



ROLE OF COLOR DOPPLER ULTRASONOGRAPHY IN PREDICTION & EARLY DETECTION OF PRE- ECLAMPTIC TOXEMIA

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ABSTRACT

Introduction- Pre-eclampsia is a pregnancy specific multisystem disorder of unknown etiology. It affects 5-7% of pregnancies and a significant cause of maternal and fetal morbidity and mortality. Doppler ultrasonography offers safe and noninvasive technology for prediction and early detection of disease.

Aims & objectives- To evaluate role of Doppler ultra-sonography in prediction of pre eclamptic toxemia in early pregnancy.

Material & methods- It was blind prospective study done in 100 pregnant patients in their second trimester with singleton pregnancy attending outdoor and indoor department of UISEMH GSVM Medical College Kanpur. A detailed B mode ultra-sonographic study done after ruling out fetal congenital malformation. Doppler indices were evaluated in uterine artery, umbilical artery and middle cerebral artery.

Results- uterine artery notch was present in 15.7% patients in whom 54.5% develop pre-eclampsia subsequently. Uterine artery PI in pre eclamptic patients was 1.5922 ± 0.2610 and in normotensive it was 1.3475 ± 0.1925 . The difference of PI between these two group was statistically significant ($p=0.0011$). In this study mean umbilical artery S/D ratio in pre eclamptic pts was 4.9256 ± 1.5049 and in normotensive group it was 3.8895 ± 1.7439 . The mean difference of S/D ratio between these two groups was statistically significant ($p=0.0047$)

Conclusion- Uterine artery notch, uterine artery PI and umbilical artery S/D ratio are reasonable predictor of women at risk of developing pre eclamptic toxemia. Out of these uterine artery notch is best predictor followed by uterine artery PI.

KEYWORDS : pre ecliptic toxemia, pregnancy, Doppler ultra-sonography, uterine artery pulsatility index, S/D ratio, umbilical artery, uterine artery notch.

INTRODUCTION

Pre-eclampsia is a pregnancy specific multisystem disorders of unknown etiology. This disorder affects approximately 5.7% of pregnancies and is significant cause of maternal and fetal morbidity and mortality¹. Pre-eclampsia predisposes to potentially lethal maternal complication such as eclampsia, abruption-placentae, acute renal failure, cerebral hemorrhage and circulatory collapse. Much of neonatal mortality is attributed to premature delivery either spontaneous or induced in maternal interest and intrauterine hypoxia leading to IUGR, learning disabilities or cerebral palsy of survivors. Therefore, early diagnosis and intrinsic management of pre-eclampsia is of utmost necessity but diagnosis depends upon hypertension proteinuria and edema, features which appear when disease has already established. Underlying pathophysiologic mechanism that are thought to be responsible for disease process appear to occur much earlier in pregnancy between 8 – 18 weeks. For this reason it seems logical to search for earlier indicators of this disease.

Doppler ultrasound provides a noninvasive method for the assessment of the uteroplacental circulation. The finding that impaired placental perfusion, reflected in increased uterine artery PI, is associated with the development of PE is compatible with the hypothesis that PE is the consequence of impaired placentation^{2,3}. The purpose of our study was to investigate the association of Doppler ultrasonography with subsequent development of pre-eclampsia. Doppler ultrasonography offers an unique safe, non-invasive technology for investigating the fetoplacental and uteroplacental circulation and early detection of abnormalities.

MATERIAL AND METHODS

The study design was blind prospective study conducted in 100 pregnant women primi as well as multipara in their second trimester with singleton pregnancy attending OPD and Indoor department.

Study conducted in department of Obstetrics and Gynaecology in collaboration with Radiodiagnosis department of GSVM Medical College, Kanpur from 2017 – 18. Exclusion criteria was twin pregnancy, molar pregnancy, chromosomally abnormal fetus,

patients and chronic renal disease, autoimmune disorder, inheritable thrombophilia and habit of illicit drug abuse.

METHOD OF SCREENING

A prior B mode detailed USG done for fetal biophysical profile and to rule out any congenital malformation. Doppler evaluation of uterine artery, umbilical artery and middle cerebral artery done. Peak systolic and diastolic velocity was obtained and RI (resistance index), PI (pulsatility index) and S/D (systolic/diastolic) ratio were evaluated. Uterine artery also looked for early diastolic notch.

OBSERVATIONS

Table – I Distribution Of Total No Of Cases(N=100)

Total no. of cases	No	Percentage
Total no. of patients followed upto delivery	70	70%
pre-eclampsia	09	9%
Normotensive	61	61%
Dropped out	30	30%

TABLE – II Distribution Of Cases According To Persistent Uterine Artery Notch

Group	No	Preclampsia n= 9	Normotensive n= 61
Ut. Artery notch			
Bilateral	3	3	-
Unilateral	8	3	5
Absent	59	3	56
Chi square = 20.736, p value=0.0001			
PPV=54.54%, NPV=94.91%			
Sensitivity=66.67%, specificity=91.80%			

TABLE – III Distribution Of Cases According To Abnormal Uterine Artery PI

Group	Preclampsia n= 9	Normotensive n= 61
PI		
	No	%
	No	%

PI >1.56(n=23)	6	66.67%	17	27.87%
PI <1.56(n=47)	3	33.33%	44	72.13%
Chi square=22, p value=0.001				
PPV=26.08%, NPV=93.61%				
Sensitivity=66.67%, Specificity=88.52%				

Table- IV Distribution Of Cases According To Abnormal S/D Ratio In Unilateral Artery

S/D Ratio in umbilical artery	Group No	Preclampsia n= 9		Normotensive n= 61	
		No	Percent	No	%
>5.56(n=13)	5	55.56%	8	13.12%	
<5.56(n=57)	4	44.44%	53	86.88%	
Chi square = 65.56%, p value=0.0047					
PPV 38.46%, NPV=92.98%					
Sensitivity 55.56%; specificity = 88.52%					

Table V Relative Predictive Value Of Different Doppler Indices

	Sensitivity	Specificity	PPV	NPV
Uterine artery notch	66.67%	91.80%	54.54%	94.91%
Uterine artery PI	66.67%	88.52%	26.08%	93.61%
S/D ratio in umbilical artery	55.56%	88.52%	38.46	92.98%
S/D Ratio in MCA	Statistically not significant			

DISCUSSION

Uterine artery notch was presented in 11 out of 70 patients in whom 6 develop pre-eclampsia subsequently(table II). Bower et al (1996) identified that presence of a diastolic notch carried a 57% positive predictive value for subsequent severe complications in our case it was 54.54%.⁴Harrington et al (1996) found negative predictive value of uterine artery notch for pre-eclampsia was 99.2% in our case it was 94.91%.⁵.

Mean uterine artery PI in pre-eclamptic cases was 1.5922 ± 0.2610 and mean uterine artery PI in normotensive group was 1.3475 ± 0.1925. The difference between these two group was found to be significant (P = 0.001) (Table III). Analysis was used to determine the cut off value of uterine artery PI to predict pre-eclampsia. At cut off > 1.56, sensitivity was 66.67%, specificity 88.52%, PPV 26.08% and NPV was 93.61% our study was supported by Papageorghiou et al (2002) who stated that one stage color Doppler screening programme at 23 weeks identifies most women who subsequently develop pre-eclamptic toxemia⁶. Cnossens et al (2011) found that uterine artery PI alone or combination with uterine artery notch is most predictive Doppler indices of subsequent development of pre-eclampsia.⁷

Mean umbilical artery S/D ratio in pre-eclamptic patients was 4.9256 ± 1.5049 and in normotensive patient it was 3.8895 ± 0.9037. The difference between these two groups was found statistically significant (p=0.0047)(table IV). Fleisher et al(1985) found that a S/D ratio >3 was proposed abnormal beyond 30 weeks of gestation⁸.

Analysis was used to determine cut off value of S/D ratio in umbilical artery. At cut off >5.56, the sensitivity is 55.56%, specificity 88.52%, PPV 38.46 and NPV is 92.98%.

In our study we found that MCA S/D ratio is not a good predictor of preeclampsia which is also supported by other studies.

CONCLUSION

- Uterine artery notch, uterine artery PI and umbilical artery S/D ratio are reasonable predictors of women at risk to develop pre-eclampsia.

- Uterine artery notch is the best predictor followed by uterine artery PI.
- Umbilical artery S/D ratio is a relative predictor of pre-eclampsia but not as good as uterine artery PI.
- MCA S/D ratio is not a predictor of pre-eclampsia.

REFERENCES

1. World Health Organization. Make Every Mother and Child Count. Geneva, Switzerland: World Health Organization; 2005. (World Health Report, 2005).
2. Campbell S, Griffin DR, Pearce JM: New Doppler technique for assessing Utero-placental blood flow. Lancet.1983; 1:675-677.
3. Martin AM, Bindra R, Curcio P, Cicero S, Nicolaidis KH. Screening for pre-eclampsia and fetal growth restriction by uterine artery Doppler at 11–14 weeks of gestation. Ultrasound in Obstetrics and Gynecology. 2001;18(6):583–586
4. Bower SJ, Harrington KF, Schuchter K, Mcgirr C, Campbell S:Prediction of pre eclampsia by abnormal uterine artery Doppler ultrasound and modification by aspirin, BR, J Obstet Gynaecol 1996;103:625-629
5. Harrington K, Cooper D, Lees CM :Doppler ultrasound of uterine arteries: the importance of bilateral notching in the prediction of pre eclampsia, placental abruption and delivery of a SGA baby, Ultrasound Obstet Gynecol 1996-7, 182-188
6. Papageorghiou AT, Yu CK, Cicero S, Bower S:Second trimester uterine artery Doppler screening in unselected population :A Review.2002aug;12(2):78-88
7. Cnossens JS, Morris RK, Terriet G, Mol BW, Vander Post JA, Coomaraswamy A, Zwinderman AH, Robson SC, Bindels PJ, Khan KS :Cmaj 2008,mar 11;178(6):701-11
8. Fleisher A, Schulmann H, Farmakides G, Bracero L, Blattner P, Randolph G: Umbilical artery velocity waveforms and intrauterine growth restriction. Am J Obstet Gynaecol 151:502;1985