Admission Cardiotocography Screening of High Risk Obstetric Patients

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Abstract

Background: To predict the neonatal outcome in high risk obstetric cases by admission cardiotocography (CTG) testing.

Methods: A total of 150 consecutive high risk obstetric patients meeting the inclusion criteria were subjected to admission CTG testing in this prospective study. The CTG tracing was categorized based on Royal College of Obstetricians and Gynaecologists (RCOG) criteria. Specific foetal and neonatal outcome measures were studied and correlated with the admission CTG testing.

Result: Foetal distress during labour developed in 15% of patients with a normal test and in 73% of patients with an abnormal test. The admission test had a sensitivity of 66.7%, specificity of 93.3% and a positive predictive value of 53.3% for predicting an Apgar score < 5 at birth. Neonatal admission to neonatal intensive care unit was required in 1% of patients with a normal test and 33% of patients with an abnormal test ($p < 0.01$).

Conclusion: The result of admission cardiotocography testing could be used to identify patients likely to develop adverse foetal outcomes and help in optimal utilization of labour room resources.

MJAFI 2008; 64 : 43-45

Key Words: Admission cardiotocography; High risk obstetrics; Labour management

Introduction

Obstetricians are concerned with the early recognition of foetal distress during labour in order to avoid an adverse outcome. Our surveillance system must detect compromised fetuses and ensure their safe delivery. The available methods range from intermittent auscultation, continuous electronic foetal heart rate (FHR) monitoring to invasive techniques of foetal blood gas analysis. The admission cardiotocography test is a short continuous electronic FHR recording for 20 minutes, along with the simultaneous recording of the uterine activity done immediately on admission to the labour suite. The present study correlated the results of admission cardiotocography (CTG) with neonatal outcome in high risk obstetric patients

Material and Methods

This prospective study was done on patients categorized as high risk as per Table 1. Consecutive 150 high risk patients presenting in active labour during the first stage were subjected to admission CTG testing for 20 minutes. The results of the admission test were categorized into normal/reassuring, equivocal/suspicious and abnormal/pathological groups as per the Royal College of Obstetricians and Gynaecologists (RCOG) guidelines (Table 2) for the interpretation of CTG tracings [1].

Patients with a normal/reassuring admission test were

monitored by intermittent auscultation for one minute, every 30 minutes in the first stage of labour and every five minutes in the second stage of labour. Those having suspicious/equivocal trace were placed on continuous CTG monitoring. In those with pathological/abnormal foetal heart rate tracings, appearance of late, significant variable or prolonged decelerations were taken as foetal distress. Delivery was consequently hastened by operative or instrumental intervention depending on the stage of labour. The foetal status / neonatal outcome measures assessed were development of foetal distress during labour, Apgar score 5

Table 1

Inclusion criteria for high risk obstetric patients

History of recurrent pregnancy losses
Previous history of stillbirth
Pregnancy with concurrent medical illness like
- Hypertension
- Diabetes mellitus
- SLE
- Thrombophilias
- Antiphospholipid syndrome
- Renal disease
Preeclampsia
Premature rupture of membranes > 6 hours
Intrauterine growth restriction
Oligohydramnios
Postdatism
Diminished foetal movements

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Table 2**RCOG criteria for interpretation of the admission test****Criteria for normal /reassuring trace:**

At least 2 accelerations(>15 bpm for >15 sec) in 20 minutes

Base line heart rate 110-160 bpm

Baseline variability 5-25 bpm

Absence of decelerations

Moderate tachycardia (161-180 bpm)/ bradycardia (100-109bpm) but with preservation of baseline variability and accelerations.

Criteria of suspicious / equivocal trace*:

Reduced baseline variability (<5 bpm) for > 40 minutes but < 90 minutes although baseline heart rate normal (110-160 bpm)

Variable decelerations (depth < 60 bpm and duration <60 seconds)

Early decelerations

Single prolonged deceleration < 3 minutes

Criteria of abnormal / pathological trace*:

Silent base line variability (< 5 bpm) pattern > 90 minutes

Base line heart rate > 180 bpm or < 100 bpm.

Late decelerations

Atypical / significant variable decelerations (depth > 60 bpm and duration >60 sec)

Prolonged bradycardia (drop of the foetal heart rate < 100 bpm for > 3 minutes or < 80 bpm for > 2minutes)

Sinusoidal pattern > 10 minutes

* Absence of accelerations in an otherwise normal CTG tracing is of uncertain significance, bpm= beats per minute

minutes after birth, admission to neonatal intensive care unit (NICU) and incidence of intrapartum still birth / neonatal mortality.

Results

The results are shown in Tables 3-5. With a normal admission test, only one neonate had a five minute Apgar score ≤ 3 . It was due to meconium aspiration and required admission to the NICU. The only neonatal mortality in the study occurred in a high-risk patient with an abnormal test. The patient was a case of severe pregnancy induced hypertension (PIH) with intrauterine growth retardation (IUGR), who developed abruptio placentae intrapartum.

Discussion

The admission test first described by Ingemarsson et al is a short strip of CST during labour [2]. It is a dynamic screening test for the state of oxygenation of the foetus on admission of the mother into labour room. It assesses the placental reserve by checking the response of the foetal heart during the phase of temporary occlusion of the utero-placental blood supply under physiological stress of repeated uterine contractions. It thereby assesses the ability of the foetus to withstand the process of labour. The Admission CTG therefore has two potential roles. It can be used as a screening test in early labour to detect compromised foetuses on admission and to select the women in need of continuous foetal electronic monitoring during labour [3]. Barring acute events like cord prolapse, uterine hyperstimulation, placental abruption, meconium aspiration, the admission

Table 3**Results of the admission test (n=150)**

Normal	101 (67%)
Equivocal	34 (23%)
Abnormal	15 (10%)

Table 4**Correlation of foetal / neonatal outcome with the admission test**

	Normal test (n = 101)	Equivocal test (n = 34)	Abnormal test (n = 15)
Foetal distress during labour	15 (15%)	19 (55%)	11 (73%)
Apgar score 5 minutes after birth between 4 -5	3 (3%)	6 (17%)	6 (40%)
Apgar score 5 minutes after birth ≤ 3	1 (1%)	3 (9%)	2 (13%)
Admission to NICU	1 (1%)	4 (12%)	5 (33%)
Intrapartum / Neonatal mortality	Nil	Nil	1 (6.6%)

Table 5**Sensitivity, specificity and positive predictive value of admission test for various foetal / neonatal outcomes**

Outcome	Sensitivity	Specificity	Positive predictive value
Development of foetal distress during labour	42.3%	95.6%	73.3%
Apgar score ≤ 5 at 5 minutes after birth	66.7%	93.3%	53.3%
Admission to NICU	83.3%	90.9%	33.3%

test is a good predictor of foetal condition at the time of admission and during the next few hours of labour in term foetuses.

We found that the admission test has a low positive predictive value for adverse foetal outcomes. This is expected in situations where an adverse event is relatively rare. In such a scenario the false positives tend to be more thereby impacting the positive predictive value. The sensitivity and specificity of the admission test were good when benign foetal outcomes like development of foetal distress during labour were excluded in favour of more ominous foetal outcomes like severe asphyxia at birth and neonatal ICU admissions. Neonatal admission to NICU was necessitated in 1% of patients with a normal test and in 33% of patients with an abnormal test ($p < 0.01$).

The Cochrane reviews recommend that continuous electronic foetal monitoring be limited to high risk pregnancies [4]. In a busy centre catering to a large number of high risk patients this may not be practical due to limited number of available CTG machines. Detractors of electronic foetal monitoring like Impey et al [5] believe that neonatal outcome is not significantly

improved by the use of admission testing as compared to intermittent foetal heart rate auscultation during labour. Thacker et al [6] believe that the use of electronic foetal 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 for a population provided comprehensive antenatal care and receiving personal attention during labour. The same may not be true for a situation where the antenatal care is inadequate and deliveries are conducted in crowded settings and inadequate health care provider to patient ratios. The controversial question is should admission CTG testing be carried out where this facility is available or has this test been introduced without proper assessment. We found that the admission test is useful in predicting the foetal outcome in high risk patients. The main value of the admission test was its high specificity. The high specificity of the admission test means that a normal test accurately excludes adverse foetal status at the time of testing. The admission test cannot be expected to predict the development of any acute asphyxial insult during the course of labour. In the absence of such acute events, an adverse foetal outcome is unlikely if the admission test is normal. The result of admission CTG testing can be used to identify patients likely to develop adverse foetal outcomes and help in optimal utilization of limited labour room resources. This is particularly relevant in situations where the antenatal attendance and follow-up has been inadequate.

Our study supports a role for admission testing in a

high risk population. A reassuring CTG tracing at admission to the delivery suite is a reliable indicator of foetal well being. Further studies are needed which define the role of admission testing in patients with specific pregnancy complications. Studies are also required to determine convenient supplemental diagnostic modalities which can enhance the positive predictive value of an equivocal / abnormal admission test. Data obtained from such trials would help in refining the role of admission testing in modern day intra-natal care.

Conflicts of Interest

None identified

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