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Original research article

CPR in early severe fetal growth restriction and late mild fetal growth restriction

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Abstract

Foetuses with an abnormal CPR that are appropriate for gestational age have a higher incidence of fetal distress in labour requiring emergency caesarean delivery, a lower cord pH, and an increased admission rate to the newborn intensive care unit when compared with fetuses with a normal CPR. The study group will comprise all pregnant women at 30-34 weeks, who fulfill the inclusion criteria, coming for antenatal screening, to the Obstetrics out-patient department after taking written and informed consent. These women were evaluated with ultrasound Doppler study with other routine investigations and CPR were calculated. In the present study, there were total 18 cases with abnormal CPR. Two cases belonged to early onset FGR could prolong the pregnancy for mean of two days after detection. Both of the women underwent LSCS. ABG of both babies were abnormal, with mean duration of stay in NICU was 20 days. In late onset FGR, there were 16 babies with abnormal CPR. We could prolong the pregnancy for mean of 2 weeks + 3 days. 6 of them had vaginal delivery and 10 women underwent LSCS. Out of which 12 babies had had abnormal AB. 11 babies were shifted to NICU and mean duration of stay in NICU was 8.5 days.

Keywords: Cerebro placental ratio, FGR, LBW

Introduction

Doppler ultrasound velocimetry of umbilical and fetal vessels has become established method of antenatal monitoring, hence allowing the non-invasive assessment of neonatal circulation and its perinatal outcome [1].

Its indices provide important information on the hemodynamics of the foetus [2].

Umbilical arteries and middle cerebral artery (MCA) are the common vessels assessed by Doppler ultrasound other than uterine vessels [3, 4, 5].

Several studies have reported higher sensitivities and specificities for middle cerebral artery/umbilical artery (MCA/UA)/ cerebroplacental ratio (CPR) Doppler ratio compared with umbilical artery velocimetry alone for the prediction of the fetal prognosis [6-9].

The CPR is emerging as an important predictor of adverse pregnancy outcome.

Foetuses with an abnormal CPR that are appropriate for gestational age have a higher incidence of fetal distress in labour requiring emergency caesarean delivery, a lower cord pH, and an increased admission rate to the newborn intensive care unit when compared with fetuses with a normal CPR [10].

Deterioration in placenta function during pregnancy results in compensatory hemodynamic changes in the fetus, with increased blood flow to the brain and other essential organs.

This redistribution of cardiac output is typically seen in small for gestational age foetuses, or any fetus that fails to reach its growth potential regardless of gestation.

Small for gestational age neonates, with birth weight below 10th percentile, may be constitutionally small or growth restricted due to impaired placentation, fetal abnormalities or adverse environmental effects, such as congenital infection.

In fetal growth restriction (FGR) due to impaired placentation, both perinatal outcome and long term neurodevelopment was worse than in constitutionally small foetuses [6].

Hence after identification of SGA foetuses and exclusion of those with fetal abnormalities, prenatal diagnosis aims to detect the FGR group and, through close surveillance, to define the best time, place and mode of delivery [8].

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An important modality for achieving this objective is by Doppler assessment of impedance to flow in the Umbilical artery, fetal middle cerebral artery and the ratio of their pulsatality index (PI) in these vessels, defined as CPR.
So, this study is done to know the efficacy of CPR in assessing perinatal outcome and to consider as an assessment tool in fetuses undergoing third-trimester ultrasound Doppler examination

Methodology
The study group will comprise all pregnant women at 30-34 weeks, who fulfill the inclusion criteria, coming for antenatal screening, to the Obstetrics out-patient department after taking written and informed consent. These women were evaluated with ultrasound Doppler study with other routine investigations and CPR were calculated. Women will be categorized into high risk and low risk pregnancies and were followed up till delivery and fetal outcome will be noted. Fetal arterial blood PH were noted and correlated with the fetal outcome.

Inclusion criteria
Women aged 18-40 years, with singleton pregnancy and period of gestation between 30 to 34 weeks who are willing to take part in the study.

Exclusion Criteria
Pregnant women with multiple gestation.

Study design: Prospective Cohort Study.

Sample size
A study carried out on "Umbilical and fetal middle cerebral artery Doppler at 30–34 weeks‟ gestation in the prediction of adverse perinatal outcome" has revealed a significant association between log10 MoM CPR and birth weight Z score r=0.131(p<.001). Based on the above findings of the study, with a power of 80%, and α error of 5%, it has been estimated that 351 pregnant women, need to be included in the study.

Statistical Analysis
Association of categorical variables will be performed by chi-square test or Fisher‟s exact test. The difference in the mean values of the quantitative variables such as CPR ratio between the different groups (low versus high risk) pregnant women will be tested for statistical significance by Mann–Whitney U-test or student‟s t test. The relationship between the CPR and birth weight Z score will be studied by estimating pearsons correlation co- efficient and regression equation. Independent predictors associated with adverse perinatal outcomes will be studied by employing logistic regression analysis. ROC curve will be applied to arrive at the cut off ratio.

Results and Discussion
In the present study, among the low risk women that is out of 322 (80.59%) women, 310(96.5%) had normal Doppler, and 12 (3.41%) had abnormal Doppler.
And among the high risk group, 78 (19.4%), 72 (92.30%) had normal Doppler, and six (7.6%) had abnormal Doppler.

Table 1: CPR in high risk and low risk cases

CPR	Normal N/%	Abnormal N/%	Total N/%
Low risk	310 / 96.5%	12 / 3.41%	322
High risk	72 / 92.30%	6/7.6%	78
	382(95.5%)	18(4.5%)	400/100%

In the present study, among the low risk women that is out of 322 (80.59%) women, 310(96.5%) had normal Doppler, and 12 (3.41%) had abnormal Doppler.
And among the high risk group, 78 (19.4%), 72 (92.30%) had normal Doppler, and six (7.6%) had abnormal Doppler.
In high risk cases, women with abnormal Doppler are almost double that is 7.6%, when compared to women belonged to low risk group that is 3.41%.
In high risk group, women with abnormal Doppler, we could prolong the pregnancy for mean of 2 days, and mean POG at birth was 31+2 days, in the mean time; these babies were followed up with NST, AFI and Diastolic flow and flow in Ductus Venosus.
In low risk group, women with abnormal Doppler, we could prolong pregnancy for mean of 2 weeks + 3 days, and mean POG at birth was 36 weeks.
Among the 12 babies, in low risk group, with abnormal Doppler, 10 had vaginal delivery at mean POG

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was 37 weeks, and babies were shifted to mother side at birth. Two babies underwent LSCS, for fetal distress, and one baby was on CPAP for 2 days, and all the babies were discharged without significant morbidity.

Table 2: CPR in early severe fetal growth restriction and late mild fetal growth restriction

	Early onset FGR(<32 Weeks) with abnormal Doppler = CPR abnormal (mean)	**Late onset FGR (>32 Weeks) with abnormal Doppler (mean)**
Total Cases = 18	2	16
CPR (Percentile) (mean)	1	2.2
Duration of prolongation of pregnancy (mean)	2 days	2weeks+3days (mean)
Vaginal	0	6
LSCS	2	10
ABG (Normal/abnormal)	0/2	4/12
NICU Stay =Yes	2	11
Duration: mean days	20	8.5

In the present study, there were total 18 cases with abnormal CPR. Two cases belonged to early onset FGR could prolong the pregnancy for mean of two days after detection. Both of the women underwent LSCS. ABG of both babies were abnormal, with mean duration of stay in NICU was 20 days.
In late onset FGR, there were 16 babies with abnormal CPR. We could prolong the pregnancy for mean of 2 weeks + 3 days. 6 of them had vaginal delivery and 10 women underwent LSCS. Out of which 12 babies had had abnormal AB. 11 babies were shifted to NICU and mean duration of stay in NICU was 8.5 days.

CPR Normal vs. Abnormal

- Period of gestation is significantly different for CPR Normal vs. Abnormal t =5.1; p<.0001 Mean (Normal) 266.47 vs. 245.41 (Abnormal)
- Birth weight is significantly higher in CPR Normal as compared to Abnormal t = 7.89; p<.0001 Mean (Normal) 2. 82 vs. 1.94 (Abnormal))
- Period of prolongation of pregnancy is significantly different for CPR Normal vs. Abnormal t = 6.74; p<.0001 Mean (Normal) 37.56 vs. 14.64 (Abnormal)

Above three results indicate that period of gestation, birth weight and period of prolongation are significantly lower with patients with CPR abnormal as compared to CPR Normal group of patients.

Conclusion

- Babies with abnormal CPR were delivered earlier with or without risk factor and the need for NICU in babies with abnormal CPR with high risk factor were more.
- The parameters considered for prolongation of pregnancy was NST, AFI, diastolic flow and Ductus Venosus, in the monitoring phase.
- In high risk cases, women with abnormal Doppler are almost double (7.6%), when compared to women belonged to low risk group that is 3.41%.

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