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Evaluation of Non Stress Test in Monitoring High Risk Pregnancies

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Abstract:
Background: *mid twentieth century observations that acceleration of the fetal heart rate in response to fetal activity reflect fetal well being, formed the basis of the Non Stress Test (NST). Freeman and Lee colleagues, 1975, introduced the NST to describe the fetal heart acceleration in response to fetal movement as a sign of fetal health.*
Aim: *To study the antepartum fetal surveillance with NST and perinatal outcome in high risk pregnancies. To prove the efficacy of NST as an effective tool for evaluation of fetal well being.*
Methods: *Hospital based prospective study. 100 pregnant women attending the antenatal OP clinic, or as emergency in the department of OBG, Government General Hospital, Vijayawada, from October 2011-October 2012, for their high risk factors, were randomly recruited into the study. NST was performed for all the cases with CTG (Cardiotocography) and results were analyzed.*
Results: *The test has high sensitivity and specificity with high negative predictive value.*
Conclusion: *As the fetal heart reactivity spontaneous or obtained with VAS (Vibroacoustic stimulation) is a solid indicator of fetal health and absence of acidosis, NST can be taken as a screening method for assessment of fetal well being and optimum time of delivery.*
Keywords: *Non Stress test, High risk pregnancy, Heart rate variability, Efficacy*.

I. Introduction

Antepartum evaluation of the fetus at risk for damage or death in utero remains a major challenge in modern obstetrics. In India alone, about 8,90,000 perinatal deaths occur annually. The test most commonly used for antepartum evaluation of fetal status is the NST. NST is non-invasive, easily performed, interpreted, and readily accepted by the patient. Heart rate acceleration with movement is a reflex that involves the cerebral cortex and is affected by physiological influences like fetal sleep which suppresses the reflex and pathological conditions like fetal hypoxia which cause variation in the fetal heart rate.

NSTs are classified as reactive and non-reactive. Reactive or normal NST is characterized by 2 or more fetal heart rate accelerations of about 15 bpm and lasting at least 15 seconds from the baseline within a 20 minute period. Non-reactive NST is characterized by lack of acceleration for a period of 40 minutes.

The NST should be analyzed taking into consideration all the factors that provide information about the fetal well being.

1) Baseline fetal heart rate: 110-160 bpm, Tachycardia: >160 bpm, Bradycardia <110 bpm
2) Beat to beat variability of the fetal heart rate.
3) Presence of absence of accelerations.
4) Presence or absence of decelerations – 3 types

a) Early decelerations or type I, caused by head compression, benign, and does not produce hypoxia or acidosis.
b) Late decelerations or Type II, indicative or utero-placental insufficiency.
c) Variable decelerations caused by cord compression. May disappear with change in the position.

II. Materials and methods

The present study was conducted in the department of OBG, Government General Hospital, Vijayawada, from October 2011 to October 2012. 100 pregnant women with high risk factors attending the antenatal OP clinic, or as emergency referred from outside, were admitted into the in-patient wards and included in the study.

Inclusion criteria: 1) single ton pregnancy with gestational age >30 weeks 2) hypertensive disorders in pregnancy 3) Diabetes complicating pregnancy, including gestational diabetes 4) Intra Uterine Growth Retardation 5) Past dates 6) Liquor abnormalities 7) Bad obstetric history
Exclusion criteria: 1) Pregnant women with gestational age <30 weeks or in labor 2) Antepartum hemorrhage 3) Eclampsia 4) Multiple gestation 5) Ruptured membranes 6) Congenital anomalies 7) Intrauterine fetal death
A detailed history of the pregnant women was taken, and thorough clinical and obstetric examination was performed. All preliminary investigations, including ultrasound, were done. The NST was performed in all of the cases with CTG (FM model – BPL FM9853) in semi-Fowlers position. Recording of the fetal heart rate, fetal movement, and uterine contractions was done. If reactive pattern was not recorded within 20 minutes period, the fetus was stimulated with VAS and the test continued for another 20 minute period. If there is no reactivity in the extended period, the trace was considered as non-reactive.
Repeat testing was done depending upon gestational age, high risk factors, result of the test, and compliance for follow-up. Twice weekly testing is advocated in women with post term pregnancy, Type I Diabetes mellitus, Fetal growth restriction and Pregnancy induced hypertension. Sometimes daily testing may be needed in women with severe pre-eclampsia remote from term.

End points to assess the efficacy of NST: Meconium stained liquor, 5 minute APGAR <7, NICU admission.

III. Observations and results

The study group consisted of 100 high risk patients. The results are as follows.

1) Distribution of risk factors

Cases	Pre-eclampsia	Post dates	IUGR	GDM	Rh –ve	BOH
100	43	39	11	7	5	2

PIH (43%) and post dated pregnancy (39%) are the commonest risk factors.

2) Gravida distribution

Cases	Primi gravida	2nd gravida	3rd gravida	4th gravid
100	55	29	12	4

Majority of patients (55%) are primi gravidae.

3) Age distribution

Cases	18-20 yrs	21-25 yrs	26-30 yrs	31-35 yrs
100	23	50	23	4

Most of the patients belong to the 21-25 yrs age group.

4) Gestational age-wise NST results

Gestational age in weeks	No. of patients	NST normal	NST abnormal
32-34 wks	2	1	1
34-36 wks	5	2	3
36-38 wks	24	11	13
38-40 wks	30	24	6
>40 wks	39	31	8

Majority of patients are more than 40 wks of gestational age.

5) Mode of delivery

Cases	Vaginal	LSCS
100	54	46

Most of the patients had vaginal delivery (54%).

6) Indications for LSCS

Failed induction	12	12%
Failure of progress of labor	5	5%
Fetal distress	11	11%
Severe PIH with abnormal Doppler	5	5%
CPD	6	6%
Abnormal Doppler	4	4%
BOH	2	2%
Breech	1	1%

In majority of cases, indication was failed induction and fetal distress.

7) Last NST vs mode of delivery

NST	No. of cases	Vaginal	LSCS
Reactive	70	48	22
Non-reactive	30	6	24

8) Last NST vs perinatal outcome

NST	No. of cases	Meconium stained liquor	Clear liquor	APGAR score <7	APGAR >7	NICU admission
Reactive	70	3	67	3	67	0
Nonreactive	30	16	14	14	16	13

The last NST results were correlated with fetal outcome. Among NST reactive cases (70), Meconium stained liquor was observed only in 3 cases, APGAR score >7 in 67 cases, and there were no NICU admissions. Among NST non-reactive cases (30), Meconium stained liquor was observed in 16 cases (>50%), APGAR score <7 in 14 cases (around 50%), and 13 of them required NICU admission.

IV. Discussion

NST is simple, cheap, non harmful, easily repeated, and cost effective with low maintenance profile. The test group consists of 100 high risk patients at 32 or more weeks of gestational age. Major risk factors are PIH, past dates, IUGR, GDM and Rh –ve pregnancies. Majority of patients with pre-eclampsia are primigravidae. Majority of patients with GDM had excessive liquor.

54% had vaginal delivery and 46% had LSCS. Out of total patients taken for LSCS, 24 had non-reactive NST and 22 had reactive NST. In our study, the incidence of caesarian section for fetal distress was high because most of the patients were referred as unbooked cases to our hospital, which is a tertiary referral center. Out of 100 patients, thick MSL was observed in 19 cases. Among them, NST was non-reactive in 16 cases. From the above results, it is seen that the incidence of perinatal morbidity increased when NST was abnormal. Among 30 cases with non-reactive NST, 16 of them were born with low APGAR (<7), and 13 cases were admitted in NICU. The patients with 2 or more risk factors like PIH with IUGR, or past dates with IUGR were observed when APGAR score was <7.

Causes of NICU admission among 13 babies – MSL (8), hypoglycemia(2), tachypnoea (1), and resuscitation (2)

Efficacy of NST obtained in the present study

Test	NST-APGAR score	NST-MSL	NST-NICU admission
Sensitivity	82.35%	84.29%	92.31%
Specificity	80.72%	84.78%	79.31%
+ve predictive value	46.67%	53.33%	40.00%
-ve predictive value	95.71%	96.30%	98.57%

Present study results are more or less comparable to recent study done by Abhijit Biswas et al (2013).

	Sensitivity	Specificity	+ve predictive value	-ve predictive value
Present study	82.3%	80.7%	46.6%	95.7%
Abhijit Biswas et al	72.7%	72.7%	30.7%	94.1%

V. Summary

This is a prospective study conducted in high risk patients in Government General Hospital, Vijayawada after 32 weeks gestational age to evaluate the role of NST as a means of antepartum surveillance and in predicting the perinatal outcome. NST was reactive in 70% and non-reactive in 30%.

Perinatal outcome – 13% required NICU admission, mostly due to birth asphyxia. 17% of the babies had APGAR <7, among which majority had non-reactive NST.

VI. Conclusion

NST has a major role to play in the currently existing antepartum case system. Fetal death rate is lower in population undergoing antepartum testing as compared to general untested population. Protocols using adjunctive tests (Biophysical profile, color Doppler) helps to further improve obstetric outcomes.

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