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CHANGES IN OPHTHALMIC ARTERY DOPPLER VELOCIMETRY IN PREGNANCIES COMPLICATED BY PREECLAMPSIA

Radio-Diagnosis

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ABSTRACT

Background Preeclampsia is a major hypertensive disorder of pregnancy associated with significant maternal and fetal morbidity and mortality. Altered cerebral hemodynamics in preeclampsia can be assessed non-invasively using ophthalmic artery Doppler velocimetry. **Aim** To evaluate ophthalmic artery Doppler indices in pregnancies complicated by preeclampsia and compare them with normotensive pregnancies. **Materials and Methods** This prospective observational study included 72 pregnant women, divided equally into normotensive and preeclamptic groups. Doppler indices including ophthalmic artery pulsatility index (OAPI), resistive index (OARI), and peak ratio (OAPR) were measured and correlated with uterine artery Doppler parameters. **Results** Ophthalmic artery pulsatility index and resistive index were significantly reduced in preeclamptic women, while peak ratio was significantly increased compared to normotensive pregnancies ($p<0.0001$). Severe preeclampsia demonstrated greater orbital hyperperfusion and lower vascular resistance. **Conclusion** Ophthalmic artery Doppler is a safe, inexpensive, and reproducible modality for assessing cerebrovascular changes in preeclampsia and may aid in early identification of high-risk pregnancies.

KEYWORDS

Preeclampsia, Ophthalmic Artery Doppler, Pulsatility Index, Resistive Index, Pregnancy Hypertension

INTRODUCTION

Hypertensive disorders complicate approximately 6–10% of pregnancies worldwide, with preeclampsia being one of the most severe forms. The disease is associated with placental dysfunction, endothelial injury, and altered maternal hemodynamics. Neurological complications contribute significantly to maternal morbidity and mortality. The ophthalmic artery, being a branch of the internal carotid artery, reflects changes in cerebral circulation and offers a non-invasive window for evaluating cerebrovascular hemodynamics in preeclampsia.

Aim and Objectives

- To observe ophthalmic artery Doppler indices in pregnancies complicated by preeclampsia.
- To compare these indices with normotensive pregnant women.
- To correlate Doppler indices with maternal blood pressure.
- To compare ophthalmic artery Doppler parameters with uterine artery Doppler indices.

Materials and Methods

This single-center prospective observational study was conducted in the Department of Radiodiagnosis, Amaltas Institute of Medical sciences, Dewas.

Study duration

One and half year

Sample size

A total of 72 pregnant women were included, with 36 women in the preeclampsia group and 36 normotensive controls.

Inclusion criteria

Singleton pregnancies with gestational age ≥20 weeks.

Exclusion criteria

Women with chronic illness, multiple pregnancies, diabetes, smoking, ocular disease, or vascular disorders were excluded.

Methodology

Doppler examination was performed using Voluson S8 color Doppler machine with 10 MHz linear probe and 5 MHz curvilinear probe. Ophthalmic artery Doppler parameters including peak systolic velocity, end-diastolic velocity, pulsatility index, resistive index, and peak ratio were measured.

RESULTS

Ophthalmic artery pulsatility index and resistive index were significantly lower in preeclamptic women compared to normotensive pregnant women, indicating reduced orbital vascular resistance and increased orbital blood flow. Peak ratio values were significantly higher in preeclampsia.Women with severe preeclampsia demonstrated more pronounced hemodynamic alterations than those with mild preeclampsia. No statistically significant difference was observed in uterine artery pulsatility index among study groups.

Table 1: Doppler Indices Observed in Study

Indices	Normotensive 20-29 wks	Normotensive 30 wk-term	Mild PE 20-29wks	Mild PE 30 wk-term	Severe PE 20-29 wks	Severe PE 30 wk-term
OAPI	2.21	1.97	1.39	1.44	1.06	1.03
OARI	0.85	0.80	0.71	0.69	0.62	0.65
OAPR	0.51	0.54	0.75	0.76	0.77	1.19
Ut API	0.69	0.79	0.71	0.90	0.70	1.08

DISCUSSION

The study findings suggest that preeclampsia is associated with orbital vascular hyperperfusion and reduced vascular impedance. Similar observations have been reported by de Oliveira et al., Ayaz et al., and Hata et al. Severe preeclampsia showed greater reductions in pulsatility and resistive indices compared to mild disease, reflecting progressive cerebrovascular involvement.

CONCLUSION

Ophthalmic artery Doppler velocimetry is a useful non-invasive imaging modality for assessing cerebrovascular changes in preeclampsia. Reduced pulsatility and resistive indices along with increased peak ratio may help identify women at higher risk of complications. The technique is safe, reproducible, and can be incorporated into routine antenatal evaluation in hypertensive pregnancies.

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