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Sunila Gupta
Assistant Professor, Department of Obstetrics and Gynaecology, Chintpurni Medical College, Pathankot, Punjab, India

Deepak Gupta
Consultant Paediatrician, District Hospital, Udhampur, Jammu & Kashmir, India

Sonika Gupta
Consultant Gynaecologist, District Hospital Udhampur, Jammu & Kashmir, India

Labour admission test: A screening test for foetal distress in labour

Sunila Gupta, Deepak Gupta and Sonika Gupta

Abstract
Objective: To evaluate the efficacy of labour admission test in identifying, early in labour, the foetuses at high risk for developing intrapartum distress and to determine the predictive value of labour admission test for foetal well-being in labour.
Methods: The present prospective study was done on 200, randomly selected patients, admitted between October 2007 to September 2008 to labour room of Lalla Ded Hospital, 30 Government Medical College, Srinagar. All patients in early labour who had completed 37 weeks of gestation with single live foetus in cephalic presentation were included and patients in 2nd stage of labour, with malpresentation and multiple pregnancy were excluded from the study. All patients were then subjected to Labour Admission Test and were categorized as reactive, equivocal or ominous in relation to the uterine 39 contractions. Post-delivery; the results of the Labour admission test were compared 41 with the neonatal outcome. Chi-square test was used for statistical analysis.
Results: The foetal distress was least common (5.55%) in patients with reactive admission test while it was highest (70%) in group with ominous admission test. Regarding ability to identify foetal distress, admission test had sensitivity-62.5%, specificity-86.9%, positive predictive value-39.5% and negative predictive value-94.4%.
Conclusions: 50 Labour admission test is a simple, easy to perform and relatively accurate method to 52 diagnose foetal compromise at the time of admission in early labour.

Keywords: Labour admission test, foetal distress, perinatal outcome, cardiotocography

Introduction
The introduction of electronic intrapartum foetal (EFM) monitoring by Edward Hon in late 1950's allowed for a continuous tracings of the FHR as well as the uterine contractions, raising the hope that if early sign of foetal distress could be detected and 23 treated in an appropriate manner, neonatal morbidity and mortality could be reduced [1]. In labour wards, with few monitors, selection of patients for continuous foetal monitoring or intermittent auscultation is necessary. At present, antenatal risk 31 classification is used for this purpose, recommending high risk patients for continuous monitoring. Unfortunately, risk assessment profiles are an insufficient tool for selection. Thus, the ideal patients for continuous electronic FHR monitoring have yet to be determined [2, 3].

The labour admission test was introduced as a screening test in early labour to detect compromised foetuses on admission and to select the women in need of continuous electronic foetal monitoring during labour. It comprised of a fetal heart rate tracing (cardiotocography) of 20 minutes duration carried out on admission to the maternity 53 ward. It can detect foetal distress already present at admission and unnecessary delay in intervention can be avoided in such cases [4].

Material and Methods
Two hundred patients admitted to the labour room of Lalla Ded Hospital; GMC Srinagar between October 2007 to September 2008, were randomly enrolled in the 7 study. All patients in early labour who had completed 37 weeks of gestation with single live foetus in cephalic presentation were included in the study. Patients in 2nd stage of labour, with malpresentation and multiple pregnancy were excluded from the study. A detailed record of obstetric, menstrual, past medical, surgical and history of present pregnancy was made. The patients were then clinically examined which included a general physical examination, systemic examination and obstetric

Corresponding Author:
Sunila Gupta
Assistant Professor, Department of Obstetrics and Gynaecology, Chintpurni Medical College, Pathankot, Punjab, India

examination. All patients were then subjected to Labour Admission Test- a short recording of foetal heart rate for 20 minutes in left lateral recumbancy position using Corometrics team foetal monitor. The interpretation of foetal heart rate data is based upon the visual pattern of heart rate as portrayed on graph paper known as cardiotocograph (CTG). Foetal heart rate tracings thus obtained were categorized as reactive, equivocal or ominous in relation to the uterine contractions according to Ingemarsson's and Arulkumaran's Criteria [4].

Following this, all the patients were monitored by intermittent auscultation with stethoscope every 30 minutes for 1 minute in first stage and every 15 minutes in 51second stage of labour post-contraction till delivery. After delivery, the Apgar scores of each neonate were assessed.

Foetal distress was considered to be present when
1. Ominous FHR changes lead to caesarean section or forceps delivery.
2. Presence of moderate to thick meconium stained liquor.
3. Apgar scores < 7 at 5 minutes.
4. Baby admitted to the NICU.

Post-delivery; the results of the Labour admission test were compared with the neonatal outcome.

Statistical Analysis
The statistical analysis of the data was done by using Chi-square test (χ^2) and Yates correction was applied wherever applicable. The tests were referred to p-values for 26 their significance. P value of <0.05 was considered significant. The data was analysed with the help of computer software SPSS (Statistical Package for Social Sciences) Version 13 for windows [5]. Screening tests were applied to the study population and were compared with other contemporary studies.

Results
Mean age of patients included in the study was 25.4years (range - 17 to 35 years) with 110 (55%) primigravidas and 90 (45%) multigravidas. One hundred and sixty twopatients (81%) had reactive admission test, 28 (14%) had equivocal test and 10 (5%) 48 had ominous test. (Table 1) Incidence of vaginal delivery was more common (78.40%) in patients with reactive admission test and incidence of LSCS and instrumental deliveries were more common (90%) among the group with ominous admission test. (Table 2) Presence of meconium was seen in 6.79%, 32.14% and 70% in reactive, equivocal and ominous group respectively. Apgar score < 7 at 5 minutes was seen in 1.85%, 3.57% and 20% in reactive, equivocal and ominous group respectively. Admissions to NICU occurred in 5.56%, 10.71% and 20% in the three groups respectively. Only one neonatal death occurred in ominous group comprising 10% of patients in this group. (Table 3)

Out of 162 patients with reactive admission test, 9 (5.55%) had foetal distress, whereas out of 38 patients with abnormal admission test, 15 (39.47%) had foetal 19 distress. Highest percentage of foetal distress (70%) was seen with ominous admission test. (Table 4) Therefore, sensitivity, specificity, positive and negative predictive value of labour 28 admission test in predicting foetal distress is 62.5%, 86.9%, 39.5% and 94.4% respectively. (Table 5)

Discussion
Over the years, it has been recognized that foetal morbidity and mortality is a known consequence of labour. In 1989, ACOG

indicated that foetal wellbeing of labouring women could be assessed by intermittent auscultation or by electronic monitoring of foetal heart tones [6]. Auscultation however is necessarily intermittent, subjective and difficult to verify and document. In theory, it would appear that continuous electronic foetal heart rate monitoring with concurrent measurement of uterine contractions would be a superior method of intrapartum evaluation. But economic constraints in developing countries of the world limit its routine use. In such a scenario, an alternative to labelling patients for EFM or at least stringent auscultation, might be a short recording of FHR on admission, known as labour admission test. Based on assumption that early uterine contractions may serve as a functional stress to foetus, an admission test might detect foetal intrauterine asphyxia already present on admission and might have some predictive value for asphyxia that may develop during labour [4]. Furthermore, the Labour Admission Test might also permit the clinician to reallocate the risk of the patients based on their admission foetal heart rate pattern. This means that obstetric patients normally considered high risk on admission to labour ward could be reallocated to low risk when initial foetal heart rate pattern was reactive [7].

In the present study, all the 200 patients were subjected to admission test. The results of admission test were not taken for consideration in the management of labour. On the basis of admission test, patients were categorized into three groups (table 1). One hundred sixty two patients (81%) had reactive admission test whereas 28 (14%) had equivocal and 10 (5%) had ominous admission test. The concordant 41 observations have been made by Vanita Das et al. [8]. In their study (73.71%) patients had reactive admission test and 26.29% had abnormal pattern. In a study by Ingemarsson et al. [4], 86.9% patients had reactive admission test, 8.5% had equivocal 49 and 4.6% had tracings suggestive of ominous test while in a study by Hegde et al[9], 84.5% patients had reactive admission test, 9.5% has equivocal test and 6% had ominous test. In a study by Jophy et al[10], 68% patients had reactive admission test, 29% had equivocal pattern while 3% had ominous pattern. In a study by Desai et al. [11], 86.07% had reactive admission test, 7.59% had suspicious tracings and 6.32% had ominous test. Kushtagi et al. [12] have similar results i.e. 86.6% had reactive, 7.4% had equivocal and 6% had ominous tracings.

Many studies have shown high proportion of instrumental/operative deliveries if admission test is abnormal as compared to reactive test. In our study, out of 162 patients with reactive admission test, only 34(20.99%) had LSCS, 1(0.61%) had instrumental delivery and 127(78.40%) had vaginal delivery, whereas in 28 patients with equivocal test, 13(46.43%) had LSCS and 15 (53-57%) had vaginal delivery. In 20 patients with ominous test results (10), 7(70%) had LSCS, 2(20%) had instrumental delivery and 1(10%) had vaginal delivery (Table 2). In a study by Hedge et al. [9], the incidence of vaginal delivery was more common (90.53%) if admission test was reactive. Instrumental and operative deliveries were common in abnormal test result group (38.71%) as compared to reactive test group (9.47%). Table 3 shows the relationship of admission test and perinatal outcome. The incidence of presence of meconium increased from 6.79% in reactive group to 70% in ominous category. Same way incidence of Apgar score <7 at 5 minute also increased from 85% to 20% from reactive to ominous group respectively. Similar trends were seen in admissions to NICU (5.56% and 20%). There was only one neonatal death and it was in ominous group. In a study by Das et al[8], similar results were obtained; 1.6% of babies had Apgar score <7 at 5 min in patients

with reactive AT, and 8.7% with abnormal AT (10.53% in the present study). In another study by Chaudhari et al[13], babies with Apgar score <7 increased from nil in patients with reactive AT to 8% in 58 patients with abnormal AT. Studies have shown that there is progressive rise in foetal distress as the admission test moves from reactive to ominous group. In the present study, out of 162 patients with reactive admission test, 9(5.55%) had foetal distress, while in equivocal and ominous group, the figures were 8 (28.57%) patients out of 28 and 7 (70%) patients out of 10 respectively (Table 4). In a study by Hegde et al [9], 3.6% patients with reactive AT had foetal distress while 15% patients with equivocal and 75% patients with ominous tracings had foetal distress. In a study by Jophy et al. [10], 6.6% developed foetal distress in reactive category, 27.6% and 66.6% developed foetal distress in equivocal and ominous test category respectively. These are comparable results. In another study by Vinita Das et al [8], in reactive category 27.9% developed foetal distress while in abnormal AT category, 47.8% developed foetal distress. Predictive ability of the admission test was evaluated to identify the foetuses at high risk for developing intrapartum distress. As evident from Table 5, the sensitivity or true positive rate of the admission test is seen to be low (62.50%) with high specificity (86.93%) meaning thereby that the pickup rate of the test is relatively less. However although the specificity of the test is high, there remains a chance that a 41 small proportion of patients might still get misclassified owing to less sensitivity. That suggests that a positive test result may helpfully identify

the patients albeit at the risk of missing some patients where intervention is otherwise warranted. A test with less sensitivity is likely to miss foetal distress when performed early in the course of labour, as many other influencing factors (cord compression, prolonged labour etc.) may be present. As such, such a test if repeated after few hours (4-6 hours) can significantly enhance the sensitivity and since it is inversely related to false negative rate, the chances of missing the patient becomes less and less. Further the negative predictive value is very high (94.44%) as compared to positive predictive value of 39.47%, which means that a negative test (i.e. reactive AT) instils more confidence in the clinician's mind as compared to a positive test result. Similar values have been seen by Ingemarsson et al. [4] (sensitivity 80%, specificity 89.6%, positive predictive value 23.5% and negative predictive value 99.12%); Hedge et al. [9] (sensitivity 66.7, specificity 90%, positive predictive value 38.7% and negative predictive value 96%) and Kushtagi et al. [12] (sensitivity 53%, specificity 93%, positive predictive value 61% and negative predictive value 91%). (Table 6)

Table 1: Results of admission test

S. No	Admission test result	Number (N = 200)	Percentage (%)
1.	Reactive	162	81
2.	Equivocal	28	14
3.	Ominous	10	5

Proportional χ^2- 310.38 p=0.000

Table 2: Mode of delivery in relation to outcome of admission test

S. No	Admission Test Result	LSCS No. (%)	Vaginal No. (%)	Instrumental No. (%)
1.	Reactive (N=162)	34 (20.99%)	127 (78.40%)	1 (0.61%)
2.	Equivocal (N=28)	13 (46.43%)	15 (53.57%)	0
3.	Ominous (N=10)	7 (70%)	1 (10%)	2 (20%)
4.	Total (N=200)	54 (27%)	143 (71.50%)	3 (1.50%)
S. No	Admission Test Result	LSCS No. (%)	Vaginal No. (%)	Instrumental No. (%)
1.	Reactive (N=162)	34 (20.99%)	127 (78.40%)	1 (0.61%)
2.	Equivocal (N=28)	13 (46.43%)	15 (53.57%)	0
3.	Ominous (N=10)	7 (70%)	1 (10%)	2 (20%)
4.	Total (N=200)	54 (27%)	143 (71.50%)	3 (1.50%)

X^2- 44.64 p = 0.000

Table 3: Perinatal Outcome In Relation To Admission Test

S.no	Perinatal outcome	Reactive (N=162) No. (%)	Equivocal (N=28) No. (%)	Ominous (N=10) No. (%)
1.	Presence of meconium	11(6.79%)	9(32.14%)	7(70%)
2.	A/S < 7 at 5 min	3(1.85%)	2(3.57%)	2(20%)
3.	Admission to NICU	9(5.56%)	3(10.71%)	2(20%)
4.	Neonatal deaths	0	0	1(10%)

χ^2- 5.36 p = 0.499

Table 4: Incidence of Foetal Distress In Relation To Admission Test

Admission test result	Number of cases with Foetal distress	Percentage (%)
Reactive (n=162)	9	5.55
Equivocal (n=28)	8	28.57
Ominous (n=10)	7	70
Total (n=200)	24	12

χ^2- 45.51 p = 0.000

Table 5: Admission Test Interpretations Viz-A-Viz Ability to Identify Foetal Distress (Evaluation by Statistical Methods) *

Sensitivity	62.5%
Specificity	86.9%
Positive predictive value	39.5%
Negative predictive value	94.4%

*For analysis purposes, ominous and equivocal have been taken together.

Table 6: Comparison of Various Studies Showing Labour Admission Test Viz-A-Viz Ability to Identity Foetal Distress in Labour

	Present study	Ingermarrson et al. [4]	Hedge et al. [9]	Das et al. [8]	Kushtagi et al. [12]
Sensitivity	62.50%	80%	66.7%	38%	53%
Specificity	86.93%	89.6%	90%	79%	93%
Positive predictive value	39.47%	23.5%	38.7%	48%	61%
Negative predictive value	94.44%	99.12%	96%	72%	91%

Conclusion

It can be inferred that admission test can be used as important noninvasive method to diagnose foetal compromise at the time of admission in early labour. It has good predictive value for predicting fetal distress. It is a simple test, easy to perform and is a good alternative to labelling low risk patients for FHR monitoring on the basis of an antenatal risk classification.

Conflict of Interest

Not available

Financial Support

Not available

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