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Research Article

Role of Fetal Doppler Study and Non Stress Test in High Risk Pregnancy

Authors
Dr J. Bindal[1], Dr Km. Deepika[2]
[1]Professor and Head, [2]P.G. Student
Department of Obstetrics, Kamla Raja Hospital, G.R. Medical College, Gwalior (M.P.), India

Abstract

Background: *Doppler identifies a prodrome of fetal disease when the decline in biophysical variables is subtle. With the combined use of USG and NST for fetal surveillance it is possible to detect both acute and chronic insults of fetus and to provide appropriate management for positive outcome.*

Methodology: *This is a prospective study was conducted on 100 women for a period of 1 year in Gajra Raja Medical College in Kamla Raja Hospital in all pregnant women with a gestational age > 32 weeks. Study included women with gestational age >32 weeks, PIH, Anaemia (Hb < 8 gm%), Oligohdyramnios, Gestational age > 41 weeks, Gestational DM, Chronic placental insufficiency, IUGR, Rh - isoimmunization, Maternal heart disease.*

Results: *Among 100 high risk pregnancies, most common high risk pregnancies observed are PIH (20%), oligo with IUGR (15%), IUGR (11%), anaemia in pregnancy (12%). Among 100 high risk pregnancies 50% pregnancies has been reached upto 37 weeks of gestation. Out of 100 women, 43 women delivered vaginally and 57 women were delivered by LSCS. Group A had best perinatal outcome with 96.875 survival rate with Apgar score < 7 at 5 min. Only in 37.5% of babies with NICU admission seen in 12.5% babies. Group D had 47.62% survival rate and maximum NICU admission (98.47%).*

Conclusion: *Doppler is useful in recognizing fetal compromise earlier than non stress test giving a lead time which is important in the management of preterm high risk pregnancies. NST still holds its importance in fetal monitoring because of its ease of performance to one another in fetal surveillance of high risk pregnancy.*

Introduction

The drive of every women contemplating motherhood is that her pregnancy culminates in a healthy offspring who will achieve the highest possible physical and mental potential.

Assessment of fetal wellbeing is done by various biophysical methods, but the problem of sample collection. Accuracy and need for laboratory technology and personnel have made biochemical methods of fetal monitoring less favourable than biophysical method.

Antepartum fetal surveillance of high risk pregnancies like PIH, DM, oligohydramnios. Rh in compatibilities to obtain a fruitful outcome has been a biggest challenge to obstetricians. Primary purpose of fetal surveillance is to detect fetal hypoxia and acidosis which are the common causes of fetal death and to possible avoid perinatal morbidity and mortality.

Doppler identifies a prodrome of fetal disease when the decline in biophysical variables is subtle.[1] With the combined use of USG and NST

for fetal surveillance it is possible to detect both acute and chronic insults of fetus and to provide appropriate management for positive outcome.[2]

With the advent of electronic fetal monitoring a relationship between fetal movement and fetal heart rate was observed and that relationship formed the basis for non stress test.

NST utilizes the observation that the occurrence of acceleration of the fetal heart rate in response to fetal movement is a reliable indicator of immediate fetal well being.[3]

So NST is most commonly used for antepartum evaluation of fetal status. It is easy, non invasive easily performed and interpreted method by which can identify nearly twice of many fetuses with an abnormal fetal heart rate pattern than intermittent ascultation of fetal heart rate.

Doppler plays an important role in fetal growth restriction (FGR) pregnancies where hemodynamic rearrangements occurrence in response to fetal hypoxamia.

It is now proved that significant doppler changes occur with reduction in fetal growth of a time when other fetal well being tests are still normal.

Material and Methods

This is a prospective study was conducted for a period of 1 year in Gajra Raja Medical College in Kamla raja Hospital in all pregnant women with a gestational age > 32 weeks.

Sample size: 100 women

Inclusion criteria

1. Women with gestational age > 32 weeks
2. PIH
3. Anaemia (Hb < 8 gm%)
4. Oligohdyramnios
5. Gestational age > 41 weeks
6. Gestational DM
7. Chronic placental insufficiency
8. IUGR
9. Rh -isoimmunization
10. Maternal heart disease

Exclusion criteria

1. Gestational age < 32 weeks
2. Intrauterine death
3. Pregnancy with cogenital anomalies
4. Multiple pregnancy
5. Medical disorder in pregnant women
6. Acute insult such as scar dehiscence, abruption, cord prolapse.

A detailed history of regarding the age parity, booked/ unbooked status, rural-urban origin and drug history of the women was noted.

After admission, the patient underwent routine antenatal surveillance including external ultrasound.

Cardiotocography recording performed as NST for 20 min daily or sometime twice daily. The tracings were evaluated with regard to baseline, variability, occurrence of accelerations, decelerations and reactivity.

The tracings were classified as-

1. Normal NST: At least 2 acceleration with fetal movement or contractions with basal fetal heart rate 110-160 beats/min with variability 5-15 beats/min for 20 min.
2. Suspected pathological NST: No acceleration Baseline HR 100-120 or 160-180 beats/min Baseline variability 5-10 beats/min or > 25 beats/min for > 20 min
3. Slight pathological NST: Baseline HR < 100 or 180 beats/min. Occasional mod variable deceleration.
4. Serum pathological NST: Silent pattern/sinusoidal late decelerations, severe variable decelerations.

The use of Doppler ultrasound during pregnancy and the examinations were performed after the patients had given their informed consent.

The examinations were done in semirecumbent position and during fetal quiescence.

The fetal vessels were located in the standard plane. Doppler study was considered abnormal when any of the parameters mentioned below was abnormal.

1. Pulsatility index of umbilical artery Ua > 2 Sd for the gestational age.
2. Absence or reversal of end diastolic flow in umbilical artery

3. PI of MCA < 5th percentile for the gestational age.
4. Abnormal cerebroplacental ratios PI MCA/UA < 1.083.

All women were subjected to doppler velocimetry and NST were divided into groups:

Group A = Doppler and NST normal

Group B = Doppler abnormal and NST normal

Group C = Doppler normal and NST abnormal

Group D = Doppler and NST both abnormal

The time interval in days between the first abnormal doppler and the development of abnormal NST was used to calculate the lead time. If the NST showed normal variability, but the variable decelerations or bradycardia an assessment of the amniotic fluid by the amniotic fluid index was done. If an AFI < 5th percentile for the gestational age was observed the women was induced or the baby delivered with in 24 hr after taking doppler and other surveillance parameters into consideration.

If NST showed decreased variability or the presence of FHR deceleration or prolonged tachycardia depending upon the doppler and other surveillance parameters, the women was induced or the baby delivered within 24 hours.

If an ominous pattern of severe bradycardia or recurrent significant deceleration was seen, an LSCS was indicated but with due to consideration to the gestational age, expected fetal weight and the maternal general condition.

Results

Table 1: Distribution of high risk factors in present study

Risk factors	No. of patients	Incidence
PIH	20	20%
IUGR	11	11%
Oligo	5	5%
PIH with IUGR	10	10%
Oligo with IUGR	15	15%
PIH with Oligo + IUGR	10	10%
Rh isoimmunization	6	6%
GDM	2	2%
Maternal heart disease	2	2%
Postdated pregnancy	7	7%
Anaemia in pregnancy	12	12%
Total	**100**	

Among 100 high risk pregnancies, most common high risk pregnancies observed are PIH (20%), oligo with IUGR (15%), IUGR (11%), anaemia in pregnancy (12%)

Table 2: Distribution of cases according to age

Age group	No. of patients	Percent
< 20	13	13%
20-30	63	63%
30-40	17	17%
> 40	7	7%
Total	**100**	

Table 3: Distribution of cases according to parity

Parity	No. of patients	Percent
P1	27	27%
P2	36	36%
P3	23	23%
≥ 4	14	14%
Total	**100**	

Table 4: Distribution of cases according to gestational age at the time of admission

Gestational age	No. of patients	Percent
32-36	43	43%
37-41	50	50%
> 41	7	7%
Total	**100**	

Among 100 high risk pregnancies 50% pregnancies has been reached upto 37 weeks of gestation.

Table 5: Comparison between NST and Doppler study

By applying Chi-square test there is no significant association between NST and Doppler study (p= 0.8236).

NST	Normal	Abnormal	Total
Reactive	32	22	54
Non reactive	25	21	46
Total	**57**	**43**	

χ^2=0.02891, p = 0.8236

Table 6: Distribution of cases with the results of NST and Doppler study

Results	Group	Number of cases	Percentage
Normal doppler study reactive NST	Group A	32	32%
Abnormal doppler study reactive NST	Group B	22	22%
Normal doppler study non reactive NST	Group C	25	25%
Abnormal doppler non reactive NST	Group D	21	21%

There were 32% patients in group A

Table 7: Association of mode of delivery with result of NST and doppler study

Results	Vaginal	LSCS
Group A (n=32)	23 (71.87%)	9 (28.13%)
Group B (n=22)	17 (77.27%)	5 (22.73%)
Group C (n=25)	3 (12%)	22 (88%)
Group D (n=21)	0 (0%)	21 (100%)
Total	**43**	**57**

χ^2=62.213, p = 0.001

By applying Chi-square test there is a highly significant association between made of delivery with the result of NST and doppler study (p<0.001).

Out of 100 women, 43 women delivered vaginally and 57 women were delivered by LSCS.

Table 8: Association of perinatal outcome with the result of doppler study and NST

Perinatal outcome	Group A N=32	Group B N=22	Group C N=25	Group D N=21
Survival	31(96.87%)	21(95.45%)	23(92%)	10(47.62%)
IUD	-	-	-	1(4.76%)
Neonatal death	-	-	-	5(23.89%)
Perinatal death	1(3.12%)	1(4.55%)	2(8%)	5(23.81%)
Admission in NICU	4(12.5%)	6(27.27%)	7(28%)	19(90.47%)
Neonatal complication	2(6.25%)	5(22.72%)	4(16%)	15(71.42%)
Mean birth weight (grams)	2316	2119	1674	1535
Apgar < 7 at 5 min	12(37.5%)	11(50%)	19(76%)	16(76.19%)

Group A had best perinatal outcome with 96.875 survival rate with Apgar score < 7 at 5 min. Only in 37.5% of babies with NICU admission seen in 12.5% babies.

Group D had 47.62% survival rate and maximum NICU admission (98.47%).

Table 9: Outcome of fetal surveillance

	Doppler study	NST
Sensitivity	56.14%	43.86%
Specificity	48.33%	51.73%
Positive predictive value	59.25%	40.75%
Negative predictive value	45.65%	54.35%

NST has low sensitivity but high specificity.

Discussion

Our study shows that in group D with both NST and Doppler abnormal perinatal outcome was worst in terms of low birth weight.

Apgar score less than 7, NICU admission and high perinatal mortality.

Inspite of the fact that Doppler was abnormal in both group B and group D, perinatal outcome was significantly better in group B suggesting that fetus was significantly more compromised when both test were abnormal as compared to only doppler abnormal.

Present study shows 57% normal doppler study and 43% shows abnormal doppler.

In Deshmukh et al[4] all high risk pregnant patients had undergone doppler study, among them 55% showed normal doppler study and 45% showed abnormal doppler.

Present study shows reactive NST in 54% women and non reactive NST in 46% women.

In Rochard et al[5] all the high risk pregnant patients had undergone non stress test, among them 40.8% patients had reactive NST and 15.2% patients had non reactive, 28% had suspicious NST and 16% had sinusoidal NST.

In present study, sensitivity of NST is 43.86%, specificity is 51.43% and sensitivity of Doppler study is 56.14% and specificity is 48.83%, so colour doppler study is more sensitive test then NST and NST is more specific test than colour doppler study.

In Latika et al[6] study sensitivity of colour doppler was 93.24% and specificity was 84.61% and sensitivity of NST was 44.62% and specificity was 51.43%.

Gomathi et al[7] conducted a similar study on 90 patients which showed worst perinatal outcome in group D with perinatal mortality of 60% Apgar score < 7 at 5 minutes was noted in 35% of babies in group D and 75% of NICU admission while group A with best perinatal outcome had perinatal death in only 5.2% of babies, mean birth weight was 2215 grams and 39.5% babies required admission to NICU.

Radhika et al[2] conducted a prospective study to evaluate 55 pregnancies concluded that group D had perinatal death in 50% of the babies. NICU admission in 87.7% of babies, born to patients in this group with low birth weight (1415 gms) and lesser mean gestational age at delviery i.e. 34.3 weeks delivery of 37.5 weeks mean birth weight of 2179 gram Apgar < 7 at 5 minutes in 5% and perinatal death in 5% of babies.

Yelikar et al[8] studied 189 patients concluded that group of had best perinatal outcome with mean gestation of delivery of 37.3 weeks NICU admission in 7.3% babies with mean birth weight of 2288 grams and no perinatal deaths whereas group D patients were delivered at mean gestation of 34.6 weeks with 100% NICU admission and perinatal deaths in 33.3% of the babies.

Conclusion

Doppler is useful in recognizing fetal compromise earlier than non stress test giving a lead time which is important in the management of preterm high risk pregnancies. An abnormal NST following an abnormal doppler is associated with the worst perinatal outcome. In cases with abnormal doppler if the prospects for neonatal survival are good it is better to deliver the fetus before NST becomes abnormal. We observed that in cases with normal doppler, sudden abnormal NST indicates acute hypoxia. NST still holds its importance in fetal monitoring because of its ease of performance to one another in fetal surveillance of high risk pregnancy.

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