

ANTEPARTUM FETAL HEART RATE MONITORING NON STRESS TEST

by

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Introduction

In 1906 Cremer was the first who recorded fetal electrocardiograms from abdominal and vaginal leads. Hon and Wohlgemuth in 1961 reviewed its clinical application. Fetal heart rate reactivity as an indicator of fetal well being was suggested by Hammacher (1969) and Kubli and Kaiser (1969). It has been estimated that approximately one third of the fetal deaths occur during intrapartum period and to prevent these fetal deaths many tests have been devised to determine antepartum fetal well being. In United States, antepartum test was designed to stimulate the uterine activity of labour and evaluate fetal heart rate response in the form of late deceleration in compromised fetus and this is the basis of contraction stress test (CST). After a long search of non-invasive, accurate and convenient method, antepartum fetal heart rate monitoring as a non stress test (NST) is now a days in routine practice to evaluate fetal well being.

Material and Method

The present study was done in the Department of obstetrics and gynecology at Hirosaki medical school during author's one year stay over there. Two hundred cases of pregnancy who had no other problem except mild degree of anaemia were

selected for this study. All patients were referred from antenatal clinic. The test was performed in NST room specially prepared for that, by using fetal heart rate monitor model FHM-602 of Terumo company made in Japan (Fig. 1). Before performing the test, pulse and blood pressure were noted. Tests were performed on patients in a semi Fowler's position on a comfortable bed. Fetal heart was located with the help of Doppler or Ultrasound transducer. A tocodynamometer was applied to the fundus to gauge the uterine and fetal activity. The duration of test range from 10 minutes to maximum 40 minutes (min). All tests were started at 38 weeks of pregnancy and continued weekly till their date of delivery and followed by NST protocol. Fetal movement was recorded on the lower channel by supplying the event marker provided with the monitor, and patients were instructed to push the marker as soon as fetal movement felt. This was recorded on the lower channel as a mark of dash (—). If spontaneous fetal activity was not observed, stimulation in the form of manual manipulation of uterus and fetus was done to avoid non-reactive pattern caused by sleeping state. In few cases change of maternal position was also done for stimulation. Interpretation of NST was done according to Evertson's criteria (Figs. 2, 3).

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Reactive NST

Presence of two or more accelerations

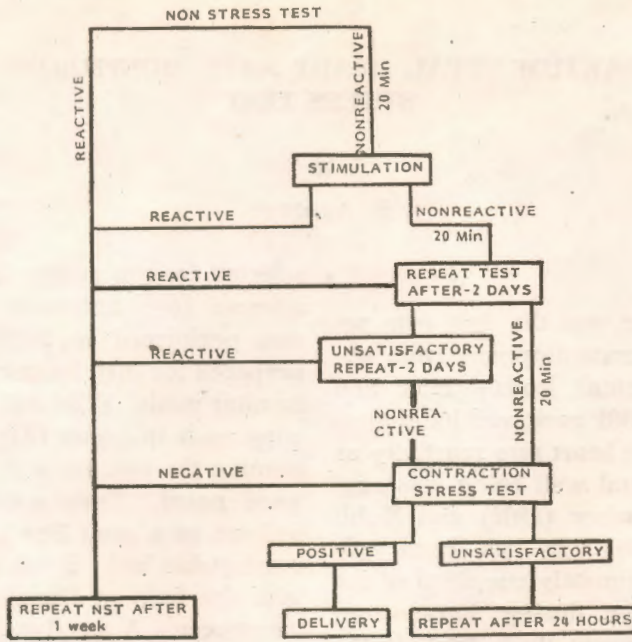


Figure 2. Non stress test protocol.

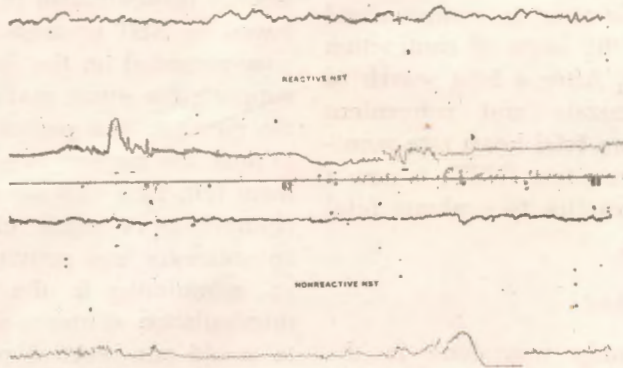


Figure 3. Non stress test showing reactive and non reactive NST.

in 20 min recording was interpreted as reactive pattern. Accelerations were defined as an increase of at least 15 beats per min (BPM) above the base line last-

ing atleast for 15 seconds. If there were less than 2 accelerations, stimulation was applied for 1 min and recording continued for another 20 min.

Non-reactive pattern

When criteria for a reactive NST were not met the test was defined as a non-reactive NST. All these cases had repeat NST after 2 days and if the non-reactive pattern persisted their follow up was done according to the NST protocol.

Sinusoidal pattern

When non-reactive pattern are superimposed by periodic oscillations it is known as sinusoidal pattern.

Combined pattern

Combination of reactive and non-reactive patterns.

Results

TABLE I
Non Stress Test Results

NST Results	No. of cases	Percentage
Reactive Pattern	185	92.5%
Non-reactive Pattern	15	7.5%

Total 200 cases of normal pregnancy were observed for NST during this study which included 62 cases of primiparas and rest multiparas. Out of 200 cases non-reactive pattern was observed in 15 cases (7.5%) and reactive pattern in 185 cases (92.5%). Fetal stimulation was done in 30 cases. Total 500 NST's were done out of which 55 NST's were done on 15 cases of non-reactive pattern.

In reactive NST group fetal distress at the time of delivery was in 22 cases (11%). Three cases had fetal distress due to outlet dystocia, 5 had transverse arrest of head and rest had cord factor involvement. This was shown at the time of delivery in form of variable and late deceleration in intra partum monitoring. Twenty cases had vaccum extraction deli-

very. Two cases of this group required cesarean section for fetal distress and 1 had forceps delivery.

TABLE II
Non reactive NST Findings

Non-reactive NST findings	No. of cases
1. Short duration of acceleration + decreased variability	7
2. Short duration of acceleration + decreased variability + Tachycardia	2
3. Variable deceleration with decreased variability	2
4. Late deceleration with decreased variability	4
Total	15

In non-reactive NST group, 3 patients were only non-reactive at 39 weeks of gestation and became reactive at their follow up examinations. Twelve cases were non-reactive at their first examination at 38 weeks of pregnancy and remained non-reactive at their follow up examinations. Two cases of this group progressed to late deceleration at their follow up examinations for which caesarean section was done. Vaccum extraction was done in 8 cases (53.2%), rest of them had spontaneous delivery. As shown in Table II most common non-reactive pattern observed was short duration of acceleration and decreased variability with or without variable or late deceleration. All patients delivered within 7 days of their last NST examinations except 3 who were absent on their last weekly examination date following their deliveries due to some private reasons. Contraction stress test (CST) was done in all non-reactive group and found to be negative in all cases. Fetal distress was 66.6% in non-reactive group as compared to 13.2% in reactive group. No perinatal mortality was observed in

both the groups. Sinusoidal pattern was not observed during this study.

Discussion

Antepartum fetal heart rate monitoring is one method of fetal assessment in a routine practice in the Deptt of obstetrics and gynecology at Hirosaki medical school. With an extensive approach of NST's it is already a established fact that a non-reactive NST is at much higher risk of perinatal mortality than a fetus with reactive pattern. The protocol of NST was remodified and instead of every non-reactive NST followed by CST they were examined more frequently than weekly interval and only persistently non-reactive NST's were followed by CST. All reactive NST's were followed by weekly examinations. The interpretation of NST's were done by Evertson and Paul (1978) latest criteria as acceleration of 2 or more in 20 min recording of atleast 15 beats per min and of 15 sec. According to this schedule all non-reactive NST's were followed by repeatative examination after every 2 days as shown in NST protocol. This reduces the need of CST in every case as CST is time consuming, costly and requires the presence of a physician who is able to interpret it accuretly and promptly. At times it also leads to premature labour and hypertonus of uterus which stretches the fetus and lead to emergency delivery. It is concluded that our revised protocol decreases the need of unnecessary CST's and managed patients equally well by screening with a simplified NST.

Hammacher (1969) first advised an acoustic and mechanical stimulus should be used when silent and narrow undulatory pattern is observed to insure that fetus is not sleeping. Thus introduction of NST approach combined with fetal stimulation expanded its clinical application. In

this series, 30 cases required stimulation and after that followed by reactive pattern as compared to previous non-reactive pattern. This reduces the unnessesary worries of both patients and physicians and their managment. It is stated that improved instrumentation greatly enhances the quality of fetal heart patterns and during this observation the use of new machinary provides accurate interpretation of all NST's and no NST was found to be classified as unsatisfactory.

In non-reactive group most common finding was reduced variability with or without decelerations. It was already observed that decreased variability sometimes seen in normal term pregnancy without any hazard. In cases of compromised fetus this decreased variability was in association with short duration of acceleration, decreased acceleration or variable or late decelerations followed by uterine contractions. Reduced variability as a sign of unfavourable condition was first reported by Mondaulon *et al* (1977). A significance of lack of acceleration and decreased variability has been reported by Evertson and Paul (1978), Lyon (1979) and they found it to be associated with increased perinatal mortality. Out of 15 cases of non-reactive group, only 2 babies were under 2500 gm weight and both were well at their time of discharge from the hospital. 66.6% fetal distress was observed in non-reactive group as compared to only 13.2% in reactive group. Reactive NST provides satisfactory indication of fetal well being in low-risk as well as high-risk patients. There are more chances of operative and instrumental delivery in non-reactive group as compared to reactive group. Non-reactive NST's were followed up more frequently than Keegan series (1980). Evertson (1978) and Keegan and Paul (1980) observed

6.5/1000 still birth rate during their non-stress test series. In present series no perinatal mortality was observed and this is explained on the basis that only low-risk patients were included in this series, secondly all the non-reactive NST's were detected and managed timely.

It is concluded that reactive NST with good variability are a reliable sign of fetal well being. Non-reactive NST is a warning sign of compromised fetus. Non-reactive NST with negative CST has less danger to fetus than a non-reactive NST with positive CST.

Summary

Two hundred cases of normal pregnancy were examined for Non stress test (NST) from 38 weeks onwards weekly till their date of delivery. The interpretation of NST's were done by Evertson's criteria. Fifteen cases of non-reactive and 185 cases of reactive pattern of NST were observed. 66.6% of fetal distress was observed in non-reactive group as compared to 13.2% only in reactive group. Perinatal mortality was 0%. Reactive NST is predictive of good fetal outcome. Non-reactive NST's should be followed up more frequently than weekly interval and CST

is only advised in repeatative non-reactive NST's. Routine use of NST to evaluate the fetal well being is advised.

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See Fig. on Art Paper II