the decrease in the thickness of the choroid alter childbirth compared to the third trimester of pregnancy is significantly more noticeable in women alter Caesarean section than in women alter natural labor.

Conclusions:

1. At the end of childbirth, the thickness of the choroid increases in comparison to the third trimester of pregnancy.
2. The mechanism of this phenomenon can be explained by an increase in alpha-1 adrenergic receptors in the third trimester of pregnancy, which complicates vasoconstriction and redistribution of blood to important organs in pregnancy.
3. Changes in the thickness of the choroid are particularly noticeable in women alter Caesarean section. This is the most important conclusion of the study that Caesarean section may have an effect on the visual organ, but the mechanism of this phenomenon remains unknown