

CONTEMPORARY STUDY

Doppler Cerebroplacental Ratio and Adverse Perinatal Outcome

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ABSTRACT

Objective: This study was done to assess the Doppler cerebroplacental ratio (CPR) in the prediction of adverse perinatal outcome especially in growth restricted pregnancies.

Materials and methods: In this study, 62 antenatal women were subjected to Doppler studies at 34 to 42 weeks of gestations. CPR was calculated and less than 1 was taken as predictor of adverse perinatal outcome. Adverse perinatal outcomes was evaluated by mode of delivery, meconium staining, 1 and 5-minute Apgar scores, birth weight, admission to NICU and other neonatal complications.

Results: Of 62 antenatal women, with an abnormal CPR had higher incidence of meconium, clinical fetal distress, operative delivery, low Apgar score (5 mins), NICU admission and neonatal death, 42.88, 47.62, 26.57, 76.19, 66.17 and 66.67% respectively as compared to women with normal CPR who had 4.88, 2.88, 2.88, 2.88, 12.19, 17.07 and 0% respectively. With the use of an abnormal CPR, the sensitivity, specificity, and positive and negative predictive values for predicting an adverse outcome were 62, 80, 62 and 80%, respectively, with an odds ratio (95% confidence interval).

Conclusion: An abnormal CPR is associated with adverse perinatal outcomes, especially in growth-restricted fetuses.

Keywords: Adverse perinatal outcome, Doppler sonography, Cerebroplacental ratio.

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INTRODUCTION

The antepartum assessment of fetal well being has assumed a critical importance in the management of pregnancy.

Recently, cerebroplacental ratio (CPR) determined by color Doppler has been shown to be a good predictor of fetal well being. CPR is the ratio of S/D ratio of middle cerebral artery (MCA) to S/D ratio of umbilical artery (UA). It measures the proportion of blood flow supplying brain and placenta. In early phase of hypoxia, when redistribution of blood occurs in favor of cerebral circulation, the diastolic flow amplitude becomes higher than normal and umbilical flow is lower, giving CPR <1.

MATERIALS AND METHODS

The present study has been carried out on antenatal women attending Antenatal clinic, outdoor and indoor, in the department of obstetrics and gynecology, in collaboration with department of radio diagnosis, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh, from September 2007 to October 2008. We excluded all cases with congenital malformations. In this study, 62 antenatal women were subjected to Doppler studies at 34 to 42 weeks of gestations. All these women were examined clinically and blood flow studies were conducted in MCA, UA. CPR was calculated as S/D of MCA divided by S/D of UA. All women were followed by weekly test. The last test was done within a week of delivery. CPR of less than 1 was taken as an abnormal value. Adverse perinatal outcomes was evaluated by mode of delivery, meconium staining, clinical fetal distress (CFD), 5-minute Apgar scores, birth weight, admission to NICU and other neonatal complications.

RESULTS

The present study includes 62 antenatal women of 32 to 42 weeks of gestational age. The maximum numbers of cases were primigravidas of 21 to 30 years of age. Most of the women were having intrauterine growth restricted pregnancies (48.4%) followed by pregnancy induced hypertension (PIH) (Table 1). Many pregnant women had more than one risk factors. Out of 62 women, 41 were having normal CPR and 21 were showing abnormal CPR. All three women with no risk factor were having normal CPR. Forty one with normal CPR, only two (4.88%) develop meconium, one (2.44%) CFD, one (2.44%) operative delivery, one (2.44%) low A/S and five (12.19%) were delivered low birth weight babies. Seven (17.07%) got admitted in NICU.

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None expired. But, twenty-one women with abnormal CPR, nine (42.86%) develop meconium, ten (47.62%) CFD, ten (47.62%) operative delivery, six (26.57%) low A/S and 16 (76.19%) were delivered LBW babies. Fourteen (66.67%) babies got admitted in NICU. Fourteen (66.67%) babies were expired. The differences in both were statistically significant in all parameters (Table 2).

Comparison of the Sensitivity, Specificity, PPV and NPV of S/D Ratio of Umbilical Artery, S/D Ratio of MCA and CPR

The CPR was more sensitive than S/D ratio of umbilical artery for presence of meconium, CFD, operative interference, low apgar score (A/S), NICU admission and low birth weight (LBW) (Table 3). It was also more sensitive than S/D ratio of MCA for predicting CFD, operative delivery for fetal distress and LBW. But, the sensitivity was similar for meconium, low A/S and NICU admission.

Table 1: Distribution of cases according to risk factors in pregnancy

Risk factors	No. of cases	Percentage
IUGR	30	48.4
PIH	12	19.4
Rh negative	7	11.3
Diabetes mellitus	5	8.06
Polyhydramnios	4	6.45
Oligohydramnios	2	3.23
Postdated pregnancy	2	3.23
Hypothyroidism	1	1.61
Medical renal disease	1	1.61
No risk factors	3	4.84

CPR was more specific for predicting LBW, S/D ratio of MCA was more specific for NICU admission and in all other parameters S/D ratio of UA was more specific (*see* Table 3).

CPR had a higher predictive value for CFD, operative delivery and LBW. It was comparable to S/D ratio of MCA for meconium and low A/S but lower for NICU admission. The S/D ratio of UA had least positive predictive value for all (Table 4).

CPR had higher negative predictive value for CFD, operative delivery and LBW. It was similar to S/D ratio of MCA for meconium and low A/S and NICU admission. The S/D ratio of UA had least negative predictive value for all (*see* Table 4).

With the use of an abnormal CPR, the overall sensitivity, specificity, and positive and negative predictive values for predicting an adverse outcome were 62, 80, 62 and 80%, respectively, with an odds ratio (95% confidence interval).

Table 2: Correlation of CPR with adverse perinatal outcome

Adverse perinatal outcome	Normal CPR (>1) (N = 41)		Abnormal CPR (<1) (N = 21)	
	No.	%	No.	%
Meconium	2	4.88	9	42.88
Chronic fetal distress (CFD)	1	2.88	10	47.62
Operative delivery for FD	1	2.88	10	47.62
Low Apgar score (5 mins)	1	2.88	6	26.57
Low birth weight babies (LBW)	5	12.19	16	76.19
NICU admission	7	17.07	14	66.67
Neonatal death	0	0	14	66.67

Table 3: Comparison of sensitivity and specificity of S/D ratio of UA, S/D ratio of MCA and CPR

Adverse perinatal outcome	Sensitivity			Specificity		
	UA	MCA	CPR	UA	MCA	CPR
Meconium	45	81	81.8	78	78	76
CFD	66.6	75	91.6	84	78	80
Operative delivery for FD	63.6	81.8	90.9	82	78	78
Low A/S in 5 minutes	57	85.7	85.7	78	74	72.7
NICU admission	38	66	62	80	85	80
Low birth weight	42.8	66	76	83	85	80

Table 4: Comparison of positive predictive value and negative predictive value of S/D ratio of UA, S/D ratio of MCA and CPR

Adverse perinatal outcome	Positive predictive value			Negative predictive value		
	UA	MCA	CPR	UA	MCA	CPR
Meconium	31	45	42.8	87	95	95
CFD	50	45	52	91	92.8	97
Operative delivery for FD	43.7	45	47.6	91	95	97
Low A/S in 5 minutes	25	30	28.6	93	97.6	97.6
NICU admission	50	70	62	72	83	80
Low birth weight	56	70	76	74	83	87.8

DISCUSSION

Evaluation of fetal condition is an integral part in the management of pregnancy, especially in high risk pregnancy as IUGR. Women with normal CPR, 4.88% had meconium staining while it was seen in 42.86% cases with abnormal CPR, which is statistically significant while Singh et al (1999) showed 6.9% meconium with normal CPR and 2.8% in abnormal CPR.¹ CFD was detected in 2.44% cases with normal CPR and 47.62% with abnormal CPR. Farooq et al (2003) noted CFD in 8.9% with normal CPR and 45.8% with abnormal CPR, which is almost comparable to our study.² Operative interference for fetal distress was seen in 2.44% with normal CPR and 47.62% with abnormal CPR. In our study, CPR is most sensitive in predicting operative interference. Low A/S was also higher with abnormal CPR, which is comparable to Singh et al (1999), who found low A/S with abnormal CPR group.² Low birth weight, NICU admission and neonatal death are more common with abnormal CPR group than with normal CPR cases. In our study CPR is also more sensitive and specific for neonatal outcome than S/D ratio of UA and MCA, which is comparable to study by Yalti et al (2004).³ Thus, CPR is better predictor than S/D ratio of UA and MCA. The CPR has been shown to be a good predictor of the fetal oxygenation status at birth and can be used to identify pregnancies that are at risk for adverse outcomes.⁴⁻⁶

Our study has some limitations as our sample size was small, with relatively small numbers of adverse perinatal outcomes, with the possibility of hidden biases.

CONCLUSION

Our study found the CPR to be modestly predictive of adverse perinatal outcomes, especially in cases of IUGR. Larger studies are needed to corroborate our findings.

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