

NON-STRESS TEST IN HIGH RISK PREGNANCY

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SUMMARY

Antepartum foetal evaluation was done in 100 high risk pregnancy women by Non-Stress Test (NST). Among 88 women with reactive pattern, all babies had good 5 min. Apgar with no perinatal death. The non-reactive NST had high false positivity (60%). Contraction stress test (CST) was done on 8 non-reactive NST patients using nipple stimulation - 6 patients with negative CST had good perinatal outcome and 2 patients with positive result had poor outcome with one perinatal death.

The NST had high sensitivity and specificity but poor positive predictive value indicating that all non-reactive NST should be further evaluated by a repeat NST or CST.

INTRODUCTION :

Over the last two decades a number of methods were evolved to assess foetal health during antepartum period. Among these, the biophysical tests like contraction stress test (CST) and Non-Stress Test (NST) have gained popularity in the antepartum evaluation for utero-placental insufficiency.

Because of certain contra indications for CST, recently much attention has been focussed on NST. It has been evaluated retrospectively and by analysing the results during baseline recording of stress test (Evertson et al, 1979). For CST, Huddleston et al (1984) used 'breast (nipple) stimulation' instead of oxytocin to induce uterine contractions.

This preliminary prospective study to analysis

the role of NST in predicting foetal outcome was undertaken before it became a 'routine' in all high risk pregnancies in our Institution.

MATERIALS AND METHODS :

NST was performed on 100 high risk pregnant women admitted to JIPMER Hospital, Pondicherry from April 1986 to March 1987. The test was done with the patient in semi-Fowler's position with a lateral tilt to prevent 'Aorto caval compression'. The recording was done by 'corometrics fetal monitor' which works under Doppler principle. Each patient was monitored for 15 min.

Foetal heart rate (FHR) tracings observed during the NST were classified into 4 categories.

I Reactive : When there were atleast 3 foetal movements - each associated with FHR acceleration of atleast 15 beats per min (BPM)

and lasting for 15 sec.

II Non-reactive : With each movement none of the criteria for reactive NST were met; or, no acceleration and poor variability were noted.

III Sinusoidal : A smooth undulating FHR pattern with a frequency of 2-5/min and amplitude of 5 - 15 BPM.

IV Unsatisfactory :

- a) acceleration of < 15 BPM or, for <15 sec.
- b) acceleration not associated with movement.
- c) No movement/tracing inadequate to draw definite conclusion.

Reactive NST was carried out weekly till delivery. Non-reactive and unsatisfactory NST was either repeated the next day or was subjected to CST using breast stimulation depending on the urgency of the situation. Breast stimulation test (BST) was interpreted as negative, positive and equivocal as per Schifrin et al (1975). The patients were followed through delivery and post partum period and perinatal outcome was correlated with test results.

The average time taken to complete NST was 15 min. and for CST it was 50 min. The patients were evaluated from as early as 34 weeks of gestation.

OBSERVATIONS AND DISCUSSION :

A total of 196 NST's and 16 CST's were performed on 100 women, with an average of 2.1 tests per patients and 1.9 NST's per patient.

INDICATIONS : (Table I)

The commonest indication for testing in the present study was bad obstetric history (27%) followed by post dated pregnancy (20%) and PIH (14%). Only 1% had diabetes complicating pregnancy. This was in contrast to the study of Phelan (1981) in which 42% were past dates and 10% were diabetes with pregnancy.

RESULTS OF NST : (Table II)

Out of 196 NST tracings, 155 (79.1%) were

TABLE - I

Indications for Monitoring

Indication	No. of patients and %
Bad Obstetric History	27
Postdated pregnancy	20
Pregnancy induced hypertension	14
Cardiac disease	10
Essential hypertension	6
Loss of foetal movements	6
Rh Sensitization	5
Diabetes mellitus	1
Miscellaneous (IUGR, Placenta Praevia, Prev. LSCS, Medical Disorders, etc.)	11
Total	100

TABLE - II

Results of NST (100 Patients)

Interpretation	No. of Tests	Percentage
Reactive	155	79.1
Non-reactive	26	13.3
Unsatisfactory	14	7.1
Sinusoidal	1	0.5
Total	196	100.0

reactive and 26 (13.3%) were non-reactive. These results were comparable to those of Nochimson et al (1978), and Keegan and Paul (1980). But the number of unsatisfactory NST is very high (7.1%) in the present study. This could be due to the criteria of "3 accelerations in 15 min" and non use of "foetal stimulation".

NON-REACTIVE AND UNSATISFACTORY NST :

When the 26 non-reactive NST were subjected to repeat NST - 23% showed reactive. This observation was similar to that of Lenke and Nemes (1984). But Devoe (1980) and Keegan and Paul (1980) obtained about 50% reactivity with repeat test.

Thirteen out of 14 unsatisfactory NST were subjected to repeat NST - 11 of them showed reactive and 2 non reactive pattern. One went into labour before the test could be repeated.

CONTRACTION STRESS TEST (CST) :

The results of 16 CST done on 12 patients of non-reactive NST are shown in Table III. The negative CST were followed by weekly NST. Positive CST were further evaluated by other means or labour was induced depending on the condition.

TABLE - III

Results of CST on 12 Patients (16 Tests)

Interpretation	No. of Tests	Percentage
Negative	13	81.2
Positive	2	12.5
Equivocal	1	6.3
Total	196	100.0

CORRELATION WITH PERINATAL OUTCOME :

The last test results of NST/CST within a week of delivery are shown in Table IV. The patient with unsatisfactory NST went into labour before the test could be repeated and delivered a healthy infant with good Apgar score. The patient who showed sinusoidal pattern (but good baseline variability) was a Rh negative woman who also delivered a baby with good Apgar score.

TABLE - IV

Last Test Results (Within a week of Delivery)

NST (100) :		
Reactive	:	88
Non-reactive	:	10*
Unsatisfactory	:	1
Sinusoidal	:	1
CST (8) :		
Negative	:	6
Positive	:	2

* 8 of these patients had CST.

Of the 88 reactive NST patients 6.8% had babies with low 1 min. Apgar (< 7/10) but all had good scores at 5 min. There was no perinatal death (Table V). The false negativity of the test (false reactive) is zero. Similar observations were made by Evertson et al, 1979 (1%) and Weingold et al, 1980 (0.7%).

Out of the 10 patients with non-reactive NST (Table V) 4 had babies with low Apgar scores at 5 min. - one of these babies had multiple soft tissue anomalies and could not be revived. Two other babies had low 1 min. Apgar but 5 min. scores were good. In total, babies of 6 of these non-reactive patients were in fact not compro-

TABLE - V

Perinatal Outcome and NST Results

NST Result	APGAR Scores at				Perinatal death	
	1 min		5 min		S.B.	Early NND
	< 7	> 7	< 7	> 7		
Reactive (n = 88)	6 (6.8 %)	82 (93.2%)	0	88 (100%)	0	0
Non-reactive (n = 10)	6 (60%)	4 (40%)	4*	6 (60%)	0	1

* 1 was NND
S.B. : Stillbirth
NND : Neonatal death

mised. The false positivity (false non reactive NST) was 60%. In the literature, the false positivity was reported to be over 50% in 75% of the studies (Thacker and Berkelman, 1986). The reasons for high false positivity may be foetal sleep, maternal medication etc. as proposed by Weingold et al (1980).

The sensitivity and specificity of NST were very high (Table VI). The negative predictive value was high but the positive predictive value (PPV) was low (40%). These indices are similar to those reported by Keegan and Paul (1980). In a review of 28 studies by Devoe et al (1985) the

mean PPV was 39%. The PPV could be improved by using scoring system Krebs & Petres, 1978) or by increasing the test period (Brown & Patrick, 1981).

It appears from this study that reactive NST is assuring and can be repeated weekly. The non-reactive NST, though associated with high perinatal morbidity is less specific and should be further evaluated by repeated NST or CST.

Eight of the non-reactive patients had CST by breast stimulation - 6 showed negative and 2 positive. Both babies of positive CST had low 5 min. Apgar. One of them born to a diabetic

TABLE - VI

Indices of NST and CST

Test	Sensitivity	Specificity	Positive Pred. Value	Negative Pred. Value
NST	100%	93.6%	40%	100%
CST	100%	100.0%	100%	100%

mother survived but the other born by LSCS to a mother with 4 weeks post dates, oligohydramnios and unfavourable cervix died immediately after birth (It had multiple soft tissue anomalies).

Of the 6 CST negative patients, though 2 had babies with low min. Apgar, all had good scores at 5 min. and these was non perinatal death. In the present study CST had 'Zero' false negativity, whereas Evertson et al (1979) and Druzin et al (1980) in their large studies had false negativity of 2.7% and 1.7% respectively.

Breast (nipple) stimulation was chosen in the present study (instead of Oxytocin) as it is less time consuming, easy to perform and no expense is involved. Capeless and Mann (1984) found that BST was in no way inferior to OCT. The average time taken to induce uterine contractions was 10 min. and to complete the test was 50 min.

In conclusion it may be said that NST is a simple, fast, reliable and non invasive method. It can be used to screen a large number of patients in busy hospitals of our country with large number of high risk pregnancies but with lack of facilities and time for a complete biophysical profile.

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REFERENCES :

1. Brown R. and Patrick J. : *Am.J.Obstet. Gynec.* 141 : 646, 1981.
2. Capeless E.L. and Mann, L.I. : *Obstet. Gynec.* 64 : 641, 1984.
3. Devos L.D. : *Am.J. Obstet. Gynec.* 137 : 983, 1980.
4. Devos L.D., Castillo, R.A. and Sherline, D.M. : *Am.J. Obstet. Gynec.* 152 : 1047, 1985.
5. Druzin M.L., Grustacos J. and Paul R.H. : *Am.J. Obstet. Gynec.* 137 : 746, 1980.
6. Evertson L.R., Gauthier R.J., Schifrin B.S. and Paul R.H. : *Am.J. Obstet. Gynaec.* 133 : 29, 1979.
7. Huddleston J.F., Suliff G. and Robinson D. : *Obstet. Gynec.* 63 : 669, 1984.
8. Keegan K.A. and Paul R.H. : *Am.J. Obstet. Gynec.* 136 : 75, 1980.
9. Krebs H.B. and Petres R.E. : *Am. J. Obstet. Gynec.* 130 : 765, 1978.
10. Lenke R.R. and Nemes J.M. : *Obstet. Gynec.* 63 : 345, 1984.
11. Nochimson, D.J., Turbeville, J.S., Terry J.E., Petrie R.H. and Lundy L.E. : *Obstet. Gynec.* 51 : 419, 1978.
12. Phelan J.P. : *Am. J. Obstet. Gynec.* 139 : 7, 1981.
13. Schifrin B.S., Lapidus M., Doctor, G.S. and Leviton A. : *Obstet. Gynec.* 45 : 433, 1975.
14. Thacker S.B. and Berkelman R.L. : *Obstet. Gynec. Surv.* 41 : 121, 1986.
15. Weingold A.B., Yonekura M.L. and O'Kieffe, J. : *Am.J. Obstet. Gynec.* 138 : 195, 1980.