

Original Article

Assessment of the Relation of Uterine Artery Doppler flow and Maternal Age during Second Trimester

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ABSTRACT:

Background: Abnormal uterine artery Doppler results have been shown to be strongly correlated with several types of adverse maternal and perinatal outcomes. **Aim of the study:** To assess the relation of uterine artery Doppler flow and maternal age during second trimester. **Materials and methods:** For the study, we selected 50 normal pregnant women between the age of 20 to 40 years. The gestational period for each subject was between 14 to 28 weeks. The calculation of gestational age was done from first day of last normal menstrual period and confirmed by either first or early second trimester ultrasound scan. Color Doppler flow was used to identify right and left uterine arteries at apparent crossover with external iliac artery. Uterine artery waveforms were obtained by performing pulsed wave Doppler using ultrasound machine. Mean pulsatility index (PI) and resistance index (RI) were calculated. **Results:** The mean age of subjects ranged from 20 to 40 years. The subjects were grouped into two groups, subjects with maternal age <30 years and subjects with maternal age >30 years. The comparison between both the groups for PI, RI and S/D ratio was non-significant. **Conclusion:** There is no correlation between maternal age and uterine artery PI, RI and S/D ratio in normal pregnancy. The uterine artery PI, RI and S/D ratios were not different in younger and elderly groups.

Keywords: Color Doppler, pregnancy, ultrasound.

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INTRODUCTION: Preeclampsia (PE), intrauterine growth restriction (IUGR), and preterm delivery are major causes of maternal or perinatal morbidity and mortality during the latter half of pregnancy.^{1, 2} The exact pathophysiology underlying these conditions remains unknown. However, preeclampsia and fetal growth restriction have been reliably associated with failures in the trophoblastic invasion of spiral arteries, and Doppler studies have shown that impedance of flow in the uterine arteries is increased under these conditions.³⁻⁵ Although no single efficient screening procedure for predicting PE has been adopted in clinical practice, uterine artery Doppler is the most widely studied clinical test available for this particular purpose, becoming a useful method for the indirect assessment of uteroplacental circulation in early pregnancy (11–14 weeks).⁶ If combined with examination of maternal history, mean arterial pressure (MAP) and certain biochemical markers (pregnancy-associated plasma protein A or PAPP-A and placenta

growth factor or PIGF), uterine artery Doppler may be regarded as an adjunct screening tool for predicting PE and intrauterine growth restriction (IUGR).⁷ Abnormal uterine artery Doppler results have been shown to be strongly correlated with several types of adverse maternal and perinatal outcomes.⁸ Hence, the present study was planned to assess the relation of uterine artery Doppler flow and maternal age during second trimester.

MATERIALS AND METHODS:

The present study was conducted in the Department of Radiology of the medical institution. For the study, we selected 50 normal pregnant women between the age of 20 to 40 years. The gestational period for each subject was between 14 to 28 weeks. The ethical clearance for the study was obtained from the ethical committee of the institute. An informed written consent was obtained from each subject after verbally explaining them the protocol and pros and cons of the study. The calculation of gestational age was

done from first day of last normal menstrual period and confirmed by either first or early second trimester ultrasound scan. Color Doppler flow was used to identify right and left uterine arteries at apparent crossover with external illiac artery. Uterine artery waveforms were obtained by performing pulsed wave Doppler using ultrasound machine. Mean pulsatility index (PI) and resistance index (RI) were calculated.

The statistical analysis of the data was done using SPSS program version 11.0 for windows. Student's t- test and Chi square test were used to check the significance of the data. A p-value <0.05 was predefined to be statistically significant.

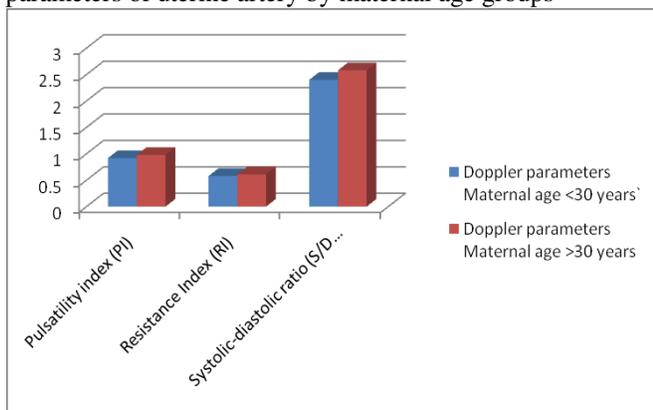
RESULTS:

In the present study, a total of 50 subjects were included. The man age of subjects ranged from 20 to 40 years. The subjects were grouped into two groups, subjects with maternal age <30 years and subjects with maternal age >30 years. Subjects with maternal age <30 years were 11 in number and subjects with maternal age >30 years were 39 in number. **Table 1** shows the comparative analysis of mean Doppler parameters of uterine artery by maternal age groups. The comparison between both the groups for PI, RI and S/D ratio were non-significant (p<0.05) [Fig 1].

Table 1: Comparative analysis of mean Doppler parameters of uterine artery by maternal age groups

Doppler parameters	Mean ± standard deviation		P-value
	Maternal age <30 years (n=11)	Maternal age >30 years (n=39)	
Pulsatility index (PI)	0.92±0.31	0.98±0.33	0.81
Resistance Index (RI)	0.58±0.12	0.61±0.14	0.24
Systolic-diastolic ratio (S/D ratio)	2.4±0.52	2.58±0.72	0.31

Figure 1: Showing comparative analysis of mean Doppler parameters of uterine artery by maternal age groups



DISCUSSION:

The present study aimed to assess the relation of uterine artery Doppler flow and maternal age during second

trimester. We observed that PI, RI and S/D ratio on comparing both the groups' non-significant results are obtained. So, this can be inferred that there is no correlation between maternal age and uterine artery PI, RI and S/D ratio in normal pregnancy. The results were compared with other studies from the literature. Oloyede OA et al examined the indices of uterine artery impedance at 22-23 weeks gestation and their relationship with maternal age and parity. Uterine artery colour imaging and pulsed wave Doppler ultrasound was conducted between 22nd and 23rd weeks in 430 pregnancies. The pregnancies were classified into 2 groups: normal and abnormal outcomes. The indices of impedance recorded were pulsatility index, resistance index and the systolic/diastolic ratio. Relevant obstetric information was retrieved from the antenatal records. Fifty eight (13.5%) out of 430 pregnancies had complications of impaired placentation, mainly intrauterine growth restriction and preterm birth (24 or 41.4% each). The indices in normal pregnancies were similar to presently used values. There was no statistically significant difference in the 2 pregnancies groups.

It was concluded that the indices in normal pregnancies were similar to values from previous studies. The values are however not significantly different in pregnancies with abnormal outcome. Prefumo F et al investigated the relationship between second-trimester uterine artery Doppler findings and parity in a large pregnant population. Uterine artery Doppler studies were performed in all singleton pregnancies at 18-23 weeks of gestation. The mean uterine artery resistance index and the presence or absence of protodiastolic notches was recorded. Two groups were identified: pregnancies not complicated by pre-eclampsia, and pregnancies with pre-eclampsia severe enough to require delivery at or before 32 weeks of gestation. In the 4132 pregnancies uncomplicated by pre-eclampsia, parity was shown to be an independent predictor for both mean uterine artery resistance index and the presence of bilateral protodiastolic notches. In the 17 pregnancies complicated with severe pre-eclampsia, uterine artery Doppler indices showed a trend towards being better predictors of disease in nulliparous compared with parous women. It was concluded that parity has a significant effect on the resistance index and the prevalence of protodiastolic notching in the uterine artery flow waveforms. This difference is clinically noticeable in its effect on notching. These findings suggest that some permanent modification may persist in the maternal vessels after a successful pregnancy, altering their impedance in subsequent pregnancies.^{9, 10}

Pirhonen J et al determined possible maternal age-related changes in uterine artery impedance in normal late pregnancy. In a cross-sectional design study, Doppler velocimetry of the uterine vessels was performed in 884 pregnant women with normal, late, singleton pregnancies. They found a statistically significant, nonlinear relationship between mean uterine artery impedance (pulsatility index)

and maternal age, with an increase of the pulsatility index in women above the age of 35. This association continued to be significant even when adjusted for gestational age and parity as confounders. It was concluded that in normal pregnancy, an increase in uterine artery impedance was noted in women above the age of 35. This finding may be related to the physiologic process of aging and may partly explain why pregnancies in older women are associated with diverse complications more often than those in younger women. Spencer K evaluated whether measurement of maternal serum PP13 at 22 to 24 weeks of gestation, alone or in combination with second-trimester biochemical markers or uterine artery pulsatility measured by Doppler velocimetry, is useful in predicting those women at risk of developing pre-eclampsia. A nested case-control study of pre-eclampsia cases with controls matched for gestational age and storage time for the maternal serum. PP13 was tested by an ELISA, with the samples blinded to pregnancy outcome. All patients also underwent uterine artery Doppler flow velocimetry at 22-24 weeks to measure the mean pulsatility index (PI). Results for Inhibin, Activin, PAPP-A and Free beta-hCG were available from previous studies. There were 73 controls and five cases with early pre-eclampsia in which delivery was induced prior to 35 weeks. In addition, there were a further seven cases with pre-eclampsia in which delivery was not induced before term. Median PP13 levels for controls and all cases were 295.9 and 212.6 pg/ml, and 171.2 pg/ml amongst the early pre-eclampsia cases, with the MoMs 1.00, 0.94 and 0.63, respectively. Receiver operator characteristic (ROC) curve analysis for either all cases or early cases versus controls yielded areas under the curve of 0.588 and 0.693 for PP13. At a specificity set to 0.80, the sensitivity for PP13 in the early cases was 0.40 and that in all cases was 0.25. Combining PP13 bivariate with any of the markers tested in the 22-24 week period did not improve the detection of early, late or all cases of pre-eclampsia compared with either marker alone. They concluded that late second-trimester PP13 alone is unlikely to be useful in predicting pre-eclampsia and early pre-eclampsia, and its prediction does not increase when coupled with second-trimester Doppler PI or other potential biochemical markers. Measuring between-trimester temporal changes may be worthy of further investigation.^{11, 12}

CONCLUSION:

Within the limitations of the present study, we conclude that there is no correlation between maternal age and uterine artery PI, RI and S/D ratio in normal pregnancy. The uterine artery PI, RI and S/D ratios were not different in younger and elderly groups

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