Correlation of Admission Test with Neonatal Outcome

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Abstract:
Cardiotocography recordings of both high risk and low risk pregnant women were studied and the results were correlated with the labour outcome, perinatal mortality and various morbidity variables such as 5 min apgar score and intrapartum fetal distress. The results were statistically analysed and the diagnostic value of admission test in terms of sensitivity and specificity in predicting the labour and perinatal outcome has been calculated. Although the majority of the patients in all the trace pattern groups showed Apgar score of >7 but still a clear trend was seen as the number of neonates with apgar score of >7 decreases and the number of neonates with apgar score of <7 increases as the admission test changes from normal to pathological.

Key Words: CTG, foetal distress, Apgar score.

Introduction:
The intrapartum assessment of fetal well being has become an integral part of the management of labour. The cardiotocography (CTG) has a major role to play in such situations because it is simple, easy to perform, non-invasive, inexpensive and has no contraindications.

Cardiotocography is a test that graphically records the fetal heart activity and uterine contractions, simultaneously and continuously, in the same time scale, with fetal movements. The fetal heart rate is obtained via an ultrasound transducer attached to the maternal abdomen. A tocotransducer can also be attached to the maternal abdomen to detect the uterine activity. Both transducers are connected to a cardiotocography machine which produces a two – channel recording on thermal paper, available for interpretation and storage. It is generally agreed that the CTG has a predictive value for fetal outcome and several studies have shown a low false negative rate.

The Admission test, first described by Ingemarsson et al.1 is a short strip (20 minute) of CTG done during labour. It is a dynamic screening test for the state of oxygenation of the fetus on admission of the mother into labour room. It assesses the placental reserve by checking the response of the fetal 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 fetus to withstand the process of labour. Therefore, based on the assumption that early uterine contractions may serve as a functional stress to the fetus, an admission test might detect fetal intrauterine hypoxia present already at admission and might have some predictive value of asphyxia that might develop in early labour.

The Admission CTG thus has two potential roles. It can be used as a screening test in early labour to detect compromised fetuses on admission and to select the women in need of continuous fetal electronic monitoring during labour.2

The normal fetal heart rate (FHR) at term is 110-160 beats per minute (bpm)3. It exhibits periodic variations resulting from autonomic influences. A normal pattern includes baseline variability of 5-25 bpm and at least 2 accelerations in a 20 minute period. An acceleration is an increase in FHR from the baseline by 15bpm for 15 seconds or more.3 A normal pattern reflects a metabolically and functionally intact fetal central nervous system.

A deceleration is a reduction in the FHR by 15 bpm from the baseline for 15 seconds or more. Decelerations indicate episodes of fetal stress. Early decelerations coincide with the duration of uterine contractions and are common in late first stage and second stage of labour when the fetal head is compressed during its descent through the pelvis. Late decelerations last beyond the duration of a contraction and reflect a reduction of blood flow into the uteroplacental pool, causing transient fetal hypoxia. Variable decelerations reflect fetal umbilical cord compression.
The National Institute of Clinical Excellence (NICE) and the Royal College of Obstetricians and Gynaecologists (RCOG) have categorised the FHR features and traces as normal, suspicious and pathological.

The clinical effectiveness of CTG is reduced by variable and inconsistent interpretation, even among experts, leading to inappropriate interventions for benign patterns and delayed or no intervention for abnormal patterns. There is, therefore, a need for continuing education on CTG interpretation to improve its value in clinical practice. However the advantages of the admission test (non-invasiveness, short duration, patient acceptance) have overridden the concerns about its lack of specificity. Abnormal CTG with fetal scalp pH study is more specific of fetal distress and hypoxia than CTG alone.

**Material & Methods:**

This is a prospective observational clinical study conducted in a tertiary care hospital of Subharti Medical College, Meerut, over a period of 12 months with a sample size of 500 patient.

*a). Inclusion Criteria:* Pregnancies >32 weeks and <41 weeks of gestation irrespective of the parity.

*b). Exclusion Criteria:* Pregnancies <32 weeks of gestation, pregnancies with known congenital anomalies, multiple pregnancies, malpresentations, use of sedative in mother before testing, patients with false labour pains, patients with an admission to delivery interval more than 24 hours and patients undergoing elective caesarean section.

The patients admitted to the labour ward were confirmed to be in labour. All patients admitted for induction had cervical priming with intracervical prostaglandin E₂ gel. The admission test for these patients was done once they started having uterine contractions.

A preliminary history was taken and a general and obstetric examination done. The patients will then be subjected to a 20 min CTG recording (paper speed 1cm/min) on a corometrics 170 series machine. The results of the admission test were categorised into normal, suspicious or pathological groups as per the RCOG guidelines for the interpretation of CTG tracings.

Patients with a normal admission test were monitored by intermittent auscultation for one minute, every 30 min in the first stage of labour and every 5 min in the second stage of labour. Those having suspicious or pathological FHR tracings were placed on continuous CTG monitoring. The patients were then followed up for the mode of delivery and the different variables of perinatal outcome collected at the time of delivery.

All the patients delivered within 24 hours of the admission test. A fetus/neonate was considered to have distress if any of the following were present: – a) Meconium staining of liquor in labour, b) FHR variations in labour, c) Apgar score of less than 7 at 1 and 5 min. and d) need for intensive neonatal care in specialist nursery. In the case of NICU admission, the neonate was followed up for a duration of 7 days after birth for perinatal mortality and morbidity.

**Observations**

The maximum number maximum number (276) of patients belonged to 26 – 30 years age group, followed by 122 in 31 – 35 years age group and 83 in 21-25 years age group. There were only 11 patients in > 35 years age group and 8 patients were < 20 years of age. Three hundred seventy one patients were of 37 – 40 weeks gestation, 110 were of 32 – 37 weeks gestation. There were only 19 patients in the 40-41 weeks gestational period. The study population comprised of 268 primigravida and 232 multigravida.

Of the total 500 cases, 130 were high risk and 370 were low risk pregnancies; 275 were admitted with spontaneous labour pains, 129 for induction of labour and 96 with premature rupture of membranes.

Table III shows that as per CTG, 401 patient showed normal pattern, 62 showed a suspicious traces and 37 had a pathological traces.

In the present study, fetal distress was seen in 139 patients. Only 64 (16.0%) cases developed fetal distress in the normal admission test group whereas, the percentage increased to 39 (62.9%) and 36 (97.3%) in the suspicious and pathological group respectively. Out of these 59 neonates had NICU admission. The
different variables of perinatal outcome were collected at the time of delivery. Fifty seven neonates developed fetal heart variation during labour, 54 showed presence of meconium stained liquor and 28 neonates had low Apgar score (less than 7 at 1 and 5 min).

Among the patients with a normal admission test, the neonates with low Apgar score were quite few (2.7%). With a suspicious admission test, 8.1% neonates had low Apgar score while with a pathological admission test, 32.4% neonates had low Apgar score.

Although the majority of the patients in all the trace pattern groups showed Apgar score of >7 but it was clear that as the admission test changes from normal to pathological, the number of neonates with Apgar score of < 7 increased. Thus, the inference is that the suspicious and pathological admission test is significantly associated with low Apgar score ($p<0.001$).

### Discussion:

Das et al. conducted a prospective randomised study to prove the efficacy of admission test in predicting fetal jeopardy during labour. They reported that incidence of fetal distress and chances of caesarean delivery were higher in the abnormal admission test group. The number of asphyxiated neonates, neonatal admissions, neonatal mortality and the passage of meconium was also higher in the abnormal admission test group. Hegde et al. in their study on 200 low risk patients found that as the admission test became suspicious or ominous, fetal distress increased and the incidence of operative delivery also increased. Kushtagi et al. conducted a similar study on 500 patients and concluded that labour admission test is of some predictive value, at least for the first few hours after admission in labour.

Sandhu et al. conducted a prospective study to predict the neonatal outcome in high risk obstetric cases by admission cardiotocography testing. The results showed that admission CTG could be used to identify patients likely to develop adverse fetal outcomes and help in optimal utilization of labour room resources.

Ingemarsson et al. carried out a study in over 1000 low risk women and observed that 40% of patients with ominous admission test developed fetal distress as compared to 1.4% with reactive admission test.

Patients included in the present study were from high risk as well as low risk group. There were 401 patients (80.2%) having normal admission test and 62 patients (12.4%) showing suspicious and 37 patients (7.4%) with pathological pattern (Table IV).
In the present study, the sensitivity and specificity are comparable to that of Kushtagi et al\textsuperscript{7}, Sandhu et al\textsuperscript{8} and Hegde et al\textsuperscript{6}. The positive predictive value and negative predictive value is comparable to Sandhu et al\textsuperscript{8}. The values of the above comparison shows that admission test can be used with great reliability to detect fetuses who are hypoxic and need continuous monitoring and immediate intervention.

Hegde et al\textsuperscript{6} observed that the number of cases with fetal distress increased as the admission test changed from reactive to ominous pattern. Sandhu et al\textsuperscript{8} also reported a significant rise in the number of cases with fetal distress if the admission test was suspicious or pathological. The present study, showed similar trend. Therefore, it is evident from all the studies that the incidence of fetal distress increases as the traces become suspicious or pathological.

Das et al\textsuperscript{5} observed that there was a marked difference in the number of asphyxiated neonates (Apgar score <7 at 5 min.) in abnormal admission test group (8.7%) versus reactive admission test group (1.6%). Neonatal admissions were 3.93 times higher with abnormal admission test and neonatal mortality was also higher with abnormal admission test as compared to reactive admission test group irrespective of high or low risk factors. Presence of fresh meconium in amniotic fluid showed greater correlation with abnormal admission test. Kushhtagi et al\textsuperscript{7} observed that when the labour admission test was reactive, irrespective of the antenatal risk status, 91.7% did not develop fetal distress. Though 8.3% cases showed fetal distress in spite of reactive admission test, the incidence of fetal distress with suspicious/ ominous patterns were significantly higher. Similar results were observed in the present study and it was seen that more fetal distress cases occurred in the high risk group than the low risk group and the labour admission test served as a useful tool in defining the current risk status in both these groups.

**Conclusion:**

It is evident from the results of the present study that admission test can be used as an important non-invasive method to diagnose fetal compromise present at the time of admission in high as well as low risk patients in early labour. The advantages of the admission test is that it is non invasive, of short duration and well accepted by patients. 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 fetal 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 fetal outcome 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. Abnormal CTG with fetal scalp pH study is more specific of fetal distress and hypoxia than CTG alone.

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**Table V: Comparison of studies for admission test outcome.**

<table>
<thead>
<tr>
<th>Study</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Das et al\textsuperscript{5}</td>
<td>38</td>
<td>79</td>
<td>48</td>
<td>72</td>
</tr>
<tr>
<td>Hegde et al\textsuperscript{6}</td>
<td>66.7</td>
<td>90</td>
<td>38.7</td>
<td>96</td>
</tr>
<tr>
<td>Ingemarsson et al\textsuperscript{1}</td>
<td>23.5</td>
<td>99.4</td>
<td>40</td>
<td>98.7</td>
</tr>
<tr>
<td>Kushhtagi et al\textsuperscript{7}</td>
<td>53</td>
<td>93</td>
<td>61</td>
<td>91</td>
</tr>
<tr>
<td>Sandhu et al\textsuperscript{8}</td>
<td>42.3</td>
<td>95.6</td>
<td>73.3</td>
<td>84</td>
</tr>
<tr>
<td>Present study</td>
<td>53.96</td>
<td>93.35</td>
<td>75.76</td>
<td>84.04</td>
</tr>
</tbody>
</table>

PPV-Positive predictive value; NPV-Negative predictive value

**Table VI: Comparative incidence of fetal distress in relation to admission test in various studies.**

<table>
<thead>
<tr>
<th>Study</th>
<th>Hegde et al\textsuperscript{6} (n=200)</th>
<th>Sandhu et al\textsuperscript{8} (n=150)</th>
<th>Present study (n=500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT</td>
<td>R S O N S P N S P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>169 19 12 101 34 15 401 62 37</td>
<td>63 9 15 11 64 39 36</td>
<td></td>
</tr>
<tr>
<td>Fd %</td>
<td>3.6 15 75 15 55 73 16 62.9 97.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

( LAT- Labour admission test; R- Reactive; S- Suspicious; O-Ominous; N-Normal; P-Pathological; FD-Fetal Distress)
References:


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