

ORIGINAL

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SMALL FOR GESTATIONAL AGE FETUS; ROLE OF COLOUR DOPPLER ULTRASOUND IN THE MANAGEMENT



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ABSTRACT... Objective: To evaluate the role of Colour Doppler Ultrasound in the management of small for gestational age fetus. SGA or IUGR. **Design:** Descriptive study. **Place & duration of study:** Study performed in the Deptt. of Radiology & Deptt. of Gynae. & Obstetrics in Allied Hospital, Faisalabad from August 2005 to July 2006. **Material & Methods:** This study was carried out on 45 patients admitted through antenatal clinic having suspicion of carrying small for gestational age fetus. A brief clinical record including age, parity, nutritional status, intercurrent illness, per-vaginum bleeding, history of drug intake, smoking, past obstetrical history was recorded. Methods involved in screening SGA fetuses were measurement of Symphyseal Fundal Height chart & Ultrasound biometry, Biophysical profile (BPP), Cardiotocography (CTG), Middle cerebral and Umbilical Arteries Doppler studies were performed after admission in the management of SGA fetuses. All these information were recorded in a specially designed Performa. **Results:** Out of 45 SGA fetuses 15(33.3%) were constitutionally small, 20(44.4%) had history of pre-eclampsia, 2(4.4%) had cardiac disease, 3(6.6%) had placental abnormalities, 5(11.1%) had multiple gestations. Gestation of patients ranged between 30-36 weeks. Umbilical Artery Doppler was used as the primary surveillance tool. Small fetuses with normal Doppler and anomaly scan were managed on out-patient basis with fortnightly Doppler ultrasound. 15 patients (33.3%) with normal end-diastolic flow were delivered at 37 weeks. 20 patients (44.47%) with absent or reversed end-diastolic flow were delivered at 34-35 weeks. 10 patients (22.2%) at 30 weeks gestation with abnormal Doppler study were managed on CTG (Cardiotocography) & biophysical profile over a period ranging between 1-14 days. Perinatal mortality was 8.8% (4 cases) mostly due to extreme prematurity. **Conclusion:** Doppler ultrasound is a very helpful tool in the management of small for gestational age fetuses & it reduces perinatal morbidity & Mortality.

INTRODUCTION

Small for Gestational Age (SGA) or (IUGR) fetus refers to a fetus that has failed to achieve a specific biometry or estimated weight threshold by a specific gestational

age. The commonly used threshold is the 10th centile for Abdominal Circumference (AC) & Estimated Fetal Weight (EFW)¹. SGA fetuses are at a greater risk of stillbirths, birth hypoxia, neonatal complications, impaired

neuro-development, & possibly Type 2 diabetes & hypertension in adult life^{2,3}. There may be fetal, placental and maternal factors underlying SGA fetuses. Methods employed to detect SGA fetuses include abdominal palpation, symphyseal fundal height, ultrasound biometry, ultrasound Doppler flow velocimetry.

Abdominal palpation & symphyseal fundal height measurements have limited diagnostic accuracy to predict an SGA neonate. Abdominal circumference & estimated fetal weight are the most accurate sonographic diagnostic measurements to predict SGA¹.

Doppler studies of the fetal, placental, & uterine vasculature were developed in the 1980s & have since become an integral part of protocols used to assess the SGA. Decreasing end-diastolic flow, Absent End-Diastolic flow (AED) & Reversed End-Diastolic flow (RED) in the Umbilical Artery during a cardiac cycle are signs of worsening IUGR. In extreme cases of fetal hypoxia a phenomenon known as "brain sparing" is seen with dilatation of the fetal intracranial vessels namely the Middle Cerebral Artery (MCA) which provides protected flow to the brain at the expense of the internal organs. The presence of such compensation suggests a compromised fetus⁴. The use of Umbilical Artery Doppler to monitor high-risk fetuses reduces perinatal morbidity & mortality⁵. Randomised trials & meta-analyses confirm that the use of the Umbilical Artery Doppler is associated with a significant reduction in perinatal mortality rates & less undesired iatrogenic intervention^{6,7,8}.

MATERIAL & METHODS

This study was carried out over a one year period in the Deptt. of Obstetrics & Gynaecology & Deptt. of Radiology of Allied Hospital, Faisalabad from August 2005 to July 2006. It is the main referral hospital in the region where about 3000 women are delivered each year. Patients suspicious of carrying small for gestational age fetuses (SGAs) on measurement of symphyseal fundal height are admitted through outdoor antenatal clinic. A brief clinical history & examination including age, parity, socio-economic status, intercurrent illness, history of hypertension, diabetes, cardiac

disease, renal disease, bleeding per-vaginam, history of smoking & drug intake were taken. Past obstetrical history was also noted including previous history of SGA fetus. Methods involved in screening & diagnosing & managing the SGA fetuses were Symphyseal Fundal Height, Ultrasound Biometry (Abdominal Circumference & Estimated Fetal Weight), Biophysical Profile (BPP), Cardiotocography (CTG), & Umbilical Artery Doppler. Serial measurements of AC & EFW or (Growth Velocities) at two weeks interval were used to diagnose fetal growth restriction. Umbilical Artery Doppler was used as a primary surveillance tool. All SGA fetuses with normal Doppler were managed conservatively with fortnightly Doppler & delivery was planned at 37 weeks. When end-diastolic flow was absent or reversed then further monitoring by cardiotocography (CTG) & biophysical profile (BPP) was carried out if gestation was less than 34 weeks. However, if gestation was over 34 weeks then delivery was planned after administration of steroids. All these informations were recorded in specially designed proforma.

RESULTS

45 cases of SGA were recorded over a period of one year. The incidence of SGA fetuses was 1.5%. 25(55.5%) patients were primigravida. 15(33.3%) were constitutionally small (having normal Umbilical Artery Doppler & Anomaly scan). History of Pre-eclampsia was present in 20(44.4%), cardiac disease in 2(4.4%), placental abnormality in 3(6.6%) & multiple gestation was present in 5 patients (11%).

Gravidity	No of pts	%age
Primigravida	15	33.3%
Multi-gravida	30	66.6%

Gestation of patients ranged between 30-37 weeks. 15(33.3%) patients with normal end-diastolic flow were delivered at 37 weeks. 20(44.4%) patients with absent or reversed end-diastolic flow were delivered at 34-35 weeks. 10(22.2%) patients at 30 weeks gestation with

abnormal Doppler study were managed on CTG (Cardiotocography & biophysical profile) over a period ranging between 1-14 days. Perinatal mortality was in 4(8.8%) cases mostly due to extreme prematurity.

Table-II. Underlying aetiology in SGA fetuses		
Aetiology	No of pts	%age
Pre-eclampsia	20	44.4%
Multiple Gestation	5	11%
Cardiac disease	2	4.4%
Placental abruption	2	4.4%
Placental Praevia	1	2.2%
No pathology	15	33%

Table-III. Umbilical Artery Doppler findings in SGA fetuses		
Doppler findings	No of pts	%age
Absent End-diastolic flow	15	33.33%
Reversed End-Distolc	15	33.33%
Normal doppler flow	15	33.33%

Table-IV. Perinatal outcome in SGA		
Perinatal outcome	No of pts	%age
Mortality	4	8.8%
Admission neonatal ward	16	35.5%

DISCUSSION

Incidence of SGA fetuses varies depending on the population. About one third of all infants weighing less than 2500 grams (2.5 Kg) at birth have IUGR & approximately 4-8 % of all infants born in developed countries & 6-30 % in developing countries are classified as growth restricted⁹. The incidence of SGA fetuses in our study was 1.5 %. This low incidence may be due to the fact that most of the deliveries in our social setup are still conducted at home & there is under reporting of SGA cases.

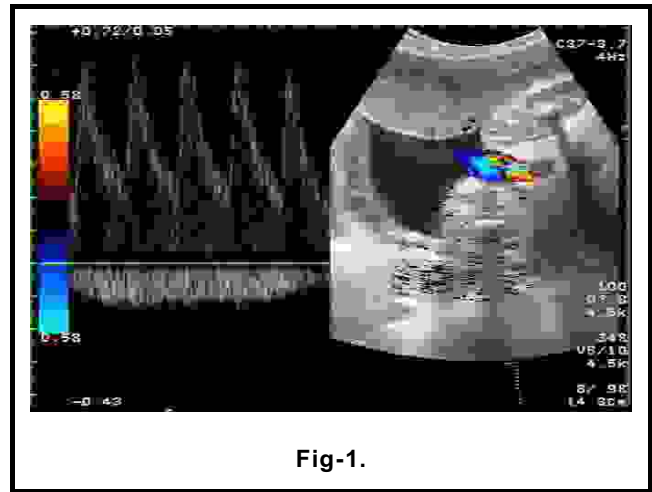


Fig-1.

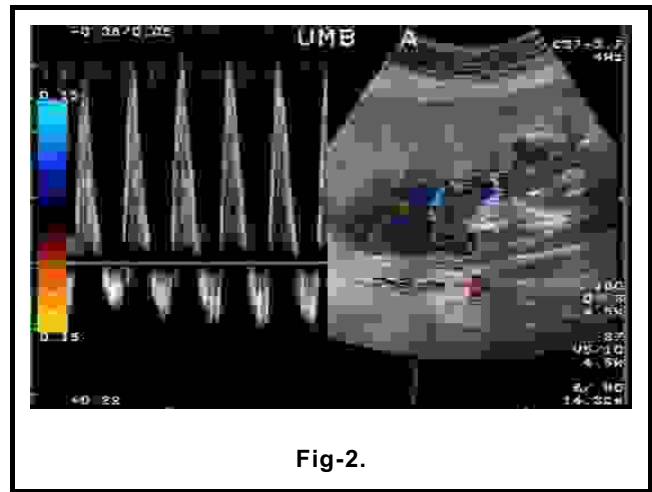


Fig-2.

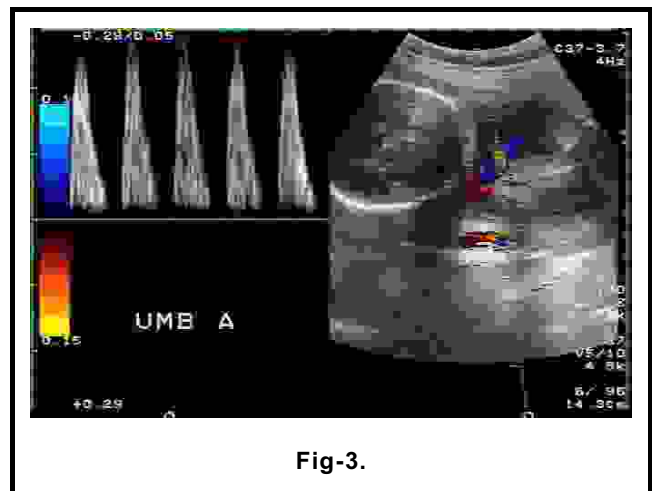


Fig-3.

Aetiology of IUGR are fetal factors i.e. chromosomal, congenital abnormalities, infection, multiple gestation. Placental factors are abnormal cord insertion, praevia, infarct & tumour. Maternal factors are nutrition, cardiovascular disease, hypertension, diabetes, renal disease, social environment including smoking, drug abuse, alcohol & high altitude living.

In our study, most of the patients belonged to poor socio-economic status. Underlying causes were malnutrition, severe pre-eclampsia, multiple pregnancy, ante-partum haemorrhage, placental abruption, placenta praevia, & cardiac diseases. Abdominal circumference & estimated fetal weight were used to diagnose SGA. A flattening growth curve on two consecutive examinations at-least 14 days apart heightens diagnostic suspicion. Methods used to diagnose suspected SGA in our study were abdominal circumference & estimated fetal weight. Doppler ultrasound is an important adjunct that provides diagnostic & correlative information on fetal oxygenation. Beyond 24 weeks an elevated umbilical artery Doppler index is a strong corroborative evidence for IUGR as a result of placental dysfunction.

A false-positive IUGR is likely in a sonographically small fetus with normal finding on umbilical artery Doppler examination & the risk of fetal distress in labour as a result of chronic hypoxia is low in such cases. After 34 weeks umbilical artery Doppler index may be within the normal range & decreased cerebroplacental ratio or middle cerebral artery Doppler index may be the only supporting evidence of placental based IUGR^{10,11,12}. Umbilical artery Doppler studies are helpful in the assessment of SGA fetus & allow the separation of the normal SGA from FGR or Fetal Growth Restriction¹³. Use of umbilical artery Doppler to monitor high risk fetuses reduces perinatal morbidity & mortality & reduction in the number of antenatal admissions & induction of labour. Interval between first occurrence of absent end-diastolic flow (AED) & an abnormal CTG/BPP (Cardiotocography/Biophysical Profile) has ranged from 1-26 days¹⁴. Gestational age, the presence of hypertension, & venous Doppler abnormalities (especially pulsations in the umbilical vein) are the key prognostic factors affecting

this interval¹⁵.

In our study, 15 patients (33.3%) had normal umbilical artery doppler values & these were managed on out-patient basis thus reducing the cost of antenatal admissions & inductions of labour. However, 30 patients (66.6%) had abnormal umbilical artery doppler studies & thus these were managed more aggressively by biophysical profile & cardiotocography (CTG) for a period ranging between 1-14 days, thus reducing perinatal morbidity, mortality, & iatrogenic prematurity. Perinatal mortality was 8.8% & admission to neonatal ward was 35%. Most of these babies were premature besides having growth restriction.

CONCLUSION

Colour Doppler ultrasound study reduces the perinatal morbidity, mortality, & cost of antenatal admission & iatrogenic prematurity by induction of labour. It is a great tool that enhances diagnostic confidence.

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It is the province of
knowledge
to speak and it is the
privilege
of wisdom to listen.

Oliver Wendell Holmes (1809-94) US writer

