

**PREDICTION OF PREECLAMPSIA BY UTERINE ARTERY DOPPLER**

Dr. Hema J Shobhne Professor, Department of Obs. & Gynae., M.L.B. Medical College, Jhansi.

Dr. Sanjaya Sharma Professor, Department of Obs. & Gynae., M.L.B. Medical College, Jhansi.

Dr. Praveshika Mishra* Junior Resident, Department of Obs. & Gynae., M.L.B. Medical College, Jhansi *Corresponding Author

ABSTRACT

Introduction: Pre-eclampsia (PE) is a multi factorial pregnancy related disorder characterized by hypertension associated with end organ changes easily reflected by proteinuria after 20 weeks of gestation. **Aims:** To evaluate the usefulness of uterine artery doppler screening in mid trimester to predict the risk for preeclampsia. To know the sensitivity and specificity of uterine artery Doppler in prediction of preeclampsia in pregnant women. **Method:** The prospective study was conducted at the department of Obstetrics and Gynecology, MLB Medical College, Jhansi over a period of 1 year. 100 subjects will be enrolled. **Result:** There were 11 (11%) cases who developed pre-eclampsia, including 4 (4%) in which delivery was before 34 weeks (early preeclampsia) and 7 (7%) with delivery at 34 weeks or later (late preeclampsia) **Conclusion:** Abnormal uterine artery Doppler studies in second trimester have been associated with subsequent adverse pregnancy outcomes including preeclampsia, fetal growth restriction, and perinatal mortality.

KEYWORDS : Uterine artery Doppler, Pulsatility index, Resistance index, Preeclampsia

INTRODUCTION

Pre-eclampsia (PE) is a multi factorial pregnancy related disorder characterized by hypertension associated with end organ changes easily reflected by proteinuria after 20 weeks of gestation.

Incidence ranges between 5-15% of all pregnancies. The first description of preeclampsia was given by Hippocrates, a father of modern medicine (460-377BC) from the island of Kos.

Even after more than two millenia since the first description, the syndrome of preeclampsia / eclampsia (PE/E) has remained a multi-system disorder of unknown etiology.

The diagnosis is based on a clinical picture and laboratory analysis; BUT, an efficient prevention and screening are still missing, the therapy is only symptomatic

Risk factors for pre-eclampsia:

- First pregnancy
- Age <20 or >40 years
- Increased intervals between pregnancy
- Obesity
- Multifetal gestation
- H/O diabetes, thrombophilia
- History of chronic hypertension or chronic kidney disease
- Infertility treatment

Why prediction is important?

- The risk for recurrent Preeclampsia can be as high as 35% (Barton & Sibai, 2008)
- Preeclampsia is associated with substantial maternal and perinatal complications.
- more than 14% (58,000) of maternal deaths/year worldwide are due to eclampsia and preeclampsia.
- The incidence of preterm birth due to preeclampsia is around 15%.
- The early detection of the risk of this complication may allow for the improvement of the outcome by increasing patient surveillance or by initiating a therapeutic intervention

Doppler Ultrasound

- Doppler Ultrasound, it has been possible to show a strong positive correlation between uterine vascular resistance,

expressed by an elevated pulsatility index (PI) or persistence of an early diastolic notch in the Doppler waveform and hypertensive disease in pregnancy, especially pre-eclampsia and fetal growth restriction.

- Impaired trophoblastic invasion of the spiral arteries : reduction in uteroplacental blood flow
- An abnormal uterine artery Doppler velocimetry result between 20 and 26 weeks of gestation is considered to be a surrogate marker of chronic uteroplacental ischemia

AIMS AND OBJECTIVES:

- To evaluate the usefulness of uterine artery doppler screening in mid trimester to predict the risk for preeclampsia.
- To know the sensitivity and specificity of uterine artery Doppler in prediction of preeclampsia in pregnant women.

MATERIAL AND METHODS

- The prospective study was conducted at the department of Obstetrics and Gynecology, MLB Medical College, Jhansi over a period of 1 year.
- 100 subjects will be enrolled.
- Women with singleton pregnancy attending routine antenatal care with gestational age 12 to 26 weeks were recruited.
- Gestational age was calculated from last menstrual period (LMP) and confirmed by first trimester ultrasound where LMP was not known.
- Preeclampsia was defined as a blood pressure of at least 140/90 mmHg measured on two occasions each 4 hours apart, accompanied by proteinuria of atleast 300 mg per 24 hours, or at least 1+ on dipstick testing.

Inclusion criteria

- All pregnancies with correct LMP
- Pregnant women with gestational age 12-26 weeks.
- Patients who gave informed written consent.

Exclusion criteria

- Patients who did not give consent
- Multiple pregnancy
- Anomalous fetus.
- Blood pressure was taken by standard mercury manometer with the women in sitting position, their arms supported at the level of the heart.

- After resting for 5 min, blood pressure was measured in both arms, and a series of recordings were made at 5-min intervals for three times.
- Transabdominal Doppler ultrasound of uterine artery was performed using a 5-MHz transducer, color Doppler. Transabdominally, the probe was placed longitudinally in the lower lateral quadrant of the abdomen, angled medially. Color flow mapping was useful to identify the uterine artery as it was seen crossing the external iliac artery.
- The sample volume was placed 1 cm downstream from this crossover point.
- The same process was repeated for the contralateral uterine artery. With advancing gestational age, the uterus usually undergoes dextrorotation. Thus, the left uterine artery does not run as lateral as does the right.

Impaired uterine artery flow was considered in the following:

- Persistent diastolic notch- unilateral or bilateral in the main uterine artery. An early diastolic notch is defined as a V shaped deflection towards the baseline in early diastole.
- Elevated mean PI > 95th percentile.
- Both of the above.

RESULT:

Table – 1 : Demographic Data of study group

Data	No. of cases	Mean ± SD
Age group (yrs)		
18-29	68 (68%)	24.0±5.42
30-34	20 (20%)	
35-39	11 (11%)	
>40	1 (1%)	
Gravid status		
I	35 (35%)	
II	26 (26%)	
III	21 (21%)	
IV	18 (18%)	
BP		
Systolic BP	131.62±12.74	
Diastolic BP	87.62±10.67	

Table – 2 : Distribution of risk factors and development of preeclampsia

Risk factors	No. of cases	Preeclampsia
Low risk cases	81 (81%)	4 (4.90%)
High risk cases	19 (19%)	7 (36.84%)
Age <20	4	1 (25%)
Age >35	3	1 (33.3%)
h/o chronic hypertension	3	1 (33.33%)
h/o diabetes	1	0
h/o chronic renal disease	-	-
Past h/o preeclampsia, IUGR, IUD	8	3 (37.50%)

Table – 3 : Mean uterine artery pulsatility index (UtAPI) between 22, 23 and 24 weeks

Weeks	No of cases	Mean ±SD Uterine artery pulsatility index (UtAPI) (Mean ±SD)
22	35	0.80±0.22
23	30	0.76±0.19
24	35	0.72±0.21

Table – 4 : Mean uterine artery pulsatility index (UtAPI) between 22, 23 and 24 weeks

Pulsatility index	No of cases	Mean ±SD Uterine artery pulsatility index (UtAPI) (Mean ±SD)
Normal	81	0.70±0.16
Abnormal	19	0.84±0.28

Table – 5 : Uterine artery spectral waveform analysis

Variable	No. of cases
Notching (1st trimester)	
Yes	30 (30%)
No	70 (70%)
Notching (2nd trimester)	
Yes	19 (19%)
No	81 (81%)

Table – 6 : Distribution of complications developed in study group

Complications	No. of cases	Percentage (%)
Preeclampsia	11	11.0
IUGR	5	5.0
Still birth	2	2.0
Early neonatal death	2	2.0
Oligohydramnios	4	4.0

DISCUSSION

- Pre-eclampsia is the most common pregnancy complication associated with serious maternal-fetal morbidity and mortality.
- In this screening study for hypertensive disorders of pregnancy we examined prospectively a small population of pregnant women attending for routine care in a well defined gestational age group.
- We used color Doppler ultrasonography to measure UtAPI, notching and Mean arterial blood pressure was recorded.
- In this prospective study second-trimester Doppler screening was carried out in 100 consecutive singleton pregnancies at 12-26 weeks of gestation.
- There were 11 (11%) cases who developed pre-eclampsia, including 4 (4%) in which delivery was before 34 weeks (early preeclampsia) and 7 (7%) with delivery at 34 weeks or later (late pre-eclampsia)
- In various other studies the incidence of preeclampsia was ranging from 8.18% to 39.2%.
- The mean systolic blood pressure in the in the second trimester of pregnancy was 131.62±12.74 mmHg.
- The diastolic blood pressure (mean±SD) was 87.62±10.67 mmHg.
- The raised blood pressure in preeclampsia is due to release of placental anti angiogenic factors and other factors which causes maternal endothelial cell activation/ endothelial dysfunction..
- Increased impedance to flow in the uterine arteries in pregnancies attending routine antenatal care identifies about 50% of those patients that subsequently develop preeclampsia and it identifies about 30% of those patients that subsequently develop IUGR.
- Shear and colleagues (2005: 1119) reported a relationship between pre-eclampsia and FGR.
- Their study showed critical maternal complications more frequently in pre-eclamptic patients with associated IUGR.
- The current study assessed the sensitivity of PI and diastole notching as a diagnostic tool to predict pre-eclampsia.
- We found that 1st trimester notching persisted into the 2nd trimester in (19)19% patients.
- The presence of notching, even with a normal PI index, places the patient at a higher risk for adverse fetal outcomes.

CONCLUSION

- Abnormal uterine artery Doppler studies in second trimester have been associated with subsequent adverse pregnancy outcomes including preeclampsia, fetal growth restriction, and perinatal mortality.
- Mid trimester uterine artery Doppler velocimetry can be used as a reliable screening test for prediction of preeclampsia especially in the high risk group and it helps to reduce maternal and fetal complications by elective delivery.
- Increased pulsatility index with notching in second trimester predicted overall preeclampsia in high risk and low risk patients, increased pulsatility index or bilateral notching predicted severe preeclampsia.

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