(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

A radiological Assessment on role of Colour Doppler values as predictors of preeclampsiain 18-24weeks of gestation

[1]Nisha Arora, [2]Avinash Munshi

[1]Associate Professor, [2]Assistant Professor, Department of Radiodiagnosis, National Institute of Medical Sciences & Research, Jaipur, Rajasthan, India

ABSTRACT:

Introduction: Theoretically, a pathological increase inplacental vascular resistance should be detectable by abnormal Doppler flow studies of the maternal uterine vessels, and this could offers the potential to detect women at risk for diseases like preeclampsia. **Materials and Methods:** Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. A total of 35 patients with gestational age between 18weeks to 24 weeks were enrolled in the present study. Complete clinical examination of all the patients was carried out. Colour Doppler was carried out in all the patients. Patients were followed up to delivery and examination of the neonate was done. **Results:** In the present study, a total of 35patients were analysed. Mean gestational age was found to be 20.2weeks, while mean age was found to be 24.1 years. Out of 7patients with abnormal Doppler findings, pre-eclampsia was foundto be present in 3 patients, while it was found to be absent in 4patients. **Conclusion:** In cases where the test proves be abnormal, increased surveillance and delivery in a well-equipped setup is necessary to reduce the maternal and fetal complications.

Keywords: Colour Doppler, preeclampsia, predictors.

Corresponding author: Avinash Munshi, Assistant Professor, Department of Radiodiagnosis, National Institute of Medical Sciences & Research, Jaipur, Rajasthan, India

This article may be cited as: Arora N, Munshi A. A radiological Assessment on role of Colour Doppler values as predictors of preeclampsiain 18-24weeks of gestation. J Adv Med Dent Scie Res 2014;2(4):244-247.

INTRODUCTION

The uterine muscalar wall fails to be invaded by trophoblasts in women who develop preeclampsia, which causes the spiral arteries to retain their muscle elastic covering and blood flow impedance.1. 3. According to theory, aberrant Doppler flow tests of the mother's uterine vessels should reveal a pathological increase in placental vascular resistance, and this could provide a means of identifying women who may be at risk for conditions such as preeclampsia.4. Preeclampsia is a pregnancy disorder that is defined as a systemic syndrome that occurs after 20 weeks of gestational age in pregnant women and is resolved before the end of the sixth week postpartum. It is characterised by the new onset of hypertension (blood pressure – systolic > 140 mm Hg, diastolic > 90 mm Hg on two occasions at least 4 h apart, or in severe cases systolic blood pressure > 160 mm Hg and diastolic blood pressure > 110 mm Hg) and proteinuria (protein [mg]/creatinine [mg] of > 0.3 or protein > 5 g in a 24-hour urine sample, or > 3 g in two samples taken 6 h apart from a patient on bed rest).2. 5 In the first or second trimester, transvaginal or transabdominal uterine artery Doppler ultrasonography can be carried out. More than 95% of patients are said to have easy access to uterine artery waveforms. The technique of colour Doppler ultrasonography is used to identify the uterine artery.Waveforms are then obtained using pulsed-wave Doppler ultrasonography. Numerous indices are able to be computed and evaluated.7, 6,

The aberrant uteroplacental circulation that arises from the failure of the second wave of trophoblastic invasion into spiral arterioles is considered to be the fundamental cause of preeclampsia. As a result, there will be less placental perfusion and more flow resistance in the uterine arteries. This hypothesis gave rise to the notion of screening for preeclampsia utilising Doppler monitoring of the uterine artery flow velocity waveform. One piece of indirect evidence for improper placentation is the persistence of high resistance to flow in the uterine arteries.

The purpose of this research is to determine if uterine artery Doppler ultrasound in the second trimester can serve as a valid screening tool for preeclampsia prediction in our high-risk (HR) and low-risk (LR) pregnant patients.

MATERIALS&METHODS

'Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. A total of 35 patients with gestational age between 18weeks to 24 weeks were enrolled in the present study. Complete demographic details of all the patients were obtained. Complete clinical examination of all the patients was carried out. Colour Doppler was carried out in all the patients. Patients were followed up to delivery and examination of the neonate was done.

Criteria for inclusion in the HR group are the following(modified from Zimmermann et al.) : H/o

chronic hypertension, diabetes, renal disease; obesity (BMI [30);age↘20or▮35years(in primi);past bad obstetric history of—preeclampsia, IUGR, and IUFD; family h/o pre-eclampsia or IUGR in mother or sister.

At 24–26 weeks, a Doppler ultrasound (with 3.5 MHzcurvilinear probe) of uterine artery velocity waveform was performed on a woman using an ultrasound machine (M/S Shimadzu India Ltd.). The woman was examined in a semi-recumbent position after 10 min of bed rest. Under real-time ultrasonography, uterine artery of each side was identified at the uterocervical junction where it appeared to cross the external iliacartery. Using color Doppler imag-ing, flow velocity waveforms of both uterine arteries wererecorded. Persistence of an early diastolic notch, unilateralor bilateral in the main uterine artery, or elevated resistanceindex or RI 0.6, or both was considered as abnormalflow velocity waveform. An early diastolic notch wasdefined as a V-shaped deflection toward the baseline in early diastole. Resistance index(RI) = systolic peak velocity - diastolic peak velocity/systolic peak velocity or(S−D)/S.

DATA ANALYSIS

For data analysis, SPSS Statistics Version 26.0 (IBM Inc., Armonk, NY) was used. Using cross-tabulation, the sensitivity, specificity, as well as positive and negative predictive values (PPV and NPV) were reported for Doppler U/S.

RESULTS

A total of 35 patients were examined in this investigation. The average age was discovered to be 24.1 years, while the average gestational age was found to be 20.2 weeks.

Table1: Gestational age

Gestational age(weeks)	Number of cases	Percentage of cases
18to20	19	54.2
21to24	16	45.7
Total	35	100

Preeclampsia was discovered to be present in 6 patients (18% of participants) in this investigation.

Table2: Age-wise distribution of patients

Age group(years)	Number of patients	Percentage of patients
Less than 22	9	25.7
22to27	16	45.7
More than 27	10	28.5
Total	35	100

Pre-eclampsia was detected in 3 of the 7 individuals with aberrant Doppler findings, while it was missing in the other 4 patients.

Table3: Doppler findings

Pre-eclampsia	Dopplerfindings		Total
	Doppler Normal findings	Doppler abnormal findings	
Negative	23	3	26
Positive	5	4	9
Total	28	7	35

DISCUSSION

Intestinal artery these requirements are satisfied by doppler ultrasonography, which is also quite simple to use with training and experience. The results of Cnossen and colleagues suggest that this treatment could be performed at 18–20 weeks of gestation in conjunction with normal anatomy ultrasonography. Additionally, it has been demonstrated that aberrant uterine artery Doppler investigations during the first and second trimesters are linked to perinatal difficulties later on.7, 9, Therefore, the goal of the current study was to determine whether Colour Doppler results might be used to predict preeclampsia in women weighing between 18 and 24 weeks gestation.

A total of 35 patients were examined in this investigation. The average age was discovered to be 23.8 years, while the average gestational age was 19.7 weeks. The use of Doppler throughout the second trimester of pregnancy in women visiting a multispecialty hospital on the outskirts of Bangalore, Karnataka state, India, was reported by Padmalatha VV et al. They came to the conclusion that the best indication for predicting pre-eclampsia and foetal growth limitation is a combination of characteristics. The uterine artery diastolic notch as a single metric outperforms the various Doppler indices. Both high-risk and low-risk pregnancies are linked to an increased resistance to uterine artery flow, which is a stronger predictor of the development of pre-eclampsia and foetal growth restriction later on.10.

Pre-eclampsia was discovered to be present in 4

individuals (16% of participants) in this investigation. Nevertheless, 4 patients had aberrant Doppler findings, compared to 21 patients who had abnormal results. Pre-eclampsia was found to be absent in two patients and present in two out of the four patients with abnormal Doppler findings. In a prior study, Razieh DF et colleagues assessed the prognostic efficacy of Doppler studies of the uterine circulations between weeks 14 and 16 of pregnancy in relation to the development of IUGR and/or preeclampsia in the studied group. The University Hospital served as the site of this prospective observational investigation. From October 2011 to October 2012, 456 pregnant women were referred to the hospital, and ultrasound sonography was performed while the ladies were 14–16 weeks gestation. Electronic capilers were used to calculate the mean peak systolic (S) to end-diastolic (D) ratio of the 3-5 cardiac cycle for all Doppler data. The resulting RI was then calculated as (S-D/S). During the study, 456 pregnant women with a mean age of 26.8±5.3 years were included. When comparing 429 pregnancies with normal outcomes (mean RI=0.6440±0.059, P=0.001) to 27 women who later had preeclampsia (mean RI=0.7526±0.039), the uterine artery RI at 14–16 weeks was considerably higher.When comparing 420 women with normal pregnancies (RI=0.6505±0.06043, P=0.001) to 36 women who had IUGR (RI=0.7244±0.04730), the uterine artery RI was likewise considerably higher in the former group.

A uterine artery notch and a higher uterine resistance index were both linked to an increased relative risk of preeclampsia, as demonstrated by Konchak et al. 11. According to their investigation, a uterine notch's sensitivity, specificity, PPV, and NPV were 83.3, 95.6, 55.6, and 98.9%, respectively.

Coleman et al.'s study [0.58] on uterine artery Doppler screening in HR women revealed that the sensitivity and specificity of the test were 91% and 42%, respectively, for preeclampsia. 58% of the women with RI C 0.7 experienced preeclampsia.

According to Schwarze et al. (2013), uterine artery notching had an 88% predictive accuracy of pre-eclampsia in LR pregnancies. The LR group in our study had a sensitivity and specificity of 70 and 94.87%, respectively, for increased uterine artery RI as a predictor of preeclampsia.

The study found that the sensitivity, specificity, PPV, and NPV for the Doppler index of unilateral/bilateral RI >0.58 were 71%, 26%, 74%, and 24%, respectively; for bilateral RI >0.58, those values were 41%, 63%, 77%, and 27%, respectively. These values were 71%, 89%, 95%, and 52% for unilateral/bilateral uterine artery notch, and 32%, 79%, 84%, and 28% for bilateral notch. In contrast to our research, another study found that the PPV in the uterine artery notch was 25% and the prevalence of PE was reported to be 18%. Additionally, the study found that the sensitivity, specificity, PPV, and NPV in RI >0.58 were 41%, 96%, 70%, and 88%, respectively. Similarly, 62%, 89%, 47%, and 94% of the values related to bilateral uterine artery notching were obtained.

Instead of evaluating PE risk clinically, a number of studies have demonstrated PPV ranging from 35 to 60% and NPV ranging from 70 to 95% based on PE diagnosed or forecasted using Doppler U/S.14. According to one study, 58% of high-risk moms who experienced hypertension also had PE.15. In a further study, 11.3% of mothers had abnormal Doppler ultrasonography findings, with corresponding sensitivity, specificity, PPV, and NPV for PE at 36%, 90%, 11%, and 98%.sixteen A positive family history of PE, smoking, nulliparity, first-trimester BMI >30 kg/m2, and a prior history of PE are risk factors for PE, according to several other studies that had similar findings to ours. Furthermore, Doppler U/S has evolved into a test of utmost importance since it was first used as a screening tool to identify PE.17.

The limited sample size, retrospective study design, and the fact that data were only taken from one institution are some of the study's limitations. Thus, in order to gain a deeper understanding of the function of Doppler U/S in PE prediction, we advise conducting extensive prospective research.

CONCLUSION

Thus, in conclusion, we find that the study of mid trimesteruterinearteryDopplervelocimetrycanbeusedas areliablescreeningtestforpredictionofpreeclampsia.Inc aseswherethetestprovesbeabnormal,increasedsurveilla nceanddeliveryinawell-equipped setup is necessary to reduce the maternal and fetal complications. However, this study wasdone in a small group of women, and so further study in a large cohort is necessary to validate the results of this study.

REFERENCES

1. Giordano R, Cacciatore A, Romano M, La Rosa B, Fonti I, Vigna R. Uterine artery Doppler flow studies in obstetric practice. J Prenat Med. 2010;4(4):59–62.
2. Carty DM, Delles C, Dominiczak AF. Preeclampsia and future maternal health. J Hypertens. 2010;28:1349– 1355.
3. Malik A, Jee B, Gupta SK. Preeclampsia: Disease biology and burden, its management strategies with reference to India. Pregnancy Hypertens. 2019 Jan;15:23-31.
4. Phipps E, Prasanna D, Brima W, Jim B. Preeclampsia: Updates in Pathogenesis, Definitions, and Guidelines. Clin J Am SocNephrol. 2016;11(6):1102–1113.
5. Sharma D, Shastri S, Sharma P. Intrauterine Growth Restriction: Antenatal and Postnatal Aspects. Clin Med Insights Pediatr. 2016;10:67–83.
6. Papageorghiou AT, Yu CK, Nicolaides KH. The role of uterine artery Doppler in predicting adverse pregnancy outcome. Best Pract Res. ClinObstetGynaecol. 2004;18:383–96.
7. Spencer K, Yu CK, Cowans NJ, et al. Prediction of pregnancy complications by first trimester maternal serum PAPP-A and free beta-hCG and with second trimester uterine artery Doppler.

PrenatDiagn2005;25:949-53.
8. Papageorghiou AT, Yu CKH, Bindra R, et al. Multicentre screening for pre-eclampsia and fetal growth restriction by transvaginal uterine artery Doppler at 23 weeks of gestation. Ultrasound ObstetGynecol2001;18:441-9.
9. Cnossen JS, Morris RK, terRiet G, et al. Use of uterine artery Doppler ultrasonography to predict pre-eclampsia and intrauterine growth restriction: a systematic review and bivariable meta-analysis. CMAJ 2008;178:701-11.
10. Padmalatha VV, Rao PSS, Abraham s, Thomas A. Predicting Pre-Eclampsia & Fetal Growth Restriction through Second Trimester Uterine Artery Doppler Sonography: An Indian experience. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS). Volume 12, Issue 1 (Nov.- Dec. 2013), PP 21-26.
11. Konchak PS, Bernstein IM, Capeless EL. Uterine artery Doppler velocimetry in the detection of adverse obstetric outcomes in women with unexplained elevated maternal serum alpha-fetopro- tein levels. Am J Obstet Gynecol. 1995;173:1115–9.
12. Coleman MAG, Mc Cowan LME, North RA. Mid trimester uterine artery Doppler screening as a predictor of adverse pregnancy outcome in high risk women. Ultrasound Obstet Gynecol. 2000; 15:7–12.
13. Schwarze A, Nelles I, Krapp M, et al. Doppler ultrasound of the uterine artery in the prediction of severe complications during low risk pregnancies. Arch Gynecol Obstet. 2005;271:46–52.
14. Bhattacharyya SK, Kundu S, Kabiraj SP: Prediction of preeclampsia by midtrimester uterine artery Dopplervelocimetry in high-risk and low-risk women. J ObstetGynaecol India. 2012, 62:297-300.
15. Chen CW, Jaffe IZ, Karumanchi SA: Pre-eclampsia and cardiovascular disease . Cardiovasc Res. 2014, 101:579-86.
16. Espinoza J, Romero R, Nien JK, et al.: Identification of patients at risk for early onset and/or severe preeclampsia with the use of uterine artery Doppler velocimetry and placental growth factor. Am J Obstet Gynecol. 2007, 196:326.
17. Musa J, Mohammed C, Ocheke A, Kahansim M, Pam V, Daru P: Incidence and risk factors for pre-eclampsia in Jos Nigeria. Afr Health Sci. 2018, 18:584-95.