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ROLE OF OBSTETRIC DOPPLER IN PREDICTION OF ADVERSE PERINATAL OUTCOME IN INTRAUTERINE GROWTH RETARDATION AND PREGNANCY INDUCED HYPERTENTION

Obstretics and Gynaecology

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ABSTRACT

To determine and compare accuracy of various Doppler parameters for perinatal outcome. Umbilical artery (UA), Middle cerebral artery (MCA) and Ductus Venosus for predicting adverse perinatal outcome in patients of intrauterine growth retardation (IUGR) and pregnancy induced hypertension (PIH).75 singleton pregnancy with clinically diagnosed of IUGR/PIH or both, having gestational age of 30 weeks were included in the study. Serial examination was carried out & perinatal outcome of each cases were noted. In Doppler examination flowmetery of MCA, Umbilical study was conducted at tertiary care hospital for duration of 1 year. artery & Ductus Venosus were included in the study. Total 75 patients were included in which 50(66.6%) patients showed abnormal umbilical artery wave form out of these 41(54.66%) patients has adverse perinatal outcome, while 43(57.33%) patients showed abnormal MCA flow in which 35(46.66%) patients had adverse perinatal out come, but Almost all patients with abnormal MCA/UA PI had adverse fetal outcome. In Conclusion, MCA / UA PI is most sensitive & specific index in predicting outcome.

KEYWORDS

Intrauterine Growth Retardation (IUGR), Pulsatility Index (PI), Umbilical Artery (UA), Middle Cerebral Artery (MCA), Middle Cerebral Artery To Umbilical Artery Pulsatility Index Ratio, Perinatal Outcome.

INTRODUCTION

Doppler techniques have been the focus of interest and research activity in obstetrics since the initial report of signals from the umbilical artery by Fitzgerald and Drumm.1 The first application of Doppler velocimetry in obstetrics was reported by Fitzgerald and Drumm1 and McCallum et al.[2]

IUGR is an important disease affecting 15% of pregnancy & is associated with significant short term & long term morbidity [1, 2]. Prediction of IUGR is the cornerstone of ANC Ultrasound & it is frequently utilized in antenatal period to assess fetal growth through serial biometric measurement, amniotic fluid index & the velocitom etry analysis of UA & MCA[3].

Fetal growth restriction refers to a fetus that has failed to achieve its genetic growth potential, usually because of placental diseases restricting nutritional supply and fetal oxygen partial pressure. SGA are at greater risk of perinatal mortality and morbidity ,[4]. Fetal umbilical artery is the mainstay of risk assessment in small fetuses and those at risk of compromise [5,6].

PIH affects 5-10% of pregnancy and one of the major causes of maternal and fetal morbidity and mortality, although there is no proven effective method for prevention of PIH. Routine anti-natal care has the aim to identify women who are at risk, for more intensive anti-natal care [9,10].

Now days, Doppler ultrasound velocitometry of utero-placental, umbilical and fetal vessels have become established method of anti-natal monitoring. Several studies have reported higher sensitivity and specificity for MCA/ UA PI Doppler ratio compared with umbilical artery velocitometry for prediction of fetal prognosis.

OBJECTIVE

The purpose of our study was to evaluate the usefulness of pulsatility index of the UA and MCA as well as ratio of MCA PI to UA PI and ductus venosus doppler in the diagnosis of true IUGR fetuses and PIH and prediction of adverse perinatal outcome.

MATERIAL AND METHODS

This was a prospective study conducted in department of obstetrics and gynecology,tertiary care HOSPITAL,Ahmedabad from august 2016 to july 2017 in total period of 1 year.

The study population comprised of 75 singleton pregnancies beyond 30 weeks period of gestation age complicated by IUGR and PIH or both. All these patients were subjected to a detailed history and physical examination with special emphasis on present and past obstetric and family history, along with signs and symptoms suggestive of hypertension and/or IUGR.

Gestational age determination was done based on LMP, clinical gestational age or Foetal biometry preferably in first trimester. Pregnancies with multiple gestation and congenital anomalies were excluded from our study. All the patients were followed by serial Doppler assessment. The results of the last Doppler examination within 10 days of the delivery were considered. The perinatal outcome of each case was noted based on intra partum and neonatal parameters.

Study of various fetal vessels was performed using 3.5 MHz broadband curvilinear transducer. After taking fetal biometry, spectrum of Umbilical artery, Middle cerebral artery and Ductus Venosus were taken. During doppler study, the patients were in a semi recumbent position with the head and chest slightly elevated. The pulsed Doppler samples were placed in the lumen of the umbilical artery, away from the placental and fetal cord insertion. For MCA, an axial view of fetal head was obtained at the level of cerebral peduncles, than the color Doppler was used to visualize the circle of Willis, and the Doppler samples were placed within 1 cm of the origin of MCA[6].Doppler indices measured for both arteries were PI, RI and S/D ratio.[7] These indices were then compared with routine ultrasonic measurement of FL/AC and were also correlated with subsequent perinatal outcome.

The outcome variables were number of newborns with IUGR,Number of fetal demise/IUD,the incidence of neonatal morbidity as reflected by the newborn remained in the neonatal intensive care unit (NICU)>48 hours, the incidence of cesarean sections and Apgar score <7 at birth, neonatal morbidity like hyperbilirubinemia,intracranial haemorrage,early onset septicaemia. Comparison of Doppler parameters in the prediction of perinatal outcome was done.

OBSERVATION AND RESULTS A Total of 75 patient who were categorized under PIH and IUGR were enrolled for study with gestational age beyond 30 weeks of pregnancy were followed till delivery perinatal outcome noted.

table 1 maternal characteristics of study population

Age group	Number	Percentage
18-23	33	44%
24-30	27	36%
>31	15	20%

Mean age group in our study was 18-23 years .

table 2 distribution of cases in relation to gravidity

Gravidity	Number	Percentage
Primi	27	36%
2nd	22	29.3%
3rd or more	26	34.7%

Maximum no. of patients in our study was primigravida (36%)

Table 3: correlation of UA waveform and abnormal perinatal outcome.

Slno	UA waveform in no of pts	Abnormal perinatal outcome Number and percentage	normal perinatal outcome number and percentage
1	Normal(25)	8(10.6%)	17(22.6%)
2	Decreased end diastolic flow(27)	22(29.3%)	5(66.6%
3	Absent diastolic flow(12)	9(12%)	3(4%)
4	Reversal(11)	10(13.3%)	1(1.3%)
Total	75	49	26

In present study out of 49 patients with abnormal perinatal outcome 29.3% had decreaed end diastolic flow,12%absent diastolic flow and 13.3% had reversal of flow.

table 4 correlation of MCA PI value and abnormal perinatal outcome

Sl no	MCA PI	Abnormal perinatal outcome	Normal perinatal outcome
1	PI>1(32)	14(18.6%)	18(24)
2	PI<1(43)	35(46.6%)	8(10.6%)
TOTAL		49	26

IN present study total of 49 patients with abnormal perinatal outcome 35 patients had MCA PI<1

Table 5: Corelation of abnormal perinatal outcome and MCA/UA P.I. ratio

Sl. No.	MCA/UA P. I ratio	Abnormal perinatal outcome No. of pts and percentage	Normal perinatal outcome No of pts and percentage
1	>1(normal)30	6(8%)	24(32%)
2	<1(abnormal)45	43(57%)	2(2.6%)
	Total	49	26

IN present study total of 49 patients with abnormal perinatal outcome 43 patients had MCA PI/UA PI<1

Table 6: Percentage and no. of pts of D.V. waveform

Sl no	D.V. waveform	Abnormal perinatal outcome No. of pts and percentage	Normal perinatal outcome No of pts and percentage
1	Normal(67)	42(56%)	25(33.3%)
2	Decreased flow (5)	4(5%)	1(1.3%)
3	Reversal of flow(3)	3(4%)	(0%)
	Total	49	26

Almost All fetuses fetuses with decreased diastolic flow or reversal of a wave in Ductus had poor perinatal outcome. D.V waveforms are sensitive marker for acidemia and hypercapnia in I.U.G.R fetuses

Table 7: Perinatal outcome in patients

Perinatal outcome	Number	Percentage
Number of fetal demise/IUD	8	10.66%
Newborns (%) Baby weight < 2.5 kg	30	40%
minute apgar score < 7/10	16	21.33%
Admission to NICU>48 hours	18	24%
Other perinatal complication	14	18.66%
Patient with Cesarean sections	15	20%
Total	49	65.33%

In present study 10.66% were IUD,40%were birth weight <2.5kg, 21.33% had apgar<7,24% had admission to NICU>48 HOURS, 18.66% had OTHER PERINATAL COMPLICATION,20% had CAESAREAN section

Table 8: Sensitivity & Specificity of UA, MCA for spectrum of perinatal outcome

Index	Sensitivity	Specificity
UA PI	83.6%	65%
MCA PI	71.4%	69.2%
MCA/UA PI	87.8%	92.3%
DV	88%	96%

DISCUSSION

Perinatal Doppler velocimetery can identify those IUGR fetuses before onset of worst perinatal outcome, But a analysis of randomized trials showed that perinatal mortality were significantly reduced when UA Doppler velocimetery was used as an adjuvant to FHR monitoring, as by the time FHR tracing become abnormal, up to 77% of fetuses are already hypoxic &acidemic[11,12].

Fetal hypoxia activates a range of biophysical, cardiovascular, endocrine and metabolic responses. Fetal cardiovascular responses to hypoxia, which include variation of the heart rate, an increase in blood pressure and redistribution of the cardiac output towards vital organs, for maintaining fetal homeostasis. The redistribution of blood flow towards brain is called 'brain sparing effect'.it has recently become clear that this phenomenon cannot always prevent the development of brain lesion [13-15].

In IUGR and PIH umbilical blood flow is significantly reduced, mainly due to changes in the placental vascular resistance. Giles et al. [16] have found that a decrease in the number of resistance vessels in the tertiary stem villi in the placenta causes an increase in resistance, leading to decreased flow through the UA and an increase in the UA PI. This is described as umbilical placental insufficiency.

Doppler flow velocimetry of the fetal MCA may assist in perinatal diagnosis and management of complicated pregnancies. A low index of pulsatility in the middle cerebral artery associated with fetal compromise has been described [17]. Fetuses with abnormal Doppler MCA/UA PI in our study had a significantly lower birth weight, lower gestational age at delivery Our study showed high sensitivity for MCA/UA PI to predict the adverse perinatal outcome of 87% and a specificity of 92% which was approxing to the study by Shahina bano et al. [18] having sensitivity of MCA/UA P.I of 83% and specificity of 100%.

The specificity for abnormal Ductus (absent/ reversal) flow was 96% for predicting the adverse fetal outcome similar to the study by M. Delrio et al. [19]which had specificity of 95%.

CONCLUSION

PI ratio of MCA & UA carries better sensitivity and specificity in predicting adverse perinatal outcome. Absent end diastolic flow/reversal in umbilical artery had high positive predictive value in predicting adverse fetal outcome. DV changes seem to be a sign of a severely compromised foetus with poor perinatal outcome. Doppler investigation of the foetal circulation may play an important role in monitoring the growth restricted foetus and thereby may help to determine the optimal time of delivery. Elderly multigravida with abnormal Doppler parameters had high incidence of perinatal morbidity and neonatal mortality rates. Pregnancies complicated by both with I.U.G.R and Pre- eclampsia had high incidence of neonatal deaths.

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