ORIGINAL ARTICLES

Role of fetal monitoring in high risk pregnancy by fetal electrocardiogram

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KEY WORDS : Fetal Monitoring, High risk pregnancy, Fetal electro cardiogram

ABSTRACT

Background : Non-stress test is an external monitoring of fetal heart rate by electrocardiography. Although intermittent auscultation of fetal heart rate is equivalent to continuous electronic fetal monitoring in detecting fetal compromise1 but continuous electronic fetal monitoring is indicated in high risk patients whose foetuses are at high risk for neonatal encephalopathy or cerebral palsy2. Objective of current study was to study the efficacy and diagnostic value of non-stress test for surveillance and its usefulness to detect fetal distress at early stage which helps to decide further management in mode of delivery.

Methods : Design : Prospective study. NST was done in 50 high risk patients for minimum of 20 minutes and in patients with non-reactive NST it was continued for 40 minutes. Maternal age, parity, complications during labour and delivery, mode of delivery, indications of caesarean section and perinatal outcome were noted.

Results : Out of total 50 cases studied patients delivered vaginally were 24 and caesarean was done in 26 cases. Most LSCS were performed due to PIH (35%) and related complications like IUGR, eclampsia (10%), fetal distress, previous caesarean pregnancy, oligohydramnios and meconium stained liquor. 52% patients were delivered by caesarean section and 48% by vaginal delivery.

Conclusions : Routine use of electronic fetal heart monitoring helped in reduction of neonatal morbidity and mortality with increased rate of caesarean section.

INTRODUCTION

Antepartum fetal surveillance is beneficial in all patients and specially in high risk pregnancies like PIH , anaemia, diabetes mellitus, oligohydramnios to obtain better fetal outcome.

Fetal hypoxia and acidosis can be detected at early stage of pregnancy to avoid further complication and hence to reduce fetal morbidity and mortality.

The interpretation of NST for antepartum evaluation is presence of acceleration of fetal heart rate with foetal movement which indicates intact and responsive central nervous system. NST is easy to use, less expensive, non-invasive and its interpretation is easy.

High risk pregnancy include[3] : PIH, eclampsia, abruption placentae, placenta previa, postdate pregnancy, oligohydramnios, previous caesarean pregnancy, anaemia, premature rupture of membrane, gestational diabetes, IUGR, Rh isoimmunisation.

METHODS

This is a prospective study of 50 high risk pregnancies who were attending antenatal outdoor department and admitted in our tertiary care institute in department of obstetrics and gynaecology. Study was conducted from January 2017 to December 2017. Study included all high risk patients with gestational age 32 weeks and more. Data of all patients was recorded as per proforma and analysed as per age, parity, period of gestation at the time of diagnosis, high risk factors, results of NST, mode of delivery, baby's status APGAR score and perinatal outcome was noted.

PROCEDURE

Patient is placed in semi fowler position keeping pillow under both the hips to avoid pressure on inferior vena cava.

Test is considered reactive when two or more than two accelerations in FHR were recorded in 20 minutes period with each acceleration of >15 beats per minute and lasting for more than 15 seconds.

We can continue current method of monitoring if no spontaneous fetal movement occurs in 20 minutes of observation. Then fetal movement is provoked by external manipulation.

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If still no acceleration with spontaneous or repeated external stimuli, test is repeated for 40 minutes and if during 40 minutes no acceleration is present , test is non-reactive.

When no FHR accelerations are seen after fetal stimulation or FHR decelerations are seen without absent variability or no variability seen with decelerations in FHR, general measures are taken of giving oxygenation, changing to left lateral position, giving IV fluids by starting ringer lactate and oxytocin is discontinued if stared and delivery is done as soon as possible.

CRITERIA FOR REACTIVITY

A) Reactive tracing :At least two acceleration with amplitude more than 15bpm for 15 seconds in 20 minutes4. Usually associated with episode of fetal movements and normal baseline variability.

B) Non-reactive tracing :Tracing with no FHR acceleration or inadequate acceleration that is <15 bpm or decreased FHR variability.

C) Unsatisfactory :Tracing not adequate for interpretation.

D) Saltatory :Rapidly occurring couples of acceleration and deceleration causing relatively large oscillation of baseline FHR.

FHR PATTERNS AND ITS IMPORTANCE

A) Characteristics of normal FHR5-6 Baseline FHR is 120-160 bpm Baseline beat to beat variability ≥ 6 bpm for 15 seconds in 15 minutes. No. of accelerations ≥ 2 in 20 minutes Fetal outcome-vigorous with APGAR score ≥7

B) Persistent fetal tachycardia Tachycardia when FHR >160 bpm Causes: Amnionitis, maternal fever, fetal compromise, drugs

C) Persistent fetal bradycardia FHR <120 bpm is known as fetal bradycardia Causes : Fetal compromise, congenital heart block in fetus, under general anaesthesia

FETAL BRADYCARDIA WITH VARIED SIGNIFICANCE

a) Baseline bradycardia FHR <120 bpm without co-existent periodic changes and with adequate beat to beat variability

b) Prolong end stage deceleration Sudden drop in FHR in a patient who is near to deliver. The FHR 40-90 bpm is a product of vagal reflex by head compression.

c) Bradycardia with lack of variability This ominous pattern occurs mainly in post term pregnancies. It may or may not be preceded by mild late deceleration.

d) Bradycardia with deceleration Prolong bradycardia following late or severe variable deceleration.

FHR variability

It is an index of fetal reserve or tolerance to hypoxic insults. Absent variability with late variable deceleration and fetal bradycardia shows hypoxic insults.

Early deceleration

Gradual decrease and return to baseline associated with contraction may be due to head compression.

Late deceleration

Due to uteroplacental insufficiency.

It is an indicator of fetal distress when they occur in context of decrease variability and lack of acceleration.

Variable deceleration

Indicates fetal hypoxia due to cord compression specially in second stage of labour.

Mild: <30 sec duration

Moderate: <80 bpm for >30 sec duration

Severe: <70 bpm for >60 sec duration

Ominous FHR pattern

Absent FHR variability and shallow rate deceleration.

Absent FHR variability and mild variable deceleration with overshoot.

Absent or markedly decreased variability and prolonged bradycardia following severe variable or late deceleration.

RESULTS

Table no. 1 shows that 40% patients were between 20-24 years. 30% patients were between age 25-29 years of age. Maximum (70%) of the patients were in their second to third decade of life. This shows maximum fertility of the population.

Table-1 : Effect of maternal age.

Maternal Age (years)	No. of patients (n=50)	Percentage (%)
<20	3	6%
20-24	20	40%
25-29	15	30%
30-34	9	18%
⩾35	3	6%

Table no. 2 shows that in our study, 48% having high risk factor were primigravida women. Although grand multiparity itself is a high risk pregnancy, in my study multipara were at less risk due to improved education and awareness.

Table -2 : Effect of gravidity

Gravidity	No. of patients (n=50)	Percentage (%)
Primi	24	48%
Second	13	26%
Third	8	16%
Multi(>4)	5	10%

As in Table no. 3 maximum number of patients 54% were between 34-36.6 weeks of gestational age. Followed by 22% women having gestational age between 31-33.6 weeks.

Table - 3 : Effect of gestational age.

Gestational age (weeks)	No. of patients (n=50)	Percentage (%)
32-33.6	14	28%
34-36.6	26	52%
37-39.6	9	18%
40-42.6	1	2%

Table no. 4 shows that majority of patients (34%) had pre-eclampsia a major high risk factor followed by oligohydramnios (12%).

Table-4 : High risk factors affecting fetal electrocardiogram

High risk Factors	No. of patients (n=50)	Percentage (%)
PIH	17	34%
Eclampsia	5	10%
IUGR	3	6%
Anaemia	5	10%
Postdated	5	10%
Oligohydramnios	6	12%
Placenta Previa	4	8%
Chronic HTN	5	10%

Table no. 5 shows that majority of high risk women (52%) underwent caesarean section while in 48% cases were delivered vaginally.

Table - 5: Mode of delivery

Mode of delivery	NST	
	Reactive	Non-Reactive
Vaginal delivery	21(42%)	3(6%)
Caesarean section	4(8%)	22(44%)

Table no. 6 shows that baby outcome is good when NST is reactive and only 24% children with reactive NST during antepartum fetal monitoring required resuscitation. In non-reactive NST 64% children required resuscitation and only 1 baby expired due to meconium aspiration syndrome. This shows that NST has significant effect on perinatal outcome.

Table-6 : Perinatal outcome according to NST reactivity.

NST	Baby well	Baby needed NICU admission
Non-reactive	9(36%)	16(64%)
NSTReactive NST	19(76%)	6(24%)

Table no. 7 shows that out of 25 patients who had non-reactive NST 48% had APGAR score <7 while 52% children had APGAR score >7.

Table-7 : Baby status as APGAR score at 1 min of delivery : According to the result of NST.

NST Reactivity	APGAR score <7	APGAR score <7
Reactive NST	3(12%)	22(88%)
Non-reactive NST	12(48%)	13(52%)

In patients with reactive NST only 12% had low APGAR score, while 88% children have APGAR score>7.

Table no. 8 shows that NST has good sensitivity of 71% with high specificity of 67%.

Table 8 : Outcome of fetal surveillance test.

Test	Sensitivity	Specificity	PPV	NPV
NST	71.42%	67.7%	60%	77%

*PPV - Positive Predictive Value *NPV – Negative Predictive Value

Table no. 9 shows that study results are comparable to Rajgopal study as regional variabilities in different study may play a role.

Table-9 : Comparison with other studies.

Study	Sensitivity	Specificity	PPV	RPV
Present(n=50)	71.42%	67.70%	60%	77%
Dilmen (n=121)(1995)	58.80%	80.80%	90.90%	46.66%
Rajgopal (n=45)(1996)	74.91%	85.71%	60%	-

DISCUSSION

This study is conducted with maximum patients (40%) of age group 20-24 years, mostly (48%) primigravida having mean gestational age between 34 to 36.6 weeks.

This is a study of foetuses in 50 high risk cases monitored with NST with cardiotocography in tertiary care centre.

34% had pregnancy induced hypertension , 12% had oligohydramnios, 10% had postdate pregnancy, 6% had IUGR.

Many patients had combined high risk factors like PIH with oligohydramnios, anaemia, IUGR or postdate pregnancy with oligohydramnios. Most commonly seen high risk factor was PIH, eclampsia, and postdate pregnancy with oligohydramnios.

Out of 50 patients 48% patients delivered vaginally either spontaneous or induced while 52% patients have undergone caesarean section due to various reasons like PIH, fetal distress , postdate pregnancy, meconium stained liquor or post caesarean pregnancy.

Mode of delivery is also affected by reactivity of NST 46% patients having non-reactive NST underwent caesarean section and 6% having reactive NST underwent caesarean section.

Most common indications of LSCS in this study was PIH and related complications like eclampsia, HELLP syndrome, IUGR followed by fetal distress in 10%, while post caesarean pregnancy was indication in 14%, IUGR was indicated in about 12% cases. MSL and oligohydramnios were accounting for 20% cases. Postdate pregnancy and related complications accounted for about 5%.

This suggests that nonreactive NST indicates fetal compromise, which can be further demonstrated by fetal scalp blood pH, umbilical cord blood gas analysis or simply by low APGAR score at 1 minute and 5 minute.

Non Stress Test less invasiveness, easy to use and easy interpretation makes it more easy and widely used.

Babies were well in 88% of reactive NST while 64% babies needed resuscitation in cases with non-reactive NST. Perinatal mortality was low and was due to meconium aspiration. 52% babies delivered by caesarean section were healthy.

This shows that timely intervention in acidotic fetus can improve fetal outcome.

CONCLUSION

As in high risk pregnancies perinatal morbidity and mortality rate is very high, judicious use of electronic fetal monitoring can detect fetal hypoxia and metabolic acidosis at early stage and timely intervention can improve perinatal outcome.

Non Stress Test has sensitivity of >71% and specificity of 67%. It can be used as a screening procedure in high risk cases to detect compromised fetus early.

Due to non-reactive NST helps us to timely intervene, improve fetal outcome and reduce fetal morbidity and mortality with reduced NICU admission rate by urgent delivery of fetus.

In developing countries like India in the periphery, where advanced equipments for fetal monitoring is not available, NST is a very useful non-invasive screening test to detect and timely refer the high risk patient to a higher centre where facilities for emergency obstetric care and NICU facilities are available.

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