

## Original Article

# Antepartum Fetal Surveillance in Intra Uterine Growth Retardation

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### ABSTRACT

**Objective:** The aim of our study was to evaluate the efficacy of doppler velocimetry and CTG in surveillance of IUGR fetuses and hence their capacity to predict adverse perinatal outcome.

**Methods:** In this prospective study antenatal fetal surveillance was done in 82 women with IUGR using fetal doppler and CTG. The results of these tests within one week of delivery were correlated. The women were divided in to four groups based on their test results and perinatal outcome parameters were compared. The data was analyzed by chi square test.

**Results:** There were significant differences in perinatal outcome between all four test result groups. Women in whom both CTG and doppler were abnormal had significant increase in preterm birth, low apgar score, NICU admissions and neonatal complications. The statistical analysis indicates that combination of the CTG and doppler was an excellent predictor of perinatal outcome.

**Conclusion:** Doppler ultrasonography and CTG effectively stratify IUGR fetuses into distinct risk categories. But doppler identifies fetal compromise earlier than CTG. For better perinatal survival doppler which has better sensitivity has to be combined with CTG.

**Key words:** Antepartum surveillance, IUGR, Perinatal outcome

### INTRODUCTION

The timely detection of morbid changes in the fetal status followed by adequate interventions to avoid perinatal death or disability is one of the most important objectives of perinatal care.

It is no longer adequate to act only at the last moment to prevent fetal mortality, the antenatal testing modalities which aim to detect fetal compromise by evaluating fetal manifestations of altered oxygenation and metabolic status will direct to appropriately time the intervention.<sup>[1]</sup>

Doppler ultrasonography and Cardiotocograph (CTG) are the principal surveillance tools in pregnancies complicated by placental vascular insufficiency and fetal growth restriction.<sup>[2]</sup> The aim of this study is to determine the distribution and relationship of doppler and CTG results in a population of IUGR fetuses.

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**MATERIALS AND METHODS**

This is prospective study was conducted our institution between 1<sup>st</sup> September 2009 to 30<sup>th</sup> September 2011 after obtaining institutional ethical committee clearance. All the pregnant women who presented to dept of OBG with gestational age  $\geq$  30 weeks with IUGR were included in the study.

IUGR was diagnosed by ultrasonological criteria and is defined as fetal weight and abdominal circumference less than 10<sup>th</sup> percentile for gestational age. The patients were followed up by serial CTG and doppler. A reactive CTG was defined as the presence of two or more fetal heart rate accelerations of 15 beats or more, within 10 min window, lasting at least 15 sec and associated with fetal movements.<sup>[3]</sup> Doppler vascular study was performed using pulsed doppler ultrasound of LOGIQ 700 3.5 MHz with a high pass filter. Doppler readings were taken from umbilical artery(UA) and middle cerebral artery(MCA).

Doppler study was considered abnormal when any of the parameters mentioned below were abnormal.

1. Pulsatility index (PI) of umbilical artery (UA)  $>2SD$  for gestational age.
2. Absence or reversal of end diastolic flow in UA.
3. PI of MCA  $<5^{\text{th}}$  percentile for the gestational

age.<sup>[4,5]</sup>

4. Abnormal ratio  $PI\ MCA/UA < 1$ .<sup>[3]</sup>

Exclusion criteria were fetal anomalies, chorioamnionitis and evidence of fetal infection. Fetuses were classified into four result groups based on the outcome of last antenatal assessment prior to delivery.

Group A: Normal: Normal CTG, Normal doppler  
Group B: Intermediate -1: Normal CTG, Abnormal doppler

Group C: Intermediate -2: Abnormal CTG, Normal doppler

Group D: Abnormal: Abnormal CTG, Abnormal doppler

The management of pregnancy and route of delivery were based on maternal and fetal parameters. Comparison were made for neonatal outcome between groups using the chi-square test. P value  $<0.05$  was considered significant. Odd's ratio and wald's 95% CI were then calculated.

**RESULTS**

A total of 82 women satisfying inclusion criteria were included in the study. Maternal features are described in Table 1. The study constituted of 58.5%(n=48) primigravida and 41.5%(n=34) of multigravida. 64%(n=53) of women had pre-eclampsia with IUGR. The

**Table 1: Maternal Characteristics**

Maternal characteristics	Numbers	Percentage
Primigravida	48	38.5%
Multigravida	34	41.5%
Mean age(yrs)	26.8(20-35)yrs	-
Mean period of gestation at Admission (wks)	34(30-38.5)yrs	-

mean period of gestation at admission was 34 weeks (range 29-38.5). The incidence of caesarean section in the study group was 37%, the commonest indication being abnormal fetal heart rate trace 54% (n=20) followed by severe preeclampsia 32% (n=12), absent/reversed end diastolic flow in umbilical artery flow (n=2) and others (n=3). The other indications included malpresentation in labour (n=2) and one for failure to progress of labour. The perinatal mortality in the study group was 7.4% and the rate of NICU admission was 21% Table 2.

The group A with normal CTG and

doppler consisted of 30 women with IUGR, group B with normal CTG and abnormal doppler consisted of 19 women, group C with abnormal CTG and normal doppler consisted of 7 women and group D with both abnormal parameters consisted of 26 women. The caesarean section rates were higher in group C(100%) may be because of statistically small sample size and two women in this group had severe preeclampsia with abruptio placenta. The perinatal death was significant in group D as compared to group A(p=0.02) (Table 3a) and group B(p=0.026)

**Table 2 : Perinatal outcome data**

	<b>Group A Group(n=30)</b>	<b>Group (n=19)</b>	<b>Group (n=7)</b>	<b>Group (n=26)</b>
<b>NST</b>	<b>Reactive</b>	<b>Reactive</b>	<b>Non reactive</b>	<b>Non reactive</b>
Doppler	Normal	Abnormal	Norma	Abnormal
Mean period of gestation at delivery (WKS)	35.6	34.1	33	33.3
Caesarean section	13 (43%)	15 (78.9%)	7 (100%)	15 (57.69%)
Perinatal death	2 (6.6%)	2 (10.52%)	1 (14.3%)	12 (46.15%)
1. IUD	0	2	0	3
2. Neonatal death	2	0	1	9
Average birth weight	2179	1678	1750	1421
Preterm babies	5 (16.6%)	11 (57.9%)	7 (100%)	22 (84.6%)
APGAR <7 @ 5 min	2 (6.6%)	-	1 (14.3%)	8 (30.76%)
Admission to NICU	12 (40%)	14 (73.6%)	7 (100%)	23 (88.46%)
Neonatal complications	4 (13.3%)	7 (36.8%)	2 (28.5%)	22 (84.6%)

**Table 3a : Comparison of perinatal outcome in Group A vs D**

<b>Group A vs. D</b>			
<b>Perinatal factors</b>	<b>P value</b>	<b>Odds ratio</b>	<b>CI</b>
Caesarean section	0.42	0.56	0.19 – 1.62
Perinatal deaths	0.002	0.08	0.016 – 0.424
Preterm birth	0.000	0.03	0.0087 – 0.1526
APGAR <7 @ 5 min	0.045	0.16	0.0306
NICU Admission	0.0005	0.087	0.0213 – 0.3553
Neonatal complications	0.000	0.08	0.0063 – 0.1251

(Table 3b). As compared to group A, group D was effective in predicting the abnormal perinatal

**Table 3b : Comparison of perinatal outcome in Group B vs D**

<b>Group B vs. D</b>			
<b>Perinatal factors</b>	<b>P value</b>	<b>Odds ratio</b>	<b>CI</b>
Caesarean section	0.863	0.7857	0.2707 – 2.2810
Perinatal deaths	0.026	0.137	0.0262 – 0.718
Preterm birth	0.0968	0.250	0.0616 – 1.015
APGAR <7 @ 5 min	NA	NA	NA
NICU Admission	0.3757	0.3652	0.075 – 1.769
Neonatal complications	0.0028	0.1061	0.025 – 0.436

**NA Not applicable. (P value could not be calculated as there is no low apgar score babies in group B)**

had statistically significant increase in preterm birth (p=0.00), low apgar score (p=0.045) and NICU admission (p=0.0005).

The neonatal complications were significantly common in group D as compared to all other groups. The comparison between group B and D showed that perinatal death (p=0.026) and neonatal complications (p=0.0028) were significantly more in group D. In comparison between group B and C, there was increased incidence of pre-term deliveries and NICU admissions in group C, but neonatal complications were common in group B with abnormal doppler.

## **DISCUSSION**

Our study compared fetal doppler and CTG as the methods of antenatal fetal surveillance in a high risk group of women comprising of IUGR. Despite a number of potential biases (since both CTG and doppler results were available to attending physician), it does strongly suggest that addition of doppler to the antenatal surveillance of fetus at risk adds additional prognostic value to antenatal testing. Though, both CTG and doppler results were

outcome, the advantage of doppler over CTG was that doppler showed changes earlier than CTG giving a significant interim period for intervention such as institution of steroids for pulmonary maturity.

When both CTG and doppler studies were normal (group A) there was low neonatal morbidity and significantly fewer days spent in NICU than when either (Group C) and both (D) were abnormal. The average birth weight of the fetuses were significantly lower when both doppler and CTG were abnormal (group D). This indicates a severe degree of placental insufficiency. The results are similar to the study conducted by Ott et al as shown in table 4.<sup>[3]</sup>

In comparison to group D, the perinatal outcome was better in group B, though both groups had abnormal doppler. It is evident that early intervention in this group, where babies were less compromised and relatively more advanced in gestation had better results. It is this group where in the compromised fetuses, but with a better survival prospects can be intervened without the requirement of monitoring till the development of abnormal CTG. The GRIT (Growth Restriction

Intervention Trial), which was designed to time the delivery in compromised preterm fetuses, showed that delaying delivery to increase maturity in severe hypoxaemia increased still birth to nearly fivefold while death before discharge fell by one third.<sup>[6]</sup> The doppler picks up haemodynamic changes during compensatory phase of growth restriction in comparison to CTG changes which occur in decompensation phase which is late sign of fetal compromise.

Ott et al<sup>[3]</sup> in their study have made an important observation of cases with abnormal CTG and normal MCA/UA results where some fetuses had neonatal morbidity, which may be explained by the loss of brain sparing effect which may have caused the doppler to be normal. Doppler depicts chronic hypoxic changes, while CTG can detect acute events in presence or absence of chronic hypoxia.

The integrated fetal testing by using modalities such as doppler, CTG and BPP would be ideal for individualized care of preterm compromised fetus for timed intervention.<sup>[2]</sup>

## **CONCLUSION**

Doppler ultrasonography and CTG can effectively stratify IUGR fetuses with placental vascular insufficiency into distinct risk categories when used separately. Fetal deterioration appears to be independently reflected in these two testing modalities, their

combined use is likely to be complementary. Doppler depicts chronic hypoxic changes earlier while CTG can detect acute events.

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