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RESEARCH ARTICLE

A STUDY OF FETAL OUTCOME IN PREGNANCY BEYOND 40 WEEKS USING FETAL HEART RATE MONITORING WITH NONSTRESS TEST

***Dr. Supriya Mahajan**

India

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ABSTRACT

Objectives: Postdate pregnancy is the most common indication for Antepartum fetal heart rate testing because of its increased perinatal morbidity and perinatal mortality. It has long been recognized that the risk of adverse fetal outcomes, such as stillbirth, meconium aspiration, asphyxia, and the dysmaturity syndrome, is increased as gestational age progresses beyond 42 weeks.

Materials and Methods: 55 patients with pregnancy beyond 40 weeks attending antenatal out-patient department of the Rajiv Gandhi medical college in the period between October 2014 to march 2015 were included. In present study, patients were monitored with twice weekly NST. In those with either NST nonreactive, induction was done. Cases with normal results were monitored till 42 weeks when routine induction was done.

Results: A reactive nonstress test in prolonged pregnancy has good negative predictive value – i.e. adverse outcomes are unlikely to occur in the setting of a reactive non-stress test – but that the positive predictive values are low. Out of 55 patients, 71.2% went into spontaneous labour and remaining were induced. Five were induced when they reached 42 weeks, remaining were induced for abnormal NST. LSCS was done in 9 Cases (60%) in induced group. There was high incidence of caesarean section in induction group as compared with those who went into spontaneous labour. Out of 55 patients, 33 delivered vaginally (60%) of which most (50.9%) had spontaneous vaginal delivery. In three patients forceps was applied for prolonged second stage and in two patients prophylactic forceps for previous LSCS. Caesarean section was done in 22 patients (40%). Three were elective LSCS, one for breech presentation and two for previous LSCS. Most common indications for caesarean section were fetal distress (12 cases) and failure to progress (7cases) Of 72 NST, performed on 55 patients, 16 (22.3%) were nonreactive and 56(77.7%) were reactive. Reactive NST is reassuring and indicates fetal wellbeing. butnon reactive NST alone cannot be taken as an indicator of fetal jeopardy. The sensitivity and specificity of NST is 60% and 82.5% for Apgar<7 at 5 minute, 66.6%and 78.2% for NICU admission, 55% and 82.5% for Apgar<7 at 5 minute, 66.6% and 78.2% for NICU admission, 55% and 85.7% for meconium staining respectively. NST reactivity is statistically significant in predicting Apgar>7 at 5 minute, necessity of NICU admission and meconium passage.

Conclusion: Reactive NST is reassuring and indicates fetal wellbeing, but non reactive NST alone cannot be taken as an indicator of fetal jeopardy. Although individual randomized trials do not show significant differences in perinatal mortality between women electively induced at specific gestational ages and women followed with antepartum testing, data shows significant increase in abnormal fetal outcome after 41 weeks.The presence FHR decelerations during and NST was associated with a less favourable outcome for the fetus.

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INTRODUCTION

The "normal" length of gestation has traditionally been defined as 40 weeks or 280 days, after the first day of the last menstrual period. This figure is used to calculate the "estimated date of confinement" or "due-date". Post-dated pregnancy is gestation longer than 40 weeks or 280 days. Post-term pregnancy is defined by the American College of Obstetricians and Gynaecologist (ACOG) as a gestation longer than 42 weeks or 294 days, from the onset of the last menstrual period.

It has long been recognized that the risk of adverse fetal outcomes, such as stillbirth, meconium aspiration, asphyxia, and the dysmaturity syndrome, is increased as gestational age progresses beyond 42 to 43 weeks.

The different tests for assessing fetal wellbeing are

- Maternal measurement of fetal movement.
- Non-stress test (NST)
- Contraction stress test (CST), using either nipple stimulation or oxytocin.
- Aminotic fluid measurements.

**Corresponding author: Dr. Supriya Mahajan, India.*

- Biophysical profile, using either five measures (reactive NST, breathing, tone, movement, amniotic fluid) or two measures (NST, amniotic fluid).
- Doppler measurements of umbilical, uterine or fetal cerebral blood flow.

However, not one test is completely accurate in predicting fetal distress. Doppler method is relatively recent and as it measures directly blood flowing to the organs has more expectations about accuracy. In the present study we have evaluated the usefulness of widely used NST in predicting fetal distress in pregnancy beyond 40 weeks.

NST is the most commonly employed antepartum evaluation test for the fetal Wellbeing.

The rationale underlying this test is that the presence of spontaneous fetal heart rate acceleration (FHR) associated with fetal movements is an indicator of fetal wellbeing

Advantages

1. Noninvasive
2. Outpatient procedure
3. Inexpensive
4. Simple
5. Easy to perform
6. Physician is not necessary
7. Trained personal is sufficient
8. Less time consuming
9. Easily accepted by Patients
10. Can be repeated

Indications

1. Postdate pregnancy
2. Chronic Hypertension
3. Decreased fetal movement
4. Hypertensive disease of pregnancy
5. Insulin dependent diabetes (A-D)
6. PIH
7. Suspected Fetal dysmaturity
8. Rhisoimmunization.
9. APH
10. Sickle cell anaemia

The following is as set of criteria for interpretation of the NST

1. **Reactive:** Two acceleration of 15 beats per minute lasting 15 seconds associated with fetal movement, twenty minutes of observation. If this criteria are not met, stimulation by motion sound (vibro acoustic by using artificial larynx) or glucose ingestion can be employed.
2. **Suspicious test:** Less than two accelerations (15 bpm, 15 secs) with movement, or accelerations but un associated with movement.
3. **Non-Reactive:** None of the criteria for reactive tests, met no acceleration and often poor variability.
4. **Uninterpretable:** Insufficient data obtained during testing period. Depending on the test results:

Reactive-Evaluation weekly until delivery

Non-reactive-To be followed by a OCT or CST
Suspicious NST-Further evaluation by repeat NST within 24 hours or CST

Uninterpretable-Requires further test of feta wellbeing (i.e., BPP or CST). Present study is conducted in a Rajiv Gandhi medical college and Chhatrapati Shivaji Hospital, thane from october 2012 to march 2015 where tertiary obstetric care and neonatal care is available. 55 patients with pregnancy beyond 40 weeks attending antenatal out-patient department of the hospital or referred from outside for suspected prolonged pregnancy were included in the study.

All patients with pregnancy beyond 40 weeks from L.M.P. were selected when

1) Women were sure of the dates and the dates correlated with clinial findings of 1st ANC examination done before 12 weeks.
2) Women were unsure of dates but clinical findings and ultrasonographic records in first half of pregnancy corresponded well.

Inclusion criteria

(1) Pregnancy beyond 40 weeks
(2) Gestational age established by
  (a) L.M.P. – Women sure of dates and minimum three previous regular menstrual cycles.
  (b) Ultrasound examination in first half of pregnancy
  (c) Findings of first clinical examinations before 12 weeks.

Exclusion criteria

(1) Pregnancies complicated by P.I.H.
(2) Congenital anomalies of fetus.
(3) LMP not known and first half of pregnancy USG not available.
(4) Twin pregnancy
(5) IUGR

All patients underwent non-stress testing as primary method of antepartum surveillance. Non-stress test (NST) was performed on all patients at 40 weeks or after whenever they got admitted. The NST was performed postprandially. The patient was given supine position with pillow under one hip, to prevent aortocaval compression. Transducer was fastened to maternal abdomen at the previously confirmed site of fetal heart sounds. Tracing was taken for at least 20 minutes. Mother was instructed to press the marker whenever she perceives the fetal movement. After tracing was over it was studied critically to label it reactive or nonreactive. A test was considered reactive if there were two or more fetal heart rate accelerations of more than 15 beats per minute and lasting 15 second in a 20 minutes period. If there were no movements within 20 minutes testing was continued for 40 minutes. A test was considered nonreactive if there were not two acceptable fetal heart rate accelerations in any given 20 minute period of observation for a total of 40 minutes.

While labelling non-stress test as reactive or nonreactive, other variables were also taken into consideration (according to criteria laid down by Phelan *et al*., 1984)

1) Baseline fetal heart rate – normal baseline heart rate was considered as 120-160 heats per minutes.
2) Variability – Beat to beat variability of 2-3 beats was considered as normal.
3) Presence or absence of accelerations with movement (as defined previously)
4) Presence or absence of bradycardia or decelerations.

Bradycardia as defined as a decline of 110 beats per minute or less. Decelerations were defined as a decline in the heart rate of 15 beats per minute or more lasting 15 seconds in response to a fetal movement. All patients with reactive NSTs were followed by repeated non-stress biweekly till they went into spontaneous labour or were induced at 42 weeks.

Table 1. Age

Age (years)	No (n=55)	%
-20	15	27.2
-25	25	45.5
-30	12	21.8
-35	3	5.5

Table 2. Gravidity

No	Gravida	No of patients	%
1	Primi	28	50.9%
2	Second	14	28%
3	Third	8	12.1%
4	Fourth	5	12.1%

Table 3. Onset of labour

Onset of labour	No n=55	LSCS
Induced	15 (28.8%)	9 (60%)
Spontaneous	37 (71.2%)	10 (27%)
Elective LSCS	3(5.4%)	

Table 4. Mode of delivery

Mode of delivery	No n=55	%	Induced	Spontaneous
Vaginal	33	60%	6	26
Normal	28	50.9%	5	22
Forceps	5	9.1%	1	4
LSCS	22	40%	10	13

Table 5. Gestational age at delivery

Gestation at delivery(weeks)	No	Apgar<7 at 5 min	NICU admission	Meconium staining
40-	16	1(6%)	1(6%)	5(31.2%)
41-	33	11(33.3%)	7(21.2%)	12(36.3%)
42-	6	3(50%)	1(16.6%)	2(33.4%)
Total	55	15	9	20

Table 7. NST results

NST results	No (%)
NR	16(22.3%)
R	56 (77.7%)
Total	72

Table 8. NST and neonatal outcome

NST result	Apgar<7 at 5 min	NICU admission	Meconium staining
NR (n=16)	9 (56.2%)	6(37.5%)	11(68.7%)
R (n=39)	6 (15.3%)	3 (7.6%)	9 (23.0%)

Table 9. Prediction by NST

Prediction of	Sensitivity	Specificity	PPV	NPV	Odds ratio	P value
Apgar<7 at 5 min	60%	82.5%	56.25%	84.6%	7.07	0.005
NICU admission	66.6%	78.2%	37.5%	92.3%	7.02	0.0129
Meconium staining	55%	85.7%	68.7%	76.9%	7.33	0.039

DISCUSSION

In present study, 55 women with pregnancy of more than 40 weeks gestation were studied. They prospectively evaluated the usefulness of NST and Doppler artery flow velocimetry for identifying postdate fetuses at risk. The risk of perinatal death decreases with advancing gestational age until some point between 38 and 41 weeks, when it begins to increase again. The gestational age at which the risk begins to increase and the degree of risk involved have been subject to a reconsideration. In present study, primigravidae show high tendency towards prolonged pregnancy (Table 2). The incidence of postdated pregnancy was found to be 50.9% in primigravida, 28% in second gravida, 12.1% in third gravida and 9% in fourth gravida. The incidence of caesarian section in present study was 40%. Most common causes for LSCS were fetal distress and failure of induction. More than 60% of the patients induced underwent caesarian section. This may be because of poor Bishop's score and unengaged vertex at the time of induction. These findings are supported by Alexander and associates (2000) and Shin (2004). Bodner –Adler (2005) found that the frequency of caesarean delivery and vacuum extraction was also significantly higher in the induction group (p=0.0001). Hannah *et al.* (1996) found that the caesarean section rate was significantly increased in women randomized to expectant management who were induced (42.0%). These women were significantly more likely to be nulliparous, to have a closed cervix at the onset of labour, and to have a longer interval from induction to delivery. When compared with the expectantly managed women in spontaneous labor, they had significantly higher caesarean section rates for fetal distress or dystocia.

The was no prenatal mortality in present study. We believe that the absence of perinatal deaths is due to exclusion of patients with preeclampsia and no cases of intrauterine growth restriction. Only 5(9%) patients showed evidence of post maturity syndrome.

Table 5 shows that poor neonatal outcome was mostly seen in patient who delivered after 41 weeks (33.3% had Apgar<7 at 5 min, 21.12% required NICU admission and 36.3% had meconium staining). This may be because of higher incidence of oligohydramnios and passage of meconium after 41 weeks. Walker and Turnbull (1953) have stated that from 41 onwards there is diminution in oxygen supply in umbilical vein which

leads to fetal anoxia and this is responsible for three fold increase in un-explained deaths in comparison to anoxic deaths at term. The perinatal mortality rate (i.e. stillbirths plus neonatal deaths) approximately doubles by 42 weeks gestations and is four to six times greater at 44 weeks. These findings are supported by the Cochrane review of 19 RCTs that found that routine labour induction at 41 weeks gestation resulted in lower perinatal mortality rates. Meconium – stained amniotic fluid was more common in the expectant management group. In a more recent meta-analysis of 16 RCTs comparing induction at 41 weeks versus expectant management, the induction group had lower caesarean delivery rates. A non-significant reduction in perinatal mortality rates also was found in the induction group. The society of Obstetricians and Gynecologists of Canada (SOGC) issued guidelines in 1997 encouraging the routine induction of labour at 41 week's gestation. Alexander *et al* (2000)[1], reviewed 56,317 pregnacies delivered at 40 weeks or more, the rate of caesarean section for dystocia and fetal distress was significantly more at 42 weeks compared with that of earlier deliveries. The incidence of neonatal seizures and deaths doubles at 42 weeks. Usher and colleagues (1998) reported perinatal death rates of 1.5, 0.7, and 3 per 1000 for 40,41 and 42 weeks respectively, Sanchez-Ramos et at in 2003 compared routine labour induction with expectant management for patients who reach or exceed 41 week's of labor for postterm pregnancies. They Concluded that a policy of labour induction at 41 Week's gestation for otherwise uncomplicated singleton pregnancies reduces caesarian delivery rates without compromising perinatal outcomes.

In our view a large randomized trial should be conducted. In present study, patients were monitored with twice weekly NST. In those with either NST nonreactivel, induction was done. Cases with normal results were monitored till 42 weeks when routine induction was done. Of 55 babies, 15(27.2%) had weight between 2000 gm – 2500 gm, only 2 babies had weight more than 3500 gm. It is because average birth weight of Indian babies at term is less than western babies.

In present study, 22.3% NST's were non reactive. Fetal outcome with respect to Apgar score at 5 minutes (less than 7-abnormal), NICU admission and presence of meconium was correlated with NST and Doppler. Non reactive NST was significantly associated with Apgar<7, NICU admission and meconium staining of amniotic fluid. The sensitivity and specificity of NST is 60% and 82.5% for Apgar<7 at 5 minute, 66.6% and 78.2% for NICU admission, 55% and 85.7% for meconium respectively. NST is based on the finding of acceleration of fetal heart rate in response to fetal movement. Dynamic biophysical activities are initiated by a complex integrated mechanism of fetal central nervous system. The presence of normal biophysical activity is indirect evidence that a given portion of central nervous system, that controls the activity is intact and functioning, therefore non hypoxemic. The absence of a given fetal biophysical activity is much more difficult to interpret, since it may be a pathogenic depression or normal periodicity. Fetal heart rate reactivity is most sensitive biophysical activity to hypoxia and the fetus with suboptimal oxygenation usually presents with non reactive NST at intial stage of hypoxia. Presence of late deceleration is an important indicator.

Results of present study suggests that a reactive nonstress test in prolonged pregnancy has good negative predictive value – i.e. adverse outcomes are unlikely to occur in the setting of a reactive nonstress test – but that the positive predictive values are low.

Conclusion

1) Reactive NST is reassuring and indicates fetal wellbeing, but non reactive NST alone cannot be taken as an indicator of fetal jeopardy. Ante partum fetal monitoring has proved to be beneficial in assessing the fetal wellbeing. The non-stress test is a simple noninvasive, time saving and repeatable test. When employed in time the perinatal morbidity and mortality can be reduced. FHR decelerations can also be associated with decreased amniotic fluid in which the umbilical cord is vulnerable to compression.
2) Although individual randomized trials do not show significant differences in perinatal mortality between women electively induced at specific gestational ages and women followed with ante partum testing, data shows a significant increase in abnormal fetal outcome after 41 weeks.
3) There is reduction in perinatal morbidity in women electively induced after 41 weeks compared with women managed with ante partum testing.

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