

## Effects of Pregnancy on The Doppler Of the Retrobulbar Artries In Preeclamptic And Healthy Pregnancy

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### Introduction

Preeclampsia is a common disorder of pregnancy complicates 4 to 8% of pregnancies and causes a maternal and fetal morbidity and mortality. It is a multiorgan disease characterized by hypertension arising in pregnancy, proteinuria in association with localized vasospasm (1) evaluation of the retrobulbar hemodynamics changes with preeclampsia is gaining interest day after day (2-4).

We can investigate the impact of ocular, orbital and systemic disease on retrobulbar arteries using Color Doppler imaging (CDI), which is an excellent noninvasive tool to analyze blood velocity.

Central nervous system arterioles and the ophthalmic artery are similar in the anatomy and in the embryological development so we can investigate the hemodynamics of the intracranial arteries using the retrobulbar hemodynamics. (5,6).

Investigation of hemodynamics of the posterior ciliary artery (PCA) has not been investigated during healthy and preeclamptic pregnant females.

This study aiming to study of the effects of preeclampsia on the retrobulbar arteries OA (ocular artery), CRA (central retinal artery) and PCA (posterior ciliary artery) compared to normotensive pregnant and non-pregnant females.

### Methods

Study was performed on three groups of women; the first group contained 30 pregnant patients suffering from preeclampsia (hypertension with systole over 140 mmhg and diastole over 90 mmhg plus proteinuria over 300 mg/l in a 24 hours urine collection sample); the second group contained 30 non pre-eclamptic pregnant females with a gestational age matched to the first group and the third group contains 30 age- matched non pregnant females.

Any pregnant patient suffering from a chronic illness, multiple pregnancy or had any ocular were excluded from the study.

### Color Doppler imaging study (CDI):

Examination of the retrobulbar arteries using CDI was performed with a 7.5-MHz matrix linear transducer. the transducer applied horizontal to the eye over the eyelid avoiding any pressure on the eye. identification of the optic nerve was done (a very important landmark). the OA was found above or below the optic nerve and it is examined 25mm behind the globe. The CRA examined 10mm of the retrolaminar portion of the optic nerve. The PCA was measured temporal to the optic nerve head.

Two similar consecutive tracings were recorded in the spectral analysis mode and then peak systolic velocity (PSV) and end diastolic velocity (EDV) were averaged. Then, the resistivity index (RI) was calculated automatically.

### Results

The three groups were age-matched, so no significant difference in age between groups with no significant difference in gestational age between the second and third group.

End diastolic volume (EDV) in all retrobulbar arteries in the healthy pregnant group were found higher than the non-pregnant group.

EDV values of the PCA in the preeclamptic group were lower than the healthy pregnant group while the EDV of the OA in the preeclamptic group was higher than the healthy pregnant group.

The resistive index (RI) values in all retrobulbar arteries in healthy pregnant group were found lower than the non-pregnant group.

The RI of the CRA and PCA in the preeclamptic group were significantly higher than the healthy pregnant group while it is not statistically significant, the RI of the OA was lower in preeclamptic group than in healthy pregnant group.

		Non- pregnant group (30)	Healthy pregnant group (30)	Preeclamptic group (30)
Ophthalmic artery	PSV	38±5	37±5	39±5
	EDV	7.53±	7.62	7.91±
	RI	0.81	0.78	0.76
Central retinal artery	PSV	10.41	10.12	9.85
	EDV	3.48±	3.75	3.71±
	RI	0.63	0.62	0.68
Posterior ciliary artery	PSV	4.71	4.55	4.14
	EDV	4.53	4.67	3.77
	RI	0.64	0.62	0.66

**Table 1:** color Doppler study of the OA, CRA AND PCA in preeclamptic pregnant, healthy pregnant and healthy non-pregnant.

## Discussion

Normal Pregnancy is associated with some ocular physiological changes that is disappeared after pregnancy. When preeclampsia developed it results in a pathological change like hypertensive retinopathy, exudative retinal detachment and cortical blindness.

Also, central nervous system may be affected by preeclampsia due to the generalized vasospasm resulting in symptoms of severe preeclampsia including headache, visual disturbances, altered mental status or cortical blindness. Thus, intracranial and orbital circulation still remains to be a concern in preeclamptic patients (2).

There are similarities between orbital and intracranial vessels in the embryology, anatomy and function, so we can evaluate the intracranial vessels indirectly by evaluating orbital vasculature by CDI (7).

The orbital artery (OA) originates from the internal carotid artery and pass through the optic canal to reach the orbital cavity, it is a medium sized artery, its diameter is 1.3 ±0.3 mm. It gives the two branches CRA and PCA (8).

Changes in the orbital circulation can be best studied with CDI, and by measuring the various indices RI and PI to detect the degree of resistance to blood flow in these vessels. (2,9).

Previous studies on Doppler artery changes with preeclampsia showed a different result. There were studies showed that the OA showed a lower value od PI and RI with preeclampsia than healthy pregnant due to vasodilatation of the OA (10,11)

Other studies showed increased in the RI and PI of the OA due to vasospasm and increase vascular resistance in severe preeclampsia (2,12).

In our study we observed that there was a decrease in the RI of the OA, PCA in healthy pregnant group compared to nonpregnant group. And this is due to vasodilatation of all orbital arteries in healthy pregnancy. The RI of the OA in the preeclampsia group is lower than it in the healthy pregnancy group with increased RI in the CRA and PCA this results in choroidal non filling and decrease filling in the choriocapillaries in preeclamptic pregnant.

There was also an decrease in EDV values in the PCA which means an ischemia and hypoperfusion in the choroidal circulation, with EDV remains good in preeclamptic patients which means normal retinal circulation with preeclampsia; this means that preeclampsia doesn't have the same effects on all blood vessels but the changes in the vessels depended on the size of the vessel and the autoregulatory mechanism.

In our study there was an increased resistance to blood flow in small caliber arteries like PCA and RCA, with possibly decrease resistance in medium sized arteries like OA, due to auto regulatory mechanisms. Further studies are also required to demonstrate if these pathologic blood flow changes of the retrobulbar arteries reflect the cerebral circulation in preeclampsia.

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