Labour Admission Test (LAT) as a Predictor of Intrapartum Fetal Distress

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Abstract

Labour is the most crucial period for the foetus to see whether it can sustain hypoxia due to stress of uterine contraction. Fetal surveillance during labour is a demanding and arduous task. However, the wellbeing of the foetus in labour is one of the cardinal concerns in obstetric care. The present study was carried out to determine the effectiveness of labour admission test in case of detecting fetal hypoxia in labour and to correlate the findings of the test with perinatal outcome irrespective of their antenatal risk status. A prospective observational study was undertaken in 100 pregnant women with 37 completed weeks of pregnancy in early stage of labour with cephalic presentation. Data generated was analysed statistically by nonparametric Chi-square test with SPSS package version10. Statistical significance was calculated between reactive and nonreactive group with p-value of < 0.05. The results of labour admission test were reactive in 77%, equivocal in 20% and ominous in 3%. Women with reactive LAT were observed low risk of developing intrapartum fetal distress (5.2%) as compared to 40% of equivocal and 66.7% of ominous group. The incidence of moderate to thick meconium stained liquor was significantly high in ominous (33.3%) and equivocal group (25%) as compared to reactive group (3.9%). The admission in neonatal intensive care unit (NICU) was significantly high in ominous test group (66.7%) as compared to those with equivocal (15%) and reactive (1.3%) test groups. Neonatal mortality was also observed in one (33.3%) baby from ominous test group. Operative delivery for fetal distress was observed in 3.9% of reactive group, in 40% of equivocal group and in 66.7% of ominous group. The labour admission test is a simple, suitable and economical viable test for the detection of intrapartum fetal distress in case of next few hours of labour in low resource countries where pregnant women presents first time labour or where the facilities of scalp pH is not available or the procedure is not done in labour wards.

Keywords: Cardiograph, Fetal distress, Foetal hypoxia, Labour admission test, Perinatal outcome.

Introduction

Labour is the most crucial period for the foetus to see whether it can sustain hypoxia due to stress of uterine contractions. Fetal surveillance during labour is a demanding and arduous task. However, the wellbeing of the foetus in labour is one of the cardinal concerns in obstetric care. Additionally, there are no reliable auscultatory indicators for fetal distress except for extreme changes in heart rate of fetus; the concept of intra-partum surveillance with electronic fetal heart monitor came into picture to detect fetal hypoxia at the earliest before permanent neurological damage occurs. The objective of this is to reduce perinatal mortality and morbidity[(1)].

The Labour Admission Test (LAT), first described by Ingemarsson is a short strip (20 minutes) of cardiotocography (CTG) carried out when a woman is admitted in labour with a low risk pregnancy[(1-2)]. The aim of the study is to assess fetal wellbeing in early labour and identify those foetuses that may be already hypoxic or may not withstand the stress of uterine contraction[(1)]. Such foetuses may require immediate delivery or continuous foetus heart rate monitoring using CTG throughout labour in order to prevent adverse perinatal outcome[(1)]. Electronic monitoring of FHR in labour is a routine practice in developed countries but economic constraints; inadequate antenatal care in developing countries limits its routine use. Hence, selection of foetuses that would require continuous monitoring becomes necessary in such settings[(3)].

The purpose of the study is to assess the predictive value of LAT in detecting fetal hypoxia at the time of labour admission and correlates its result with perinatal outcome in obstetric population irrespective of their antenatal risk status.

Material and Methods

The study was approved by the institutional ethics committee. This study was conducted at labour room complex, department of obstetrics and gynaecology at NKPSIMS & LMH, Nagpur during November 2013 to April 2014. We included the 100 cases randomly both high and low risk who had completed gestational age 37 weeks with cephalic presentation in early stage of labour. Pregnant women with congenital malformed baby, multiple foetus, abnormal lie and presentation, previous scar, cord prolapse and abruption placentae were excluded from the study. A written informed consent from the patient was taken who included in the present study. All women were subjected to an admission CTG, which included a 20 minute recording of FHR and uterine contractions. On admission, the details of women's and their history were documented including age, parity antenatal care, menstrual, obstetric, and medical history. Before subjecting the patient for LAT, general physical, per abdominal and vaginal examination were performed to determine the

stage of labour. FHR tracing were categorized according to NICE clinical guidelines 2007 as Reactive, Equivocal or Ominous[4].

After the admission test, monitoring of patients during labour was done intermittently by auscultation for one minute, every 30 minute in first stage of labour and every 5 minutes in second stage of labour post contraction in reactive group. Cases with equivocal group were put on continuous CTG monitoring. Delivery was hastened by operative or instrumental intervention depending of stage of labour in ominous group. The liquor colour and Apgar score of each neonate was determined after delivery.

Outcome measure: Foetus/Neonate that showed one of the following was considered as to be distressed:

1. Ominous FHR leading to C-section / Operative delivery.
2. Presence of moderate –thick meconium stained liquor (MSL).
3. Apgar score at 5min<7.
4. Admission into neonatal intensive care unit (NICU).
5. Incidence of intrapartum/ neonatal mortality.

Statistical analysis: Data obtained from the study groups were analyzed and statistically verified by non-parametric Chi-square test with the use of computer software SPSS version10. 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.

Results

Majority of the pregnant women were between the age group of 21-30 years (75%) and primigravida (62%). Of the total cases, 38 were high risk and 62 were low risk pregnancies. Only 5.2% of women with reactive admission test (77%) showed evidence of fetal distress. Of the 20 women who had equivocal trace, 8(40%) babies had fetal distress, whereas 66.7% babies with ominous admission had fetal distress (Table 1).

Table 1: Results of Admission Test and incidence of fetal distress

Results	AT result		Foetal distress	
	N	%	N	%
Reactive	77	77	4	5.2
Equivocal	20	20	8	40
Ominous	3	3	2	66.7

(Data are expressed in number (n) and percentage (%), P value <0.001)

These results are comparable to various other studies (Table 2). It is can be observed from Table 1 and Table 2 that numbers of fetal distress significantly increase with worsening of admission test (p <0.001).

Table 2: Comparison of various studies for incidence of foetal distres

Study	No	Incidence of Fetal Distress (%)		
		Reactive	Equivocal	Ominous
Rahman et al. (7)	176	7	39	85
Nagure et al. (8)	160	11.3	39.1	85.7
Kansal et al. (9)	500	16	62.9	97.3
Hegde at al.(10)	200	3.6	15	75
Present study	100	5.2	40	66.7

33.3% patients with ominous test had moderate to thick meconium, compared to 25% and 3.9% in equivocal and reactive groups (p< 0.001). 66.67% of babies born to patients with ominous LAT had NICU admission compared to 15% and 1.3% of those babies born to patients with equivocal and reactive AT respectively(p<0.001).

There was no intrapartum death in babies born to mothers in reactive and equivocal groups, where as one baby (33.3%) died in ominous group due to birth asphyxia (Table 3).

Table 3: Relationship between fetal/neonatal outcomes and admission test

Parameters	Reactive (n = 77)	Equivocal (n = 20)	Ominous (n = 3)
Mod-thick MSL	N 3 3.9%	N 5 25%	N 1 33.33%
APGAR score at min<7	1 1.3%	3 15%	2 66.67%
NICU admission	1 1.3%	3 15%	2 66.67%
Neonatal death	0	0	1 33.33%

Spontaneous vaginal delivery was high 89.6% in reactive group women. 11 women in equivocal and 3 women in 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 4).

Table 4: Type of delivery with the results of LAT and incidence of fetal distress

Type of delivery	Reactive (n=77)	Equivocal (n=20)	Ominous (n=3)
Spontaneous vaginal	**69 (89.6%)**	**9 (45%)**	-
Delivery	1 (1.4%)	1(11.1%)	-
With fetal distress	68 (98.6%)	8 (88.9%)	-
Without fetal distress			
Forceps/Ventous	**2 (2.6%)**	**3 (15%)**	**1 (33.3%)**
With fetal distress	1 (50%)	2 (66.7%)	-
Without fetal distress	1 (50%)	1(33.3%)	1 (100%)
LSCS	**6 (7.8%)**	**8 (40%)**	**2 (66.7%)**
With fetal distress	2 (33.3%)	5 (62.5%)	2 (100%)
Without fetal distress	4 (66.7%)	3 (37.5%)	-

(Data are expressed in number (n) and percentage (%)

Interval between AT and detection of fetal distress was 6-9 hrs in reactive and equivocal groups and 3 hrs in ominous group (Table 5).

Table 5: Interval between AT and detection of foetal distress

		Time (hours)		
Test	3	6	9	Total
Reactive (n= 77)		1	3	4
Equivocal (n= 20)		2	6	8
Ominous (n= 3)	2			2

AT has high specificity and low false positivity and comparable to other studies (Table 6).

Table 6: Sensitivity and specificity of AT

Parameters	**Present study**	**Rahman et al. (2007-09)**	**Ingemarsson et al. (1984-85)**
Sensitivity	73.6%	63%	23.5%
Specificity	94%	91%	99.4%
PPV	60.8%	55%	40.0%
NPV	97%	93%	98.7%

Discussion

Even though labour and delivery is regarded as a normal physiological process, the intrapartum complications can arise very quickly and unexpectedly in both high and low risk pregnancy. Intermittent auscultation and continuous electronic monitoring are considered acceptable methods of intrapartum surveillance in both low and high risk pregnancies. It is also recommended that a 1 to 1 nurse-patient ratio be used if auscultation is employed. Economic constraints, busy labour rooms with lesser staff and few monitors in developing countries limits routine and continuous electronic monitoring of fetal heart in labour[5]. The baseline fetal heart rate (FHR) can be measured with intermittent auscultation while other features like baseline variability, acceleration and deceleration[5-6] are difficult to measure leading to late diagnosis of fetal distress and acidosis. LAT helps to identify those foetuses that may be already be hypoxic or may not withstand the stress of uterine contractions which can expose them to hypoxia in labour[1]. So, LAT can be used as a screening tool in early labour to identify unsuspected cases of fetal jeopardy that may benefit with continuous electronic fetal heart monitoring during labour[1].

The present study showed evidence of fetal distress in 5.2% babies from reactive group, 40% from equivocal group and 66.7% from ominous group (Table 1). Similar observations were demonstrated by Rahman et al[7], Nagure et al[8], Kansal et al[9] and Hegde et al[10] studies as shown in Table 2. Our present study and most of the studies[7-10] confirms that labour admission test with ominous, followed by equivocal result has higher risk of intrapartum fetal distress as compared to reactive result and these particular group of women requires continuous electronic fetal heart monitoring.

As per criticism of various authors, the policy of EFM states that it lead to increase in intervention rates with no evidence of fetal benefits[11]. Antepartum risk factors are not accurate as predictors of fetal outcome

as fetal heart rate changes and fetal acidosis might occur with some frequency in high and low risk groups[11]. In the present study, 100 pregnant women were admitted in labour with 38% of the cases in high risk group and 62% in low risk group. The high risk factors were pregnancy induced hypertension (PIH), premature rupture of membrane (PROM), eclampsia, severe anaemia, intrauterine growth restriction (IUGR), and bad obstetrics history (BOH). The results can be compared with the findings of Kamal Buckshee et al study[12], (32% in high risk and 68% in low risk) and Dwarakanath et al study[11] (40.5% in high risk and 59.5% in low risk group).

It has been recognized that meconium passage is a manifestation of normally maturing gastrointestinal tract or is the result of vagal stimulation from umbilical cord compression. But in global sense, meconium passage is still considered as a sign of fetal distress occurring due to fetal hypoxia and is considered a marker of adverse perinatal outcome. However, neonatal morbidity and mortality is primarily the result of thick tenacious meconium rather than thin meconium. In present study, the incidence of moderate to thick meconium stained liquor was significantly high in ominous group (33.3%) as compared to equivocal (25%) and reactive group (3.9%).

We found that the incidence of admission of newborn in intensive care unit was highest in ominous AT group (66.6%) compared to equivocal (15%) and reactive group (1.3%). This finding is in agreement with studies conducted by Rahman et al[7], Nagure et al[8].

Operative delivery for fetal distress was required only in 3.9% patients in reactive group, 40% in the equivocal group and 66.7% in the ominous group. In ominous group LSCS for fetal distress done in Ingemarsson study[2] 20% cases were taken, in Dwarakanath et al[11] LSCS for fetal distress done in 35%, 50% in Buckshee et al study[12], and in Rose Jophy et al study[13] LSCS done in 33.33% for LSCS for fetal distress.

The interval between LAT and development of fetal distress in the present study was 6-9 hours in reactive and equivocal group and 3 hours in ominous group. Shakira et al[14] have shown this interval to be 6 hours in reactive group, while Ingemarsson et al[2] and Kulkarni et al[15] showed this interval to be 6 hours and 5 hours respectively. Kushtagi et al[16] have shown this interval to be 6 hours after reactive LAT in low risk and 3 hours in high risk mothers. Most of the foetuses developed fetal distress within 6 hours in the study by Gurang et al[17]. So it can be speculated that LAT has some prognostic value for the first few hours if admission to detect fetal hypoxia. LAT cannot be expected to predict fetal distress after several hours of labour with other influential factors like prolonged labour, cord problems which may become functional as the labour progresses. So in cases where admission to delivery interval is more than 6-8 hours, intrapartum CTG should be repeated to detect fetal distress.

Table 6 shows that AT has high 94% specificity and low false positivity. Rahman et al[5] reported 95% specificity and Ingemarsson et al[2] also reported a very high specificity of test (99%). The high specificity of the admission test means that a normal test accurately excludes adverse fetal status at the time of testing.

Conclusion

The labour admission test is a simple, convenient, non-invasive and economical screening test in high as well as low risk pregnancies. It can be used for the detection of intrapartum fetal distress during early hours of labour in low resource countries. Where pregnant women present in labour for the first time or where the facilities of scalp pH is not available in labour wards. The labour admission test cannot predict the development of any acute asphyxia insult during the labour. The high specificity of the test helps to screen hypoxic foetuses in a busy labour ward and thus decreases morbidity and mortality.

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