

A study on fetal umbilical, MCA doppler parameters in borderline AFI and oligohydramnios

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Abstract

The incidence of oligohydramnios in Indian population is 4-5% and has many causes, the most common being IUGR. The incidence of IUGR varies from region to region and even in the same region, it varies in different sub populations. In India, according to recent UNICEF surveys, the incidence of IUGR is 25-30%. Data for the study was collected from patients attending the department of Radio-diagnosis, referred by Department of Obstetrics and Gynecology at our college. The study included 30 antenatal women who were diagnosed as having a fetus with intra uterine growth restriction based on grey scale ultrasound findings and referred for obstetric Doppler Ultrasound. Umbilical artery PI was elevated in 18 patients (60%) and was normal in 12(40%) patients. 63.3% of fetuses (n=19) had evidence of redistribution of blood to the brain as evidenced from the ratio of PI in the MCA and umbilical arteries.

Key Word: Fetal Umbilical, MCA Doppler Parameters, AFI and Oligohydramnios

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INTRODUCTION

Every new-born has the right to be born undamaged mentally and physically. The fulfilment of this goal plays a pivotal role in materno-fetal medicine, whose sole objective is that every pregnancy should culminate into a healthy baby and a healthy mother. The growth of human fetus, a complex process resulting in an increase in size over time has been the subject of extensive study. Before the advent of ultrasound evaluation physicians were interested in the growth process of fetus and its well-being, the prospective assessment of fetal growth during pregnancy has been limited to measuring the uterine size

and guessing the fetal size by palpation and could only look at the infant at delivery and infer at what happened in utero. This led to increasing perinatal mortality and morbidity. The very objective of obstetrics was getting defeated. But now, in the era of sophisticated modality of real time ultrasound, Amniotic fluid index assessment has become very easy, thus minimizing the future catastrophe.^{1,2} Amniotic fluid volume (AFV) is a term used to describe the volume of amniotic fluid present which directly relates to oligohydramnios. The most common definition of oligohydramnios is a condition in which the AFV is decreased related to gestational age. The incidence of oligohydramnios in Indian population is 4-5% and has many causes, the most common being IUGR. The incidence of IUGR varies from region to region and even in the same region, it varies in different sub populations. In India, according to recent UNICEF surveys, the incidence of IUGR is 25-30%.¹ Perinatal mortality rate (PMR) in cases of oligohydramnios was 87.7 % and out of which 4.15% babies had congenital anomalies verall labor induction was needed more often, and abruptio placenta, Caesarean section rate (CSR), PMR and congenital anomalies were high in oligohydramnios.² Accurate antenatal diagnosis of

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oligohydramnios by real time ultrasound can reduce the complications and assess for the fetal wellbeing. With the introduction of Doppler Ultrasound examination, it became possible to assess the uteroplacental blood flow, fetoplacental blood flow and to assess the fetal blood circulation. The uteroplacental and fetoplacental circulation give information on the placental resistance whereas evaluating the fetal circulation using Doppler ultrasound could non-invasively assess the fetal response to hypoxia. This has become possible to identify those small fetuses that were at increased risk of perinatal morbidity and mortality due to impaired uteroplacental and fetoplacental circulations.^{3,4} Umbilical arterial (UmbA) Doppler velocimetry is the most rigorously evaluated tests of fetal well-being.³ Doppler ultrasound studies of the human fetal circulation have shown that in fetuses with IUGR there is a significant reduction of middle cerebral arterial (MCA) pulsatility index when compared with those in normal fetuses.⁴ At Cordocentesis, a significant correlation has been observed between hypoxemia in fetuses with IUGR and an abnormal MCA pulsatility index.⁵

METHODOLOGY

The study was conducted for a period of 18 months. Data for the study was collected from patients attending the department of Radio-diagnosis, referred by Department of Obstetrics and Gynecology at our college. The study included 30 antenatal women who were diagnosed as having a fetus with intra uterine growth restriction based on grey scale ultrasound findings and referred for obstetric Doppler Ultrasound if the following inclusion criteria were met:

1. Singleton pregnancy in third trimester.
2. Women with reliable dating of pregnancy confirmed by an early first trimester ultrasound

RESULTS

All our patients ranged from 19 years to 31 years. Majority of the patients (80%) were in 21–30 years age group. The average age of the patients was 24.5 years. Least number of patients were seen in the group of more than 30 years.

Table 1: Age distribution of patients studied

Age in years	No. of patients	%
19-20	3	10.0
21-30	26	86.7
>30	1	3.3
Total	30	100.0

Table 2: Ultrasound findings: Amniotic Fluid Index

Ultrasound findings: AFI	No. of patients	Percentage
Normal	11	36.7
Mild Oligohydramnios (>4 – 5 cm)	6	20.0
Moderate Oligohydramnios (2 – 4 cm)	11	36.7
Severe Oligohydramnios (< 2 cm)	2	6.6
Total	30	100.0

examination using CRL or BPD or with known LMP will be selected.

The exclusion criteria for the study included any pregnancy with

1. Antenatal women where IUGR was a clinical suspicion only and no grey scale ultrasound assessment was done.
2. All subjects with history of rupture of membranes, active labor, multiple pregnancies and fetuses with congenital anomalies.

Doppler US evaluation was performed following a detailed clinical history and US biometry. Follow up Doppler studies were performed, if clinically indicated to determine a favourable or a worsening trend in the Doppler indices. However, only the results of the first Doppler ultrasound were used for analysis of perinatal outcome.

Outcome criteria: - Doppler results were analyzed for prediction of perinatal outcome.

Perinatal outcome variables included:

1. Birth Weight
2. Perinatal death
3. Emergency Caesarean section for fetal distress
4. Low APGAR score (5 min APGAR score of less than 7)
5. Admission to NICU for complications of Low Birth Weight

Pregnancy was considered to have “Adverse outcome” when any of the following complications were present

1. Perinatal death
2. Emergency CS for fetal distress
3. 5 min APGAR score of less than 7
4. Admission to NICU for complications of low birth weight.

Pregnancy outcome was considered to be “Uneventful or Favourable” when the above complications were absent.

In our study, 20 % of patients had mild oligohydramnios, Approx. 37 % had moderate oligohydramnios while 6.6 % showed severe oligohydramnios. The remaining percentage of patients were normal

Table 3: Findings of umbilical artery Doppler examination

PI	Number	Percentage
Normal Value : < 1.5		
Elevated	18	60.0
Normal	12	40.0
Total	30	100.0

Umbilical artery PI was elevated in 18 patients (60%) and was normal in 12 (40%) patients.

Table 4: Ratio of PI of MCA to PI of umbilical artery – Cerebroplacental Ratio

MCA PI /UmbA PI Normal Value : > 1.08	Number	Percentage
Decreased <1.08	19	63.3
Normal	11	36.7
Total	30	100.0

63.3% of fetuses (n = 19) had evidence of redistribution of blood to the brain as evidenced from the ratio of PI in the MCA and umbilical arteries.

Table 5: Showing Performance characteristics of Doppler indices

Doppler indices	Number	Percentage
1. Elevated Umb A PI (> 1.5)	18	60.0
2. Abnormal MCA PI (< 1.5)	11	36.7
3. MCA PI / Umb A PI (Cerebroplacental Ratio) (<1.08)	19	63.3

Table 6: Umbilical artery PI in predicting perinatal outcome

Study	Sensitivity
D Gramellini <i>et al</i> ¹⁰	64%
K W Fong <i>et al</i> ⁶	44.7%
BN Lakhkar <i>et al</i> ²⁰	50%
Present study*	84.2 %

DISCUSSION

Fetal growth and development is a natural process for each and every human kind, which has aroused the interests of all clinicians for many years, since not all fetuses grow or develop equally. Intrauterine growth restriction does not imply a specific pathophysiology but merely a result of a series of events occurring along several possible pathways. Hence, accurate antenatal diagnosis must decide whether the fetus is constitutionally small for gestational age or small as a consequence of impaired placental perfusion. Doppler flow velocity analysis can be valuable in solving this problem, by examining umbilical arteries (Feto-placental circulation) and middle cerebral artery (fetal-circulation).^{6,7} Our study was done in 30 pregnant women, who were diagnosed as having fetuses with intrauterine growth restriction based on clinical suspicion and grey scale ultrasound examination. Numerous studies with varying results have been published and difficult to compare. This controversy can partly be explained by small number of patients enrolled, varying sample sizes and techniques as well as different criteria used to define the adverse perinatal outcome. In addition some studies

were performed in high risk and some in low risk population, similarly major and minor perinatal outcome.^{8,9} As can be seen yet, there is no universally accepted standard for defining an abnormal Doppler flow velocity waveforms and pregnancy outcome measure, therefore, conflicting observations might continue to emerge. In our study, it is observed that the maximum number of pregnant women were in the age group of 21-25 years (50%). This can be attributed probably for the increased pregnancy rate in these age groups. In this study all patients underwent Doppler study in the third trimester of their pregnancy. In this study 20% of fetuses showed mild oligohydramnios. 36.7% of fetuses showed moderate oligohydramnios and 6.6% showed severe oligohydramnios. In the present study the umbilical artery PI had a sensitivity of 84.2%. According to D. Gramellini *et al*¹⁰, the sensitivity of PI in the Umbilical artery in predicting perinatal outcome was 64%. Umbilical artery was the main vessel used for monitoring high risk pregnancies. This is because umbilical artery represents fetoplacental system and primarily reflects placental resistance. In present study as there is more number of PIH cases probably this can be attributed for difference in

the studies. Another study by K W Fong *et al*¹¹ showed the sensitivity of PI in the umbilical artery as 58.3%. The following table compares the results of the present study with other studies. Absence or reversal of the end diastolic flow velocity was seen in 10% fetuses in our study compared with that of 37% in the study by Benson and Doubilet¹²

CONCLUSION

The umbilical-placental and cerebral vascular beds are directly involved in the hemodynamic adjustments of fetal growth restriction. A Doppler index that reflects both of these areas can be useful for identifying fetuses with increased placental and/or decreased cerebral resistance Doppler imaging is of value for monitoring the pregnancy because it can provide indirect evidence of fetal compromise and is known to improve outcomes of high risk pregnancies with Intrauterine growth restriction. Hence Doppler evaluation is complementary to all other surveillance modalities.

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