

A Retrospective Study to Evaluate Retinal Vascular Outcomes in Pregnant Iraqi Women

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Abstract: This study aims to know the outcomes of patients as a result of retinal vasculopathy during pregnancy. We investigated whether the mother's blood pressure during pregnancy has an effect on the retinal microvessels. Demographic information and data were collected from different hospitals in Iraq, where 210 patients were included. The study aimed to know the changes of retinal blood vessels to pregnant patients. The average age for this study ranged between 25-40 years. Patients underwent OCTA, a new, non-invasive fundus imaging technology that can identify retinal and choroidal blood flow motion information with high accuracy and visualize retinal and choroidal microcirculation of living tissue. The statistical analysis performed was a descriptive analysis of data through graphs and tables of qualitative and quantitative variables using a database in Microsoft Office™ Excel. In the second stage, with the final results of the study, an analysis was carried out using the IBM SOFT SPSS statistical program. The Result which found that 210 patients were included and divided into two groups, the mean age to the patient group was 33 ± 6.3 and the control group was 32 ± 4.8 with a b value of 0.98. It was found that DCP was greater in all quadrants for pregnant women with 16.2 ± 0.3 compared to the control group with 15.8 ± 0.4 . In addition, there was a slight increase in the arteriolar caliber to the patient's group with 115.2 ± 12.2 compared to the control group, which was 114.4 ± 10.2 . In the current study, the results indicate that ocular changes are directly proportional to the severity of hypertension because when blood pressure levels decreased, these changes decreased significantly.

Keywords: DCP, hypertension, blood pressure, retinal, vascular, GDM, OCTA.

INTRODUCTION

During pregnancy, the main threat to the visual system is changes in the blood vessels to the retina [Deloison, B. *et al.*, 2012; Khan, F. *et al.*, 2005], which can be defined as a thin layer of nervous tissue located in the inner part of the back of the eyeball. [Khan, F. *et al.*, 2010]

The retina, like any other organ, needs oxygen and nutrients. A lack of blood supply can lead to serious vision changes and even vision loss [Regnault, T.R.H. *et al.*, 2002; Sibai, B.M. *et al.*, 1998]. After all, it is the retina that fixes the image in its cells, converts the "image" into nerve impulses, and transmits them to the brain, where the image is decoded [Lockhart, C.J. *et al.*, 2009; Granger, D.N. *et al.*, 2010].

Angiopathy is an injury that increases the permeability of retinal vessels. It should be noted that retinal vasculopathy is not an independent disease but always appears as a consequence of certain diseases [El Assaad, M.A. *et al.*, 2002; Cheung, C.Y. *et al.*, 2011].

In retinal vasculopathy, vasodilation, stenosis, or tortuosity occurs, which alters the velocity of blood flow and impairs neuronal regulation [Cheung, C.Y.L. *et al.*, 2011; Liew, G. *et al.*, 2008].

Damage to the retinal vessels helps the ophthalmologist to identify the underlying disease at the initial stage and sometimes even before the symptoms of the disease appear. [Goktas, S. *et al.*, 2014; Gonul, S. *et al.*, 2015] Basically, retinal vasculopathy is common in people over 40 years of age, but sometimes the disease occurs in children and newborns. [Kara, N. *et al.*, 2014; Kim, J.W. *et al.*, 2016; Roskal-Watek, J. *et al.*, 2017] The deception of retinal vasculopathy is that in its early stage, it is almost asymptomatic. And later, when the visual impairment begins, the process may become irreversible [Rothwell, R.T. *et al.*, 2015; Daien, V. *et al.*, 2013]. A frequent increase in pressure has a detrimental effect on the retina, as it affects the walls of blood vessels from the inside [Daien, V. *et al.*, 2013]. The walls of the vessels thicken and become damaged. Circulation is disrupted, blood clots form and blood vessels begin to burst in front of the eye, which can lead to retinal hemorrhages. A hallmark of hypertensive vasculopathy is narrow, convoluted vessels of the fundus.

The decrease in pressure contributes to the expansion of retinal vessels and a decrease in their tone. Therefore, the speed of blood flow slows

down, blood clots form, and the permeability of the vascular walls increases. With retinal vasculopathy caused by hypotension, patients often complain of a strong pulsation of the eye vessels [Heringa, S.M. *et al.*, 2013].

MATERIAL AND METHOD

Patient Sample

Demographic information and data were collected from different hospitals in Iraq, where 210 patients were included. The study aimed to know the changes of retinal blood vessels to pregnant patients. The average age for this study ranged between 25-40 years.

Study Design

Demographic information and data were collected through cooperation with ethical committees, where the study period ranged for 14 months, and the statistical analysis program was based on spss, IBM soft 22, and Microsoft Excel 2013.

has been studied the result of Blood Pressure of patient Retinal Arteriolar.

Which included (SBP, DBP, and arterial blood pressure) And another control group they were transferred to the hospital in the gynecological area and the intensive care unit.

The selection criteria were divided into patients with a confirmed diagnosis of hypertension during pregnancy and patients who had a physiological pregnancy. Exclusion criteria: patients without an accurate diagnosis, patients with eye diseases that preclude funduscopy, a patient who refuses to explore.

Patients underwent OCTA, a new, non-invasive fundus imaging technology that can identify retinal and choroidal blood flow motion information with high accuracy and visualize retinal and choroidal microcirculation of living tissue. It has unique advantages in normal choroidal retinal vascular changes, disease management follow-up, and treatment effect detection.

OCTA detects red blood cell movement in the lumen of the vasculature by measuring OCT signal changes for multiple scans of the same cross-section and collects continuous en-face

information to obtain a full 3D choroidal retinal vascular image. Therefore, the relationship between the OCTA scan signal and the direction of blood flow, and the rate of blood flow will affect the strength of the OCTA signal.

The statistical analysis performed was a descriptive analysis of data through graphs and tables of qualitative and quantitative variables using a database in Microsoft Office™ Excel. In the second stage, with the final results of the study, an analysis was carried out using the IBM SOFT SPSS statistical program.

The term "retinal vasculopathy" is a collective term and refers to a whole complex of possible causes and consequences of vascular diseases of the circulatory system, which nourish the structures of the fundus.

These causes include, in particular, injuries, diabetes, and chronic high or low blood pressure. Retinal vasculopathy", issued during a routine examination of a woman during pregnancy, indicates the presence of some abnormal changes in the network of arterioles, venules, and capillaries.

Such changes can develop both in the first pregnancy and in a repeat pregnancy. As a rule, retinal vasculopathy in pregnant women, according to the hypertonic type, develops in the third trimester; About 90% of diagnosed vasculopathy cases occur in the ninth month.

Study Period

Cooperated with the Ethics Committee for the purpose of obtaining the required licenses to conduct this study and collect data on patients; this study was conducted over a period of 14 months from 29-6-2020 to 22-8-2021.

AIM OF RESEARCH

This study aims to know the outcomes of patients as a result of retinal vasculopathy during pregnancy. We investigated whether the mother's blood pressure during pregnancy has an effect on the retinal micro vessels.

RESULTS

Table 1: Main characteristics and demographic data of patients

Variable	Patient, N=110	Control, N=100	P-value
Age, years	33±6.3	32±4.8	0.98
BMI	28.1±3.8	27.3±4.3	0.72
Income			
Low	40	30	0.76
moderate	50	40	
High	20	30	
Hypertension Family History			
Yes, n (%)	3 (2.7)	3 (3)	0.99
No n (%)	107 (97.2)	97 (97)	0.88
GDM			
Yes	30 (27.2)	23 (23)	0.33
No	80 (72.7)	77 (77)	
Smoking			
Yes	10 (9.09)	5 (5)	0.82
No	100 (90.9)	95 (95)	
In-Vitro Fertilization			
YES	35 (31.8)	28 (28)	0.01
NO	75 (68.18)	78 (78)	0.065

GDM: Gestational diabetes diagnosis- BMI; body mass index

Table 2: Demographic results related to Retinal vascular parameters

Variable	Patient	Control
superficial retinal capillary plexus- vessel length density	13±1.1	13.3±1.3
DCP	16.2±0.3	15.8±0.4
Arteriolar caliber, µm	115.2±12.2	114.4±10.2
Venular caliber, µm	178.5±11.9	160.9±5.5
Venular fractal dimension	1.24.4±0.04	123±0.04

Table 3: Fetal scan and Baby measurement at delivery of pregnancy patient

Variable	Fetal Scan	Baby Measurement at Delivery
HC, cm	26.88 (2.50)	32.55 (1.40)
AC	25.5 (1.9)	28.90 (1.59)
birth weight, g	2100.11 (289.8)	2987.08(355.9)

HC: Head circumference, cm- **AC:** Abdominal circumference, cm

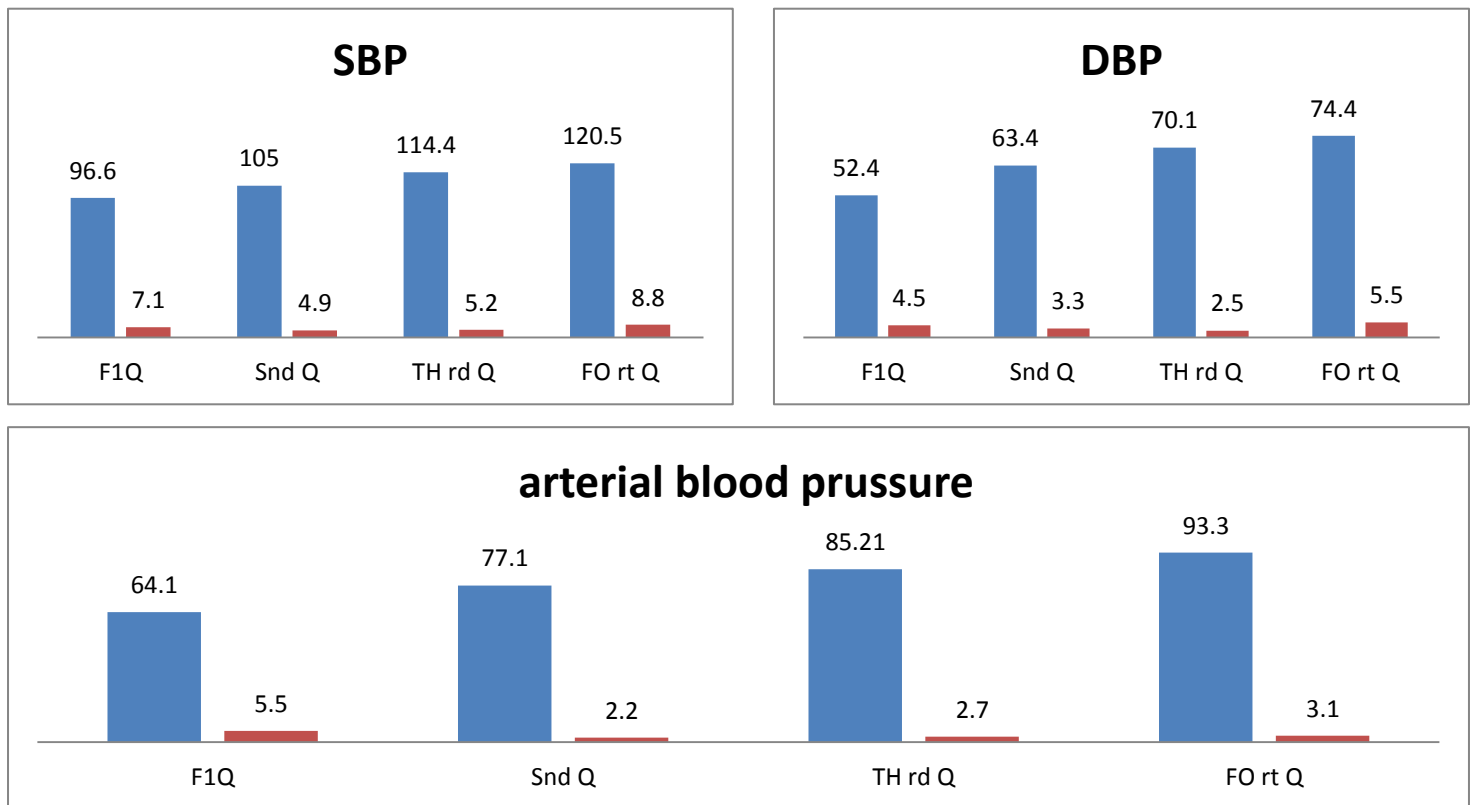


Figure 1: Result of Blood Pressure of patient Retinal Arteriolar

DISCUSSION

In this study, 210 patients were collected from different hospitals in Iraq, where they were distributed into two groups (110 patients with 33 ± 6.3 years old) (100 control groups 32 ± 4.8 years old), where pregnant patients were included in this study to evaluate retinal vascular and initial information was taken. For patients (age, height, weight), the BMI was calculated for the study sample by relying on a special equation where a slight increase was observed in the group of patients with 28.1 ± 3.8 , while for the control group, the BMI was 27.3 ± 4.3 and no A difference in financial income between the group of patients and the control group, where the statistical differences between the two groups were non-existent.

Hypertension family history was identified for both groups, with 3% of patients were identified, meaning that family history did not constitute a statistical significance between the control group and patients at a p-value of 0.99, as shown in Table 1.

In Table 2, demographic results related to retinal vascular parameters were shown, where it was found that DCP was greater in all quadrants for

pregnant women with 16.2 ± 0.3 compared to the control group with 15.8 ± 0.4 .

In addition, there was a slight increase in arteriolar caliber to the patient's group with 115.2 ± 12.2 compared to the control group, which was 114.4 ± 10.2 .

As a result of the phase change in the hormonal state, as a result of the development of the fetus, the formation of the placenta that produces skin inhibitors, the preparation of the body for childbirth, the sensitivity of the tissues of the woman's body to glucose changes during pregnancy. Against this background, the need for strict glycemic control triggers microvascular reactions, [Shalev, I. *et al.*, 2013] including those at the retinal fundus, which can be transient and persistent. Increased retinal blood flow, which corresponds to a hyperdynamic hemodynamic state during pregnancy, can induce endothelial damage and become an important factor in the development of microangiopathy [Changizi, M.A. *et al.*, 2000].

In recent years, the method of optical coherence tomography with functional angiography (OCT-A) has become widespread in diagnosis, allowing

qualitative and quantitative non-invasive analysis of retinal and choroidal microvasculature [Rossitti, S. *et al.*, 1993]. The advantages of OCT-A include the speed of the study and the ability to apply this method repeatedly, which is most important in pregnant patients [Gonul, S. *et al.*, 2015].

A number of studies have shown that there is a decrease in vascular density and enlargement of the central vascular area, which is of great importance in determining the prognosis of the course of the disease [Liew, G. *et al.*, 2008]. However, there is only a limited amount of information in the literature about the status of retinal blood flow according to OCT-A in pregnant patients.

Hypertension is a highly prevalent chronic disease that, in one way or another, affects the blood circulation and causes many complications, among which are ophthalmic disorders, which are mainly manifested in the form of retinopathy and hypertension, respectively. Their risk stems from the higher risk of blindness associated with them.

Changes that occur in the retinal blood vessels due to pregnancy-induced hypertension and the severity of retinal arterial changes correlates to a greater degree than the degree of underlying vascular spasm. Patients classified in the high-risk group for pre-eclampsia are twice as likely to have generalized retinal arterial stenosis than the low-risk group. Retinal changes appear in pregnancy-induced hypertension and are significantly associated with blood pressure.

CONCLUSION

In the current study, the results indicate that ocular changes are directly proportional to the severity of hypertension because when blood pressure levels decreased, these changes decreased significantly.

The results of variable studies support the hypothesis that ocular changes in hypertensive disease during pregnancy are related to the severity of hypertension and that fundus examination helps assess disease severity.

The significance of these changes lies in the fact that they can be irreversible, clinically causing defects in the visual field or altering visual functions.

Also, we conclude from this study on a clear contraction of SCP-PD with simultaneous dilation

of DCP-PD in the third trimester of a healthy pregnancy.

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