NON STRESS TEST VERSUS DOPPLER VELOCIMETRY IN THE PREDICTION OF FOETAL OUTCOME

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SUMMARY

In the present study, the predictive value of non stress test and umbilical artery A/B ratio was compared in 45 patients. There were obstetric risk factors in 25 patients. 13 pregnancies culminated in adverse perinatal outcome.

NST was found to have specificity 85.71%, sensitivity 74.19% and positive predictive value 60%. The corresponding values with umbilical artery A/B ratio was 53.84%, 93.75% and 77.77% respectively. As an indication of perinatal outcome in IUGR foetuses, the specificity of NST was 85.7%, and the sensitivity was more than 100%, corresponding values for A/B ratio were 66.66% and 100% respectively. Absence of end-diastolic velocity in the umbilical artery was associated with adverse perinatal outcome.

Thus, Doppler velocimetry compares favourably with NST as a foetal surveillance tool and as an indicator of foetal outcome in high risk pregnancy. We, as obstetricians, should utilize this sensitive tool fully in the management of high risk pregnancies.

INTRODUCTION

Evaluation of foetal conditions is an integral part of management of any pregnancy. The two main objectives of antenatal tests are to provide firstly a scanning method and to help identify at risk pregnancy already complicated by some clinically recognised condition such as hypertension or foetal growth retardation. Nonstress test is

commonly used in prediction of foetal status. The rationale of NST is that the state of foetal oxygenation is reflected by changes in foetal heart pattern. Doppler velocimetry of the umblical artery indicates the state of uteroplacental bed and hence foetal wellbeing. The basic principle underlying the Doppler technique is that when a beam of ultrasound is transmitted across a blood vessel, the circulating red cells backscatter the incident beam. The beam consequently undergoes a shift the doppler frequency shift-in the frequency proportional to the speed of the moving cells. Doppler information is interpreted by wave form analysis as S/D or A/B ratio where S or A represents the peak systolic and D or B represents the end diastolic component of the Doppler waveform (Stuart et al 1980).

MATERIAL AND METHODS

The study population consisted of 45 patients taken from Dr. T.M.A. Pai Rotary Hospital, Bejai, Mangalore.

The aims of the study were :

Assess the specificity, sensitivity, positive and negative predictive values of NST and A/B ratio done in the third trimester after 32 weeks of pregnancy in both normal and high risk cases for the prediction of perinatal outcome.

Criteria for inclusion in the study included :

1. Well documented length of pregnancy
2. Singleton pregnancy
3. Gestational age-beyond 32 weeks.

The perinatal outcome was considered abnormal when any one or a combination of the following parameters was present :

1. Apgar scores less than 7 at 5 minutes.
2. Thick meconium
3. Perinatal death
4. Respiratory complications within 72 hours of birth.

Corometrics electronic foetal heart monitor was used for recording non-stress test. A continuous recording of the foetal heart was obtained with patient in left lateral position. The reading was considered reactive when two or more accelerations of 15 beats/minute lasting for 15 seconds, were seen over a 20 minute period.

The ultramark VI Duplex Doppler was used for measuring the wave forms in the umbilical artery during foetal apnea and the patient in a semirecumbent position with a lateral tilt. When there were 3-4 waves of equal height on the angioscan screen the image was frozen and measurements were taken. A cursor was moved so that it was tangential to the peak and through. Frequency was read out in Kilohertz units. A/B ratio of 3 was chosen as the upper limit because of the better sensitivity and specificity achieved in identifying IUGR infants. (Rochelson et al 1987).

OBSERVATION AND DISCUSSION

Obstetric risk factors in the 25 out of 45 patients in the study are shown in Table I. 13 pregnancies culminated in adverse perinatal outcome Table II.

Tables III & IV demonstrate the best performance values of NST and A/B ratio.

Table I

Risk Factors	No. of patients
Pregnancy induced hypertension	6
Pregnancy induced hypertesnion with IUGR	5
Pregnancy induced hypertension with Bad obstetric History	2
Bad obstetric History	5
PIH with IUGR with BOH	1
IUGR with Anemia	1
IUGR with chronic hypertension	1
Anemia with PIH	1
Diabetes, PIH, BOH	1
Placenta Previa	1
Placenta Previa with PROM	1

Table II
CRITERIA FOR ABNORMAL OUTCOME

1. Apgar Scores of less than seven at five minutes.
2. Perinatal Death
3. Respiratory complication within seventy two hours of birth
4. Congenital Anomalies
5. Thick Meconium stained hind waters.

Neonatal Death	3
Respiratory complications	3
Congenital Anomalies	2
Thick Meconium	2
Low Apgar	2
Septicemia	1
Total number of cases	13

Table III
TEST PERFORMANCE VALUES OF NON STRESS TEST

Sensitivity	TN TN + FP	23 23 + 8	74.19%
Specificity	TP TP + FN	12 12 + 2	85.71%
Positive Predictive Value	TP FP + TP	12 12 + 8	60%
Negative Predictive Value	TN TN + FN	23 23 + 2	92%
	TP TP + FP	12 12 + 8	
Relative Risk			7.5
	FN FN + TN	2 2 + 23	

True Positives (TP)	- 12
True Negatives (TN)	- 23
False Positives (FP)	- 8
False Negatives (FN)	- 2

Specificity was 85.71%, sensitivity was 74.19% and positive predictive value was 60% with NST. The corresponding values with A/B ratio were 53.84%, 93.75% and 77.77% respectively. The combination did not improve the sensitivity. Trudinger et al (1986) reported a sensitivity of 60%, specificity of 85%, positive predictive value of 64%, negative predictive value of 83% for A/B ratio. 36%, 97%, 58% and 75% were the corresponding values for NST.

Diagnostic efficacy of NST and A/B ratio in the total study population is shown in Table V.

Table VI demonstrates diagnostic efficacy of NST and A/B ratio in IUGR foetuses. The specificity

Table IV
TEST PERFORMANCE VALUES FOR SYSTOLIC/DIASTOLIC RATIO

Sensitivity	TN	30	93.75%
	TN + FP	30 + 2	
Specificity	TP	7	53.84%
	TP + FN	7 + 6	
Positive Prective Value	TP	7	77.77%
	FP + TP	7 + 2	
Negative Predictive Value	TN	30	83.33%
	TN + FN	30 + 6	
Relative Risk	TP	7	4.62
	TP + FP	7 + 2	
	FN	6	
	FN + TN	6 + 30	

True Positive (TP)	-7
True Negative (TN)	-30
False Positives (FP)	-2
False Negative (FN)	-6

was 85.7% and sensitivity was more than 100% with NST. In a study conducted in Yonego (Nippon Sanka 1993) the outcome of 20 IUGR foetuses with nonreactive pattern in NST was compared with that of fetuses with reactive pattern. The sensitivity and specificity were 81% and 84.2% respectively.

Table VII bears out the observation by Rochelson et al (1987) that absent end diastolic velocimetry in the umbilical artery are associate with increased perinatal mortality and morbidity.

CONCLUSION

In the present study, Doppler velocimetry compared favourably with NST as a foetal surveillance tool.

Table V

DIAGNOSTIC EFFICACY OF NON STRESS TEST AND SYSTOLIC DIASTOLIC RATIO IN TOTAL STUDY POPULATION

Sensitivity	22	84.6%
	22 + 4	
Specificity	3	100%
	3 + 0	
Positive predictive value	3	42.85%
	4 + 3	
Negative predictive value	22	100%
	22 + 0	

True Positives (TP)   -3
True Negatives (TN)   -22
False Positives (FP)   -4
False Negatives (FN)   -Nil

Table VI

DIAGNOSTIC EFFICACY OF NON STRESS TEST AND SYSTOLIC/DIASTOLIC IN IUGR

	NST	S/D
Sensitivity	00	100%
Specificity	85.7%	66.66%
Positive predictive value	85.7%	100%
Negative predictive value	-	50%

True Positives (TP) - 6		TP - 4
True Negatives (TN) - 0		TN - 2
False Positive (FP) - 1		FP - 0
False Negatives (FN) - 1		FN - 2

Table VII
OUTCOME OF FOUR PATIENTS WITH ABSENT
END DIASTOLIC FLOW

Patient No.	Maternal Complication	Maturity in Weeks	NST	Outcome
1.	IUGR with Hypertension	34 weeks	Non-reactive	Emergency LSCS on the same day. Apgar 4 at 5 minutes respiratory complication present and weight 1.2 kg.
2.	PIH	34 weeks	Non-reactive	Emergency LSCS on the same day. Apgar 6 at 5 minutes, baby died of Necrotising Enterocolitis.
3.	PIH with IUGR	38 weeks	Non-active	Emergency LSCS on the same day. Apgar 6 at 8 minutes. Baby had septicemia discharged after three weeks.
4.	PIH with IUGR	40 weeks	Reactive	Intracervical PGE2 gel instilled / thick meconium. Baby discharged after two weeks (Meconium aspiration)

The sensitivity of A/B ratio was better than NST for the recognition of foetal compromise. Absent end-diastolic flow indicates adverse perinatal outcome. Thus, Doppler velocimetry is a sensitive foetal surveillance tool, and we should utilize its immense potential for management of high risk pregnancies.

REFERENCES

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