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Evaluation of anterior segment parameters during and after pregnancy

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ABSTRACT

Purpose: To compare the anterior segment parameters during pregnancy and post-pregnancy.
Materials and methods: Fifty-four healthy pregnant women in their third trimester with ages ranging from 18 to 38 years were included in the study. All of the patients underwent comprehensive ophthalmologic examinations, including refraction, anterior segment, and fundus examinations, intraocular pressure, and axial length measurements. In addition, anterior chamber angle, anterior chamber depth, anterior chamber volume, corneal volume, central corneal thickness, and keratometry values were measured by Pentacam Scheimpflug camera. All measurements were measured again 3 months after delivery.
Results: The mean intraocular pressure, anterior chamber angle, anterior chamber depth, anterior chamber volume, corneal volume, central corneal thickness, and keratometry measurements were significantly different during pregnancy and post-pregnancy ($p < 0.05$ for all); however, the mean spherical refraction, cylindrical refraction, and axial length were not statistically significantly different during pregnancy and post-pregnancy ($p > 0.05$ for all).
Conclusions: We found that there is an increase in the anterior chamber parameters, corneal volume, corneal thickness, and corneal curvature and a decrease in intraocular pressure in the third trimester.

1. Introduction

During pregnancy, almost all organ systems go through physiological changes due to hormonal effects. One of the most important organs affected by these changes is the eyes [1]. These physiological changes that occur as a result of pregnancy are usually measurable in the third trimester when hormonal activity levels peak. However, these changes are transient because, several weeks postpartum, all hormonal activities return to their pre-pregnant state [2]. In previous studies, researchers have tried to define the physiological effects of pregnancy on the eyes. A drop in intraocular pressure (IOP), loss in the visual field, decreased corneal sensitivity, and increase in corneal thickness and curvature are some of the physiological changes [2–8].

A review of anterior segment parameters is very important in an ophthalmologic exam. Today, Pentacam, which uses Scheimpflug technology, is used to analyze anterior segment parameters. Usability, fast recording modes, and the ability to measure quantitatively are the main advantages of Pentacam. Pentacam can be used to measure central corneal thickness (CCT), corneal volume (CV), corneal curvature (K1, K2), anterior chamber depth (ACD), anterior chamber volume (ACV), and anterior chamber angle (ACA) [9].

In the literature, there are some studies about the effect of pregnancy and the postpartum period on refractive values, CCT, K1, and K2 [5–7,10,11], but there are no studies that focus on CV and anterior chamber parameters (ACD, ACV, and ACA).

In this study, our main goal is to investigate the effect of pregnancy on anterior segment parameters and the changes in anterior segment parameters in the postpartum period.

2. Materials and methods

2.1. Study population and design

This prospective study was performed in the Departments of Obstetrics, Gynecology, and Ophthalmology at Kayseri Education

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Table 1
Comparison of anterior segment and other parameters during and after pregnancy.

Variable	During pregnancy ($n=54$)	3 months after delivery ($n=54$)	Difference (%)	p
ACD	3.03 ± 0.27	2.96 ± 0.25	−2.38 ± 2.22	<0.001
ACA	40.71 ± 4.73	39.63 ± 5.00	−2.58 ± 6.40	0.002
ACV	177.98 ± 30.27	169.98 ± 29.66	−4.47 ± 4.40	<0.001
CCT	539.85 ± 33.38	535.69 ± 34.95	−0.79 ± 1.22	<0.001
CV	61.41 ± 3.18	60.86 ± 3.31	−0.91 ± 1.52	<0.001
K1	42.98 ± 1.67	42.91 ± 1.69	−0.16 ± 0.41	0.004
K2	43.87 ± 1.69	43.79 ± 1.76	−0.20 ± 0.49	0.005
IOP	13.39 ± 2.93	15.35 ± 2.76	16.89 ± 18.26	<0.001
AL	23.07 ± 0.73	23.06 ± 0.72	−0.02 ± 0.67	0.586
Spherical refraction	−0.21 ± 0.85	−0.21 ± 0.87	−0.13 ± 0.33	0.999
Cylindrical refraction	−0.69 ± 1.03	−0.68 ± 1.01	−0.06 ± 0.49	0.830

CCT: central corneal thickness, CV: corneal volume, K1, K2: corneal curvature ACD: anterior chamber depth, ACV: anterior chamber volume, ACA: anterior chamber angle IOP: intraocular pressure, AL: axial length values are expressed as mean ± SD.

and Research Hospital, Turkey. All patients that were examined agreed to participate in the present study and a written informed consent form was obtained from each patient. The study complied with the Declaration of Helsinki and was approved by the local ethics committee.

Fifty-four healthy pregnant women in their third trimester whose ages ranged from 18 to 38 years were included in the study. All of the patients underwent comprehensive ophthalmologic examinations, including best-corrected visual acuity (BCVA), refraction, anterior segment, and fundus examinations, IOP measured by Goldmann applanation tonometry, axial length (AL) measurements, and Pentacam Scheimpflug camera imaging. The AL was measured with the IOL Master 500 (Carl Zeiss Meditec Inc., Jena, Germany). All measurements were also performed in the third postpartum month.

Ocular exclusion criteria for this study included the following: high spherical > ±3 dioptri or cylindrical > 2dioptri refractive errors, BCVA worse than 20/20, IOP > 21 mmHg, dense media opacities, history of uveitis, glaucoma, or ocular trauma, and previous intraocular surgery. Moreover, a history of systemic disease, such as hypertension or diabetes mellitus, multiple pregnancies, and any medication also resulted in patients being excluded from the study.

2.2. Pentacam Scheimpflug camera measurements

The Pentacam (Oculus, Germany) system uses rotating Scheimpflug imaging for noninvasive and three-dimensional anterior segment evaluation. In this study, three-dimensional anterior chamber analysis modules were used. Pentacam Scheimpflug camera measurements were made in darkness to standardize all measurements for each patient. After the placement of the head in the appropriate position, the patient was asked to look at the blue fixation light. To avoid miscalculations due to poor imaging quality, each patient underwent three measurements, and only one measurement as defined "OK" for examination quality specification by the unit selected for the study. The ACA, ACD, ACV, CCT, CV, K1, and K2 measurements were obtained in each Pentacam image. These measurements were re-obtained three months after delivery.

2.3. Statistical analysis

The measurements of anterior segment parameters from the right eyes were used for the analyses. All statistical tests were performed using Statistical Package for the Social Sciences, version 16. The normality of the data was confirmed separately for each variable using the Kolmogorov–Smirnov test ($p > 0.05$). A comparison of anterior segment parameters between during pregnancy and in the third month postpartum was performed by a paired t-test. Statistical significance was defined as a p value of 0.05.

3. Results

The mean age of the pregnant women was 27.37 ± 5.64 (range 18–38) years. The mean number of gestation weeks was 31.93 ± 3.79 (range 28–39) weeks. Table 1 shows the results of the ACA, ACV, ACD, CCT, CV, K1, K2, spherical and cylindrical refractive error, AL, and IOP measurements during and after pregnancy. There was a statistically significant difference in the mean ACV, ACD, CCT, CV, K1, K2, and IOP values between those taken during pregnancy and those taken 3 months after delivery ($p < 0.05$). There was, however, no significant difference ($p > 0.05$) in the mean spherical and cylindrical refractive error and AL measured during pregnancy and those values measured 3 months after delivery. Figs. 1–3 show distribution of anterior chamber parameters during pregnancy and third postpartum month.

4. Discussion

It is a known fact that the hormones secreted from the placenta during pregnancy affect the ocular system and other systems. With recent advancements in ocular endocrinology, estrogen, progesterone, and androgen receptors have been found in the cornea, lens, iris, ciliary body, lacrimal glands, meibomian glands and conjunctiva [12–14]. The fact that most ocular diseases have different manifestations before, during, and after pregnancy reveals that these hormones are effective in the ocular system as well. There are many studies that deal with the effects of pregnancy on

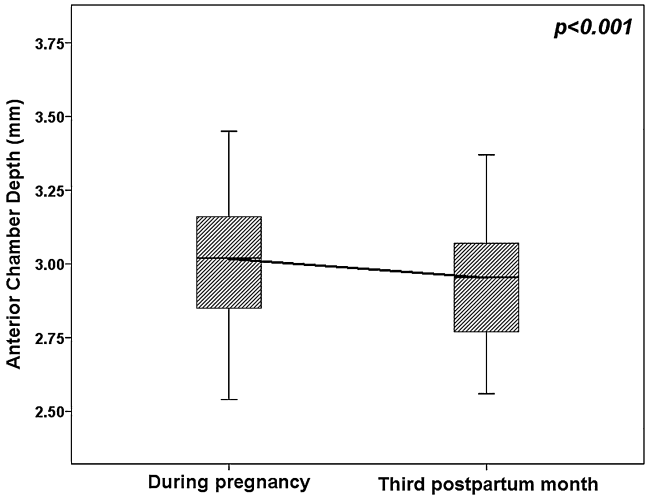

Fig. 1. Distribution of anterior chamber depth during pregnancy and third postpartum month.