



RECENT ADVANCES IN ULTRASOUND AND COLOR DOPPLER INDICES IN DETECTION & MANAGEMENT OF IUGR

Radio diagnosis

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ABSTRACT

Objective: Our aim is to evaluate the fetal biometry with modifications of velocimetric (UA, MCA, DV) using color Doppler, CTG and BPP parameters in fetal monitoring for early antenatal detection and proper management of IUGR so as to reduce perinatal mortality and morbidity.

Methods: This retrospective longitudinal study was carried out at the G.S Medical College and Hospital, Pilkhuwa (U.P) from October 2016 to February 2019. The study was conducted on a sample of 385 pregnant women assisted from the 32nd weeks and more with full clinical examination, laboratory assessment followed by detailed ultrasound and colour Doppler, CTG to delivery.

Results: 88 patients had IUGR. The patients with abnormal indices had a higher incidence of Caesarean delivery (42.33%), low Apgar score (7cases), need for admission to NICU (66%) and neonatal complications (30.9%) as compared to those with normal indices.

Conclusions: The CTG parameters and Doppler velocimetry integrated with fetal biometry can be used as valuable methods in antenatal detection of early signs of fetal compromise in IUGR foetuses and proper management by fetal monitoring resulting timely delivering a preterm foetus so as to avoid adverse fetal outcome. There is need of further advancement in the understanding of complex mechanism of aetiology and pathophysiology of IUGR foetuses in detection of placental insufficiency level, and management by using multiple fetal monitoring tools.

KEYWORDS

Ultrasound, Color Doppler, Intrauterine Growth (IUGR), CTG, (Cardiotocography)

INTRODUCTION

The intrauterine growth restriction is formally defined as the failure of pregnancy to reach the expected growth of the foetus and manifests as a deviation of fetal growth from normal patterns. IUGR & preeclampsia are responsible for perinatal mortality & morbidity, still birth, neonatal death as well as delayed effects including cerebral palsy & adult diseases. The antenatal detection of IUGR is most important and constitutes a major challenge for early diagnosing by radiologist and management by obstetricians. The main causes of IUGR are placental insufficiency, maternal diseases like anaemia, PIH etc. The other conditions such as congenital anomalies, Infections or drug & substance misuse have also resulted in IUGR. In the current scenario ultrasound is the most accurate method of detecting IUGR. IUGR Index consists of abdominal circumference, HC/AC Ratio, amniotic fluid index, maternal hypertension, and low maternal weight gain.

Most Instances of fetal growth restriction corresponds with cases of placental insufficiency (Lack Monetal 2010). The customized standards for fetal growth & birth weight improve the detection of IUGR by the better distinction between Physiological (SGA) and pathological smallness (IUGR). Serial fundal height measurement (SFH) plotted on customized charts is a useful screening tool. Single ultrasound measurement of the abdominal circumference around 34 weeks gestation has been shown to detect 85% of Growth-restricted foetuses with better sensitivity than SFH. Whereas fetal biometry & Doppler parameters are the mainstays for diagnosis of IUGR. SGA can be termed physiological smallness because it is not associated with adverse outcome. The differentiation between growth restricted foetus and SGA is made by umbilical artery Doppler, cerebro-umbilical ratio and flow in uterine artery. According to ACOU guidelines, a foetus with IUGR is a foetus with Sonographic estimated weight less than the 10th percentile for gestational age. IUGR can complicate 15% to 22% of all pregnancy and represents second cause of perinatal mortality after prematurity & related to increased risk of perinatal complications as Hypoxemia, low Apgar scores, cord blood acidemia with possible negative effects for neonatal outcome.

A) PI in assessing perinatal outcome among hypertensive disorders of pregnancy.

Fetal monitoring is done by serial measurements of fetal biometry and using CTG charting, AFI, BPP and Doppler studies.

BPP is excellent for the identification of the non-hypoxemic SGA foetuses while it is time-consuming method for diagnosing hypoxic IUGR. The BPP becomes abnormal 6 to 12 hours to 2 weeks before fetal demise. The aim was to evaluate the modifications of velocimetry (UA, DV & MCA) and CTG parameters in relationship to days before delivery in order to find out those associated with earlier fetal compromise in fetal growth restriction.

MATERIAL AND METHODS

This retrospective longitudinal study was carried out at the G.S. Medical College & Hospital, Pilkhuwa (UP) from October 2016 to February 2019. The study included 385 women at 3rd trimester. Their ages ranged from 22 to 40 years. 88 cases of IUGR after 32 weeks were assessed by weekly serial ultrasound followed by color Doppler and CTG charting, BPP scoring till delivery. Abdominal circumference less than 5th percentile and estimated fetal weight less than the 10th percentile for that gestational age were selected for the study. In cases with risk factors, serial Sonography with color Doppler was done to identify fetal growth restriction.

Inclusion Criteria

- All pregnant women in IIIrd trimester stage Exclusion Criteria
- Known congenital anomalies were excluded from the study.

OBSERVATION

Based upon color Doppler and CTG observations, the study population was divided into 4 groups:-

- GROUP I**- 34 pregnant women with normal Doppler and normal CTG
- GROUP II**- 24 pregnant women with Abnormal Doppler and normal CTG
- GROUP III**- 10 pregnant women with Normal Doppler and Abnormal CTG
- GROUP IV**- 20 pregnant women with abnormal color Doppler and abnormal CTG.

The maximum number of cases were from 20 -30 years belongs to Primipare group. 24 women had abnormal color Doppler findings as absent /reverse end diastolic velocity, increased pulsatility MCA, and cerebroplacental ratio, abnormal findings in DV, and umbilical vein. 20 women had abnormal CTG findings .The maximum number of women of group IV showed abnormal Doppler findings prior to CTG and BPP. Perinatal mortality and neonatal complications noted in abnormal Doppler and abnormal CTG group were significantly high.

DISCUSSION

In the management of IUGR, the choice of therapy depends on the nature of the insult that leads to growth restriction. If fetal biometry confirms the diagnosis of IUGR, care should be taken to rule out fetal malformations and aneuploidy. In a first step ,once a small foetus i.e. EFW <10th centiles has been identified ,Ut. Artery PI, UA PI ,MCA PI and the CPR should be measured in order to classify IUGR versus SGA .For IUGR foetuses ,changes in the UA,DV,and CTG ,BPP are used to define stages of deterioration.

STAGING AND OBSTETRIC MANAGEMENT

Stage I: - Mild placental insufficiency

EFW below 10th centiles with abnormal CPR but without the presence of vasodilatation or uterine Doppler flow. Fetal Growth Restriction is low risk type fetal deterioration before term with mild abnormal UA or MCA Doppler. Labour induction beyond 37 weeks is acceptable when pulmonary maturity has proven. Weekly Doppler monitoring and BPP scoring appears reasonable. Vaginal delivery with continuous fetal monitoring is recommended

Stage II: - Severe placental insufficiency

Defined by absent end diastolic velocity (AEDV) of umbilical artery / centralization as persistent vasodilatation of middle cerebral artery (MCA).Delivery is recommended after 34 weeks. Risk of caesarean section exceeds 50%.Elective caesarean is a justified option. Twice a week fetal monitoring is advised.

Stage III:--Advance fetal deterioration

Low suspicious signs of acidosis with suspected fetal compromise as persistent increased DV waveform pulsatility, low short term variability in CTG and abnormal BPP. Stage is defined by reverse end diagnostic velocity (REDV) or DV PI > 95th centiles associated with higher risk of stillbirth. Delivery recommended by caesarean section after 30 weeks, CTG and BPP monitoring advisable every 24 to 48 hours.

Stage IV- High suspicion of fetal acidosis

Associated with fetal decompensation /persistent a wave in DV or persistent pulsatile umbilical vein or abnormal BPP or decelerative cardiotocography .High risk of stillbirth is a possibility. Spontaneous incidences if fetal heart decelerations, reduced STV <3 ms) in CTG or reverse atrial flow in DV. Emergency caesarean is justified. Delivery between 26 to 28 weeks by caesarean section under steroid treatment in a tertiary care centre is advisable. Intact survival exceeds 50% only after 26-28 weeks .monitoring every 12 -24 hours is indicated.

Table-1: Maternal, Fetal & Perinatal characteristics of study population.

Maternal Characteristics	N(385)	%
Parity	250	60.3
Primipare	135	39.7
Multipara		
Pregnancy Complications		
Pre-eclampsia	123	32.4
Intrauterine Growth Restriction	88	22.8
Very low birth weight	58	15.0
Delivery		
Spontaneous Vaginal Delivery	93	25.1
Induced	123	32.7
LSCS	162	42.0
Indication for LSCS		
Fetal distress	34	38.8
Severe pre-eclampsia	8	11.2
Others	46	50.0

Table-2: Distribution of study result according to test result

Test Results	Number	Percentage
Women with normal color flow imaging	44	50.00
Women with abnormal color flow imaging	44	50.88
Women with normal CTG	62	70.00
Women with non-reactive CTG	26	30.00

Table-3: Neonatal characteristics of study population.

POG at birth (weeks)	35.8	(n=88)
Live Births	81	
Stillbirth	7	
Term Babies	42	(48.2%)
Preterm Babies	39	(51.7%)
Average birth weight	1898.7 grams	
Birth Weight (grams)		
>2500	8	(10.3%)
1500-2500	46	(53.4%)
1000-1500	17	(27.2%)
<1000	9	(10.8%)
Apgar at 5<7	7	
Admission to NICU	56	(66%)
Neonatal complications	25	(32.7%)
Duration of stay>10 days	35	(40.8%)

Table-4: Distribution of patients according to abnormal color Doppler findings

Abnormal Color Doppler	Group II (no. 44)	Group IV (no. 26)	Total Number	Percent
Umbilical artery (P.I. & R.I.)	21	2	23	31.9
Absent/Reversal in UA	9	8	17	23.6
MCA(PI)	26	15	41	56.9
PI of MCA/UA<1.08	27	17	44	61.1
Ductus Venosus	8	5	13	18.0
Uterine artery	5	3	8	11.1

Table-5: Evaluation of Ultrasound, Doppler and CTG diagnosis of IUGR.

Test	Sensitivity	Specificity	PPV	NPV
Clinical diagnosis	71.4	43.6	33.7	79.1
Ultrasound	75.7	64.3	46.0	86.8
Doppler	82.9	86.2	70.7	92.6
CTG	68.4	76.7	74.3	88.6

Table-6: Distribution of study population according to perinatal outcome.

Perinatal Outcome	Group-I No.=34	Group-II No.=24	Group-III No.=10	Group-IV No.=20
Survival	29	16	8	6
Intrauterine Death	2	2	0	4
Neonatal Death	1	3	1	3
Perinatal Death	2	3	1	7

CONCLUSION

The CTG parameters and Doppler velocimetry integrated with fetal biometry can be used as valuable methods in antenatal detection of early signs of fetal compromise in IUGR foetuses and proper management by fetal monitoring resulting timely delivering a preterm foetus so as to avoid adverse fetal outcome .There is need of further advancement in the understanding of complex mechanism of aetiology and pathophysiology of IUGR foetuses in detection of placental insufficiency level , and management by using multiple fetal monitoring tools.

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