Original Research Article

Admission test in detecting fetal asphyxia at the time of admission in labour

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Abstract

Introduction: The intrapartum assessment of fetal well being has become an integral part of the management of labour.

Aim: The objective of this study was to evaluate the predictive value of admission test in detecting fetal asphyxia at the time of admission in labour and to correlate the results of admission test with perinatal outcome in high risk obstetric cases compared with low risk obstetric cases.

Materials and methods: This was a prospective observational study conducted in the labour and maternity ward of Govt. Gandhi hospital in Secunderabad, during the period 2012 to 2013 with a sample size 50 high risk obstetric cases and 50 low risk obstetric cases. All women were subjected to an admission CTG, which included a 20 minute recording of FHR and uterine contractions.

Results: The majority of women were primigravida in the 18-23 years age group in both high risk and low risk groups. Admission test was reactive in 35 cases (70%) in high risk group, 42 cases (84%) in low risk group where as non reactive in 15 cases (30%) in high risk group and 8 cases (16%) in low risk group. In cases with reactive admission test spontaneous vaginal deliveries were more in low risk group than in high risk group. Operative deliveries were more in high risk group than in low risk group in both reactive and non reactive admission test. Indication for caesarean section in both reactive and non reactive admission test was more in high risk group i.e. 1 case (25%) and 6 cases (66%) respectively. Perinatal outcome was abnormal in high risk groups in both reactive and non

reactive admission test. Specificity and Negative predictive value in high risk group is less than that in low risk group.

Conclusion: The admission CTG appears to be a simple non-invasive test that can serve as a screening tool in both high-risk and low risk obstetric patients with significant results.

Key words

Admission test, Cardiotocography, High risk pregnancy, Fetal distress, Fetal hypoxia, Perinatal outcome.

Introduction

Surveillance of the foetus during labour is important to ensure the delivery of a healthy baby in good condition with the minimum of intervention [1]. Although, the vast majority of foetuses cope well during labour, the journey through the birth canal is stressful and the foetus may mount a 'stress response'. Foetuses with utero-placental insufficiency develop hypoxia in labour that may be acute or sub-acute. Some foetuses may be hypoxic prior to entering labour. Foetal monitoring during labour identifies the foetuses at risk of hypoxic damage, so that appropriate intervention could be instituted to optimise perinatal outcome. Such an approach is introduced to prevent neurological injury, including cerebral palsy [2]. For this purpose, electronic foetal monitoring (EFM) has widely been adopted [3]. Although with intermittent auscultation the baseline foetal heart rate (FHR) can be measured, other features of the foetal heart such as baseline variability, accelerations and decelerations are difficult to quantify [4]. Therefore, the use of antepartum and intrapartum cardiotocography (CTG) has increased over the last 15 years. As a consequence some authors attribute a considerable decrease in the overall perinatal mortality to the use of CTG and today CTG is a first line investigation for ante and intrapartum fetal assessment [5].

Incidence of acidosis at birth is not very different between low and high risk groups [6]. This levels us with the task of determining who is at risk. A new system may have to be developed to identify who are at risk in labour and perhaps can be solved by clinical means by the addition of an 'ADMISSION TEST'.

The Admission test, first described by Ingemarsson, et al. [7] 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 uteroplacental 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 fetuses which are already at risk and those which are likely to have problems in labour may be identified by the Admission Test and need careful continuous monitoring. A better understanding of the evolution of FHR changes with hypoxia will help interpretation of the admission test (AT) and to identify the fetus at risk on subsequent intermittent auscultation. It is equally important that any FHR trace has to be interpreted in conjunction with the clinical picture and not in isolation as this will provide the best answer regarding management.

The objective of this study was to evaluate the predictive value of admission test in detecting fetal asphyxia at the time of admission in labour

and to correlate the results of admission test with perinatal outcome in high risk obstetric cases compared with low risk obstetric cases.

Materials and methods

This was a prospective observational clinical study conducted in Govt. Gandhi hospital, Secunderabad, over a period of 2012-2013 with a sample size of 50 high risk patients and 50 low risk patients.

All patients with cephalic presentation and term gestational age were taken. Careful history regarding, the last menstrual period, parity and brief previous obstetric history was taken. Number of antenatal check up was noted. A thorough clinical examination including pulse rate blood pressure, presence or absence of membranes, Pelvic assessment was done.

All preliminary and base line investigations like HB estimation, blood group, Rh typing, and complete urine examination was done. NST was done using cardiotocogram for 20 minutes.

Inclusion criteria

High risk cases with medical complications like pregnancy induced hypertension, diabetes, anemia, fetal complications, cyanotic heart diseases in the age group of 18-33 years with primis, second and third gravidae were included.

Exclusion criteria

Patients with age group >33 years, history of medications like diazepam, narcotics, tranquilizers were excluded.

Methods of performing the test

Prior to performance of tests information regarding use of medication such as diazepam, narcotics, tranquilizers and other sedatives was elicited as these may affect fetal activity.

The procedure was clearly explained to the patient as patient's co-operation is very essential to this test. The time of the day when test is done is also noted.

Patient was placed in the left lateral position using pillows under one of her hips, to displace the weight of the uterus away from the inferior vena cava. The transducer was applied to the patient with elastic adjustable retaining strap that encircles the abdomen after applying an adequate amount of ultrasound coupling gel over the transducer face. The patient was instructed to push the calibration button every time when she feels fetal movements. Uterine activity was measured by external tocodynamometry where transducer was placed over the uterine fundus and held in place by a belt. FHR for 20 minutes period was recorded, if the patient perceived low fetal movements with acceleration of > 15 beats lasting for 15 sec then the test is stopped. If no movement was recorded the test was continued for another 20 minutes period or baby can be stimulated by vibro acoustic stimulation.

FHR tracings were classified as reactive pattern, suspicious pattern and ominous pattern. Patients with reactive pattern were monitored with fetoscope. Patient with non reactive pattern were to be kept on continuous foetal monitoring but due to lack of adequate equipment these patients monitored more carefully with intermittent electronic monitoring and more cautiously by intermittent auscultation with fetoscope.

All the patients delivered within 24 hours of the admission test. Progress of labour, mode of delivery, apgar score at one minute and 5 minutes, whether baby needed any resuscitation, color of liquor were noted. Placenta was examined for infarcts and other anomalies. Mother and baby were followed till discharge.

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 duration of 7 days after birth for perinatal mortality and morbidity.

Data obtained from the study groups was analysed and statistically verified by nonparametric Chi-square test (x^2 test) with the use of computer software SPSS version 10.

Results

Among the selected cases 76% of cases in high risk group and 58% of cases in low risk group were in age group of 18-23 years, where as 50% of cases in high risk group and 46% in low risk group were primigravida (**Table - 1**).

Table - 1: Age distribution and gravidity of patients.

Characteristic	**High risk group (n 50)**	**Low risk group (n 50)**
Age in Years		
18-23	38 (76%)	2.9 (58%)
24 – 28 Yrs	9 (18%)	14 (28%)
29 – 33 Yrs	3 (6%)	7 (14%)
Gravidity		
PRIMI	25 (50%)	23 (46%)
Second gravid	15 (30%)	20 (40%)
Third gravid	10 (20%)	7 (14%)
Pattern of reactive admission test		
Reactive	35 (70%)	42 (84%)
Non Reactive	15 (30%)	8 (16%)

In the high risk group admission test was reactive in 35/ 50 cases (70%) and in low risk group 42 / 50 cases (84%) where as admission test was non reactive in high risk group 15/ 50 cases (30%) and in low risk group 8/ 15 cases (16%) as per **Table - 2**.

In cases with reactive admission test 25/35 cases (71%) in high risk group and 36/42cases (86%) in low risk group, where as in cases with non reactive admission test 5/15 cases (33%) in high risk group and 6/8 cases (75%) in low risk group had spontaneous vaginal deliveries. (Table 2) Among the cases with reactive admission test 4/35 cases (11%) in high risk group and 2/42 cases (4%) in low risk group had operative deliveries. In cases with non reactive admission test 9/15 (60%) in high risk group and 1/8 (12.5%) in low risk group had operative deliveries (**Table – 3**).

Table - 2: Mode of delivery in both high risk and low risk cases.

Mode of Delivery	**High risk group**	**Low risk group**
REACTIVE group	35	42
Spontaneous vaginal Delivery	25 (71%)	36 (86%)
Instrumental delivery	6 (17%)	4 (10%)
Cesarean section	4 (11%)	2 (4%)
NONREACTIVE group	15	8
Spontaneous vaginal Delivery	5 (33%)	6 (75%)
Instrumental delivery	1 (7%)	1 (12.5%)
Cesarean section	9 (60%)	1 (12.5%)

Table – 3: Indication for caesarean section in reactive and non reactive admission test.

Indication	**High risk group**	**Low risk group**
REACTIVE group	4	2
Foetal distress	1 (25%)	-
Prolonged labour	1	1
Failed induction	1	-
PROM > 12 hrs	1	1
NONREACTIVE group	9	1
Foetal distress	6 (66%)	1
Prolonged labour	1	-
Failed induction	1	-
PROM > 12 hrs	1	-

In reactive admission test only 1/4 case (25%) in high risk group showed indication fetal distress. In cases with non reactive admission test in high risk group the operative intervention was for fetal distress in 6 / 9 cases (66%) while in low risk group it was in one case for fetal distress.

In cases with reactive admission test and non reactive admission test indication for caesarean

section was foetal distress in 1 (25%), 6 (66%) respectively.

In reactive admission test in high risk group 4/35 cases (11%) had abnormal perinatal outcome, in that 2 neonates had thick meconium stained liquor with apgar scores at 5 min being more than 7, 1 neonate had Apgar score < 7 at 5 min with clear liquor, 1 neonate required NICU admission.

Among the cases with reactive admission test in low risk group 2/42 cases (5%) had abnormal perinatal outcome, in that 1 neonate had thick meconium stain liquor with apgar score at 5 min> 7, other neonate had apgar score < 7 at 5 min with clear liquor and no neonate was admitted in NICU.

Among the cases with non reactive admission test in high risk group 8/15 (53%) had abnormal perinatal outcome, in that 4 neonates had thick meconium stained liquor with 5 min apgar score > 7, 2 neonates had apgar score < 7 with light meconium stained liquor and 2 neonates were admitted in NICU.

Among the non reactive admission test in low risk group 3/8 (38%) had abnormal perinatal outcome, 1 had thick meconium stained liquor with apgar score > 7 at 5 min, 2 neonates had apgar score < 7 at 5mins with clear liquor and no neonate wad admitted in NICU (**Table - 4**).

In high risk group specificity of the admission was found to be 81% and negative predictive value 83% while in low risk group specificity is 88% and negative predictive value is 91% (**Table - 5**).

The cases included in high risk group were Pregnancy induced hypertension being 21 cases (42%), Prolonged pregnancy being 15 cases (30%), Anemia complicating pregnancy with preterm delivery being 5 cases (10%), Anemia complicating pregnancy with IUGR being 4 cases (8%), and Cyanotic heart disease complicating pregnancy being 5 cases (10%) as per **Table – 6**.

Table - 4: Perinatal outcome in reactive and non reactive group of admission test.

Feature	High risk group	Low risk group
REACTIVE group	4/35	2/42
Thick meconium Stained liquor	2 (50%)	1 (50%)
Apgar score <7 with Clear liquor	1 (25%)	1 (50%)
NICU admission	1 (25%)	Nil
NONREACTIVE group	8/15	3/8
Thick meconium Stained liquor	4 (50%)	1 (33%)
Apgar score < 7 with Clear liquor	2 (25%)	2 (66%)
NICU admission	2 (25%)	Nil

Table - 5: Efficacy of admission test in high risk and low risk groups.

Feature	High risk group	Low risk group
Sensitivity	66%	60%
Specificity	81%	88%
Negative predictive Value	83%	95%
Positive predictive Value	53%	37%

Most of the cases were in age group of 18-23 years with primigravida in both high risk and low risk groups.

Discussion

Use of electronic FHR monitoring at the time of admission in labour has been employed by some centres to identify fetuses that are at an increased risk of hypoxia [2]. EFM can detect hypoxia early and avoid unnecessary delay in intervention. It is a non-invasive recordable method of foetal monitoring and is a highly logical solution to the undeniable human

factors/human lapses of manual foetal monitoring of labour. Uterine contractions serve as a functional stress to the foetus; a short tracing of FHR on admission to the labour ward may thus detect fetal intrauterine hypoxia already present on admission and also help identify those who are risk of developing hypoxia during labour [7].

Table - 6: Risk factor for high risk pregnancy cases.

High Risk Factor	No. of patients	%
Pregnancy induced Hypertension	21	42%
Prolonged Pregnancy	15	30%
Anemia Complicating Pregnancy with Preterm Delivery	5	10%
Anemia complicating pregnancy with IUGR	4	8%
Heart disease complicating Pregnancy.	5	10%

In present study 50 high risk antenatal cases and 50 low risk antenatal cases admitted in the Labour room were selected. The patient's were subjected to admission test after fulfilling the criteria of selection. The number of cases with reactive admission test was less in high risk group which may be explained due to preexisting risk factor which causes uteroplacental and fetoplacental dysfunction. Cases with non reactive admission test were more in high risk group than in low risk group due to preexisting risk factor which has an effect on placental blood flow.

Kushtangi P, et al. [8] observed that the number cases with reactive admission test were 83% in high risk group and 89% in low risk group.

Spontaneous Vaginal deliveries

In cases with reactive admission test, spontaneous vaginal deliveries were more in low risk group than in high risk group whereas operative deliveries were more in high risk group than in low risk group.

Spontaneous vaginal deliveries were found to be less in high risk group inspite of reactive admission test which may be explained because of the compromised status of the fetus when the process of labour started and the chances for it to become hypoxic early in the course of labour were more leading to early obstetric intervention. The operative intervention was more in high risk group than in low risk group inspite of reactive admission test which may be due to fetus getting hypoxic early due to preexisting risk factor.

Spontaneous vaginal deliveries were less in high risk group with non reactive admission test as early operative intervention was done due to preexisting risk factor which compromised fetus early in labour.

Operative Deliveries

The operative intervention was more in high risk group with non reactive admission test as fetus gets hypoxic early which may be due to preexisting risk factor.

Das, et al. [10] conducted a prospective randomized study to prove the efficacy of admission test in predicting fetal jeopardy during labour. They reported that incidence of the caesarean section rate of 46% in reactive admission group and 61% in non reactive admission test group.

Indication for Cesarean Sections

Among the cases with reactive admission test and non reactive admission test cesarean section rate is more in high risk group than in low risk group.

In cases with reactive admission test in high risk group out of 4 emergency caesarean sections, indication was fetal distress in 1 case (25%) which is indicating preexisting placental insufficiency due to preexisting risk factor while in low risk group out of 2 emergency caesarean

sections no case had the indication of fetal distress.

In cases with non reactive admission test in high risk group the operative intervention was for fetal distress in 6 / 9 cases (66%) while in low risk group it was in one case for fetal distress.

Perinatal Outcome

Abnormal perinatal outcome was more in high risk group in both cases with reactive and nonreactive admission test due to preexisting antenatal risk factor.

Efficacy of admission test

In high risk group specificity of the admission was found to be 81% and negative predictive value 83% while in low risk group specificity is 88% and negative predictive value is 91%. Hence the admission test may be said to be more useful in low risk group than in high risk group. In high risk group it is advocated that admission test may be supplement with fetal vibroacoustic stimulation or fetal scalp stimulation to decrease false positives.

In a study by Kushtagi P, et al. [8] reported specificity and negative predictive value of labour admission test were 93 and 90% respectively.

Ingemarsson, et al. [7] observed that the specificity was 99.4% and negative predictive value was 98% in their study and study, where as Hegde et al reported specificity was 90% and negative predictive value was 96%.

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 admission CTG is a simple non-invasive test that can serve as a screening tool in high-risk obstetric patients to detect foetal distress already present or likely to develop and prevent unnecessary delay in intervention. 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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