

COLOUR DOPPLER STUDIES IN HIGH RISK PREGNANCIES

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SUMMARY

50 high risk and 18 control patients were subjected to colour doppler study of umbilical arterial flow and its effects on fetus. Pregnancy induced Hypertension and IUGR constituted majority of the cases 34 (68%). 50% cases were primigravidas. Abnormal wave forms were detected in 17 patients who had S:D ratio >3 (13 AEDV (3) REDF (1) with sensitivity in detecting IUGR of 69.2%, 100% & 100% in the respective groups. An abnormal neonatal outcome was noted in 24% patients.

Patients with AEDV & REDF had high incidence of prematurity (average 32 weeks) & low birth weight (average 1250 grams) and caesarean section rate of 66.7% & 100% respectively.

In the last trimester absence of flow in umbilical artery in diastole signals the presence of fetal compromise. This warning is even grave when there is reversal of flow in diastole. All 18 control patients had normal FVW and no abnormal neonatal outcome. Thus colour doppler is a very useful modality in evaluating the fetus.

INTRODUCTION

"How do Y'all know about the fetal well being as the baby's on the inside and Y'all are on the outside?"

This is a quote from a patient with little

education and great insight. The fetus has now achieved the status of a 'Second Patient'.

Doppler ultrasound technology has been extensively applied to investigate fetal, fetoplacental & uteroplacental circulations, and there is ample of evidence

associating abnormal doppler finding with high risk pregnancies like hypertensive states, intra uterine growth retardation, diabetes, twins and anticipation or early diagnosis of an adverse perinatal outcome.

The application of doppler technology in obstetrics has made possible for the first time non invasive evaluation of placental fetal circulation in undisturbed human pregnancy.

The introduction of doppler ultrasound into perinatal medicine may allow recognition understanding and possible treatment of many haemodynamic deviations in the uteroplacental fetoplacental and fetal circulation.

The clinical applicability of this new technology is promising.

MATERIAL & METHODS

This is a prospective study of 68 women registered in M.Y. Hospital & Choithram Hospital from July 92 to May 1993.

50 were high risk cases and 18 were included in the control group. None of

these patients from the control group had any high risk factor adversely affecting the perinatal outcome. These patients were followed the delivery and one week postpartum.

The high risk factors selected were - PIH. IUGR. twin pregnancy, Diabetes with pregnancy, postdatism, Rh negative mother, and previous history of congenitally malformed babies. All the patients had a complete routine workup and Doppler sonography at Choithram Hospital Machine used was Hitachi EUB - 565.

OBSERVATIONS

Table 1 shows the indications for Doppler studies. Majority of cases i.e. 40% were with Hypertension states in pregnancy namely mild and severe pre-eclampsia (in which 90% belonged to the severe pre-eclampsia group). IUGR constituted 28% cases. Both IUGR & PIH were the mainstay of Doppler studies. Table II illustrates the incidence of abnormal velocity wave form in High risk pregnancies. The high risk pregnancies were more common in women with

Table I
Analysis of the indications for doppler studies in high risk cases

S.No.	Indications	No.of Patients	Percentage (%)
1.	Hypertensive states	20	40
2.	IUGR	14	28
3.	Prolonged pregnancy	05	10
4.	Rh-Negative patients	04	08
5.	Diabetes	03	06
6.	Twin Pregnancy	02	04
7.	Risk of congenital malformation	02	04

Table II
Incidence of abnormal velocity wave form in High risk pregnancies

S.No.	Type of Waveforms	No.of Patients	Percentage
1.	Normal Waveforms	33	66
2.	Abnormal Waveforms	17	34

Table III
Umbilical artery blood flow in relation to parity in high risk cases

S.No.	Doppler Ratios	No.	P ₀	P ₁	P ₂	P ₃	P ₄
1.	S:D <3	33	13	15	4	1	-
2.	S:D >3	13	9	2	1	-	1
3.	AEDV	3	3	-	-	-	-
4.	REDF	1	-	-	-	1	-

Table IV
Mode of delivery in relation to S: D ratio in high risk cases

S.No.	Doppler	No.	Vaginal Delivery	Forceps Delivery	Cesarean Section
1.	S:D <3	33	11 (33.3%)	1 (3%)	21 (63.7%)
2.	S:D >3	13	1 (7.6%)	0	12 (92.4%)
3.	AEDV	3	1 (33.3%)	0	2 (66.7%)
4.	REDF	1	0	0	1 (100%)

parity 0 & 1, 50% patient were nullipara, and 34% were primipara. Table (III) while in control group - 50% were nullipara and 38.8% were primiparas.

It was seen that the incidence of abnormal wave-forms was higher in nullipara group of patients while most of the multiparas had normal wave forms.

Cases with abnormal wave forms had higher incidence of caesarean section (Table IV). With abnormal wave forms there was tendency to prematurity and low birth weight neonates (Table V).

In 17 cases with abnormal FVW 5 (10%) had a good neonatal outcome while 12 (24%) had abnormal outcome (Table VI).

Table V

Effect of umbilical artery velocimetry at timing of delivery & birth weight in high risk cases

S.No.	Doppler	No.	Average gestational Age at delivery (weeks)	Average birth Weight (Grams)
1.	S:D 3	33	36.9	2597
2.	S:D 3	13	35.3	1856
3.	AEDV	3	32.0	1253
4.	REDF	1	32.0	1250

Table VI

Comparison of neonatal outcome in high risk and control cases in relation to doppler FVW

Sr.No.	Doppler Flow Velocity waveform	Neonatal Out come	
		Normal	Abnormal
1.	High risk cases		
	1. Normal FVW	29 (58%)	4 (8%)
	2. Abnormal FVM	5 (10%)	12 (24)
2.	Control Cases		
	1. Normal Flow	18 (100%)	0

Table VII

Fetal and neonatal parameters versus doppler derived patterns in high risk cases

S.No.	Parameter	Normal S:D ratio	Abnormal S:D ratio
1.	Number of cases	33	17
2.	Birth weight (average)	2657 grams	1708 grams
3.	Delivery 37 Wks (%)	12%	47%
4.	% of SGA	27%	0
5.	% of LSCS for fetal distress	12%	52.9%
6.	% of NICU admission	12%	58%
7.	Umbilical artery S:D (Aveg.) ratio	2.7	3.9

Table VIII
Neonatal outcome in AEDV and REDF group

S.No.	Neonatal outcome	AEDV	REDF
1.	Number of Cases	3	1
2.	Average gestational age at delivery (Weeks)	32 weeks	32 weeks
3.	Average birth weight (Grams)	1253 ggm.	1250 Grm.
4.	% of IUGR	66%	100%
5.	Caesarean section for fetal distress	66%	100%
6.	PNM %	33%	100%
7.	NICU admission	66%	100%

Table IX
Sensitivity of doppler in identifying the IUGR Fetus

S.No.	Doppler	Ratio	No.of Patients	IUGR at Birth
1.	S:D	3	17 11 (64.7%)	
2.	S:D	3	17 09 (69.2%)	
3.	AEDV		3	03 (100%)
4.	REDF		01	01 (100%)

Thus the predictive value of abnormal waveforms in identifying neonatal outcome was 70.5%.

While the predictive value of raised S.D. ratios was 61.5% and that of A E D V was 100%. Table VII shows fetal and neonatal parameters versus Doppler derived patterns high risk cases. Table VIII shows neonatal outcome in AEDV and REDF group.

Out of 50 high risk cases 34 cases (Hypertension and IUGR patients) were at risk for IUGR in which 17 cases had S.D.ratio <3 17 case had abnormal wave-

forms in which 1 with REDF, 3 with AEDV and 13 had raised S.D. ratio (Table IX). Of these 34 cases - 24 had IUGR at birth- and 11 babies were SGA. Therefore 13 out of 24 babies were true IUGR and the sensitivity of Doppler in identifying IUGR was 54.16%.

DISCUSSION

The objective of the study was to evaluate the comparative application of Doppler blood flow studies as a routine antepartum fetal surveillance method in

high risk pregnancies verses other normal pregnancies and to estimate the predictive value of abnormal flow velocity waveform in neonatal outcome.

Elevated Umbilical artery S: D ratios have been correlated with vascular lesions of the placenta in a study by Ciles et al (1985). This finding was confirmed by Bracero et al (1988).

The absence of a diastolic velocity component in the umbilical artery and reversal of end diastolic flow are distinctly abnormal findings which identify high resistance fetoplacental circulation rather than the normally low resistance system. They are ominous signs which denote impending fetal death and immediate intervention is required in these cases.

Doppler in Hypertensive States with Pregnancy :

Several authors have shown that hypertensive women have an increased incidence of abnormal velocity waveforms compared the general population.

Schulman et al in (1984) and Trudinger et al in (1985) both suggested that abnormal umbilical velocity waveforms were associated with maternal hypertension.

In a study of 136 pregnant women Ducey et al (1987) found that 43% of pregnant hypertensive women had abnormal umbilical artery S: D ratios Guzman et al (1988) studied 50 women with abnormal umbilical and normal uterine S: D ratios, 33% of these women had hypertension.

In the present study - out of 50 high risk cases, 20 patients had hypertension i.e. 40%, and 60% of these hypertensive women had abnormal waveforms and abnormal fetal outcome was seen in 45%

cases. In 3 cases AEDV was seen and in 1 case there was REDF Only one out of these 4 babies survived.

Fleischer et al (1985) studied 71 hypertensive pregnant women. They showed that when the mean uterine S: D ratio was 2.6, there was a normal pregnancy outcome. When this level was exceeded or there was notching in the waveforms, pregnancy was complicated by Stillbirth, premature birth, IUGR, and preclampsia.

In an Indian study by Pakyanadhan et al (1989) of 50 high risk pregnancies by Doppler, maximum cases i.e. 70% were of Hypertensive States in pregnancy as compared to present study in which maximum cases too were of the same group (i.e. 40%).

SIGNIFICANCE OF ABSENT END DIASTOLIC VELOCITY IN THE UMBILICAL ARTERY WAVEFORMS :

In a study by Rocheson et al (1987) the outcome in 10 fetuses with AEDV studied between 31 to 36 weeks was compared with 151 fetuses studied at similar gestational ages. AEDV uniformly heralded an adverse perinatal outcome. Fetuses with AEDV weighed less, were born earlier, and spent more days in NICU than the other fetuses. In addition, there was a higher incidence of intrauterine growth retardation, pregnancy-induced hypertension and caesarean section for fetal distress.

Brar et al (1988) and Reed et al (1987) found similar outcomes in fetuses with AEDV. The results of the present study were comparable to the above studies in both the groups i.e. those with AEDV and those with S: D > 3.

Doppler studies in IUGR :

In a study by Trudinger et al (1985) 172 mothers were examined all within 10 days of delivery, there were 53 fetuses subsequently born small for gestational age 34 had an abnormal S: D ratio. These 34 pregnancies were delivered earlier (34.6 weeks) than 19 normal ratio SGA fetuses (37.6 weeks). They required more frequent NICU admissions and included all the subsequent neonatal deaths (6 compared to 0). Serial studies in association with fetal growth failure show a rising S: D ratio, in some cases absent or even reversed.

In the present study - out of 50 high risk cases 14 i.e. 28% cases were with IUGR alone, 5 cases i.e. 35.7% has abnormal waveforms and 3 babies were admitted in NICU. In other cases IUGR was associated with hypertension and twin pregnancy.

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