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Original Research Paper

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SONOGRAPHIC ASSESMENT OF PLACENTAL THICKNESS AND ITS RELATIONSHIP WITH GESTATIONAL AGE DURING THE SECOND AND THIRD TRIMESTERS

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KEYWORDS :

INTRODUCTION

Determining fetal gestational age accurately is essential in prenatal care as it guides fetal monitoring and supports better maternal and neonatal health outcomes[1]The estimated gestational age (GA) and expected time of delivery typically relies on the last menstrual period (LMP). For this method to be accurate, women should have regular menstrual cycles, consistent bleeding patterns, and no recent use of hormonal contraceptives within the past three months. However, these conditions are not met by all patients, which can result in unreliable LMP-based estimates of the expected date of delivery (EDD).[2]

Ultrasound-based fetal biometry is considered the most dependable and important method for assessing fetal growth .During the second and third trimesters, gestational age (GA) is most often estimated using key fetal biometric measurements, including biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL).[3]

Assessing gestational age is important for properly timing invasive procedures like chorionic villus sampling and amniocentesis, as well as for accurately interpreting biochemical tests, including maternal serum marker screenings such as alpha-fetoprotein levels.[4]

Although fetal biometry is typically effective in estimating gestational age, it may not be entirely relied upon in specific conditions such as genetic syndromes, abdominal wall abnormalities, diaphragmatic hernia, twin pregnancies, skeletal disorders, or cranial anomalies like hydrocephalus and craniosynostosis.[5]

Assessing placental thickness (PT) offers a potential supplementary method for estimating gestational age.[6]The placenta is a fetal organ that links the developing fetus to the mother, playing a vital role in supporting fetal development. It carries out essential functions such as respiration, excretion, nutrition, and hormone production. Through this organ, gases like oxygen and carbon dioxide, metabolic waste like urea, nutrients such as glucose, and hormones are exchanged between the maternal and fetal circulatory systems.[7]

This study aimed to establish the normal placental thickness (PT), measured sonographically in millimeters during the second & third trimester, and to assess whether this measurement can be correlated with gestational age.

MATERIALS AND METHODS

Study Design- This was a cross sectional study carried out in the radiology department of a tertiary care medical institute.

Data Collection- A total of 200 pregnant women in their second and third trimesters were enrolled based on predefined inclusion and exclusion criteria. The study aimed to evaluate the effectiveness of placental thickness as an independent indicator for estimating gestational age during the second and third trimesters. The study spanned a period of five months.

Inclusion Criteria

- Singleton pregnancies.
- Women with confirmed last menstrual period.
- Pregnant women presenting in 2nd and 3rd trimester of pregnancy.
- Age Above 18 years.
- Ready to give informed and written consent to bepart of study.

Exclusion Criteria

- 1st trimester and above 40 weeks pregnancies.
- Age below 18 years.
- Those who refused consent to be part of study.
- Cases in whom date of last menstrual period is not known.
- Patients with diabetes, hypertension, anaemia, fetal or placental anomalies, marginal or velamentous cord insertion, poly/oligohydramnios, multiple pregnancies, Intra uterine growth restriction, placenta previa were excluded from the study.

Imaging Protocol

An ultrasound examination was performed with the patient in the supine position using a real-time curvilinear array ultrasound machine, specifically the GE Voluson P8, equipped with a 3.5- 8 MHz transducer. Placental thickness (measured in millimeters) was assessed at the level of the umbilical cord insertion site. On sonography, the cord insertion site typically appears as V-shaped hypoechoic areas near the chorionic plate within the thickest region of the placenta. Measurements were taken at or near the central portion of the placenta, extending from the placental-myometrial interface up to the echogenic chorionic plate. The myometrium and any subplacental venous structures were carefully excluded during the measurement process. Standard biometric parameters, including biparietal diameter (BPD), Head circumference (HC), abdominal circumference (AC), and femur length(FL) were also measured in addition to placental thickness.

Statistical Analysis

SPSS (Statistical Package For Social Sciences) was used to perform the statistical analysis Data was entered in the excel spread sheet.

Descriptive statistics included mean placental thickness and standard deviation. Scatter plots illustrated mean placental thickness against GA. Pearson's coefficient was calculated. Significance was set at p value < 0.05.

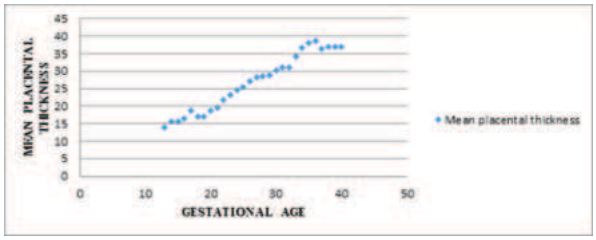
RESULTS

In the total study group of 200 normal antenatal women, the age ranged between 18 yrs to 37 years.The analysis of the age distribution among these cases revealed that the majority belonged to the age group between 21-25 yrs(36%) followed by 26-30 yrs (31%) and 31-35 yrs (20%).

Age	No of Patients
<20	18
21-25	72
26-30	62
31-35	40
>35	8

The mean placental thickness was assessed for each gestational week, revealing a progressive increase in thickness with advancing gestational age. At 13 weeks of gestation, the mean placental thickness was recorded at 13.83 mm, reaching a maximum of 38.60 mm by 36 weeks. Beyond 36weeks, a slight decrease in thickness was noted, ranging between 2-3 mm up to 39 weeks.In this study, the minimum and maximum placental thickness values were 13.83 mm and 38.60 mm, respectively.

Gestational age in weeks + days	No. of cases	Mean placental thickeness	Standard Deviation
13-13+6	6	13.83	1.60
14-14+6	2	15.50	0.71
15-15+6	2	15.50	0.71
16-16+6	2	16.50	0.71
17-17+6	3	18.67	2.08
18-18+6	7	17.00	1.73
19-19+6	8	16.88	1.25
20-20+6	10	18.80	1.03
21-21+6	11	19.64	1.50
22-22+6	7	21.86	1.34
23-23+6	8	23.14	1.57
24-24+6	4	24.50	2.08
25-25+6	5	25.40	1.14
26-26+6	5	27.06	1.29
27-27+6	8	28.12	1.46
28-28+6	13	28.46	1.39
29-29+6	10	28.90	2.07
30-30+6	7	30.14	4.71
31-31+6	8	31.12	1.81
32-32+6	14	31.14	2.82
33-33+6	5	34.20	1.30
34-34+6	5	36.60	1.67
35-35+6	9	38.20	2.05
36-36+6	10	38.60	1.51
37-37+6	12	36.25	1.14
38-38+6	15	36.93	1.28
39-39+6	3	37.00	1.00
40-40+6	1	37.02	



A plot of placental thickness (measured in millimeters) against gestational age (measured in weeks) demonstrated a linear relationship, indicating that placental thickness increases proportionally with the progression of gestational age from 11 to 36 weeks.

To assess the relationship between placental thickness and gestational age, the Pearson correlation coefficient was calculated, yielding a value of r = 0.9842 with a p-value < 0 .00001. This indicates a statistically significant positive correlation, confirming that placental thickness (measured in millimeters) increases with advancing gestational age (measured in weeks).

DISCUSSION

The estimation of gestational age is most commonly based on clinical history in conjunction with ultrasonographic assessment utilizing fetal biometric parameters[8]

Although these methods are regarded as reliable, there are specific clinical scenarios in which they may not provide fully dependable results.

The biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL) are the most commonly employed biometric parameters for estimating gestational age.

Head circumference (HC) is affected by growth fluctuations or external influences that may potentially distort fetal head morphology. Abdominal circumference (AC) serves as an indicator of the size of several internal organs, notably the liver, which is impacted early in the course of fetal growth restriction due to glycogen depletion. It demonstrates a strong correlation with the extent of fetal malnutrition.[9]

Femur length may not provide an accurate estimation of gestational age in cases of congenital skeletal dysplasias or conditions associated with short stature.[10]

Given the reduced reliability of fetal biometry in determining gestational age in such conditions, the use of alternative or adjunctive markers, such as placental thickness, is warranted, as it is less susceptible to the influence of fetal anomalies.

The present study evaluated the association between placental thickness (in millimeters) and sonographically determined gestational age (in weeks). Findings demonstrated that placental thickness increases progressively with advancing gestational age in a linear

pattern, closely corresponding to the gestational age between 13 and 36 weeks of gestation.Beyond 36 weeks of gestation, a mild reduction in placental thickness was observed, ranging from 2 to 3 millimeters up to 39 weeks.

This finding aligns with previous research, including the study by Adhikari et al, which reported a gradual increase in placental thickness from 11 mm at 11 weeks to 38.33 mm at 40 weeks of gestation. Furthermore, their study observed that between 11 and 34 weeks, placental thickness closely corresponded to gestational age in weeks, whereas from 35 to 40 weeks, placental thickness measured approximately 1–2 mm less than the gestational age.[11]

Bleker et al. proposed that the reduction in placental volume observed in late pregnancy may be due to a decline in intravillous blood volume. Similarly, the present study observed a decrease in placental thickness beginning after 36 weeks of gestation.[12]

Ohagwu CC et al. conducted a prospective study aimed at evaluating placental thickness as a parameter for estimating gestational age in normal singleton pregnancies. The study included 730 women with uncomplicated singleton gestations. Correlation and regression analyses were performed to examine the relationship between placental thickness and gestational age. The results demonstrated a progressive, nearly linear increase in mean placental thickness with advancing gestation, with a peak value of 45.1 ± 6.4 mm observed at 39 weeks. A strong positive correlation was found between placental thickness and gestational age.[13]

Karthikeyan et al. conducted a cross-sectional study involving 211 women between 11 and 40 weeks of gestation to assess the relationship between placental thickness (PT) and fetal growth parameters. The study demonstrated a strong positive correlation between PT and gestational age across all trimesters, with additional significant correlations observed with BPD, AC, FL, HC, and estimated fetal weight. The authors concluded that PT is a useful predictor of gestational age.The same was demostrated in our study.[14]

The limitations of the present study include its cross-sectional design, with placental thickness (PT) measured only once per participant. Additionally, the sample size was relatively small, and the placental location was not considered, which may influence PT measurements. Furthermore, as PT may vary with ethnicity, larger studies involving diverse populations are needed to further evaluate its reliability as a marker for estimating fetal gestational age.Since all ultrasound measurements were performed by a single observer using the same machine, the possibility of observer bias (intra-observer variability) and instrumental bias cannot be excluded.

CONCLUSION

Although fetal biometry remains a widely accepted method for estimating gestational age and fetal weight, its accuracy may be compromised in certain clinical scenarios.in such situations placental thickness may serve as a valuable adjunctive parameter for estimation of both gestational age and fetal weigh especially from 13- 36 weeks of gestation and when the duration of pregnancy is unknown or uncertain.

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