Role of Cardiotocography to Improve Perinatal Outcome in High Risk Pregnancy

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ABSTRACT

Introduction: FHR monitoring is very important role in labouring patient when incidence of fetal hypoxia and progressive asphyxia increases mainly in high risk pregnancy. Now a day's cardiotocography (CTG) become a popular method to monitor fetal wellbeing and it is assisting the obstetrician in making decision on the mode of delivery to improve perinatal outcome. Study aimed to assess the benefit of cardiotocography to improve perinatal outcome in high risk pregnancy.

Material and methods: In this prospective observational study 201 gravid women with high risk pregnancy in first stage of labour were taken. Result was assessed in the form of liquor status, apgar score at one minute and five minute, birth weight, NICU admission, Perinatal mortality. Statistical analysis is done by using Chi square test and $p<0.05$ is considered as statistically significant.

Results: Perinatal morbidity in the form of NICU admission is higher in nonreactive group as compare to reactive group (75.7%v/s 22.8%). The admission CTG was reactive in 127 patients (63.1%) and nonreactive in74 patients (36.9%). This study concluded that there is statistically significant role of reactivity of CTG and NICU admission.($P< 0.001$). The sensitivity of CTG for NICU admission 75.7%, specificity 77.2% with Positive predictive value 65.9% and however a high Negative predictive value (84.5%) was also seen.

Conclusion: Cardiotocography is the best non invasive screening test to evaluate the fetal health and to predict the perinatal outcome in high risk pregnancy. Incidence of fetal distress, MSL, abruption, low birth weight and NICU admission was more frequent in those cases that have nonreactive traces

Keywords: Cardiotocography, Admission Test, Foetal Distress, Perinatal Outcome.

INTRODUCTION

Electronic fetal heart rate monitoring (EFM) involves the use of a cardiotocograph (CTG) to record the fetal heart rate (FHR) so as to determine the fetal well-being in order to detect signs of intrapartum hypoxia. Assessment of fetal well being in labour ward by admission cardiotocography helps us to look for already prevailing high risk factors and also new factors that have recently appeared.[1-3]

Fetal distress is a condition in which fetal physiology is altered due to hypoxia which increases the chance of fetal death. It is a progressive condition, which if not corrected, will result in decompensation of physiological response and cause damage the brain or death of foetus.[4] Foetus reacts at onset of asphyxia with various compensatory mechanisms, which enable foetus to survive asphyxia. The clinical means, by which we ensure adequate fetal compensation, is by fetal heart rate monitoring. So FHR monitoring plays the most important role in management of labouring patient when incidence of fetal hypoxia and progressive asphyxia increase. Now a day's cardiotocography (CTG) become a popular method to monitor fetal wellbeing and it is assisting the obstetrician in making decision on the mode of delivery to improve perinatal outcome. The admission test first described by Ingemarsson et al[5] is a short strip of fetal heart rate monitoring during labour. It is a dynamic screening test for the state of oxygenation of the fetus on admission of mother in labour room.

The admission CTG test is a short continuous electronic FHR monitoring for 20 minutes, along with simultaneous recording of uterine activity done immediate on admission to the labour suit. If CTG is nonreactive then patient will be given special treatment and test will be repeated and decision will be taken according to repeat CTG traces in labour room.[6] Study aimed to assess the benefit of cardiotocography to improve perinatal outcome in high risk pregnancy.

MATERIAL AND METHODS

This prospective study was conducted in the Department of Obstetrics and Gynaecology Sanjay Gandhi Memorial Hospital Mangolpuri, New Delhi, from Feb 2013 to May 2014. A total of 201 high risk antenatal mothers were subjected to cardiotocography. Cardiotocography monitoring was performed on these mothers and interpretations made based on fetal heart rate, base line variability, number of accelerations and deceleration and CTG was then designated as reactive or non reactive. On this basis the fetal outcome was predicted by Birth weight, Apgar score at one minute and five minute, liquor status,NICU admission and perinatal mortality. The prediction of cardiotocography traces with perinatal outcome was done.

Inclusion criteria

Women who had Gestational age ≥ 36 wks in first stage of labour with high risk factor like Anaemia, PIH, Diabetes mellitus, Rh Negative, PROM, IUGR(Intrauterine growth restriction, Post datism, Previous caesarean section, Bad obstetrics history, Oligohydramniose and decrease fetal movements.

Exclusion criteria

Patient excluded in this study group were gestational age < 36 wk and all antenatal patient without mentioned obstetric high risk factors in inclusion criteria.

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Methodology

After obtaining the institutional ethical committee approval, study was started. Patients admitted in obstetrics unit with inclusion criteria, were analyzed. Written informed consent was obtained. A detail clinical history of patient was taken. Period of gestation was ascertained by last menstrual period and the duration of previous menstrual cycles or by first trimester ultrasound scan if not sure of date. The Cardiotocography was done for 20 min and the rate of baseline variability, acceleration and deceleration were assessed according to RCOG criteria (Table 1) of CTG and here if any case of suspicious then CTG done >40 min and decision was taken either CTG reactive or Nonreactive. If CTG trace was nonreactive then iv fluid, left lateral position given to patients and repeat CTG taken for another 40 min. If repeat CTG remain nonreactive then operative or instrumental intervention taken as soon as possible to decrease perinatal mortality and morbidity.

RESULTS

A total of 201 high risk antenatal mothers were subjected to cardiotocography. Out of 201 women common high risk factor in our study consisted of PIH (34.8%), Previous section (15.4%), Oligohydramnios (13.9%), Postdatism (12.4%), IUGR (6.5%), Rh negative (6.5%), GDM (5.5%), Anemia (5.0%).

Among high risk cases maximum were of PIH group and Out of 70 PIH cases, 44 (62.9%) had reactive and 26 (37.1%) had nonreactive CTG. ($p < 0.001$). Women those had previous LSCS 31(15.4%) cases, out of this, 23 (74.2%) had reactive and 8(25.8%) had non reactive CTG ($P < 0.001$). There were also significant difference in reactive and non reactive CTG among women with anaemia and GDM group. Although other risk factor were also there like oligo, post datism, IUGR and Rh Negative but difference was not significant (Table 2).

In this study out of 74 nonreactive CTG 66.2% foetus had meconium stained liquor, 9.5% had blood stained liquor and 24.3% had clear liquor. So this study suggests that CTG has definite role in identifying presence of meconium and abruptio placenta ($p < 0.001$).

In this studied group out of 74 nonreactive cases, 36.5% of cases had Apgar score 0-4 at 1 minute and 58.1% foetus had Apgar score <7 at 5 minute. So this suggest that CTG had importance in detection of fetal distress with low apgar score at 1 and 5 minutes ($P < 0.001$)(Graph-1).

Foetuses with reactive CTG required less NICU admission as compared to non reactive foetuses (22.8%v/s75.7%) with p value being significant ($P < 0.001$).

This table show that CTG monitoring had 75.7% sensitivity,77.2% specificity with 65.9% positive predictive value (table 4).

Out of 74 non reactive cases 65(87.8%) cases survived and 9(12.2%) cases died as compare to reactive group where all baby survived suggest that there is strong correlation between CTG monitoring and decrease perinatal mortality ($p < 0.001$) (Table 5).

DISCUSSION

Labour is a stressful process, and changes observed on the CTG trace may reflect fetal response to the ongoing hypoxic or mechanical stresses during labour such as compression of the umbilical cord or reduction in the placental blood flow. Continuous fetal monitoring is mandatory in any fetus considered to be at a 'high risk' of sustaining intrapartum hypoxic injury. It is essential to promptly diagnose 'accidents' related to labour (placental abruption, cord prolapse and uterine rupture) so as to institute timely and appropriate management to improve outcomes.

Feature	Baseline (bpm)	Variability (bpm)	Decelerations	Accelerations
Normal	110-160	≥ 5	None	Present
Suspicious	100 – 109 161 – 180	<5 for ≥40 ≤ 90 mins	Early deceleration, variable decelerations, Single prolonged deceleration for up to 3 mins	The absence of accelerations with otherwise normal trace is of uncertain significance
Pathological	< 100 > 180 Sinusoidal pattern > 10 mins	< 5 for> 90 mins	Atypical variable decelerations, Late decelerations, Single prolonged deceleration for more than 3 minutes	

Table-1: RCOG guidelines for use of electronic fetal monitoring (2001).[7] (Categorizing the Individual Features of the CTG Traces)

High Risk	CTG Trace				P value
	R.	NR	Total	%	
Anaemia	8(80%)	2(20%)	10	5.0%	<0.001*
GDM	9(81.8%)	2(18.2%)	11	5.5%	<0.001*
IUGR	6(46.2%)	7(53.8%)	13	6.5%	0.658
OLIGO	12(42.9%)	16(57.1%)	28	13.9%	0.237
PD	15(60%)	10(40%)	25	12.4%	0.078
PIH	44(62.9)	26(37.1%)	70	34.8%	<0.001*
Prev LSCS	23(74.2%)	8(25.8%)	31	15.4%	<0.001*
Rh Neg	10 (76.9%)	3(23.1%)	13	6.5%	<0.001*
Total	127	74	201		

Table-2: Reactivity of CTG according to High Risk factor

Perinatal outcome	Reactive		Non Reactive		P Value
	Frequency	%	Frequency	%	
Liqour					
Blood stained	1	0.8%	7	9.5%	<0.001
Clear	82	64.6%	18	24.3%	
MSL	44	34.6%	49	66.2%	
Total	127	100.0%	74	100.0%	
Apgar at 1 min					
0 – 4	19	15.0%	27	36.5%	0.001
5 – 7	108	85.0%	47	63.5%	
Total	127	100.0%	74	100.0%	
APGAR at 5 min					
0 – 4	0	0.0%	2	2.7%	<0.001
5 – 7	42	33.1%	43	58.1%	
>7	85	66.9%	29	39.2%	
Total	127	100.0%	74	100.0%	
NICU admission					
No	98	77.2%	18		0.038
Yes	29	22.8%	56		
Total	127	100.0%	74		

Table-3: Correlation of CTG with different perinatal parameters

Sensitivity	75.7%
Specificity	77.2%
PPV	65.9%
NPV	84.5%

Table-4: Sensitivity, Specificity, PPV and NPV of CTG for NICU admission.

Perinatal Mortality	Reactive		Non Reactive		P Value
	Frequency	%	Frequency	%	
No	127	100%	65	87.8%	<0.001
Yes	0	0%	9	12.2%	
Total	127	100.0%	74	100.0%	

Table-5: Correlation between CTG reactivity and perinatal mortality

Now a days cardiotocography (CTG) had become a popular method for monitor fetal wellbeing and it is assisting the obstetrician in making decision on the mode of delivery to improve perinatal outcome.

A total 201 of high risk cases were chosen and subjected to the cardiotocography monitoring for find out the fetal wellbeing. In this study out of 201 cases, 63.2% cases had reactive CTG and 36.8% had non reactive CTG and most common indication for CTG monitoring were PIH 70 (34.8%), previous LSCS 31 (15.4%), Oligohydramnios 28 (13.9%), Postdatism 25 (12.4%), Rh negative and IUGR 13 (6.5%), GDM 11 (5.5%) and Anemia 10 (5.0%).

Atul K Sood[10] in his study found there was significant co-relation between apgar score <7 neonatal admission are more commonly associated with nonreactive tracing (p<.005). In Cochrane review[11] suggested that that there no role of traditional CTG monitoring to improve perinatal outcome. In study conducted by Verma et al[12] Concluded that CTG monitoring can be used as screening test in detection and timely intervention in high risk fetuses.

In study conducted by Rahaman et al[13] Concluded that CTG can be used as screening method in 'triaging' foetus of high risk pregnancy in non industrialized countries with heavy workload. In this study 75.7% babies with non reactive CTG and 22.8% of reactive babies were admitted in nursery concluded that there is statistically significant role of reactivity of CTG and NICU admission.(P< 0.001). The sensitivity of CTG for NICU admission 75.7%, specificity 77.2% with Positive predictive value 65.9% and however a high Negative predictive value (84.5%) was also seen. In present study 63.2% cases had reactive CTG and 36.8% cases had non reactive CTG and about similar result obtained in study conducted by Sundhu G S et al (2008).[8]

Perinatal outcome and its statistical association.

- **Apgar score at one and five minutes**

In this study out of 74 nonreactive cases, 27(36.5%) cases had apgar score between 0-4 and 60.8% had APGAR score ≤ 7 at 5 minute. This shows that CTG is important in prediction of low apgar score.(P= 0.001

Meconium stained liquor

In this study out of 74 non reactive cases 66.2% had meconium stained liquor, 9.5% had fresh blood stained liquor and 24.3% had clear liquor.(P< 0.001)

- **Number of nicu admissions**

In this study 75.7% babies with non reactive CTG and 22.8% of reactive babies were admitted in nursery concluded that there is statistically significant role of reactivity of CTG and

NICU admission.(P< 0.001. The sensitivity of CTG for NICU admission 75.7%, specificity77.2% with Positive predictive value 65.9% and however a high Negative predictive value (84.5%) was also seen**.**

- **Perinatal mortality**

In this study out of 74 non reactive cases 9 babies (12.2%) had died and 65 (87.8%) were survived with total perinatal mortality rate being 4.5%. (P<0.001)

CONCLUSION

Admission test is non invasive and the best screening test to evaluate the fetal health and to predict the perinatal outcome. So we can reduce the perinatal morbidity and mortality in our country.The mean Apgar score of the CTG reactive group was higher than CTG non-reactive group and the babies with reactive CTG had less/minimum stay in nursery proving the efficacy of CTG.It has therefore concluded that Admission test is a effective technique in detection and early prediction of pre-existing fetal distress and thereby plan early intervention to improve perinatal outcome.

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