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Fetal Doppler versus NST as predictor of adverse perinatal outcome in severe PIH and IUGR

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Abstract
Background: *A healthy mother and a healthy baby has been the prime objective of prenatal care since time immemorial. This has gained great importance in recent times. Hypertensive disorders during pregnancy is the most common medical complication about 7% of all primigravidas and a very common cause of IUGR.*
The doppler flow velocimetry is the only means by which we can study the pathological changes in the placental bed before the clinical manifestations.
NST describe fetal heart rate acceleration in response to fetal movement as a sign of fetal health.
This study was undertaken to observe the doppler flow velocity in the umbilical artery compared with NST to predict perinatal outcome in high risk pregnancies.
Aims: *To study fetal doppler waveform velocimetry and NST in PIH and IUGR patients and correlate with fetal outcome and prediction of fetal well being.*
Settings and Design: *An open, prospective ,randomized case control study.*
Methods and Material: *In this a randomized case control study was conducted on patients in the Department of obstetrics and gynaecology, Jawaharlal Nehru Medical college, Acharya Vinoba Bhave Hospital, Sawangi (Meghe) on 100 patients between july 2006 to September 2008.*
Statiscal Analysis Used: *Calculated as sensitivity , specificity ,positive predictive value and negative predictive value and the data analyzed by the chi- square method.*
Results: *In the group with abnormal NST but normal velocimetry, there were more women underlying caeserean delivery for fetal distress . Those with normal NST had 50% caeserean rate and 40% required NICU admission, fetuses with abnormal velocimetry who also had a non reactive NST are more susceptible to adverse outcome. Adverse perinatal outcome defined as fetal distress ,CS for fetal distress , admission to NICU. The group having one abnormal test (doppler or NST) was not statiscally significant, when both test were abnormal , the outcome was statistically worse than the preceeding three groups (P valve <0.001).*
Conclusions: *The sensitivity of NST was only 25% compared to 71.42% by doppler study where as the specificity of the two modalities was comparable 93.75% and 88.13% respectively.*
Our study clearly indicates that abnormal doppler findings in umbilical artery is a reflection of unfavourable outcome to fetal mortality and morbidity as compared to NST.
As far as perinatal outcome is concerned it was more specifically observed in doppler study than NST study and a very reliable diagnostic modality in picking up cases at risk of adverse perinatal outcome.
Keywords: *Doppler velocimetry, NST, PIH and IUGR patients.*

Introduction

The purpose of the antenatal visits is to provide appropriate guidance, pick up the high risk cases and direct special care to these patients. Prenatal care is directed both to the mother and to the fetus to achieve this ultimate goal of a healthy mother and a healthy baby. Hypertensive disorders during pregnancy is the most common medical complication about 7% of all primigravidas. It has also been detected to be a very common cause of IUGR.

The doppler study is the only means by which we can study the pathological changes in the placental bed before the clinical manifestations have set in and hence direct special care to these high risk women. It identifies a pattern of blood flow distribution that suggests hypoxia, changes in the fetal circulation can be monitored and enables greater knowledge about the physiological and pathological changes in the fetus during pregnancy.

NST was first introduced to describe fetal heart rate acceleration in response to the fetal movement as a sign of fetal health. This test involved the use of doppler detected fetal heart rate acceleration coincident with fetal movements perceived by the mother. Currently NST is one of the most widely used primary testing method for assesstment of the fetal well being and has also been incorporated into the biophysical profile testing system.

Materials and Methods

The study was conducted on patients in the Department of obstetrics and gynaecology , Jawaharlal Nehru Medical college, Acharya Vinoba Bhave Hospital, Sawangi (Meghe) on 100 patients between july 2006 to September 2008.

Study design: An open, prospective, randomized case control study.

Inclusion Criteria

1 Gestational age (> 32 weeks)
2 Pregnant females with PIH
3 All pregnant female with IUGR as diagnosed by clinical criteria and confirmed by USG.

Exclusion Criteria

1 Any congenital anomaly in the fetus as diagnosed by USG.

Methodology

A doppler flow velocimetry was done on pregnant women for measuring the waveform in the umbilical artery.

The ratio used : umbilical artery sytolic to diastolic ratio (S/D) described by Stuart et al 1980 was in the study.

Patients who were found to have an elevated S/D ratio , absent and reverse end diastolic flow were induced. And others were allowed to go into spontaneous labour.

NST was done bi-weekly on PIH and IUGR patients and if the result was nonreactive, then the patient was induced .

Results

The false positive and false negative rate were calculated. False negative result was defined as an abnormal result after a normal test . A false positive was defined as a normal outcome after an abnormal test.

- Sensitivity – ability to predict all abnormal outcome (A/A +Bx100)
- Specificity- ability to predict normal outcome (D/C + D x 100)
- Positive predictive value (PPV) – ascertains the probability of a given abnormal test having an abnormal outcome –(A/A+Cx100)
- Negative predictive value (NPV)- characterized the likelihood of a normal test having a normal outcome (D/B + D x 100).

The data was analyzed by the chi – square method and differences were considered significant when P value was less than 0.05.

Comparison of doppler velocimetry and NST.

	Doppler	NST
Sensitivity	71.42%	25%
Specificity	88.13%	93.75%
PPV	78.12%	69.23%
NPV	83.87%	68.96%
Accuracy	75%	59%

As clear from above table that sensitivity of doppler predict adverse perinatal outcome is more than NST but NST was found to be more specific.

Perinatal oucome	Normal doppler Study (n-62)		Abnormal doppler Study (n -38)		P valves
	Normal NST n=50	Abnormal NST n=12	Normal NST n=20	Abnormal NST N=18	
Fetal distress	2 (4%)	4 (33.33%)	12 (60%)	11 (61.11%)	<0.001
Apgar score < 5 at 1 min	0	1 (8.33%)	4 (20%)	7 (38.89%)	<0.001
Apgar score < 7 at 5 min	2 (4%)	2 (16.67%)	3 (15%)	6 (33.33%)	<0.001
MSL	1 (2%)	5 (41.66%)	13 (65%)	13 (72.24%)	<0.001
CS for fetal Distress	1 (2%)	3 (25%)	10 (50%)	12 (66.67%)	<0.004
NICU	2 (4%)	4 (33.3%)	8 (40%)	12 (66.67%)	<0.003
NND	0	0	1 (5%)	3 (16.66%)	<0.004

In the group with abnormal NST but normal velocimetry, there were more women underlying caeserean delivery for fetal distress. Those with normal NST had 50% caeserean rate and 40% required NICU admission, fetuses with abnormal velocimetry who also had a non reactive NST are more susceptible to adverse outcome. Adverse perinatal outcome defined as fetal distress, CS for fetal distress , admission to NICU.

The group having one abnormal test (doppler or NST) was not statiscally significant, when both test were abnormal, the outcome was statistically worse than the preceeding three groups (P valve <0.001).

Discussion

This study included 100 high risk patients in which 85% were between 21-30 years and 48 % were primigravida. In patients with PIH 23 out of 71 (32.39%) had abnormally increased waveform indices in umbilical artery and out of 71 cases 21 was found with non reactive NST (29.58%) which was similar to the result of doppler study.

68 cases had IUGR, 39 had associated PIH . 30 out of 68 (44.12%) had abnormal doppler study, while 38 cases (55.88%) had normal study. Out of 68 cases of IUGR , 22 (32.35%) had non reactive NST while 46 cases (67.65%) had normal value.

A total 51 (51%) had normal delivery, 10 cases (19.61%) delivered vaginally had abnormal doppler study. 15 out of 51 (29.41%) delivered vaginally had non reactive NST. A total of 41% patients underwent caesarean section. 46.34% of patient had abnormal doppler study and 26.83% had non reactive NST.

NST indicates the integrity of autonomic nervous system (ANS). Any hypoxic insult to ANS is reflected by a non –reactive NST. A reactive

NST predicts fetal well being for 2-7 days. 75% patients had good perinatal outcome, more than two thirds NST were reactive whereas 25% with poor perinatal outcome, 4 NST was non reactive. 1 patient who had IUFD had a reactive NST 2 days prior to IUD. The false negative rate was 16% and false positive rate was 60%.

In doppler study a S/D ratio of 3 or more was selected a cut off value. 31 cases with poor perinatal outcome, had S/D ratio >3.

The perinatal mortality in our study was 60 per 1000 live births (i.e. 6 case out of 100 cases).

Overall 78.18% of the cases with abnormal doppler had an adverse outcome as compared to 21.85% in patient with normal doppler. This difference is highly significant statistically ($p<0.01$).

The sensitivity in our study was 71.42% and specificity of 88.13%. The sensitivity of NST in our study was 25% and specificity 93.75%. Above findings support the view tha doppler study has promising capacity to identify bad perinatal outcome, IUGR , IUD and intrapartum asphyxia. And it is leading obstetrics from a guessing game to a genuine medical diagnostic speciality and better than NST.

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