ROLE OF ULTRASONOGRAPHY IN DETECTION OF INTRAUTERINE GROWTH RETARDATION

MAJID A.,[1] MEHMOOD S.[2] AND AKBAR A.A.[2]

[1]Department of Radiology, Peshawar Medical College, Peshawar
[2]Ch. Rehmat Ali Memorial Trust / Continental Medical College, Lahore, Pakistan

ABSTRACT

Objective: To compare the diagnostic role of ultrasonography with antenatal clinical diagnosis in suspected cases of intrauterine growth retardation (IUGR).

Study Design: Cross sectional study.

Place and Duration of Study: Department of Radiology, Shaikh Zayed Hospital, Lahore from March 2007 to March 2008.

Patients and Methods: One hundred clinically diagnosed pregnant women above 30 weeks of pregnancy were examined by gray scale and colour Doppler ultrasound. After delivery the baby's weight was determined. A comparison was made between antenatal clinical diagnosis and ultrasound findings using neonatal birth weight as gold standard.

Results: Diagnostic accuracy of clinical evaluation was 59%. The sensitivity of ultrasound biometry was 86.44%, specificity 82.92%, positive predictive value 58.62%, negative predictive value 80.95% and diagnostic accuracy 85%.

Conclusion: Ultrasound biometry combined with multi vessel doppler ultrasound provides better evaluation of clinically suspected cases of IUGR.

Key Words: IUGR, Clinical evaluation, Gray scale ultrasound, Doppler ultrasound.

INTRODUCTION

Intrauterine growth retardation (IUGR) is defined as growth at or below the 10th percentile.[1-3] Hence, size, rather than growth, is most often used to define IUGR, although other definitions of IUGR have been suggested.[3]

Infants who are small for gestational age at birth (low birth weight) have higher neonatal morbidity, mortality and worse long-term prognosis than infants who are appropriate size for gestational age.[4] Growth potential percentiles are superior to conventional reference ranges for the prediction of adverse perinatal outcome.[5] Low birth weight accounts for almost 30% of all births.[6] This condition (IUGR) can be a sign of genetic disorders, fetal infection, uteroplacental insufficiency, or constitutionally small fetuses.

In a well – dated pregnancy, the most sensitive ultrasound indicator of IUGR is the abdominal circumference. The advent of color doppler has enabled more precise examination of the uteroplacental and fetoplacental circulation. Decreased, absent or reversed end diastolic flow in umbilical artery suggestive of increased fetoplacental resistance.[7-9] Umbilical artery doppler should be performed for fetoplacental circulation in pregnant women with suspected severe placental insufficiency.[7,8]

The diastolic notch present in the uterine arteries since the beginning of the gestation disappears around the 20th weeks of gestation. Detection of diastolic notch after 26 weeks of gestation suggests IUGR. After 26 weeks of gestation uterine artery resistance index is between 0.45 and 0.58. Improvement in the identification of the fetus at risk of intrauterine demise may lead to more successful management strategies.

Ultrasound biometry combined with Doppler studies provides better evaluation of suspected IUGR as compared to only antenatal clinical diagnosis. Ultrasound has no harmful effect on fetus or on mother; on the other hand it is a useful tool in diagnosing IUGR fetuses.

This study was conducted at the department of Radiology, Shaikh Zayed Hospital, Lahore. Patients were selected from Obstetrics and Gynecology Department according to the devised criteria.

MATERIAL AND METHODS
Sample size
One hundred clinically diagnosed pregnant women

Corresponding Author: Dr. Abdul Majid, Head of Radiology Department Peshawar Medical College, Peshawar. Phone# 091-5853486. Cell Phone# 0315-4152631, 0301-4632650 Fax# 091-5843968. E-mail: teleradiologypk@gmail.com

above 30 weeks of pregnancy.

Clinical Evaluation and History

Study was performed in collaboration with Obstetrics and Gynecology department. Obstetrician referred the pregnant women having gestational amenorrhea of more than 30 weeks (sure about her last menstrual period) with clinical suspicion of intrauterine growth retardation within one week prior to delivery.

Their demographic information (e.g. age, gestational amenorrhea) was recorded. A brief history (hypertension, diabetes mellitus and anaemia) was taken and clinical assessment (fundal height in weeks) by referring Obstetrician was recorded.

Ultrasound

After obtaining informed consent, Ultrasound biometry, Doppler study of umbilical and uterine arteries was performed in the supine position with slightly raised head or lateral recumbent position by using Nemio 30 (Toshiba) machine with 3 − 5 MHz transducers.

The following measurements were taken:

Biparital diameter in mm, femoral length in mm, abdominal circumference in mm, expected fetal birth weight in grams, percentile weight, amniotic fluid index in cm, both uterine arteries resistive index, umbilical artery systolic / diastolic ratio, and analysis of waveform patterns of arteries. Findings were correlated with standard charts according to gestational amenorrhea. Expected fetal birth weight according to gestational age less than 10th percentile on ultrasonography was diagnosed as IUGR. On Doppler examination decreased, absent or reversed end diastolic flow in umbilical artery RI greater than 0.58 in uterine arteries and early diastolic notch in uterine arteries after 30 weeks of gestation were considered as indicator of IUGR. Neonatal birth weight

Immediately after delivery the baby's weight in grams was obtained. The baby's weight less than 10th percentile for the gestation age was considered diagnostic of IUGR.

Using neonatal birth weight as gold standard clinical assessment and ultrasound findings were compared in each case.

RESULTS

In this study all the women included were clinically suspected as having IUGR fetuses. Mean age of pregnant women was 28.4 years with standard deviation (SD) ± 4.43 years. Mean gestational age in weeks was 36.72 with SD ± 1.68 weeks. Mean fundal height in weeks was 34.08 with standard deviation ± 1.76 weeks. Mean neonatal birth weight was 2301.08 grams with SD ± 347.71 grams. Among these 100 cases 41 of the fetuses were appropriate for gestational age and 59 cases were IUGR (i.e. low for their respective gestat-

ional age) as confirmed at delivery.

By considering neonatal birth weight as gold standard 59% fetuses were IUGR. So the diagnostic accuracy of clinical evaluation was 59%.

The sensitivity of ultrasound biometry was 86.44%, specificity 82.92%, positive predictive value 58.62%, negative predictive value 80.95% and diagnostic accuracy 85%. The umbilical artery S/D ratio and waveform pattern was abnormal in 42 cases and was normal in 58 cases. Out of this abnormal S/D ratio 38 cases turned out to have IUGR fetuses confirmed at birth while 4 cases have normal fetuses confirmed at delivery. The sensitivity of umbilical artery S/D ratio in diagnosing IUGR was 90.24%, specificity was 64.40%, positive predictive value 65.51%, negative predictive value 90.47% and diagnostic accuracy 75%.

Similarly when uterine artery was taken into account, resistive index of uterine artery was raised in 41 cases and normal in 59 cases. Out of these raised cases 36 cases have IUGR fetus confirmed at delivery, while 5 cases were having normal fetus at birth. Among 59 normal uterine indexes 23 cases were having IUGR fetuses confirmed at birth. The sensitivity of uterine artery resistive index in diagnosing IUGR was 87.80%, specificity was 61.01%, positive predictive value 61.01%, negative predictive value 87.80% and diagnostic accuracy was 72%. Uterine artery waveform pattern was abnormal (i.e. early diastolic notch) in 47 cases and normal in 53 cases. Among these abnormal cases 39 of fetuses were IUGR confirmed at delivery while 8 cases have normal fetus confirmed at delivery. Among 53 normal waveform cases 20 were diagnosed as IUGR while 33 were having normal fetuses. The sensitivity of uterine artery waveform pattern in diagnosing IUGR was 80.48%, specificity was 66.10%, positive predictive value 73.58%, negative predictive value 82.97% and diagnostic accuracy was 72%.

The amniotic fluid index was decreased in 39 cases and was normal in 61 cases. Among these decreased 35 cases were having IUGR fetuses confirmed at delivery while 4 case were having normal fetus. Among 61 normal cases 24 fetuses were diagnosed as IUGR and 37 as normal.

DISCUSSION

IUGR has attracted a lot of attention of the scientific community; extensive research is going on in many centers. With better understanding of the pathophysiology of IUGR better fetal monitoring and therapeutic modalities will be available to us in future to tackle this serious problem more effectively.[1,5,9,10]

The diagnosis of IUGR is difficult in antenatal period. Early antenatal diagnosis is important to reduce fetal morbidity and mortality.[2,9] A study conducted by Khanum Z et al.[11] signifies the importance of assessment as screening test for identification of IUGR. In our study the sensitivity of clinical evaluation was 59%.

Our study also concludes that sonographic assessment is more precise than clinical assessment.

Smith – Bindman et al[3] concluded that diagnosis of IUGR is based on fetal measurements, assessment of amniotic fluid volume, and other sonographic findings. Once IUGR has been diagnosed, sonography can help establish its cause.

We also conclude that if above mentioned points are kept in mind this will definetly increase the sensitivity of whole procedure.

A prospective study was carried out by Mladenovic Segedi et al.[12] The combination of AC and FL model gives better results in fetal weight estimation than the one using BPD and AC.

Finally they concluded that the accuracy of fetal weight estimation increases with the number of measured ultrasonic fetal parameters.

The results in our study also showed that combination of different parameters of ultrasound biometry when combined with different doppler parameters gives better accuracy and can also predict the severity of the condition.

The study by Sieroszewski et al[13] showed the sensitivity of the notch observation in 20 – 24 week in the uterine flow velocity waveform for the prediction of PIH and/or IUGR in the 3rd trimester was 73.68% and the specificity 97.15%.

A study conducted by Brodszki et al.[14] concluded that doppler examination of umbilical artery is considered a valuable parameter in clinical decision making.

Lakhkar BN et al[15] concluded while umbilical artery S/D ratio is the most sensitive index (66.6%) in predicting any adverse perinatal outcome Malhotra N et al[16] conducted a study on 70 pregnant women with growth – retarded fetuses. They concluded that umbilical artery doppler should be used in the management of growth-reported fetuses.

Schwarze A et al,[17] concluded that abnormal venous doppler waveforms in preterm IUGR fetuses with absent end diastolic flow are strongly related to adverse fetal and perinatal outcomes before 32 weeks of gestation.

Doppler technology has also been shown to provide the possibility of evaluating fetoplacental hemodynamics, distinguishing between fetuses affected by hypoxemia and those who are unaffected, allowing improvements in management and outcome. Since the crucial point is therefore represented by early recognition of IUGR.

It is **concluded** that ultrasound biometry combined with multi vessel doppler ultrasound provides better evaluation of clinically suspected cases of intrauterine growth retardation as well as predicts severity of disease.

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