Original Research Article

Role of labour admission test in predicting pregnancy outcome in low-risk cases

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ABSTRACT

Background: The present study was carried out to determine the role of labour admission test (LAT) in detecting fetal hypoxia in labour and to correlate the findings of the test with perinatal outcome in low-risk cases.
Methods: In this study 150 low risk pregnant term women were subjected to LAT and classified according to NICE 2017 guidelines. Pregnancy outcome in terms of need for operative delivery and neonatal status at birth were noted. Data was analysed statistically by Chi-square test.
Results: The LAT was normal in 78.67%, suspicious in 17.33% and pathological in 4%. Operative delivery for fetal distress was observed in 18.75% of normal group, in 50% of suspicious group and in 100% of pathological group. The incidence of meconium-stained liquor was significantly high in pathological (50%) and suspicious group (19.23%). The incidence of low 5-minute Apgar score was significantly high in pathological LAT group (33.33%) as compared to suspicious (7.69%) and normal LAT groups (2.54%). Admission to neonatal intensive care unit (NICU) was significantly high in pathological test group (50%). LAT in this study showed 48.15% sensitivity, 96.75% specificity and 76.47% positive predictive value as a screening tool for predicting fetal distress in low-risk patients suggesting that a normal LAT in early labour is an indicator of good pregnancy outcome.
Conclusions: LAT is an effective, non-invasive screening method with good specificity to detect fetal distress in low-risk woman and helps to plan management accordingly to improve pregnancy outcome.

Keywords: Cardiotocograph, Fetal distress, Labour admission test

INTRODUCTION

Labour is a crucial period for the fetus as it must sustain the stress of uterine contractions. The occurrence of hypoxia and subsequent metabolic acidosis during or before labor can lead to short term complications like neonatal unit admission, hypoxic ischemic encephalopathy, neonatal death and long-term complications such as learning difficulties, mental retardation, cerebral palsy, and paralysis of the infant.[1]

Fetal surveillance aims at differentiating healthy fetuses that are mounting a normal stress response from hypoxic fetuses. It is estimated that 20-40% stillbirths in the non-anomalous category occur as result of intrauterine hypoxia. A screening test is ideally needed at the onset of labour which can detect fetal compromise.[2] Labour admission test (LAT) is natural contraction stress test done in labour to identify fetuses who may be already hypoxic and may not withstand the stress of contractions. Such fetuses may require immediate delivery or continuous fetal heart rate monitoring to prevent adverse perinatal outcome.

In developing countries with inadequate antenatal care and limited resources, intrapartum fetal morbidity and mortality are not uncommon. Hence, LAT can be useful to detect high risk fetuses in low-risk mothers. The purpose of the study was to assess the reliability of LAT in detecting fetal hypoxia and to correlate its results with the maternal and perinatal outcome.

Objectives

Objectives of the study were: to determine the role of LAT in detecting fetal distress in low-risk term patients; to find out the implication of LAT on mode of delivery and perinatal outcome; and to find out the predictive power of LAT on perinatal outcome.

METHODS

A prospective cross-sectional study done in the department of obstetrics and gynaecology, in Chinmaya mission hospital, Bengaluru after its ethical committee approval. A sample size is 150 patients is chosen after calculation. Women with singleton pregnancy with cephalic presentation with gestational age between 37-42 weeks in labour admitted during July 2017 to April 2018 for vaginal delivery were included in the study and known cases of high-risk pregnancies and those not willing to participate were excluded.

An informed consent was taken from all patients included in the present study. On admission, the details of women and examination findings were noted. Women were subjected to an admission cardiotocography (CTG), for 20 minutes with paper speed of 1cm/min on corometrics 170 series monitors. Fetal heart rate (FHR) tracing was categorized according to NICE clinical guidelines 2017 as reactive, suspicious or pathological.[12]

After LAT monitoring was done intermittently by auscultation for one minute, every 30 minutes in first stage of labour and every 5 minutes in second stage of labour post contraction in reactive group. Cases with suspicious group received oxygen and intravenous fluids in left lateral position and were put on continuous monitoring and reclassified. Delivery was hastened by operative or instrumental intervention depending on stage of labour in pathological group. Mode of delivery and presence of neonatal distress was determined if one of the following was present: presence of moderate–thick meconium-stained liquor (MSL); Apgar score at 5 min <7; admission into NICU; and incidence of intrapartum/neonatal mortality.

Statistical analysis

Data was analyzed using SYSTAT software version 13. The descriptive statistical analysis has been done in the study. P value ≤0.05 was considered significant. Other measures such as sensitivity, specificity, positive predictive value and negative predictive value of the test were calculated.

RESULTS

A total of 150 low risk, term patients, were subjected to LAT. General characteristics of these subjects is as described in Table 1. Majority of women were in the age group of 26-30 years (42.67%). 96 (64%) of the patients were nulliparous and 134 (89.33%) were booked and majority were less than 40 weeks.

Table 1: Distribution of subjects (n=150).

Variables	Number	Percentage
Age (years)		
18-20	6	4
21-25	49	32.67
26-30	64	42.67
>30	31	20.66
Parity		
Nullipara	96	64
Multipara	54	36
Booking status		
Booked	134	89.33
Unbooked	16	10.67
Gestational age (weeks)		
37	19	12.67
38	41	27.33
39	53	35.34
40	29	19.33
41	08	05.33

Mean age 27.19 SD: 4.27; mean parity 0.42 SD: 0.61

Table 2: Pregnancy outcome.

Variables	Number	Percentage
Mode of delivery		
FTNVD	58	38.67
Instrumental (forceps 5+ vacuum 19)	24	16
LSCS	68	45.33
Apgar score at 5 min		
<7	7	4.67
≥7	143	95.33
Meconium-stained liquor		
Yes	15	10
No	135	90
Need for resuscitation		
Yes	22	14.67
No	128	85.33
NICU admissions		
Yes	16	10.67
No	134	89.33
Foetal distress		
Yes	27	18
No	123	82

The admission delivery interval

The range was 0.5 hour to 11 hours with mean of 4.393 hours.

Pregnancy outcome

Pregnancy outcome in terms of mode of delivery, baby's status and presence of fetal distress is shown in Table 2.

Operative delivery due to fetal distress

58 patents had vaginal delivery. In the rest, 29 (31.52%) patients had operative delivery (LSCS and instrumental) for fetal distress (n=92). Among 68 LSCS cases, 24 (35.29%) were due to fetal distress. Among 24 instrumental delivery cases, 5 (20.83%) were because of fetal distress which includes 1 forceps and 4 vacuum deliveries.

Table 3: Results of labour admission test.

Normal (%)	Suspicious (%)	Pathological (%)	Total (%)
118 (78.67)	26 (17.33)	6 (4)	150 (100)
LAT after extended trace (n=150)			
133 (88.67)	0	17 (11.33)	150 (100)

Table 4: Association of age, parity, booking status, gestational age with LAT.

Parameters	Total	Normal		Suspicious		Pathological	
	N	N	%	N	%	N	%
Age in years							
18-20	6	6	100	0	0	0	0
21-25	49	40	81.63	8	16.33	1	2.04
26-30	64	45	70.31	15	23.44	4	6.25
>30	31	27	87.1	3	9.68	1	3.22
Total	150	118	78.67	26	17.33	6	4
Parity							
Nullipara	96	72	75	19	19.79	5	5.21
Multipara	54	46	85.18	7	12.96	1	1.85
Total	150	118	78.67	26	17.33	6	4
Booking status							
Booked	134	110	82.09	21	15.67	3	2.24
Unbooked	16	8	50	5	31.25	3	18.75
Total	150	118	78.67	26	17.33	6	4
Gestational age (weeks)							
37	19	14	73.68	4	21.05	1	5.26
38	41	31	75.61	7	17.07	3	7.32
39	53	45	84.91	8	15.09	0	0
40	29	22	75.86	7	24.14	0	0
41	8	6	75	0	0	2	25
Total	150	118	78.67	26	17.33	6	4

For age, Pearson Chi square value: 6.309, df 6, p value 0.389, hence not significant; for parity, Pearson Chi square value: 2.359, df 2, p value 0.307, hence not significant; for booking status, Pearson Chi square value: 13.614, df 2, p value: 0. 001, hence significant; and for gestational age, Pearson Chi square value: 16.185, df 8, p value 0.04, hence significant

Labour admission test

Out of 150 patients, normal FHR tracings were observed in 118 women, whereas 26 had suspicious and 6 had pathological LAT (Table 3). In suspicious group (n=26), an extended trace was obtained for 90 minutes in which 15 (57.69%) became normal and 11 (42.31%) were pathological. Therefore, a total of 133 cases with normal AT and 17 cases with pathological AT were obtained. Interval between AT and detection of fetal distress was 3-9 hours (mean average 5.36±1.49) in normal AT group and 0.5-5 hours (mean average 2.17±1.32) in suspicious group.

Association of age, parity, booking status and gestational age with LAT

Pathological NST was more in un-booked cases (18.75%) and in cases with higher gestational age (25%) which was statistically significant (Table 4).

Maternal and neonatal outcome in various LAT groups

Incidence of spontaneous vaginal delivery was high (45.76%) when the LAT was normal and operative deliveries were more common in other groups with significant p value. Operational delivery for fetal distress significantly increases as the LAT result worsens (p value <0.05) (Table 5).

The incidence of meconium-stained liquor (MSL) is significantly higher in the pathological LAT (50%) (Table 5). Mean Apgar score at 5 minutes score in babies having normal, suspicious and pathological LAT pattern was 8.85, 8.15 and 7.67 respectively. The incidence of low APGAR (<7) at 5 minutes is higher in the pathological LAT (33.33%) which is significant (Table 5). The incidence of NICU admission is higher in the pathological LAT (50%) group significant p value (p<0.05) (Table 5). It is evident from above that incidence of fetal distress significantly increased with worsening of admission test (p<0.001) (Table 5). In this study, interval between LAT and detection of fetal distress was 3-9 hours in normal AT group and 0.5-5 hours in suspicious group. In a study by Gaikwad, fetal distress was seen if the time interval between test and delivery is >5 hours unless associated acute catastrophe like cord prolapse, abruptio placentae occurs.[3] Nikitha et al also in their study found interval between AT and detection of fetal distress was 6-9 hours in reactive and equivocal groups and 3 hours in ominous group.[4]

Table 5: Maternal and neonatal outcome in various LAT groups.

Part A: Association between labour admission test and operative delivery			
Labour admission test	Operative delivery (%)		
	Yes	No	Total
Normal AT	64 (54.24)	54 (45.76)	118 (100)
Suspicious AT	22 (84.61)	4 (15.39)	26 (100)
Pathological AT	6 (100)	0 (0)	6 (100)
Total	92 (61.33)	58 (38.67)	150 (100)
Part B: Association between labour admission test and MSL			
Labour admission test	MSL (%)		
	Yes	No	Total
Normal AT	7 (5.93)	111 (94.07)	118 (100)
Suspicious	5 (19.23)	21 (80.77)	26 (100)
Pathological AT	3 (50)	3 (50)	6 (100)
Total	15 (10)	135 (90)	150 (100)
Part C: Association between LAT and 5 minutes Apgar score			
Labour admission test	5 minutes Apgar score (%)		
	<7	>7	Total
Normal AT	3 (2.54)	115 (97.46)	118 (100)
Suspicious	2 (7.69)	24 (92.31)	26 (100)
Pathological AT	2 (33.33)	4 (66.67)	6 (100)
Total	7 (4.67)	143 (95.33)	150 (100)
Part D: Association between LAT and NICU admission			
Labour admission test	NICU admission (%)		
	Yes	No	Total
Normal AT	9 (7.63)	109 (92.37)	118 (100)
Suspicious AT	4 (15.39)	22 (84.61)	26 (100)
Pathological AT	3 (50)	3 (50)	6 (100)
Total	16 (10.67)	134 (89.33)	150 (100)
Part E: Distribution of fetal distress in each LAT group			
Labour admission test	Foetal distress (%)		Total
	Yes	No	
Normal AT	13 (11.02)	105 (88.98)	118 (100)
Suspicious	9 (34.61)	17 (65.38)	26 (100)
Pathological AT	5 (83.33)	1 (16.67)	6 (100)
Total	27 (24)	123 (76)	150 (100)

For part A, Pearson Chi-square value: 12.23, df=2, p value: <0.05, hence significant; for part B, Pearson Chi-square value: 15.298, df=2, p value: <0.001, hence significant; for part C, Pearson Chi-square value: 12.815, df=2, p value <0.05, hence significant; for part D, Pearson Chi-square value: 11.493, df=2, p value <0.05, hence significant; and for part E, Pearson Chi-square value: 26.113, df=2, p value <0.001, hence significant

Table 6: Performance of LAT for predicting maternal and fetal outcome.

Variables	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Operative delivery	18.48	100	100	43.61
Presence of MSL	46.67	92.59	41.18	93.98
Low 5 min Apgar score (<7)	57.14	90.90	23.53	97.74
Need for resuscitation	45.45	94.53	58.82	90.97
Admission to NICU	37.5	91.79	35.29	92.48
Fetal distress	48.15	96.75	76.47	89.47
Validity of LAT as a screening tool	48.15	96.75	76.47	89.47

Performance of LAT for maternal and fetal outcome

As evident in Table 6, the sensitivity of LAT is low (48.15%) so we may need other tests to confirm fetal acidemia. However, the test has high NPV with good specificity (96.75%) which means that a normal LAT reassures that the baby has no distress at admission and LAT can be used as a non-invasive screening method.

DISCUSSION

In this study out of 150 cases, 78.67% cases had normal CTG, 17.33% cases had suspicious CTG and 4% had pathological CTG. Similar results were seen in various other studies by Gaikwad et al, Nikita and Rajelakshmi.[3-5]

In Normal AT group of this study, 45.46% of the subjects had vaginal delivery whereas in pathological AT subjects all had operational delivery (100%). Gaikwad et al in their study found that only 8.4% cases in the reactive group had operative delivery for fetal distress while 75% babies had fetal distress in the pathological group (p<0.0001).[3] These results are in concordance with studies by Nikita, Rajelakshmi and Patel.[4-6]

In this study, 33.33% of 6 pathological cases, had <7 Apgar score at 5 minute. In a study on low-risk cases by Rajelaxmi, abnormal tracings had 2-fold increased risk of having low Apgar score then reactive tracings showing statistical significance.[5] In a study by Saterah, the Apgar scores at minutes 1 and 5 in the abnormal AT group were lower than those in the normal AT group.[7]

In this study, in pathological LAT cases 50% had meconium-stained liquor (p<0.001). Similar significant correlation was also observed in study conducted by Gupta et al.[8] Nikita et al, in their study found 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).[4]

In this study 50% babies with pathological LAT and 15.39% of suspicious LAT group babies were admitted in NICU and the specificity of LAT for NICU admission was 91.79% and a high NPV (92.48%) was also seen. Similar results have been seen in studies by Gaikwad and Pravin.[3,9] In study by Nikita, the admission in NICU was significantly high in ominous test group (66.7%).[4] Neonatal mortality was also observed in one (33.3%) baby from ominous test group in their study.

A total of 27 babies had fetal distress, of whom 83.33% were in the pathological AT group. Rajelaxmi et al in their study found that abnormal tracings were associated with poor foetal outcome than reactive tracings (p<0.0001).[5] Prabha and Gaikwad too in their studies observed that the incidence of fetal distress was higher in the pathological group followed by suspicious group while it was low in the reactive group.[3,10]

LAT in this study has high specificity and high PPV comparable to other studies like Rahman, Nikita, and Vidya Gaikwad.[3,4,11] A study conducted by Rahaman et al concluded that CTG can be used as screening method in 'triaging' fetuses in non-industrialized countries with heavy workload.[11]

CONCLUSION

Continuous electronic fetal monitoring is accepted in high-risk pregnancies, but normal pregnancies too require some reliable objective assessment to optimize the outcome. LAT is non-invasive, relatively low-cost screening test commonly available now a days to predict fetal hypoxia and to guide intra partum management in low-risk cases.

ACKNOWLEDGMENTS

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