ORIGINAL RESEARCH

Evaluation of Colour Doppler values for localization of placenta and uterine artery Doppler as predictors of preeclampsia in 18-24 weeks of gestation

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Received: 10 November, 2018 Accepted: 14 December, 2018

ABSTRACT
Background: The present study was planned for evaluating Colour Doppler values for localization of placenta and uterine artery Doppler as predictors of preeclampsia in 18-24 weeks of gestation. **Materials & methods:** One hundred patients underwent ultrasound scanning between 18 and 22 weeks of gestation and were subsequently monitored until delivery. During the ultrasound examination at 18-22 weeks, the positions of the placenta and the uterine artery Doppler were assessed in all participants. The primary outcomes of the study included the incidence of preeclampsia and intrauterine growth restriction (IUGR). Both grey scale ultrasound and color Doppler imaging were utilized in the assessment. Any correlations between the radiological findings and clinical or surgical outcomes will be documented and analysed. **Results:** The average gestational age recorded was 22.3 weeks. In 85% of the instances, the placenta was situated centrally, whereas in the remaining 15%, it was positioned laterally. Pre-eclampsia was observed in 12% of the patients. Notably, significant correlations were found between Doppler findings and the incidence of pre-eclampsia. **Conclusion:** Identifying high-risk patients and proactively monitoring those at risk for preeclampsia allows for enhanced supervision, which can mitigate morbidity and enhance pregnancy outcomes.
Key words: Colour Doppler, USG findings

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INTRODUCTION

Pre-eclampsia is a complex disorder affecting multiple organ systems, occurring in approximately 3% to 8% of pregnancies in Western nations, and represents a significant contributor to both morbidity and mortality on a global scale. Research indicates that 10% to 15% of maternal fatalities are directly linked to pre-eclampsia and eclampsia.[1, 2] Epidemiological studies lend support to the notion that genetic and immunological factors may play a role in the disorder's etiology. Pregnant women with a personal history of pre-eclampsia face a risk that is two to five times greater than those without such a history. The incidence of pre-eclampsia varies by ethnicity, with rates ranging from 3% to 7% among healthy nulliparous women and from 1% to 3% among multiparous women.[3, 4]

Management of early preeclampsia is primarily symptomatic, focusing on extending the duration of pregnancy and mitigating severe maternal complications, contingent upon the condition of the fetus. This approach includes the regulation of blood pressure, prophylactic measures against seizures, and continuous monitoring of fetal well-being. In cases of severe preeclampsia, particularly when it manifests early, the fetus may experience escalating nutritional deficiencies, which can lead to intrauterine growth restriction (IUGR) and neonatal asphyxia, potentially culminating in fetal demise. Additionally, premature delivery, whether prompted by fetal distress or the worsening of maternal health, may result in enduring neurological impairments.[5-7]Hence; the present study was conducted for evaluating Colour Doppler values for localization of placenta and uterine artery Doppler

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as predictors of preeclampsia in 18-24 weeks of gestation.

MATERIALS & METHODS

The present study was conducted with the aim of establishing the role of Colour Doppler values for localization of placenta and uterine artery Doppler as predictors of preeclampsia in 18-24 weeks of gestation. One hundred patients underwent ultrasound scanning between 18 and 22 weeks of gestation and were subsequently monitored until delivery. During the ultrasound examination at 18-22 weeks, the positions of the placenta and the uterine artery Doppler were assessed in all participants. The primary outcomes of the study included the incidence of preeclampsia and intrauterine growth restriction (IUGR). Both grey scale ultrasound and color Doppler imaging were utilized in the assessment. Any correlations between the radiological findings and clinical or surgical outcomes will be documented and analysed. All collected data were recorded in a Microsoft Excel spreadsheet, and univariate analysis was conducted to determine the level of significance.

RESULTS

The average gestational age recorded was 22.3 weeks. In 85% of the instances, the placenta was situated centrally, whereas in the remaining 15%, it was positioned laterally. Pre-eclampsia was observed in 12% of the patients. Notably, significant correlations were found between Doppler findings and the incidence of pre-eclampsia.

Table 1: Distribution of cases according to gestational age

Gestational age (weeks)	Number of cases	Percentage of cases
18 to 20	33	33
21 to 22	39	39
23 to 24	28	28
Total	100	100

Table 2: Distribution of cases according to placental location

Location of placenta	Number of cases	Percentage of cases
Central	85	85
Lateral	15	15
Total	100	100

Table 3: Incidence of Pre-eclampsia

Pre-eclampsia	Number of patients	Percentage of patients
Present	12	12
Absent	88	88
Total	100	100

Table 4: Distribution of patients in relation to Doppler study and occurrence of pre-eclampsia

Pre-eclampsia	Doppler Normal findings	Doppler abnormal findings	Total
Negative	81	7	88
Positive	8	4	12
Total	89	11	100
Chi- square value	81.8		
p- value	0.001 (Significant)		

DISCUSSION

Preeclampsia is classified as an autoimmune disorder marked by elevated blood pressure. The condition initiates with atypical apoptosis of cytotrophoblasts, resulting in inflammatory responses and heightened concentrations of anti-angiogenic factors, which subsequently disturb the angiogenic equilibrium. Pregnant women diagnosed with preeclampsia exhibit increased levels of fetal DNA and RNA derived from the placenta, which is frequently impacted in pregnancies complicated by this disorder. Nonetheless, it is still unclear whether these elevated levels are a causative factor or a resultant effect of preeclampsia.[6-9] Hence; the present study was conducted for evaluating Colour Doppler values for localization of placenta and uterine artery Doppler as predictors of preeclampsia in 18-24 weeks of gestation.

In the present study, the average gestational age recorded was 22.3 weeks. In 85% of the instances, the placenta was situated centrally, whereas in the remaining 15%, it was positioned laterally. Pre-eclampsia was observed in 12% of the patients. Notably, significant correlations were found between Doppler findings and the incidence of pre-eclampsia.Razieh DFevaluated the predictive value of Doppler investigations of the uterine circulations during 14-16 weeks of gestation with regard to the development of preeclampsia and/or IUGR in study population. This prospective observational study was

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carried out at university hospital. All 456 pregnant women referred to hospital from October 2011 to october2012, ultrasound sonography was done at 14-16 weeks of gestation. In all Doppler measurements, the mean peak systolic (S) to end-diastolic (D) ratio of 3-5 cardiac cycle was computed by electronic capilers and the RI calculated as (S-D/S). A total of 456 pregnant women with mean age of 26.8±5.3 years were recruited during the study. The uterine artery RI at 14-16 weeks was significantly higher in 27 women subsequently developed preeclampsia than in 429 pregnancy with a normal outcomes.The uterine artery RI also was significantly higher in 36 women developed IUGR compared with 420 women with normal pregnancies. RI=0.69 to predict preeclampsia and RI=o.7 to predict IUGR as mentioned are optional cut-off value for RI of the uterine artery in their study which were congruent with other studies.[10]Woschitz MC evaluated the prognostic role of uterine artery Doppler for pre-eclampsia in high-risk patients. Because of the higher prevalence of new onset of disease in a high-risk population, a better performance could be expected in this special group. This retrospective study compares uterine artery Doppler to predict pre-eclampsia in patients with a history of pre-eclampsia and also in patients with chronic hypertension, both with high-risk to develop recurrent, superimposed or new onset pre eclampsia. Doppler measurements of uterine arteries were performed every 4 weeks in the 1st and 2nd trimester. Pre-eclampsia occured in 33% of current high-risk pregnancies. The best performance of pre eclampsia was provided by bilateral notching plus increased PI ≥ 2.5, both in the 1st and 2nd trimester. In the 1st trimester the specifity was 81% in the Prior PE group and 95% in the C. H. group. In the 2nd trimester the sensitivity was 97% in the Prior PE group and 100% (95% CI: 93 100) in the C. H. group. Sensitivity was very low in the 1st and 2nd trimester. Their results showed, that the negative predictive value of uterine artery Doppler works well even in a high risk group.[11] Barati Minvestigated the predictive value of a uterine artery Doppler in the identification of adverse pregnancy outcomes such as ‘pre-eclampsia’ and ‘small fetus for gestational age’ (SGA).Three hundred and seventy-nine women, with singleton pregnancy, between 18 and 40 years of age, without risk factors, randomly underwent Doppler interrogation of the uterine arteries, between 16-22 weeks of gestation. Those who had a mean pulsatility index (PI) of >1.45 were considered to have an abnormal result, and were evaluated and compared with those who had normal results for adverse pregnancy outcomes, including pre-eclampsia and small for gestational age. The relationship between the variables was assessed with the use of the chi-square test. There were 17 cases (4.5%) of abnormal uterine artery Doppler results and 15 of them (88.2%) developed pre-eclampsia and four cases (23.5%) had neonates small for gestational age. For predicting pre-eclampsia, the mean uterine artery PI had to be >1.45, had to have a specificity of 95.5% (95% CI, 70-92%), a sensitivity of 79% (95% CI, 43-82%), a negative predictive value (NPV) of 98.9% (95% CI, 72-96%), and a positive predictive value (PPV) of 88.2% (95% CI, 68-98%). In the case of ‘small for gestational age’ it had to have a specificity of 96.5% (95% CI, 42-68%), a sensitivity of 57% (95% CI, 53-76%), an NPV of 99.2% (95% CI, 70-92%), and a PPV of 23.5% (95% CI, 30-72%). Uterine artery Doppler evaluation at 16-22 weeks of gestation might be an appropriate tool for identifying pregnancies that may be at an increased risk for development of pre-eclampsia and small fetus for gestational age.[12]

CONCLUSION

Identifying high-risk patients and proactively monitoring those at risk for preeclampsia allows for enhanced supervision, which can mitigate morbidity and enhance pregnancy outcomes.

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