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Role of vibroacoustic stimulation test in assessment of fetal well being in high risk pregnancy and comparison with nonstress test

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Abstract

Introduction: High risk pregnancies need appropriate surveillance so that timely interventions can be employed and thus bring down the rate of perinatal morbidity and mortality. NST is commonly performed fetal surveillance test. Vibroacoustic stimulation test improves the sensitivity and specificity in high risk pregnancy.

Method & Materials: The study was done on 150 patients with high risk pregnancies fulfilling inclusion criteria. NST and VAST was performed and results were interpreted. The perinatal outcome was noted.

Results: Out of total 150 patients 133 were reactive for both NST and VAST. 17 patients were nonreactive on NST and 7 patients become reactive on performing VAST. However, 10 patients remains nonreactive on both NST and VAST.

Conclusion: VAST is easy to perform, bed side test and cost effective adjuvant to NST, in the antenatal fetal assessment of high risk pregnancy with higher specificity, sensitivity, positive and negative predictive value in predicting perinatal outcome.

Keywords: Vibroacoustic stimulation test, fetal well being, high risk pregnancy, comparison

Introduction

High risk pregnancies need appropriate surveillance so that timely interventions can be employed and thus bring down the rate of perinatal morbidity and mortality. fetal morbidity and mortality is higher in the high risk pregnancy group such as those with prolonged pregnancy, intrauterine growth restriction, hypertension or other risk factor [1].

The test commonly used for antepartum assessment is non stress test (NST) based on fetal heart rate acceleration in response to fetal movement, as a sign of fetal health. fetal heart rate acceleration associated with fetal movement is reflex that is affected by pathological and physiological influences on the fetal brain. The most common physiological condition is the fetal sleep state and most common pathological condition is fetal asphyxia. The main disadvantage with NST is that it has high frequency of false positive rates and interpretation of NST is rely on only one variable [2].

The vibro acoustic stimulation test (VAST) aim to assess the functional state of fetal central nervous system and its reflex, cardiovascular response. The test is based on the observation that the fetal cochlear system get mature enough to appreciate acoustic stimulation from 28 week, and auditory sensations is one of the first to get affected by hypoxia [3]. This is expected to induce a startle reflex in fetus, with subsequent fetal movement and fetal heart rate acceleration [4]. Hence, VAST provides reassurance of fetal wellbeing.

The VAST test offers advantage over NST by lowering both incidence of nonreactive test and testing time. So in order to identify non reacting results and to avoid unnecessary intervention, additional acoustic stimulation is effective [5]. Hence, the present study has been undertaken to study the efficacy of VAST as a test of antenatal fetal surveillance in various high risk pregnancy conditions, its advantage over NST.

Objective

1. To evaluate the effectiveness of VAST in antenatal fetal assessment in high risk pregnancy.
2. To correlate the VAST results with perinatal outcome.
3. To compare the results of VAST and NST.

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Material and method

The prospective observational study was conducted in the obstetrics and gynecology department, NIIMS &R hospital, Jaipur, Rajasthan. Duration of study was for 1 year from March 2016 to Feb 2017.

Inclusion criteria

A total of 150 pregnant women who have consented for the study with high risk factors for fetal morbidity and with gestation period of 34 weeks or more were subjected for the study. High risk factors include:

Post dated pregnancy (>41 weeks to 42 weeks)

Post term pregnancy.

Bad obstetrics history (BOH).

Intra uterine growth retardation (IUGR).

Pregnancy induced hypertension (PIH), preeclampsia.

Gestational induced diabetes (GDM), diabetes complicating pregnancy.

Exclusion criteria

Patients in labor.

Preterm labor.

Multiple gestations

Malpresentations

Case requiring immediate caesarean section for placenta previa or abruption and cord prolapse.

Equipment for fetal heart rate recording was fetal monitor for NST. NST was observed for-basal heart rate, variability,

presence of at least 2 accelerations and absence of deceleration. Acoustic stimulation by Teksonic instrument with sound frequency 80-85 db for VAST. By acoustic stimulation the fetus was stimulated for <3 seconds, if no quantifying acceleration were noted, the stimulus was repeated at 1 min, for maximum 3 times and recording was done for 10 min. The presence of FHR acceleration in response to stimulus was considered as reactive, and the absence of FHR acceleration at the end of 3 stimuli was considered as nonreactive. All the patients were carefully followed during labor to find out pregnancy outcome.

Parameters like meconium stained liquor, non reassuring fetal heart rate pattern, mode of delivery, birth weight, perinatal morbidity & mortality, NICU admission, Neonatal morbidity were noted. Z test was applied for statistical analysis of significance of incidence rate of each parameter. Patients were divided into 3 group:

Group I: Patients with reactive NST and VAST

Group II: Patients with nonreactive NST but reactive VAST

Group III: Patients with nonreactive NST and VAST

Observation

Table 1: Distribution of total cases with reactive and non reactive NST and vast.

Result	NST	VAST
Reactive	133	140
Nonreactive	17	10
Total	150	150

Table 2: Comparison between group I and II:

Pregnancy outcome	Group I (reactive NST and reactive vast) N=133		Group II (nonreactive NST but reactive vast) N=7	
	No	%	No	%
Meconium stained liquor	16	12%	2	28%
Non reassuring fhr pattern	30	22%	2	28%
Low birth weight	50	37%	1	14%
Mode of delivery (operative interference)	26	19%	1	14%
Nicu admission	10	7%	1	14%
Neonatal complication	1	0.7%	0	0.0%
Perinatal mortality	0	0.00%	0	0.0%

Table 3: Comparison between Group I and Group III

Pregnancy out come	Group I (reactive NST and vast) N=133		Group III (nonreactive both NST and vast) N=10	
	No	%	No	%
Meconium stained liquor	16	12%	1	10%
Non reassuring FHR pattern	30	22%	2	20%
Low birth weight	50	37%	2	20%
Mode of delivery (operative interference)	26	19%	3	30%
NICU admission	10	7%	1	10%
Neonatal complication/morbidity	1	0.7%	1	10%
Perinatal mortality	0	0.0%	0	0.0%

Out of total 150 cases 133 (88%) patients were reactive to NST and VAST both throughout the pregnancy, they were included in group I. 7 (4.6%) patients who were nonreactive on NST become reactive on VAST were included in Group II. 10 (6.6%) patients remain nonreactive to both NST and VAST were allotted in group III. Observation were noted and chi square test was applied., P value <0.05 was considered as significant.

In group I total 26 patients, in group II 1 and in group III 3 patients required operative interference. in group I although NST and VAST both were reactive but total 10 patients need NICU admission after delivery.

Discussion

In current study out of total 150 patients 17 patients were nonreactive on NST, when these patients were subjected to VAST 7 patients found to be reactive on VAST. Thus there was reduction in number of nonreactive NST from 17 to 10 nonreactive VAST, During the period of antenatal surveillance in these 7 patients which became reactive on VAST, were continued and out of these 7 only 1 Patient need operative interference and 1 patient need NICU admission after delivery. These findings were coinciding with the previous study done by Imam bano *et al.* (2011), they studied on 100 patients and

concluded that there was statistically significant reduction of number of nonreactive NST from 12% to nonreactive VAST 7%.

In 1986 smith *et al.* [6] performed a retrospective study of analysis of adjunctive use of acoustic stimulation in the study group and found 50% reduction in number of nonreactive test. Consequently a prospective study was done to compare the NST with VAST, in which it was found that the incidence of nonreactive test in control group of NST was 14%, while in the study group was 9%. Chen (1991) studied 103 pregnant women and found a reduction in number of falsely nonreactive NST test from 26 to nonreactive VAST in 0.

Perez-delboy *et al.* [7] studied 113 patients and randomized them into VAST group and NST group. he found that 5 (9.6%) patients subjected to NST alone had persistent nonreactive NST, while no patients in the group subjected to VAST had persistent nonreactive test. (p=0.0002).

Tongsong and piyamongko *et al.* [8] studied the incidence of nonreactive NST which was 13.8% and reduced to 6.8% in VAST group. Due to fetal sleep activity cycles the testing time of NST is also longer. With the application of VAST, there is a reduction of testing time due to modification of behavioral cycle. In present study time of reactivity was not noted.

Serafini *et al.* [9] studied FHR acceleration response to an acoustic stimulation, which was compared to traditional NST in regard to pregnancy outcome as reflected by the incidence of intrapartum fetal distress, meconium stained liquor, 1 and 5 min APGAR score and perinatal mortality. They found that fetus with spontaneous or sound generated reactivity had comparably good outcomes with respect to all outcome measures investigated. Fetus which lacked spontaneous and sound stimulated reactivity had an increased risk for intra partum fetal distress.

Salamalekis *et al.* [10] studied a series of 180 cases of high risk pregnancies in order to assess if a NST taken 24 hour before delivery is of any prognostic significance. They concluded that the nonreactive test could identify a population at risk but it was not helpful as a "stand-alone" modality in decision making because of the low sensitivity and positive predictive value (40.9% and 28.1), respectively.

Conclusion

The results show that the VST fairly detects an abnormal perinatal outcome and thereby alerts for the better perinatal care. VAST is easy to perform, bed side test and cost effective adjuvant to NST, in the antenatal fetal assessment of high risk pregnancy with higher specificity, sensitivity, positive and negative predictive value in predicting perinatal outcome.

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