COLOR DOPPLER STUDY OF UTERINE AND UMBILICAL ARTERY IN NORMAL VS HYPERTENSIVE PREGNANT WOMEN AND ITS CORRELATION WITH FETAL OUTCOME

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ABSTRACT

BACKGROUND

Doppler sonography has become a part of routine antenatal surveillance in Obstetrics during past decade. Colour Doppler can be used to distinguish between low and high risk pregnancies.

OBJECTIVES

To analyze if colour Doppler can improve the clinical diagnosis and its effect on perinatal outcome.

SELECTION CRITERIA

All the patients enrolled are of reproductive age groups (15-45 yrs.) with any parity, gestational age of more than 28 weeks. We have divided the patients into 2 groups, one with blood pressure of >140/90 with proteinuria >+1, another with BP <140/90 and proteinuria <+1. All patients enrolled and Colour Doppler was done to study uterine artery and umbilical artery.

RESULTS

We did our colour Doppler study of umbilical arteries and both uterine arteries involving 200 patients and compared perinatal outcome in normotensives and hypertensives.

CONCLUSION

The use of utero-placental Doppler ultrasound improve pregnancy outcome by early diagnosis and early start of treatment.

KEYWORDS

Colour Doppler, SGA, AGA, IUGR.

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INTRODUCTION

Doppler sonography in conjunction with 2D sonography has become an important tool in antenatal surveillance in Obstetrics. Blood flow velocimetry is done to look for any hemodynamic changes in uteroplacental and fetal vessels. These changes can be demonstrated well before clinical manifestation of obstetrics complications. Most commonly Doppler is done on uterine and umbilical arteries. Hypertensive disorders of pregnancy are found in 5-15% of pregnant patient. The utero-placental blood flow has been found to be decreased and resistance increased in hypertensive pregnancies and fetal growth restriction in comparison of normotensive pregnant patients, which are having low resistance and high blood flow.

Indices have been developed to measure the level of resistance like S/D ratio, pulsatility index and resistance index.

So in antenatal period, every hypertensive pregnant women should have colour Doppler to identify the

compromised and growth restricted fetus.¹ The umbilical and uterine Doppler abnormalities have been documented in pregnancy complicated by hypertension and fetal growth restriction.² Timely interventions can be done to improve maternal and fetal mortality and morbidity. Thus, the Doppler velocimetry has become an important tool in the evaluation and management of high-risk pregnancies.²

The study was conducted with the aims and objectives to study the Doppler velocimetric indices of the uterine and umbilical artery in normotensive and hypertensive pregnancy in the third trimester; to detect the number of small for gestational age fetuses with abnormal velocimetric study in each group and correlate the relation of birth weight and Doppler velocimetric findings with perinatal outcome in both the groups.

AIMS AND OBJECTIVES

To analyze blood flow velocity waveforms and numerical indices describing wave forms and to distinguish low and high risk pregnancies by uterine arteries and umbilical Doppler measurement.

MATERIAL AND METHODS

The present study was conducted in the Department of Obstetrics and Gynaecology, MLB Medical College Jhansi, during the period of 2 years, i.e. Aug 2013 to Sept 2015. A total of 200 cases from the women attending the antenatal

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outpatient department were included in the study of which 100 were hypertensive and 100 normotensive. All the women had a singleton pregnancy of >32 weeks/gestation and vertex presentation and did not have any history of medical disorder. Both primigravida and multigravida were selected for the study.

Among the hypertensive group, the women who had recorded blood pressure of >140/90 on two or more occasions six hours apart after adequate rest were selected. Baseline investigations and Doppler velocimetry of both the uterine arteries and umbilical artery was performed in both the groups. The patients were followed up till delivery. Antihypertensive medications like methyldopa, labetalol and nifedipine were given study group and blood pressure was maintained below 140/90mmHg. Perinatal outcome in form of small for gestation age, neonatal death, intrauterine death, NICU admission and stay, Healthy were noted and compared with the results of the Systolic Diastolic (SD) ratio, Resistance Index (RI) and Pulsatility Index (PI) of Doppler velocimetry of uterine and umbilical artery.

OBSERVATIONS

The mean values of Uterine Artery Doppler Velocimetric Indices, i.e. S/D ratio, RI and PI (Table I) were higher in the hypertensive cases than normotensive cases of the same gestational age. The values in both the groups gradually decreased with increase in the gestational age. The mean SD ratio decreased from 4.72 at 28 weeks to 3.6 at 38-40 weeks in the hypertensive group and from 3.11 at 28 weeks to 2.2 at 38 weeks in the normotensive group.

GESTATIONAL AGE (IN WEEKS)	Normotensive			Hypertensive		
	S/D	RI	PI	S/D	RI	PI
<28 WEEKS	3.11	.73	.96	4.72	.9	1.5
28-30 WEEKS	2.93	.695	.96	4.8	1.4	1.2
30-32 WEEKS	2.8	.67	.88	3.8	.9	1.4
32-34 WEEKS	2.71	.63	.83	3.9	1.1	1.3
34-36 WEEKS	2.45	.57	.78	3.6	.8	1.2
36-38 WEEKS	2.2	.49	.71	4	1.3	1.4

Table 1: The mean value of Doppler indices in uterine artery

The mean values of Umbilical Artery Doppler Velocimetric Indices (Table II) were higher in hypertensive than in normotensive group of the same gestation. The values in both the groups gradually decreased with increase in gestation. The mean SD ratio decreased from 4.72 at 28 weeks to 3.2 at 38-40 weeks in the hypertensive group and from 3.14 at 28 weeks to 2.2 at 38 weeks in the normotensive group.

GESTATIONAL AGE (IN WEEKS)	Normotensive			Hypertensive		
	S/D	RI	PI	S/D	RI	PI
<28 WEEKS	3.14	.747	1.07	4.73	.95	1.3
28-30 WEEKS	2.94	.70	.967	4.85	1.42	1.5
30-32 WEEKS	2.8	.69	.896	3.8	.9	1.2
32-34 WEEKS	2.7	.64	.838	3.9	1.2	1.3
34-36 WEEKS	2.4	.58	.79	3.2	1.34	1.2
36-38 WEEKS	2.2	.52	.72	4.26	.9	1.5

Table 2: The mean value of Doppler indices in umbilical artery

The result of Doppler findings of study and control group in association of appropriate and small for gestational age were statistically significant (p value = 0.020) (Table III).

Uterine artery Doppler finding	Control Group			Study Group		
	SGA (%)	AGA (%)	Total (%)	SGA (%)	AGA (%)	Total (%)
Abnormal	8	4	12	39	17	56
Normal	18	70	88	11	33	44
Total	26	74	100	50	50	100
Umbilical artery Doppler finding	Control Group			Study Group		
	SGA (%)	AGA (%)	Total (%)	SGA (%)	AGA (%)	Total (%)
Abnormal	9	7	16	26	13	39
Normal	13	71	84	12	49	61
Total	22	78	100	38	62	100

Table 3: Doppler findings among controls and study group

In study group, uterine artery colour Doppler showed that 44% were having adverse perinatal outcome in which 9% were IUD, 4% neonatal death and 31% were NICU admissions. The data was statistically significant with Chi square value 22.321 and p value 0.0000231. (Table 4).

Similarly, umbilical artery colour Doppler in study group showed 43% were having adverse perinatal outcome, in which 7% were IUD, 13% neonatal death and 29% were NICU admissions. The data was statistically significant with Yates Chi square value 23.337 and p value 0.0000136. (Table IV).

	Birth Weight	UTERINE ARTERY DOPPLER			UMBILICAL ARTERY DOPPLER		
		N	Ab.	Total	N	Ab.	Total
IUD	AGA	0	2	2	0	1	1
	SGA	0	7	7	0	6	6
	Total	0	9	9	0	7	7
NND	AGA	0	1	1	1	2	3
	SGA	0	3	3	0	4	4
	Total	0	4	4	1	6	7
NICU	AGA	5	9	14	8	5	13
	SGA	2	15	17	5	11	16
	Total	7	24	31	13	16	29
Healthy	AGA	25	7	32	40	5	45
	SGA	5	19	24	7	5	12
	Total	30	26	56	47	10	57

Table 4: Perinatal outcome and Doppler study in hypertensives (Study group)

In control group, uterine artery colour Doppler showed only 11% were all having adverse perinatal outcome in which 4% neonatal death and 7% were NICU admissions, while umbilical artery colour Doppler showed 12% were all having adverse perinatal outcome in which 5% neonatal death and 9% were NICU admissions. (Table V).

Outcome	Birth Weight	Uterine			Umbilical		
		N	Ab.	Total	N	Ab.	Total
NND	AGA	1	0	1	1	0	1
	SGA	2	1	3	1	3	4
	Total	3	1	4	2	3	5
NICU	AGA	3	1	4	1	2	3
	SGA	3	0	3	2	4	6
	Total	6	1	7	3	6	9
Healthy	AGA	75	2	77	71	6	77
	SGA	12	0	12	6	5	11
	Total	87	2	89	77	11	88
Table 5: Perinatal outcome and Doppler study in normotensives (Control group)							

DISCUSSION

The study shows major colour Doppler changes in umbilical and uterine arteries of hypertensive pregnant women compared to normotensives. In normal pregnancy, there is progressive fall in the uterine artery S/D ratio, pulsatility index and resistance index from second trimester till term.³ In hypertensive disorders of pregnancies, Doppler indices are higher.⁴ The mean SD ratio decreased from 4.72 at 28 weeks to 3.6 at 38-40 weeks in the hypertensive group and from 3.11 at 28 weeks to 2.2 at 38-40 weeks in the normotensive group. Schulman et al. reported progressive fall in s/d ratio with advancing gestational age.⁵

Correlation of perinatal outcome birth weight and Doppler findings in hypertensive and normotensive group. Jain et al. noted adverse perinatal outcome in 70% considering UA Doppler alone in high risk pregnancy. Abnormal uterine artery Doppler findings were found in 44% hypertensive and 11% normotensive cases. Abnormal umbilical artery Doppler waveforms were found in higher number of hypertensive as compared to normotensive cases (43% vs. 12%). Trudinger et al. (1985) reported 47.3% cases of abnormal uterine artery Doppler in the study of hypertensive cases.⁶ The findings of the present study are more or less similar to those of Ducey et al. and others. Abnormal umbilical artery Doppler findings were seen more in hypertensive than normotensive cases (39% vs. 19%).

Thus in cases of hypertensive pregnant women with abnormal and normal colour Doppler finding, we can arrest the changes by appropriate therapy and decrease the maternal and perinatal morbidity and mortality.

Management includes close monitoring of maternal and fetal wellbeing, tight control of hypertension, corticosteroid therapy in preterm. First line antihypertensive drugs include methyldopa, labetalol. Second line agents are hydralazine, nifedipine and prazosin.⁷

CONCLUSIONS

Colour Doppler is a very important diagnostic tool to screen high risk among hypertensive pregnant women. It helps in screening the patients who need strict monitoring for their fetal well-being. Our study shows that Abnormal Doppler findings of the uterine and umbilical are more common in SGA fetuses. By detecting decreased uteroplacental and fetoplacental blood flow, it can identify an hypoxic fetus.⁶ and we can do timely interventions and decrease perinatal mortality and morbidity to an extent. So colour Doppler should be performed as a routine test in hypertensive pregnant women.

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