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Original Research Article

Role of Admission Cardiotocography in Predicting Perinatal Outcome in Low Risk Obstetric Population

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ABSTRACT

Objective: To predict reliability of admission cardiotocogram in detecting fetal hypoxia and correlate the results of admission test with the perinatal outcome in low risk obstetric population.

Methods: It was a cross-sectional study conducted during the period of one year from January 2012 to December 2012. The study included 100 low risk pregnant women, admitted to labor room, with period of gestation ≥ 37 weeks, in first stage of labor with fetus in cephalic presentation. All of them were subjected to admission test, a 20 minute recording of fetal heart rate and uterine contractions on cardiotocograph machine at the time of admission.

Result: The result of admission test was reactive in 85% equivocal in 6% and ominous in 9% women. Intrapartum fetal distress was 3.5% in reactive group as compared to 33%, in the equivocal and 88% in the ominous group ($p<0.001$). Incidence of thick meconium stained liquor was significantly high in ominous group (77.8%) and equivocal group (33.3%), as compared to reactive group (3.5%). Incidence of neonatal intensive care unit (NICU) admission was also significantly high (77.8%) in babies delivered from mother in ominous test group as compared to those with equivocal (16%) and reactive (1.1%) test group. Operative delivery for fetal distress was required in only 17.6% women of the reactive group, in 66.7% women of the equivocal group and in 88.9% women of the ominous group.

Conclusion: The admission cardiotocography is a non-invasive test for screening in low risk obstetric group Esp. in developing countries with heavy workload and limited resources to help in triaging fetuses.

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

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INTRODUCTION

Fetal heart rate monitoring is a common intervention in obstetric unit. Intermittent auscultation can measure baseline FHR, but other features of fetal heart rate such as baseline variability, acceleration and decelerations are difficult to assess. Due to this fact, antepartum and Intrapartum cardiotocography (CTG) has become first line investigation for ante and Intrapartum fetal assessment.[1-6]

Presently continuous CTG monitoring is done in high risk patients only. Unfortunately risk assessment profiles are often insufficient tools for selection.

In developing countries with inadequate antenatal care and limited resources, Intrapartum fetal morbidity and mortality are not uncommon. Ingemarsson et al describes an alternative method of monitoring FHR during labor, to pick the apparently low risk women whose fetus is compromised in labor after the admission test (AT).[7] The admission cardiotocogram is a short, usually 20 minutes, recording of the fetal heart rate immediately after admission to the labor ward.[8,9] Uterine contraction of labor put stress on placental circulation; an abnormal tracing might indicate deficiency and hence identify fetal compromise at an early stage to allow necessary intervention.

The objective of this study was to assess the reliability of admission cardiogram in detecting fetal hypoxia already present at admission, to predict hypoxia in labor and to correlate the results of the AT with the perinatal outcome in low risk obstetric population and to reduce the neonatal morbidity and mortality by early intervention.

MATERIALS AND METHODS

Study Design and Setting

The study conducted during January 2012 to December 2012, was a prospective, cross-sectional study at the Labor and maternity ward, department of obstetrics and gynaecology at Darbhanga Medical College & Hospital, Darbhanga, Bihar, India. Written informed consent was obtained from the women who participated in the study.

Inclusion and Exclusion Criteria

Women with a period of gestation ≥37 weeks, in first stage of labor with fetus in cephalic presentation and patients had been classified low risk during the antenatal period and had no obstetric complications at that visit. Women who were excluded from the study were period of gestation <37 weeks, any evidence of risk factor/obstetric complication on admission (pre-eclampsia, diabetes-overt or gestational, suspected intrauterine growth restriction (IUGR), multiple pregnancies, abnormal lie and presentation, patients those who were identified for elective lower segment caesarean section (LSCS) like previous caesarean section, ultrasonography (USG) confirmed lethal congenital anomaly of fetus, acute hypoxic states like abruption of placenta, cord prolapse, uterine scar rupture etc.

Admission Test Procedure and Monitoring

One hundred (100) pregnant women admitted in the first stage of labor were recruited for this study who met the inclusion criteria. On admission, women's detail history including age, parity, antenatal care, menstrual, obstetric and medical history were documented. General physical examination was done. Per abdominal and bimanual examination were performed to determine the stages of labor, following which patients were subjected to AT. A tracing was taken for 20 minutes. The FHR traces thus obtained were categorized as reactive, equivocal or ominous as according to the classification proposed by NICE (National Institute of Clinical Excellence- Clinical guideline September 2007).[10] Following the AT, patients with reactive trace were monitored intermittently by auscultation for one minute every 30 minute in first stage of labor and every 5 minutes in second stage of labor post contraction. Cases with equivocal trace were put on continuous CTG monitoring. In those with ominous tracings, appearance of late, significant variable or prolonged decelerations, delivery was consequently hastened by operative or instrumental intervention depending upon stage of labor. After delivery, the liquor color, and Apgar score of each neonate were determined.

Fetal and Neonatal Outcome

Fetus/neonate was considered to be in distress if any of the following were present:-

1. Ominous FHR changes led to caesarean section (LSCS) or forceps/ventouse delivery.
2. Presence of moderate thick meconium stained liquor.
3. Apgar score at 5 minutes < 7.
4. Admission into neonatal intensive care unit (NICU) for birth asphyxia.
5. Neonatalseizureswithinfirst24hrsto 48 hrs.
6. Incidence of Intrapartum /neonatal mortality.

Statistical Analysis

Data obtained from the study groups were analyzed and statistical verified by nonparametric Chi-square test (x^2 test) with the use of computer software SPSS version 10. Statistical significance was calculated between reactive and nonreactive group where ever possible. A p-value of <0.05 was considered as the definition of statistical significance.

Table 1: Admission test result and incidence of fetal distress

Results	AT result		Fetal distress	
	N	%	n	%
Reactive	85	85	3	3.5
Equivocal	6	6	2	33
Ominous	9	9	8	88

Table 2: Correlation of fetal/neonatal outcomes with admission test

	Reactive (n=85)		Equivocal (n=6)		Ominous (n=9)	
	n	%	n	%	n	%
Mod-thick MSL	3	3.5	2	33	7	77.8
APGAR score at 5 min < 7	2	2.3	4	66	8	88.9
NICU Admission	1	1.1	1	16	7	77.8
Neonatal death	0		0		1	11.1

Table 3: Mode of delivery with the result of the admission test & occurrence of fetal distress

Mode of Delivery	Reactive (n=85)	Equivocal (n=6)	Ominous (n=9)
Spontaneous Vaginal delivery	**70 (82.3%)**	**2 (33.3%)**	**1 (11.11%)**
a) With fetal distress	1		
b) Without fetal distress	69	2	1
Forceps/Ventouse	**6 (7.05%)**	**2 (33.33%)**	**1 (11.11%)**
a) With fetal distress	1	2	1
b) Without fetal distress	5		
LSCS	**9 (10.5%)**	**2 (33.33%)**	**7 (77.78%)**
a) With fetal distress	1	1	7
b) Without fetal distress	8	1	

RESULTS

Majority of the women were between the age group of 21-30 years (71%) and primigravida (61%). Only 3.5% of women with reactive admission test 85% showed evidence of fetal distress. Of the six (6%) women who had equivocal trace, two (33%) babies had fetal distress, whereas 88% babies born to women with ominous admission test had fetal distress. It is evident from (Table 1) that incidence of fetal distress significantly increase with worsening of admission test ($p<0.001$).

About 77.8% patients with ominous test had moderate-thick MSL, compared to 33% and 3.5%in equivocal and reactive AT group respectively ($p<0.001$). 77.8% of babies born to patients with ominous AT had NICU admissions compared to 16% and 1.1% of those babies born to patients with equivocal and reactive AT respectively ($p<0.001$).

Table 2 shows that incidence of birth asphyxia was significantly high in ominous and equivocal groups as compared to reactive group when new born were assessed by Apgar score <7 at 5 minute. There was no Intrapartum /neonatal death in babies born to mothers in reactive and equivocal AT groups, where as one baby (11.1%) died in ominous test group due to birth asphyxia.

Incidence of spontaneous vaginal delivery was high (82.3%) when the test was reactive. An important observation was that of the 15 patients in the reactive group who underwent instrumental /operative delivery, only 2 patients indication was fetal distress and in other 13 patient's indication was other than fetal distress, mostly non progression of labor. Three patients (55.6%) in the equivocal group and 8 patients (83.3%) in the ominous group had instrumental/operative delivery and in majority of these patients indication was fetal distress. incidence of operative delivery significantly increases as the admission test result worsens. (Table 3)

DISCUSSION

Auscultation however is necessarily intermittent, subjective and difficult to verify and document. Also in developing countries like India, with busy labor wards and a minimum staff, sole reliance on auscultation is often ineffective.

In the present study, 3.5% babies from reactive group, 33% babies from equivocal group and 88% babies from the ominous group showed evidence of fetal distress. Hegde et al[11] also reported similar rates (i.e. 3.6% in reactive, 15% in equivocal group and 75% in ominous group) of fetal distress in their study. Ingemarsson et al[7,8] in their study observed development of fetal distress in 1.3% of the reactive group, 10% of the equivocal group and in 40% of the ominous group babies.

Operative delivery for fetal distress was required only in 2.3% (2/85) patients in the reactive group 50% (3/6) in the equivocal group and the 88.9% (8/9) in the ominous group. Ingemarsson et al[7,8] also observed operative delivery rate of 1.35% in the reactive group, 8.2% in the equivocal group and 50% in the ominous group. Elimian et al[12] was also in favor that women with non-reactive AT are more likely to be delivered by LSCS, to have fetal distress resulting in caesarean section and to have longer neonatal hospital stay.

Detractors of electronic fetal monitoring like Impey et al[13] believe that neonatal outcome is not significantly improved by the use of admission testing as compared to intermittent fetal heart rate auscultation during labor. Thacker et a[14] also feel that the use of electronic fetal monitoring is of limited effectiveness and carries an increased risk of interventions. According to them increased information at admission will not necessarily lead to better clinical outcomes. This may be true in industrialized countries provided that patients receive comprehensive antenatal care and personal attention during labor. The same may not be true for non-industrialized countries where the antenatal care is inadequate and deliveries are conducted in crowded settings and inadequate health care provider to patient ratios.[15-18]

Table 4 shows that AT has high specificity (95%) and low false positivity. Ingemarsson et al[7,8] also reported a very high (99%) specificity of the AT. The high specificity of the admission test means that a normal test accurately excludes adverse fetal status at the time of testing.

Three patients with reactive AT had fetal distress in labor. It was found that in all of them AT-delivery interval was more than 12 hours. Other influencing factors like problems of cord, prolonged labor etc. which may become operational as labor progresses. Therefore, in cases where admission test delivery interval is expected to be prolonged, it is good to repeat CTG to detect fetal distress.

Table 4: Sensitivity and specificity of admission test

	Present Study	Ingemarsson et al. (1984-85)
Sensitivity	73.70%	23.50%
Specificity	94.80%	99.40%

CONCLUSION

The admission cardiotocography is a simple noninvasive test that can serve as a screening tool in low risk obstetric population to detect fetal distress already present or likely to develop and prevent unnecessary delay in intervention. Thus it helps in preventing fetal morbidity and mortality.

As the test has high specificity, it has role in obstetric wards of non-industrialized countries with a heavy workload and limited resources to help in 'triaging' fetuses.

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