THE NON STRESS TEST IN THE EVALUATION OF FETAL WELL BEING

By

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SUMMARY

Non-Stress tests were performed on 122 consecutive patients attending a high risk pregnancy clinic. The results of NST and Fetal outcome were expressed by scoring systems. The specificity of the NST was found to be 85.6% but sensitivity was only 52%. The negative predictive value was 87.4%. The test is therefore a valuable aid in the management of high risk pregnancies. While a positive stress test is a good predictor of good fetal outcome, a negative test indicates the need for appropriate intervention or close follow-up.

Introduction

Accurate antepartum evaluation of fetal well-being is essential in the management of high risk pregnancies. Evaluation of fetal well being by fetal heart-rate changes in response to fetal movements (Lee *et al*, 1976; Rochard *et al*, 1976) is a rapid, convenient, non invasive method. This is the primary method of antepartum fetal surveillance in most centres. The present study was undertaken to assess the specificity, sensitivity and predictive value of NST in the evaluation of fetal outcome in high risk pregnancies.

Material and Methods

Nonstress test was performed on 122 consecutive patients attending the high risk pregnancy clinic. Each patient was placed in the left lateral position to eliminate aortocaval compression. A Corometrics 112 Fetal monitor manufactured by Corometrics Medical system, Inc. U.S.A. was used to perform the test. The fetal heart rate was recorded using ultrasonic transducer and fetal movements were marked by the patient, by pressing the remote control button.

A six point scoring system modified from Meyer Menk (Pearson, 1981) was used to express the results of non stress testing. This scoring system (Table I) includes baseline fetal heart rate, amplitude of fluctuation (long term variability) and acceleration of fetal heart rate with fetal movements. Positive response was defined as an increment in fetal heart of 10-15 beats/min lasting for 10-15 sec. If the acceleratien of fetal heart rate is less than 10-15 beats/min and or lasts for less than 10-15 sec it is termed 'atypical'. A score of 5-6 was considered to be 'good score' and a score of 3-4 was considered to be a 'bad score'.

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TABLE I
Six Point Scoring System for Non Stress Test

	0	1	2
Baseline FHR	<100 >180	100-120 160-180	120-160
Amplitude of fluctuation	<5	>5 -<10	>10-<25
Acceleration of foetal movement	None	Atypical shape	Positive Response

Fetal outcome was also evaluated using a 15 point scoring system (Table II). Fetal outcome scores of 6 and above denoted a poor outcome whereas score of 5 and below denoted good outcome. The usefulness of the NST score in predicting fetal outcome and its effect on active intervention of pregnancy were analysed. Chi square test and proportion test were used for statistical analysis. Sensitivity, Specificity and predictive value for NST were calculated according to Fletcher *et al* (1982).

Results

The indication for NST in the patients studied are shown in Table III. In 45%

TABLE II
Scoring System for Fetal Outcome

	0	1	2	3	4	5
Nature of amniotic Fluid	Clear	Thinly meconium stained	Moderately stained	Thick meconium stained	—	—
Mode of delivery	Spontaneous	Forceps	Caesarean section	—	—	—
One minute Apgar	—	9-10	7-8	5-6	3-4	0-2
5 minute	—	9-10	7-8	5-6	3-4	0-2

TABLE III
Maternal Risk Factors

	No.	%
1. Elderly Primi	4	3.28
2. Teenage Primi	9	7.38
3. Family history of diabetes Mellitus	8	6.56
4. Past history of diabetes Mellitus	2	1.64
5. Anaemia (Hb. <10.6)	23	18.85
6. Pregnancy induced hypertension	52	42.62
7. Poor weight gain	33	27.05
8. Poor fetal movement	17	13.93
9. Poor metrogram	20	16.39
10. Previous pregnancy wastage	28	22.95
11. Vaginal bleeding	7	5.74
12. Postdatism	13	10.66
13. Rh. Isoimmunisation	1	0.82

only one risk factor was evident, 35% (43) had 2 risk factors while the remainder (20%) had more than 2 risk factors. While 48.5% of the patients delivered spontaneously, 20.5% had forceps delivery and 31% were delivered by Caesarean section. As indicated in Table IV a significantly higher number of patients with a 'good' NST score (5 and 6) had a good foetal outcome ($P < 0.001$) as compared to these with bad NST score.

TABLE IV
Fetal Outcome in Patients With Good and Bad NST Scores

NST Score	Foetal outcome	
	Poor	Good
1. Bad NST score (n = 27)	13 (48.1%)	14 (51.9%)
2. Good NST score	12 (12.6%)	83* (87.4%)

* $P < 0.001$ (Chi Square test).

The specificity of the NST score in predicting good fetal outcome was found to be 85.6% but sensitivity was only 52%. The negative predictive value was 87.4%.

The proportion of patients undergoing active obstetric intervention proved to be significantly higher in women with bad NST scores ($P < 0.05$, Table V) than in women with good NST scores.

TABLE V
Proportion of Patients With Active Intervention in the 2 Groups

NST score	% with active intervention
1. Good NST score (n = 95)	38.9%
2. Bad NST score (n = 27)	*66.67%

* P(<0.05 (Chi square test).

Discussion

The maternal risk factors in our patients are comparable to those in other studies (Krebs and Petis *et al*, 1978, Nochimson *et al*, 1978). As expected, the abnormal delivery rate was high in this group of women with high risk pregnancies.

Non stress tests are usually classified as 'reactive and non reactive', based purely on fetal heart rate accelerations (Rochard *et al*, 1976).

The failure to take other important factors like baseline fetal heart rate and variability into account may be responsible for the lower positive predictive value of the test (Lenstrup and Haase, 1985). This use of a scoring system ensures detailed analysis of the graphs and also standardises reporting.

In a large multicentric study, the corrected stillbirth rate in high risk pregnancies within one week of reactive NST was only 1.9/1000 (Freeman *et al*, 1982) indicating that the test has high specificity. In our study also the specificity was 85%. However the sensitivity of the test is low (52%).

In this study, a good NST score was found to be associated with good fetal outcome in 87.4% of patients—giving a high negative predictive value. This compares well with the results of other studies ranging from 92.8% to 99.5% (Devoe *et al*, 1985). In contrast, bad NST scores were predictive of poor outcome only in 48.1% of patients. Previously published studies have also shown a wide range of positive predictive value ranging from 11.5 to 85.7% (Devoe *et al*, 1985). Early active obstetric intervention on a higher proportion of patients with bad NST score (Table V) explains this. The test assesses fetal status at the time it is

performed, but fetal outcome is also affected by intrapartum factors like abruption, prematurity and birth injuries which cannot be predicted by NST. Therefore false negatives do occur in a small proportion of patients (Lenstrup *et al*, 1985).

In conclusion, we find that a good NST score is reassuring: a bad NST score indicates a need for reevaluation and/or obstetric intervention. The low sensitivity and positive predictive value may be improved by performing the test biweekly (Barss et al, 1985). Contraction stress test and fetal biophysical profile (Manning *et al*, 1984) are indicated in patients with abnormal NST.

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