

Study of Middle Cerebral Artery Flow Indices as a Predictor of Neonatal outcome in Intra Uterine Growth Retardation

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Abstract: The aim of the study was to correlate color Doppler changes in IUGR cases and their neonatal outcome. The study population comprised 100 pregnancies of 30-40 weeks based on reliable last menstrual period (LMP) and/or scan in the first trimester over a period of 1 year. Doppler was done and middle cerebral artery flow indices were noted and the neonatal outcomes were followed. In a longitudinal study conducted in a tertiary care hospital, among 50 pregnant females showed that the means age of study group was 25.2 ± 6.1 years. Mean gestational age was 37 ± 2.1 weeks. 57% had decreased amniotic fluid by 5 to 10 cm. 37% had <1 abnormal C/U RI ratio. Majority 70% had abnormal flow on Doppler scan. It was seen that the umbilical artery indices were on a higher range among the IUGR pregnancy whereas the middle cerebral artery indices were decreased. The middle cerebral artery flow and the umbilical artery flow test i.e. color Doppler are very useful in identifying the IUGR and which further helps in managing them in an appropriate way.

Keywords: Intrauterine growth retardation; middle cerebral artery flow index, umbilical artery flow index

INTRODUCTION

Intrauterine growth restriction is the common clinical sign of chronic fetal hypoxemia. It is difficult to differentiate between suboptimal fetal growth due to intrauterine starvation and adequate growth of a constitutionally small infant. Umbilical and middle cerebral artery velocimetry is a good predictor of growth restricted fetus at risk of antenatal compromise [1].

Accurate diagnosis of IUGR is essential since early detection and proper antenatal management of IUGR can decrease perinatal mortality and morbidity [2]. Umbilical and middle cerebral artery velocimetry is a good predictor of growth restricted fetus at risk of antenatal compromise [3].

The brain of normally developed fetus has low vascular impedance with continuous flow throughout cardiac systole. It is suggested that late onset of placental insufficiency is commonly associated with redistribution of blood flow in favour of fetal brain (i.e., brain sparing) combined with suboptimal growth of intraabdominal organs. In response to hypoxia the fetus as a compensatory mechanism redistribute cardiac output and blood supply to brain to maintain constant oxygen delivery to this vital organ. Increasing flow may be reflected in elevated diastolic velocities in Doppler waveform obtained from cerebral blood vessels. In IUGR placental studies have shown that $> 70\%$ of

placental vascular bed is obliterated once impedance increased in umbilical artery with AEDF (absent end diastolic flow)[4].

MATERIAL AND METHODS

Our study included 50 pregnant women those who were delivered by cesarean section admitted in OBGY ward in a tertiary care hospital. Study period was 1 year. Gestational age of the females was 30 to 40 weeks based on reliable last menstrual period (LMP).

Inclusion criteria

- Patients giving informed valid consent
- Singleton pregnancy.
- Clinical evidence of an SGA fetus detected on symphysiofundal height (SFH).
- Ultrasonographically estimated fetal weight or abdominal circumference below the 10th percentile for gestational age.

- Gestational age of 30-40 weeks based on reliable last menstrual period (LMP) and/or adating scan in the first trimester.
- Pregnant woman with known dates of L.M.P.

Clinical assessment

Laboratory investigation included complete blood profile, liver function test and kidney function test. Ultrasound was done. Doppler studies were also carried out and both were used to determine composite ultrasound gestational age, estimated fetal weight (EFW) fetal biophysical profile, and umbilical and middle cerebral resistance index Doppler studies. Gestational age and fetal weight were determined on the basis of fetal biparietal diameter, abdominal circumference, and femur length. IUGR was defined as estimated fetal weight of less than the 10th percentile for gestational age, according to Sabbugha and Minague growth curve [5].

STATISTICAL ANALYSIS

Data was collected and compiled in using Microsoft excel 07. Statistical test were applied using

statistical software, openepi version 2.3.1. p value was calculated by applying chi square test for qualitative data and student ‘t’ test for quantitative data respectively. P value <0.05 was considered statistically significant.

RESULTS

Present study showed that means age was 25.2± 6.1 years. Mean gestational age was 37± 2.1 weeks. Mean neonatal birth weight was 2±0.5kg (Table-1).

Majority of cases (57%) had severe amniotic fluid and 22% had oligohydramnios, only 21% had normal volume (Fig-1).

Majority of the cases showed increased flow. Only 31% had normal flow (Fig-2).

Majority of our cases had borderline resistance (35%) and only 30% had normal flow (Fig-3).

Table-1: Fetal wellbeing tests performed in neonates

Fetal parameters	Mean
Abnormal C/U RI ratio <1.0 (n, %)	37%

C/U RI -middle cerebral/umbilical artery resistance index.

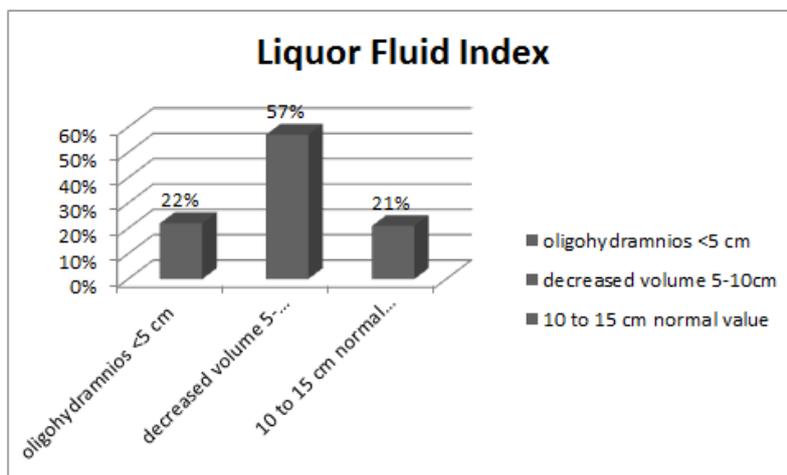


Fig-1: Liquor Fluid Index

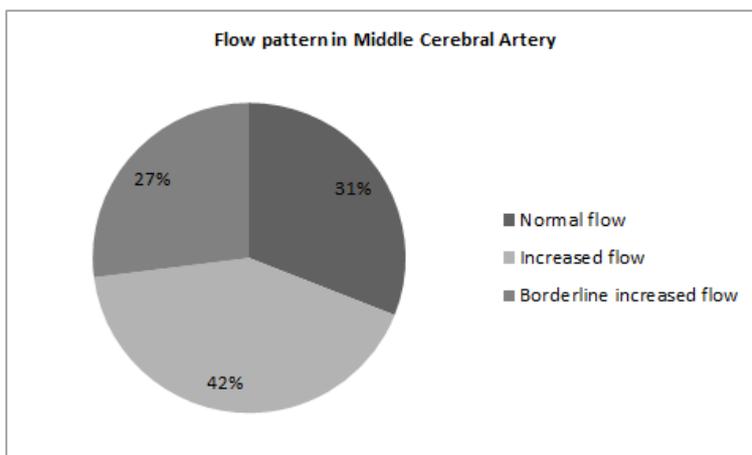


Fig-2: Flow pattern in Middle Cerebral Artery

Table-2: Middle cerebral artery index

Middle Cerebral Artery	Mean	SD
Pulsatility index	1.44	0.29
Resistance index	0.75	0.05
Systolic diastolic ratio	4.16	1.3

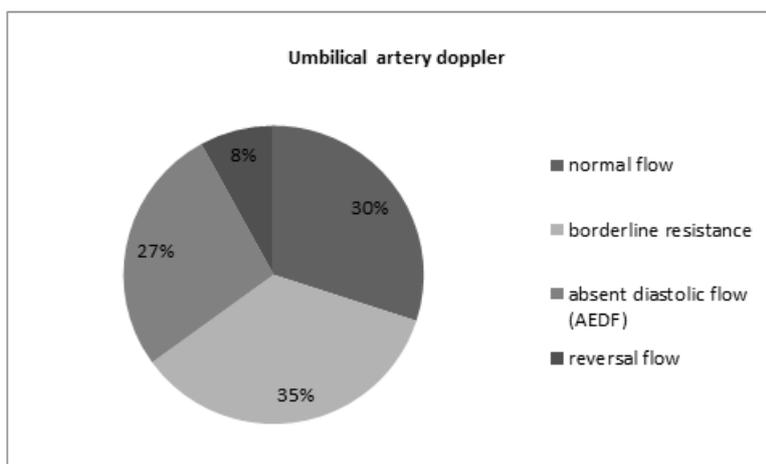


Fig-3: Umbilical artery Doppler

Table-3: Umbilical artery index

Umbilical artery index	Mean	SD
Pulsatility index	1.01	0.21
Resistance index	0.60	0.10
Systolic diastolic ratio	2.5	0.70

Out of 50 cases 70% had abnormal MCA and UA Doppler wave forms. Normal Doppler wave forms were seen in 30% of in the present study. In the remaining 70% of the cases with abnormal MCA and UA flows, 60% of the cases under went LSCS. 1% cases were induced for delivery due to reverse flow in the UA, with gestational age between 30 to 32wk and babies were weighing less than 1.2 kg. 32% newborn cases in this group were kept in NICU for respiratory distress and meconium staining of liquor and for further management.

DISCUSSION

In a study by Nalini YL *et al.* [2] showed that most of cases (53%) had decreased amniotic fluid. Even the study showed that majority of cases had increased flow in middle cerebral artery (46%). S/D ratio in the middle cerebral artery showed significant decline averaging about 2.55. 70% of cases had abnormal S/D ratio. Similar results were seen in present study. In a study by Alaa Ebrashy [6] *et al.* showed that C/U RI <1.0 was found in significantly more fetuses of women

with preeclampsia than in their controls (0.7 ± 0.3 and 1.3 ± 0.7 , respectively; $P < 0.001$).

A study by Zahra Fardiazar [7, 8] showed that the mean maternal age was 28 ± 7 years, mean gestational age was 31.79 ± 2.59 weeks and mean growth restriction was 3 ± 2 weeks. Similar findings were seen in present study. Study by Dhand Hemlata [1, 9] showed that oligohydramnios was associated 23.94% of the cases. Doppler waveforms in the middle cerebral artery and 36 of the 71 (50.7%) pregnancies. Study by Patange RP *et al.* [10] showed that mean gestational age was 32.36 ± 1.79 wks. Almost similar umbilical and middle cerebral artery index values were seen as compared to present study. It was seen that the umbilical artery indices were on a higher range among the IUGR pregnancy whereas the middle cerebral artery indices were decreased.

CONCLUSION

The middle cerebral artery flow and the umbilical artery flow test i.e color Doppler are very useful in identifying the IUGR and which further helps in managing them in an appropriate way.

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