

## Role of Middle cerebral artery & Umbilical artery Doppler in Intrauterine Growth Restriction for Prediction of Adverse Perinatal Outcome: A Prospective Study in tertiary care Hospital of Tripura

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Conflict of interest: Nil

### Abstract:

**Objectives:** To determine umbilical artery PI, middle cerebral artery PI and the MCA PI/UA PI (CPR) ratio to assess the fetal intrauterine growth restriction by Color Doppler and the adverse effect on perinatal outcome.

**Methodology:** A total 60 cases of clinically suspected IUGR pregnant mothers were evaluated by Colour Doppler study, following detailed clinical examination. In colour Doppler umbilical artery Pulsatility index(PI) were recorded. PI of Middle Cerebral artery was measured in each case and ratio of MCA PI &UA PI were calculated. All those 50 cases were followed up till early neonatal period.

**Result:** Out of 60 clinically suspected IUGR cases, 9 were intrauterine fetal deaths and 51 live births. Out of 9 intrauterine deaths, 6 (100%) cases have reversal of umbilical artery diastolic flow & 3 (60%) have absent umbilical artery diastolic flow. Out of 51 live births, low Apgar score were 7cases, emergency c/s were 12 cases & admission in NICU 8 cases.

**Keywords:** Intrauterine Growth Retardation, Pulsatility Index, Revers Diastolic Flow, Absent Diastolic Flow, Cerebral Redistribution, Umbilical Artery (UA), Middle Cerebral Artery (MCA), MCA PI/ UA PI ratio.

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### Introduction

IUGR is defined as a fetal growth less than 10<sup>th</sup> percentile for the gestational age. The IUGR may be symmetric and asymmetric. Approximately 70 percent of fetuses with a birth weight below the 10<sup>th</sup> percentile for gestational age are constitutionally small and the remaining 30 percent; the cause of IUGR is pathological.

Ultrasonographic biometry helps to identify a heterogeneous group of small for gestational age fetuses that include fetuses with IUGR, fetuses with small constitution, and fetuses with appropriate growth (misdiagnosed as small).

The Colour Doppler study is a better tool to detect the IUGR. The normal value of Umbilical Artery Pulsatility Index (UAPI) is 2.0 in the early second trimester and around 1.0 near term. The absent or reversed end-diastolic flow in umbilical artery signifies increased impedance to umbilical artery blood flow. It is due to poorly vascularised placental villi and is seen in extreme cases of fetal growth restriction. The hypoxic growth restricted fetus attempts brain sparing by reducing cerebrovascular impedance and thus increasing

blood flow to brain. Doppler US studies of the human fetal circulation have shown that in fetuses with IUGR there is a significant reduction of Middle Cerebral Arterial Pulsatility Index (MCAPI) when compared with those in normal fetuses. Results of several studies suggest that the MCA PI/UA PI(C/U) Doppler ratio is more accurate in the prediction of adverse perinatal outcome than UA Doppler US alone.

The purpose of this study was to know usefulness of colour Doppler study of umbilical artery and middle cerebral artery for prediction of adverse perinatal outcome in clinically suspected Intrauterine Growth Retarded Pregnancies which is one of the most important perinatal syndromes and is a world-wide problem.

### Methodology

60 clinically suspected IUGR patients were recruited from antenatal OPD and Obstetric ward of the Department of Obstetrics & Gynecology, Agartala Government Medical College and GBPH Hospital, The study was approved by the Ethical

Committee of Agartala Government Medical College & GBP Hospital, Agartala, Tripura.

The study was conducted in the Department of Radio-Diagnosis in collaboration with Department of Obstetrics and Gynecology of Agartala Government Medical College & GBP Hospital, Agartala, Tripura. Doppler Ultrasonography evaluation was performed after the grey scale USG assessment. Follow up Doppler Studies were performed if clinically indicated to determine a favorable or a worsening trend in the Doppler indices.

**Table 1: showing Pregnancy Outcome Uneventful Vs Adverse**

Pregnancy outcome	No of cases	Percentage
Adverse	27	45%
Uneventful	33	55%

**Table 2: Perinatal Mortality Vs Absent /Reversal of Diastolic Flow**

Spectral Characteristic	NO of cases	IUFD	Mortality
Absent EDF	05	03	60%
Reversed EDF	06	06	100%

Mean birth weight at delivery was 2.43kg +/- 0.26 kg (2SD). 60% of neonates had birth weight of less than 2.5kg. There were 9 intrauterine deaths and 51 live births. Of the 51 live births 8 neonates were admitted to NICU, 7 neonates had 5 min Apgar score less than 7 and 12 babies were born by emergency caesarean section.

In all cases with reversal of diastolic flow, IUFD of the fetus occurred within one week of diagnosis. And all the cases were less than 32 weeks. One case of absent diastolic was 36weeks and remaining 2cases were 35 weeks of gestational age.

Cerebroplacental ratio (MCA/UA PI Ratio) was most sensitive (sensitivity 93.8%).It was more sensitive than either UA PI (sensitivity 89.21%) or MCA PI (sensitivity 87.5%) alone in predicting any adverse outcome. Cerebroplacental Ratio and UA PI were equally specific (Specificity = 74.6%) and MCA PI had comparably low specificity (specificity = 39%).

Diagnostic accuracy of Cerebroplacental ratio (Accuracy =92.9%) was better than UA PI (Accuracy=88%) and MCA PI (Accuracy=61%) in predicting adverse outcomes.

Out of 9 intrauterine deaths, 6 (100%) cases have reversal of umbilical artery diastolic flow & 3 (60%) have absent umbilical artery diastolic flow.

### Discussion

When fetal growth retardation is diagnosed during the third trimester of pregnancy, the obstetrician must decide whether the fetus is "constitutionally" small or small as a consequence of impaired placental perfusion. Doppler flow velocity analysis

### Results

Out of the 60 pregnancies studied acceptable wave forms were obtained from all the cases & followed up with repeat Doppler. Mean gestational age at the first Doppler US examination was 35.2 weeks +/- 3.46 weeks (2SD). 48% (n=24) fetuses had at least one abnormal outcome, of those; some (n=8) had more than one abnormal outcome. Remaining 26 fetuses had normal outcome.

can be valuable in resolving this question. The umbilical-placental and cerebral vascular beds are directly involved in the hemodynamic adjustments of fetal growth retardation.

A Doppler index that reflects both of these areas can be useful for identifying fetuses with increased placental and/or decrease cerebral resistance. PI varies in relation to the intracranial artery considered, so it is important that the artery be identified precisely and with certainty.

In the evaluation of the fetal cerebral circulation, the MCA is the most accessible vessel and it can be easily located on colour Doppler therefore the vessel of choice. It is the main branch of the circle of Willis and carries 80% of the blood flow to the ipsilateral cerebral hemisphere, a constant 3%-7% of cardiac output throughout gestation. Hence we used middle cerebral artery for the evaluation of fetal cerebral circulation.

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