ORIGINAL RESEARCH PAPER

Obstetrics & Gynecology

COMPARISON OF INTRAPARTUM CARDIOTOCOGRAPHY & OBSTETRIC DOPPLER IN PREDICTING PERINATAL OUTCOME IN HIGH RISK PREGNANCY

KEY WORDS:
Cardiotocography, color Doppler, High risk pregnancy, perinatal outcome, FG

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ABSTRACT

Background: High risk pregnancy needs special antepartum as well as intrapartum care and investigations. CTG is admission screening test to monitor fetal wellbeing by use of cardiotocograph. It monitors fetal heart rate and uterine contractions. Color Doppler is ultrasound dependent test which uses vascular flow velocities and Doppler waveform to predict fetal outcome.

Objective: Comparison of efficiency of CTG & Color Doppler ultrasound for intrapartum fetal surveillance in high risk pregnancy.

Methods: Retrospective study of 100 high risk pregnancies of ≥ 34 weeks POG in labor with CTG and color Doppler findings were done on admission at Gujarat Adani Institute of Medical Sciences, Bhuj. Subjects were classified into 4 groups based on CTG and color Doppler findings. Maternal and fetal outcome were recorded and correlated with CT Gand color Doppler findings.

Results: Most common cause of high-risk pregnancy was preeclampsia(n=60/100,60%).In our study, rate of normal delivery was 40% and c-section was 60% (31% elective & 29% emergency). Out of 100 fetuses, 76 were healthy, 22 were admitted in NICU (6 NICU deaths) and 2 were still birth. Perinatal outcome was most favorable with normal CTG and Color doppler and was least favorable with both of them abnormal. Outcome was intermittent in other two groups. CTG found to have sensitivity 62.5% and specificity 82.5% in detection of adverse fetal outcome. Similarly,sensitivity and specificity of color doppler was 48.8% and 98.6% respectively.

Conclusions: In our study it was found that CTG is more sensitive and color Doppler is more specific in detection of adverse fetal outcome.

INTRODUCTION:

Antepartum fetal surveillance is most important for screening of fetal well-being in utero in high risk pregnancies like hypertensive disorders of pregnancy, diabetes mellitus, fetal growth restriction, postdated pregnancy etc. High risk pregnancies increase the maternal and fetal morbidity and mortality; to prevent this early detection is required for prompt management of high-risk pregnancies. Preeclampsia is a major cause of maternal and perinatal mortality and morbidity worldwide and responsible for 24% of all maternal deaths in India (1,2).

Various methods like Cardio-tocography(CTG),Contraction Stress Test (CST), Biophysical Profile (BPP), modified BPP and Doppler velocimetry are available for fetal surveillance in high risk pregnancy. Comparison of efficiency of various methods of fetal surveillance in high risk pregnancies is must (3).

CTG:

It is a non-invasive test used for the surveillance of high-risk pregnancies when the fetus is judged clinically to be at risk for hypoxemia neonatal morbidity or neonatal mortality. The presence of fetal heart rate acceleration with fetal movement that detect the coupling of fetal neurological status to cardiovascular reflex responses. It is an assessment tool used for at risk patients in labour to evaluate fetal health through the use of electric fetal monitors that continuously record the fetal heart rate (FHR) and its changes with uterine contractions (1,2).

Doppler:

Color doppler also a non-invasivemethod based on the physical principal of change in frequency of the sound wave when it is reflected by blood flow in fetal vessels for fetal wellbeing. Doppler changes mainly seen in fetal growth restriction. Doppler involves assessment of various vessels of fetus & each has its own significance. Umbilical artery, uterine artery and middle cerebral artery are mainly used for Antepartum fetal surveillance in high risk pregnancy. (3)

This study was undertaken to determine the etiology of high-risk pregnancy and the use of both CTG and Doppler velocimetry for antepartum surveillance; and compare the results in terms of perinatal outcome.

METHOD:

Retrospective study of 100 patients was conducted in GKGH hospital. All high-risk pregnancies who had available intrapartum CTG and USG doppler were included.

Inclusion Criteria:

1) Singleton pregnancy of more than 34 weeks' gestation in labour.

2) One or more of high-risk factors like hypertensive disorders of pregnancy, gestational or overt diabetes, postdated pregnancy, oligohydramnios, fetal growth restriction, anemia, antepartum hemorrhage, bad obstetric history, medical comorbidities.

Exclusion Criteria:

1) Multiple pregnancies
2) Pregnancy less than 34 weeks
3) Pregnancy more than 34 weeks but not in labour
4) Pregnancy without any risk factor

Method for CTG: CTG was performed after tilting the patient 15^{0} to left by using fetal monitor. Blood pressure is recorded before start of test and repeated as indicated. Fetal heart rate is monitored using Doppler ultrasound transducer and uterine contractions and fetal movements are recorded using to codynometer. Fetal activity is recorded by giving event marker to patient.

Test is performed ideally for 20 minutes, but if non-reactive it is monitored for at least 40 minutes. CTG was classified according to FIGO guidelines. (4)

Method For Ultrasound Doppler Velocimetry:
Ultrasound Doppler was performed using convex curvilinear transducer of Philips HD5 ultrasound machine. Mother lies in semirecumbant position with slight lateral tilt. Doppler wave form and velocities of umbilical (UA), fetal middle cerebral artery (MCA) and bilateral uterine arteries were noted using adequate settings.

Pulsatility index (PI), resistance index (RI) and systolic/ diastolic ratio (S/D ratio) were calculated for each artery. Cerebro-placental ratio (CPR) (ratio of UA-PI and MCA-PI) was calculated(5,6).

All The Patients Were Divided Into Four Categories:
Group A: Normal CTG and normal Doppler
Group B: Normal CTG and abnormal Doppler
Group C: Abnormal CTG and normal Doppler
Group D: Abnormal CTG and abnormal Doppler
Neonatal outcome was assessed on basis of mode of delivery, NICU admission, meconium, APGAR, Fetal growth restriction (FGR) and neonatal mortality and morbidities.

Sensitivity and specificity of CTG and doppler in predicting poor fetal outcome was primary outcome measure.

RESULT
Out of 100, maximum patients were in group A followed by group C. out of 100 cases, 76 fetuses were born healthy. 22 fetuses were admitted in NICU, 6 of them died. & 2 fetuses were still birth.

Most common risk factors in our study was hypertensive disorder of pregnancy and oligohydramniosthe study showed that when both CTG and color Doppler were abnormal, it indicates that these fetuses suffer from severe placental insufficiency that leads to increase perinatal mortality and neonatal morbidity.

Table – 1 General Details

MATERNAL AGE (n=100)	
<20	6
20-25	22
26-30	28
31-35	21
>36	23
RISK FACTORS	
PIH	69
Oligohydramnios	22
GDM	3
Others	6
PARITY	
Primigravida	60
Multigravida	40
GESTATIONAL AGE (WEEKS)	
34-36	26
37-39	66
>40	8
GESTATIONAL OUTCOME	
NVD	40
C-Section	60
Emergency	29
Elective	31
FETAL OUTCOME	
Mother side	76
NICU Admission	22
NICU Discharge	16
NICU Death	6
Still birth	2
CTG	
Normal	74
Abnormal	26
DOPPLER	
Normal	88
Abnormal	12
GROUP	
Group A	69
Group B	5
Group C	19
Group D	7

Table 2 Neonatal Outcome

	A(n=69)	B(n=5)	C(n=19)	D(n=7)
Healthy	64	1	11	0
FGR	4	2	7	3
NICU- Admission	4	3	9	6
NICU-Discharge	3	2	8	3
NICU-Death	1	1	1	3
Still Birth	0	1	0	1

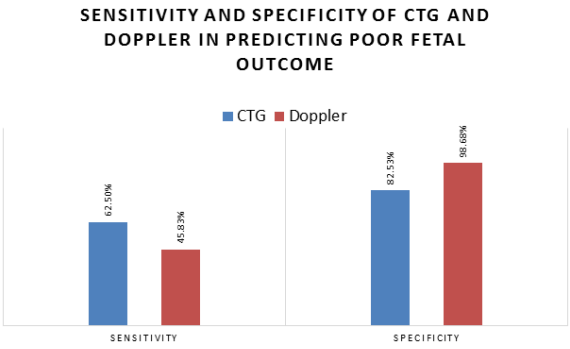

Figure 1 Study Details

Table 3 Sensitivity, Specificity and Predictive Value of CTG and Doppler for predicting adverse fetal outcome

Test	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
CTG	62.50%	82.53%	57.69%	87.84%
Doppler	45.83%	98.68%	91.67%	85.23%

DISCUSSION:
In this retrospective study, to predict the perinatal outcome in high risk pregnancy, comparison role of CTG&color Doppler was analyzed.

GROUP A (both CTG and Doppler are normal) had less operative delivery and good perinatal outcome. Out of 69, 64 were healthy, 4 were FGR and 1 fetus died. Out of 4 NICU admissions, 3 survived. 1 FGR didn't require NICU care.

In Group B (normal CTGand abnormal Doppler), out of 5- only 1 neonate was healthy, 2 were FGR and 1 was still birth. 2 out of 3 NICU admissions survived (66%).

In Group C (abnormal CTG and normal Doppler), Out of 19, 11 neonates were healthy and 7 were FGR. 8 out of 9 NICU admissions survived(89%) and only 1 neonate died.

As per study result, poorest perinatal outcome was seen in group D (abnormal CTG and Doppler) with maximum NICU admission, high operative delivery rate and high still birth rate. Only 3 out of 6 NICU admissions survived(50%). Maximum NICU admission were seen in group D(100 %- 6 out of 6 live births) followed by group B (75%- 3 out of 4 live birth).

The study suggests, abnormal color doppler is better predictor of adverse fetal outcome as compared to abnormal CTG. As per study, CTG and Doppler have sensitivity of 62.5% & 45.83% respectively; specificity of 82.53% & 98.6% respectively.

Most common cause of abnormal Doppler and CTG is preeclampsia with FGR that required early delivery and

become most common cause for NICU admission.

CONCLUSION:

In our study it was found that CTG is more sensitive and color Doppler is more specific in detection of adverse fetal outcome. Both tests have interdependency in making prediction of perinatal outcomes in high risk pregnancy.

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