International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 3, March 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.3.2025.198

ORIGINAL RESEARCH

Two-dimensional sonographic placental measurements in the prediction of small for gestational age infants

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Received: 26 January, 2025 Accepted: 22 February, 2025 Published: 27 March, 2025

ABSTRACT

Background: Small for gestational age SGA) refers to foetuses with birth weight less than tenth centile for gestational age. The present study was two- dimensional sonographic placental measurements in the prediction of small for gestational age infants. **Materials & Methods:** 110 patients with singleton live pregnancy between 18 weeks 0 days to 23 weeks 6 days who visited from OBG department of JJMMC&H were included. Placenta was scanned from various angles to obtain the largest placental diameter possible- maximal placental diameter (MaxPD), and maximal placental thickness (MaxPT). **Results:** There were 60 AGA, 40 SGA and 10 LGA. The mean placental thickness in AGA patients was 25.4 mm, in SGA was 22.3 mm and in LGA was 36.8 mm. The maximum placental thickness in AGA was 26.8 mm, in SGA was 22.9 mm and in LGA was 37.4 mm. The difference was significant (P< 0.05). The mean placental diameters in AGA patients was 14.6 mm, in SGA was 11.2 mm and in LGA was 16.5 mm. The maximum placental thickness in AGA was 14.9 mm, in SGA was 12.6 mm and in LGA was 16.8 mm. The difference was significant (P< 0.05). Sensitivity (%), specificity (%), PPV (%) and NPV (%) for MPT ≤ 25.25 was 84.2, 62.5, 30.5 and 95.3. For MPD ≤ 12.95 was 85.2, 82.1, 48.5 and 96.2 and for MPT + MPD was 85.7, 65.9, 31.2 and 95.7 respectively. **Conclusion:** Placental measurements taken in mid-gestation are a valuable predictor of SGA. Measurement of placental diameter and thickness is quick and simple.

Keywords: foetuses, placental thickness, singleton live pregnancy

INTRODUCTION

The placenta 'the sprightliness of foetus in utero' functions diversely to reinforce the maturation of the foetus and interacts with the two individuals- mother & developing foetus. The human placenta develops with the principal function of providing nutrients and oxygen to the foetus.[1] Adequate foetal growth and subsequent normal birth weight depends on the efficient delivery of nutrients from the mother to the foetus via normally functioning utero- placental organ.Small for gestational age (SGA) refers to foetuses with birth weight less than tenth centile for gestational age. Worldwide, the prevalence of SGA is 27% of live births, whereas it is 46.9% in India alone.[2] SGA babies are at a higher risk of intrauterinefoetal death than non- SGA babies. Unfortunately, only 50% growth restricted foetuses are timely identified in antenatal period.[3] Even though there is no proven intervention to prevent fetal growth restriction (FGR), early prediction would allow for improved patient counselling and appropriate

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triage to a regimen of increased fetal surveillance.[4]

Previous investigators have shown that small placental volumes were more common in small for gestational age (SGA) foetuses and adverse pregnancy outcomes.[5]In an attempt to develop an effective screening test for the prenatal diagnosis of placental insufficiency, research studies have explored the relationship between placental measurements, uterine artery Doppler indices and biochemical screening in the first, and second trimesters.[6] Of the ultrasound predictors, placental volume has been shown to be an independent first trimester predictor of SGA whereas second trimester placental volume and uterine artery pulsatility index were found to be independent predictors.[7]The clear disadvantage of a placental volume is the skill and expertise required to obtain and analyse a 3D volume. Hence alternative 2D placental assessment of size maybe of use in predicting an SGA fetus. The present study was two- dimensional sonographic placental measurements in the prediction of small for gestational age infants.

MATERIALS & METHODS

The study was carried out on 110 patients with singleton live pregnancy between 18weeks 0 days to 23 weeks 6 dayswho visited OBG department of JJMMC&H. All gave their written consent to participate in the study.

Data such as name, age, etc. was recorded. Foetal and placental biometry was performed on all the patients using GE LOGIQ S7 ultrasound machine with a trans abdominal probe of 2 to 5 MHz.The following foetal biometric parameters were recorded in terms of gestational age: head circumference (HC), bi parietal diameter (BPD), abdominal circumference (AC), femur length (FL), transverse cerebellar diameter (TCD), and estimated foetal weight (EFW) using Hadlock's formula.Placenta was scanned from various angles to obtain the largest placental diameter possible- maximal placental diameter (MaxPD). Then, the diameter was measured along the fetal surface using a linear or bilinear approach (whichever is deemed a better fit). In the same image, the maximal placental thickness (MaxPT) was recorded. Then ultrasound probe was rotated by 90° and the above measurements was repeated in this orthogonal plane.Using the two values obtained, the mean placental diameter (MPD) and mean placental thickness (MPT) was calculated.

Clinical management of the individual pregnancies including use of steroids, tocolysis, additional ultrasounds or iatrogenic premature delivery will be left to the attending obstetrician. After the delivery, gestational age at delivery, mode of delivery and the birth weight of the neonate will be recorded. The neonate will be classified into: AGA (appropriate for gestational age), SGA (small for gestational age) with birth weight <10th centile for gestational age and LGA (large for gestational age) with birth weight >90 centile for gestational age.Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Comparison of placental thickness

PT	AGA (60)	SGA (40)	LGA (10)	P value
Mean placental thickness	25.4	22.3	36.8	0.01
Max. placental thickness	26.8	22.9	37.4	0.02

Table I shows that there were 60 AGA, 40 SGA and 10 LGA. The mean placental thickness in AGA patients was 25.4 mm, in SGA was 22.3 mm and in LGA was 36.8 mm. The maximum placental thickness in AGA was 26.8 mm, in SGA was 22.9 mm and in LGA was 37.4 mm. The difference was significant (P< 0.05).

Table II Comparison of placental diameter

PDT	AGA (60)	SGA (40)	LGA (10)	P value
Mean placental diameter	14.6	11.2	16.5	0.04
Max. placental diameter	14.9	12.6	16.8	0.02

Table II, graph I shows that the mean placental diameters in AGA patients was 14.6 mm, in SGA was 11.2 mm and in LGA was 16.5 mm. The maximum placental thickness in AGA was 14.9 mm, in SGA was 12.6 mm and in LGA was 16.8 mm. The difference was significant (P< 0.05).

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Graph I Comparison of placental diameter

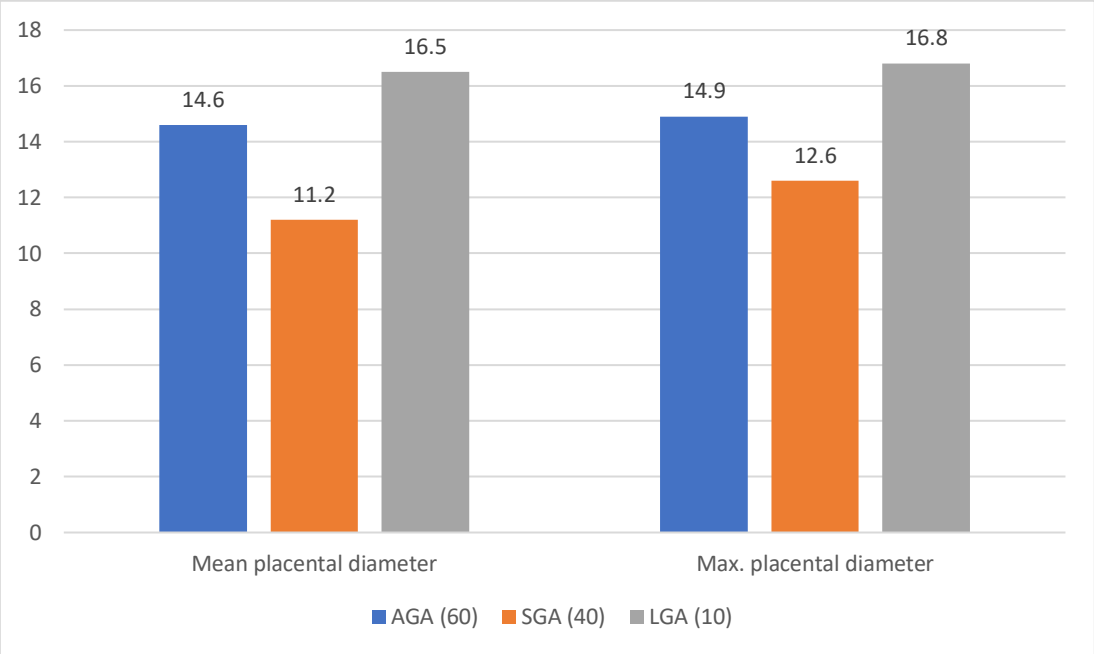

Table III Sensitivity Specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) for Prediction of SGA

Test	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
MPT ≤ 25.25	84.2	62.5	30.5	95.3
MPD ≤ 12.95	85.2	82.1	48.5	96.2
MPT + MPD	85.7	65.9	31.2	95.7

Table III shows that sensitivity (%), specificity (%), PPV (%) and NPV (%) for MPT ≤ 25.25 was 84.2, 62.5, 30.5 and 95.3. For MPD ≤ 12.95 was 85.2, 82.1, 48.5 and 96.2 and for MPT + MPD was 85.7, 65.9, 31.2 and 95.7 respectively.

DISCUSSION

One of the main causes of the pathophysiology in SGA pregnancy is placental insufficiency. Perinatal mortality, morbidity, and fetal distress during labor are all substantially correlated with fetal growth limitation. Clinical practice is greatly impacted by the prenatal diagnosis of SGA due to its correlation with unfavorable outcomes. Placental growth restriction that can be seen on sonography occurs several weeks before fetal growth restriction. Placental thickness abnormalities are caused by decreased placental size, which occurs prior to the development of IUGR.

Placental thickness irregularities with the associated gestational age are one of the early warning indications of the development of growth restriction because decreased placental size occurs before the beginning of IUGR. Prematurity, intraventricular hemorrhage, necrotizing enterocolitis, respiratory distress syndrome, and extended hospital stays are among the several negative consequences linked to intrauterine growth restriction (IUGR).[8] A better foetal outcome can be achieved if IUGR is identified prenatally and the fetus is closely monitored using a variety of foetal monitoring techniques, including the non-stress test, biophysical profile, and umbilical artery Doppler, as opposed to situations in which IUGR was not detected prenatally.[9]The present study was two- dimensional sonographic placental measurements in the prediction of small for gestational age infants.

We found that there were 60 AGA, 40 SGA and 10 LGA. The mean placental thickness in AGA patients was 25.4 mm, in SGA was 22.3 mm and in LGA was 36.8 mm. The maximum placental thickness in AGA was 26.8 mm, in SGA was 22.9 mm and in LGA was 37.4 mm. A study by Ki Hoon Ahn et al[10] aimed to determine the correlation between the placental thickness-to-estimated foetal weight ratio on midterm ultrasonography and small-for-gestational-age (SGA) infants showed that women who delivered SGA infants had higher placental thickness to estimated fetal weight ratios. This study stated that since placental thickness to estimated fetal weight ratio in midterm pregnancy was associated with infant body weight at delivery, this ratio could be an effective adjunctive screening marker for predicting SGA status.

We found that the mean placental diameters in AGA patients was 14.6 mm, in SGA was 11.2 mm and in LGA was 16.5 mm. The maximum placental thickness in AGA was 14.9 mm, in SGA was 12.6 mm and in LGA was 16.8 mm. An Ireland based study done by Patricia McGinty et al[11] provided reference ranges for

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placental length and thickness from 18 to 24 weeks' gestation. The study urged that a single measurement of placental length incorporated into the anatomy scan may assist in the early detection of a group at risk of delivering an SGA neonate.

We found that sensitivity (%), specificity (%), PPV (%) and NPV (%) for MPT ≤ 25.25 was 84.2, 62.5, 30.5 and 95.3. For MPD ≤ 12.95 was 85.2, 82.1, 48.5 and 96.2 and for MPT + MPD was 85.7, 65.9, 31.2 and 95.7 respectively. A study done in India by Megha Jindal et al[12] showed that placental measurements taken in mi gestation are a valuable predictor of SGA. Being a quick and simple measurement, placental thickness and diameter, study urged that this approach must be explored in future to develop a predictive model for growth restricted foetuses.

The shortcoming of the study is small sample size.

CONCLUSION

Placental measurements taken in mid-gestation are a valuable predictor of SGA. Measurement of placental diameter and thickness is quick and simple.

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