Use of Cardiotocogram (CTG) as an Admission Test as a Predictor of Foetal Outcome in Labour in Low Risk Group

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ABSTRACT

BACKGROUND

Intrapartum foetal morbidity and mortality is not uncommon in a low risk population. Any foetus has the potential risk of intrapartum hypoxia which may lead to birth injury. CTG as admission test can be used in low risk pregnant women as an alternative to continuous electronic foetal monitoring. We wanted to evaluate the role of Cardiotocogram (CTG) as admission test in intrapartum low risk pregnant women and to predict foetus at risk of adverse outcome.

METHODS

This is a prospective observational study which included 200 low risk pregnant women with >37 weeks of gestation in labour. All 200 pregnant women were subjected to admission test (AT) using Sonicaid foetal monitor for 20 minutes. The trace thus obtained was classified as normal, suspicious and pathological AT as per NICE guidelines.¹ Admission test results were compared with various labour outcome variables i.e., incidence of foetal distress, mode of delivery, neonatal outcome in relation to AT result. Statistical analysis is done using chi square test and p value of <0.01 is taken as statistically significant.

RESULTS

Out of 200 patients, 164 (82%), 20 (10%) and 16 (8%) had normal, suspicious and pathological admission test result respectively. The incidence of foetal distress (100% Vs 7.92%), caesarean section rate (100% Vs 7.3%), low Apgar score at 5' (50% Vs 4.87%), NICU admission (50% Vs 4.87%) was higher in pathological AT group than in normal AT group. There was one neonatal death in pathological admission test group. Sensitivity, Specificity, PPV, NPV and over all diagnostic accuracy was 54.45%, 92%, 69%, 93% and 83% respectively.

CONCLUSIONS

Admission test in this study had low sensitivity but high specificity. High specificity in predicting foetus at risk of foetal distress, supports its use as admission test in low risk pregnant women. Early intervention in pathological admission test group reduced the incidence of neonatal morbidity inspite of low sensitivity in detecting distressed foetus. Specificity of 92% and NPV of 93% supports its role as admission test in low risk pregnant women.

KEY WORDS

CTG, Foetal Distress, Low Risk Pregnancy, Apgar Score, Perinatal Outcome, EFM

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BACKGROUND

Foetal monitoring is essential during labour to ensure delivery of healthy foetus. Although widely considered the best method of delivery for the mother and the baby, a vaginal birth is not bereft of risks. Although the introduction of intrapartum foetal surveillance has not been able to make this journey any easier, it has certainly helped in making it much safer than it has ever been. Routine electronic foetal heart rate monitoring in labour has become an established obstetric practice in western world. In labour wards with few monitors, selection of patients for continuous monitoring or intermittent auscultation is necessary. Risk assessment based on antepartum factors is not accurate as predictors of foetal outcome, as foetal heart rate changes and foetal acidosis might occur in low risk group. Continuous electronic foetal monitoring is not accepted in low risk women. Admission CTG can be used as an objective method to optimize the outcome in low risk pregnant women in labour.

Foetal morbidity and mortality is also observed in low risk population in the intrapartum period. Any foetus has the potential risk of intrapartum hypoxia which may lead to birth injury. If for some reason continuous monitoring cannot be applied, alternative ways of using monitors might be of interest, such an alternative is the admission CTG. Admission test is recording of foetal heart rate and uterine contraction in labour for a period of 20 minutes.

This study evaluates the role of CTG as admission test (AT) in intrapartum patient to predict foetus at risk for adverse outcome in low risk cases.

METHODS

The prospective observational study population included 200 low risk pregnant women in labour admitted at MVJ Medical College and Research Hospital, Hoskote. Singleton pregnancies with >37 weeks of gestation with cephalic presentation with intact membranes in 1st stage of labour were included in the study. Patients were first given a description of the procedure they have to undergo after a preliminary history taking, thorough general examination & obstetric examination. Informed consent was taken. Later patients were subjected to admission test using sonicaid foetal monitor at speed of 3 cm/min for 20 minutes after ensuring maternal hydration and food intake. The trace thus obtained was classified as Normal, Suspicious, and Pathological according to National Institute of Clinical Excellence (NICE) guidelines (2007).¹ In patients with suspicious admission test, a 20 minutes extended strip was taken after the following actions: Repositioning of patients, discontinuation of uterine stimulants, administration of oxygen to the mother, correction of maternal dehydration. The trace obtained is again classified as normal, suspicious or pathological.

Patients with normal admission test were followed by intermittent auscultation for 1 minute every 30 minutes in first stage and every 5 minutes once in second stage of labour. Patients with persistently suspicious admission test were monitored by continuous electronic monitoring. In patients with pathological admission test, appropriate intervention was taken immediately. Admission test was repeated at 6 hrs.,

if labour progressed for >6 hrs., in normal admission test group and suspicious admission test group. Foetal distress was considered to be present when pathological FHR changes were seen and led to LSCS or instrumental vaginal delivery on that indication or Apgar score of less than 7 at 5 minutes. Labour outcome was assessed with respect to incidence of foetal distress during labour, operative deliveries, Apgar score at 1 minute and 5 minutes & neonatal intensive care admissions.

The data collected is analysed statistically by computing the sample statistic. The statistical analysis was done using statistical test -chi square test. The results were considered significant if p value <0.01.

RESULTS

The maximum number of patients belonged to 20-25 years age group. Out of the 200 women who underwent admission test, 82% had normal admission test, 10% showed suspicious admission test & 8% had pathological admission test.

Maternal Age in Years	No. of Women, n=200
<20	18
20-25	112
26-30	70

Table 1. Maternal Age Distribution

Mean±SD: 22.49±3.13

7.92%, 45% and 100% of the women in normal admission test group, suspicious admission test group, pathological admission test group developed foetal distress respectively. A total of 38 patients (19%) developed foetal distress in the present study. The incidence of foetal distress increases as the trace progress towards pathological trace. $\chi^2=90.100$ and the p value <0.001, which suggests that the values obtained in the study are highly significant. In normal admission test group 84.2% had vaginal delivery, 8.5% had instrumental delivery and 7.3% had LSCS. In suspicious admission test group 35% had vaginal delivery, 20% had instrumental delivery and 45% underwent LSCS. In pathological admission test group 100% patients underwent LSCS. p value <0.001, suggests that the values obtained in the study are highly significant.

Sl. No.		Normal AT n (%)	Suspicious AT n (%)	Pathological AT n (%)
1.	No of women	164(82)	20(10)	16(8)
2.	Foetal distress	13(7.92)	9(45)	16(100)
3.	Mode of delivery			
a)	Vaginal delivery	138(84.2)	7(35)	-
b)	Instrumental delivery			
i.	With foetal distress	6(3.65)	3(15)	-
ii.	Without foetal distress	8(4.87)	1(5)	-
c)	LSCS			
i.	With foetal distress	7(4.26)	6(30)	16(100)
ii.	Without foetal distress	5(3.04)	8(15)	-
4.	Neonatal outcome			
	Apgar score			
a)	>7 -5'	156(95.12)	15(75)	8(50)
	<7-5'	8(4.87)	5(25)	8(50)
b)	NICU admission	8(4.87)	5(25)	8(50)

Table 2. Maternal and Foetal Outcome

Only in a minority of cases i.e. 4.87%, in normal admission test group, the admission test did not predict poor perinatal outcome (APGAR<7 at 5'). In suspicious group 25% of the neonates had APGAR <7 at 5'. Among the patients with pathological trace false positive rate was 50%. 8(4.87%)

Neonates out of 164 patients in normal admission test group, 5(25%) neonates out of 20 patients in the suspicious admission test group and 8(50%) neonates of patients with pathological admission test group had NICU admission. $\chi^2=36.60$ and $P<0.001$ suggests that the value obtained in the study are statistically significant.

Sl. No.	Mode of Delivery	Admission test To Delivery Interval	Birth Weight in Kg	Colour of Liquor	Apgar Score 1'-5'	NICU Admission
1	LSCS	6 hrs.	3.5	Clear	8-9	
2	LSCS	5 hrs.	2.7	Thick	7-8	
3	Outlet Forceps	3 hrs.	2.6	Thick	5-6	6 days MAS
4	LSCS	8 hrs	3	Clear	8-9	
5	LSCS	2 hrs. 15 min	2.9	Thin	8-9	
6	Outlet forceps	2 hrs. 30 min	2.8	Thin	7-8	
7	Outlet forceps	3 hrs.	2.8	Thin	7-8	
8	LSCS	3 hrs.	2.6	Thick	5-6	5 days
9	Outlet forceps	4 hrs.	3.3	Thin	5-6	2 days
10	Outlet forceps	3 hrs 10 min	2.8	Thick	5-6	2 days
11	LSCS	7 hrs.	3.2	Clear	5-6	2 days
12	LSCS	2 hrs	3	Thick	5-6	4 days
13	Outlet forceps	2 hrs. 30 min	2.9	Thick	8-9	

Table 3. Outcome of 13 Patients with Normal Trace who Developed Foetal Distress during Labour

Admission test was false negative in predicting foetal distress during labour in 13 cases, but only 6 newborns had poor perinatal outcome.

Sl. No.	Mode of Delivery	Admission Test to Delivery Interval	Colour of Liquor	Birth Weight in kg	Apgar Score 1'-5'	NICU Admission
1	LSCS	6 hrs.	Clear	3.1	8-9	
2	LSCS	2 hrs. 30 min	Thick	2.8	5-6	3 days
3	LSCS	3 hrs.	Thick	2.7	5-6	5 days
4	LSCS	2 hrs.	Thick	2.3	5-6	4 days
5	Outlet forceps	2 hrs. 30 min	Thin	3.3	5-6	1 day
6	LSCS	4 hrs. 20 min	Thick	3.4	7-6	
7	Outlet forceps	5 hrs.	Clear	3.1	8-9	
8	Outlet forceps	3 hrs. 20 min	Clear	3	8-9	
9	LSCS	2 hrs.	Clear	3.5	8-9	

Table 4. Patients with Foetal Distress in Suspicious Admission Test

In patients with suspicious trace and clear liquor, the perinatal outcome was good.

Sl. No.	Mode of Delivery	Admission Test to Delivery Interval	Colour of Liquor	Birth Weight in Kgs	Apgar Score 1'-5'	NICU Admission
1	LSCS	40 Min	Thick	2.6	4-5	15 days MAS
2	LSCS	45 Min	Thick	2.7	8-9	
3	LSCS	1 Hr	Thick	2.7	5-6	
4	LSCS	40 Min	Thick	2.7	8-9	
5	LSCS	40 Min	Thick	2.7	2-4	10 days, MAS
6	LSCS	45 Min	Thick	2.9	5-6	3 days
7	LSCS	50 Min	Thick	3.2	7-8	
8	LSCS	30 Min	Thick	2.9	2-4	Baby died on second PND due to birth asphyxia
9	LSCS	40 min	Thin	2.8	7-9	
10	LSCS	45 min	Thin	2.8	7-8	
11	LSCS	40 Min	Thick	2.7	4-5	14 days, MAS
12	LSCS	50 Min	Thick	3.8	5-6	4 days
13	LSCS	40 Min	Thin	3	8-9	
14	LSCS	55 min	Thin	3.1	8-9	
15	LSCS	45 Min	thick	3.2	4-6	2 days
16	LSCS	40 Min	thick	3.2	5-6	1 day

Table 5. Outcome in Women with Pathological Admission Test

In patients with pathological trace and thick meconium stained liquor perinatal outcome was poor which included one neonatal death. With pathological trace false positive rate to predict perinatal outcome was 50%; this could probably be the

result of an early intervention and, hence improving the perinatal outcome.

Sensitivity	54.45%
Specificity	93%
Positive predictive value	69%
Negative predictive value	92%
Diagnostic accuracy	88%

Table 6. Diagnostic Utility of Admission Test (Outcome/ Foetal Distress)

The above table depicts the diagnostic utility of cardiotocography as admission test in labour. As seen in the above table, specificity is high. However, the sensitivity is low.

Statistical Analysis

Statistical analysis of the data obtained from the study population was done using Chi-square test (χ^2) with the use of computer software SPSS version 10. Statistical significance was calculated between groups with reactive, equivocal and ominous AT. The results obtained were considered statistically significant if p value <0.01 .

DISCUSSION

British guidelines published in 2001² do not recommend the labour admission test in low risk women, while Swedish guidelines published the same year³ recommend the test in all women. The British recommendations were based upon three studies,^{4,5,6} and the Swedish upon seven studies.^{4,7-12}

Over the years it has been recognized that foetal morbidity and mortality occurs as a consequence of labour even in patients categorized as low risk based on various risk classifications. Indeed, about half of admission to NICU derives from so called low risk pregnancies.

The study population in this study included 200 low risk pregnant women admitted to labour ward of MVJMC AND RH. The correlation of admission test with 5' Apgar score was good. Reactive trace was followed by 96.34 % of babies with Apgar score >7 at 5 minutes. Thus, only in minority of cases (3.65%) admission test with normal trace did not predict poor perinatal outcome.

An abnormal admission test was associated with 52.7% of babies with Apgar score of <7 at 5 minutes. Thus, ominous admission test was false positive in predicting perinatal outcome in 47.22%. From an analysis of this study, it would be safe to conclude that normal admission test could be followed by intermittent auscultation every 30 minutes in 1st stage and every 5 minutes in the 2nd stage. An ominous admission test should be managed appropriately without delay.

The incidence of foetal distress in the reactive admission test group, in the study by Ingemarsson et al⁴ and Aparna et al¹³ are 3.6% and 1.3% respectively. In the present study incidence of foetal distress in normal admission test group is 7.92% which is comparable with the study by Kushtagi P et al.¹⁴ Thus in 7.92% patients the admission test did not predict foetal distress in this study. Thus, the admission test was false negative in predicting foetal distress in labour in 7.92% patients. In the suspicious admission test group, the incidence of foetal distress in the present study is 45% which is comparable with studies by Kushtagi P et al. In the present study the incidence of foetal distress in pathological admission test is 100% which is comparable with the studies by Aparna

Hedge et al¹³ and Kushtagi P et al.¹⁴ Thus pathological admission test was false positive in predicting poor perinatal outcome in 50% of the patients. As we can see in the above table that in all the studies the incidence of foetal distress is increasing as the trace progress from suspicious to pathological trace. In the present study also, we see that the incidence of foetal distress is increasing as the trace is progressing towards pathological trace. Thus, admission test can detect foetal distress already present at admission and unnecessary delay in intervention can be avoided in such a case.

The correlation of admission test with 5' Apgar score was good. Reactive trace was followed by 96.34 % of babies with Apgar score >7 at 5 minutes. Thus, only in minority of cases (3.65%) admission test with normal trace did not predict poor perinatal outcome.

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In the present study the sensitivity is 54.45% which is comparable with that of Kushtagi P, et al¹⁵ study. In the studies by Ingemarsson et al⁴ and Kamal Buckshee et al¹⁵ the sensitivity is 23.5% and 21.43% respectively. Thus, admission test as a low sensitivity and high specificity. Cardiotocography as admission test showed sensitivity of 53.8% and high specificity of 92%. Although the sensitivity is low, its high specificity low cost and the ease of doing, support its role as admission test.

CONCLUSIONS

This study evaluates the use of CTG as a means of admission test for triage of cases requiring continuous monitoring in low risk obstetric patients. It tries to study the ability of the test to identify or predict the foetal distress at the time of admission to labour room. Cardiotocography as admission test showed sensitivity of 54.45% and high specificity of 92% in the present study. It can detect foetal distress already present on admission. It is a simple test, easy to perform and is a good alternative to labelling low risk patients in labour either to intermittent auscultation or continuous monitoring in poor resource settings. The reactive admission CTG is associated with low risk for foetal distress as measured by Apgar score and pathological CTG is associated with high risk for foetal distress. Early intervention in pathological admission test group reduced the incidence of neonatal morbidity inspite of low sensitivity in detecting distressed foetus. Specificity of 92% and NPV of 93% supports its role as admission test in low

risk pregnant women. From an analysis of this study, it would be safe to conclude that an ominous admission test should be managed appropriately without delay and obstetrician should be more vigilant in patients with suspicious as well as normal admission test by doing continuous or intermittent monitoring, for timely intervention.

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