ORIGINAL ARTICLES

Correlation of Placental Thickness Measured Sonographically with the Gestational Age Estimated by Fetal Growth Parameters in Normal Singleton Pregnancy

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ABSTRACT

Objective: To correlate the mean placental thickness with the gestational age estimated by fetal growth parameters in normal singleton pregnancy.

Study Design: Cross-sectional study.

Place and Duration of Study: Combined Military Hospital, Quetta Pakistan, from Feb to Aug 2020.

Methodology: All patients who fulfilled the inclusion criteria at the Department of Radiology, Combined Military Hospital Quetta were included. After taking informed written consent and history, transabdominal-ultrasonography using a low frequency 3-5 MHz curved array transducer was done to assess the outcome.

***Result*:** A total of 100 women with a singleton pregnancy were included. The mean age of women was 28.100 ± 3.349 years. The mean placental thickness (PT) was 29.785 ± 5.700 mm. A significant positive correlation of placental thickness was noted with gestational age with a Pearson Correlation of 0.985 and *p*-value of 0.001.

Conclusion: Placental thickness has a linear relationship with gestational age. Placental thickness in millimeters can be an essential parameter for estimating gestational age.

Keywords: Gestational age, Placental thickness, Ultrasonography.

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INTRODUCTION

Ultrasonography has been an integral part of obstetric care for the past few decades. Antenatal ultrasound scanning protocols have revolutionized the planning and execution of successful fetal delivery and early detection of potential adverse outcomes. Among other benefits of obstetric ultrasonography lies its invaluable ability to assess gestational age with a high level of accuracy.[1,2] Precise knowledge of gestational age is essential for determining the adequacy of fetal growth and the interpretation of anomaly screening biomarkers. Early detection of IUGR helps in taking timely preventive or curative action. It is also valuable in selecting the appropriate time and method of delivery and pregnancy termination. Precise GA measurement, for example, will prevent unnecessary labour induction due to GA overestimation. Several studies have established that gestational age by sonography is more accurate than the age estimated by the last menstrual period (LMP).[3,4] Gestational age by LMP is subject to error, particularly in our population.

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There is always a need to study newer parameters that shall improve the accuracy of sonographic GA estimation and can be used to date pregnancy in cases where one or more of the routinely used parameters become less reliable and need to be substituted like BPD in hydrocephalus. Various parameters have been studied in different populations of the world,[5] one of which is placental thickness which has gained particular interest as a potentially essential and reliable fetal growth parameter. In a study conducted in India, it was established that there was a significant correlation between the gestational age and the placental thickness with a correlation coefficient (r) value of 0.968 at a 5% confidence interval.[6] A similar study in Nigeria reported a correlation coefficient (r) of 0.79 and 0.67 in the second and third trimesters, respectively between placental thickness and gestational age.[7] Prasad *et al*, reported that placental thickness increases linearly with the gestational age.[8] Placental thickness has a value in predicting fetal outcome, too.[9] Sun *et al*, established that a thick placenta for the gestational age is a predictor of adverse pregnancy outcomes.[10] Few studies concluded that subnormal PT was a predictor of LBW infants. A suboptimal placental thickness is an early indicator of fetal growth retardation (IUGR).

Another study showed that placental thickness and placental volume were increased in thalassemic fetuses compared to their normal counterparts.[2]

Therefore, establishing a relationship between PT and GA in our population is very important in evaluating the efficacy of incorporating placental thickness as a fetal growth monitor. Once it is known, it shall help accurately determine the gestational age, especially in cases where routinely used fetal growth parameters become less accurate, like BPD in hydro-cephalus. Subsequently, a disproportionate PT for a given GA will alert the doctor of a possible disease condition. Significantly, its ability to predict fetal IUGR shall positively affect pregnancy outcome. A timely preventive measure can therefore be taken.

METHODOLOGY

This cross-sectional study was conducted at Combined Military Hospital, Quetta, from February to August 2020. After getting approval from the Ethical Committee (IERB no.Trg-14-05/004), data was collected. Sample size was calculated by correlation sample size calculator with the level of significance = 5%, correlation coefficient = 0.96 and sample size n=100. The sampling technique was non-probability consecutive sampling.

Inclusion Criteria: Pregnant women aged 18-35 years, with singleton pregnancy, 11-39 week gestation and known last menstrual period by the patient, were included in the study.

Exclusion Criteria: All the patients having multiple pregnancies, placental anomalies, poor visualization of the placenta, fetal anomaly or growth retardation, maternal disease including hypertension, diabetes, anaemia and unknown last menstrual period (LMP) were excluded from the study.

Informed consent of the patients was taken. Characteristics of patients, including age and last menstrual period, were recorded on a standardized data collection form. Placental thickness (PT), biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC)and femur length (FL) was measured by trans abdominal Ultrasonography using a low frequency 3-5MHz curved array transducer and recorded on the data collection form. As sonography is user-dependent, all measurements were taken by a single user to minimize the user-related bias.

Statistical Package for Social Sciences (SPSS) version 20 was used for the data analysis. Mean ± SD were calculated for quantitative variables including gestational age (GA), placental thickness (PT), BPD, HC, AC and FL. Pearson's correlation coefficient was calculated to establish a correlation between PT and GA. The *p*-value of ≤0.05 was considered significant.

RESULTS

One hundred women with a singleton pregnancy were selected. The mean maternal age was 28.10 ± 3.349 years. The mean placental thickness (PT) was 29.785 ± 5.700 mm. The mean biparietal diameter (BPD) was 63.260 ± 14.748 mm. The mean head circumference (HC) was 240.990 ± 45.866 mm. The mean abdominal circumference (AC) was 206.720 ± 55.247 mm. The mean Femur length (IL) was 75.440 ± 12.895 mm. The mean gestational age (GA) by USG was 25.152 ± 5.170 weeks. The mean gestational age (GA) by last menstrual period (LMP) was 24.870 ± 5.058 weeks. In our study the significant positive correlation of PT was noted with gestational age with Pearson Correlation of 0.985 and *p*-value of 0.001 and with all other ultrasonographic fetal growth parameters i.e. BPD, FL, AC, HC with Pearson correlation of 0.988, 0.987, 0.991 and 0.988 and the *p*-values of 0.001, 0.001, 0.001 and 0.001 respectively, as shown in Table.

Table: Correlation of placental thickness measured sonographically with the gestational age estimated by fetal growth parameters in normal singleton pregnancy.

Parameters		*p*-values
Gestational Age (GA)	Pearson Correlation	0.985
	p-value	0.001
Femur Length (FL)	Pearson Correlation	0.988
	p-value	0.001
Biparietal Diameter (BPD)	Pearson Correlation	0.987
	p-value	0.001
Abdominal Circumference (AC)	Pearson Correlation	0.991
	p-value	0.001
Head Circumference(HC)	Pearson Correlation	0.988
	p-value	0.001

The linear relation of gestational age (weeks) with the placental thickness (mm) is shown in Figure.

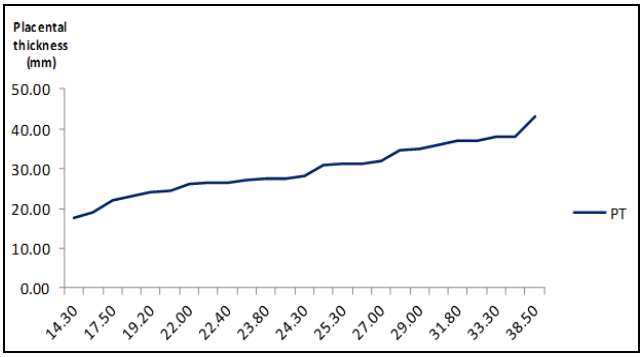

Figure: Linear relationship of placental thickness (Y-axis)with gestational age (x-axis).

DISCUSSION

This study correlated mean placental thickness with the gestational age estimated by fetal growth parameters in normal singleton pregnancy.

Sonographic measurements of fetal body parts provide a direct way of assessing fetal size. Numerous formulas have been used for estimating fetal weight from one or more of the following fetal body measurements: head (BPD, HC), abdomen (AC) and femur (FL). All of these are subject to errors in different circumstances as described above, and the need for newer parameters is always there to improve gestational age measurement and predict adverse fetal outcomes.[11,12]

Placental thickness appears to be a promising parameter for the estimation of gestational age because of the linear increase in placental thickness with advancing gestational age.[13,14] Usually, during obstetric ultrasound examination, the placenta used to be examined only for its location and position. However, nowadays, due to detailed ultrasonography, we can detect the morphological changes of the placenta as the placenta matures. As the gestational age advances, the placental thickness also increases gradually. So abnormal thick or thin placenta should be evaluated and correlated with other parameters for the pregnancy duration estimation. The measurement of placental thickness in ultrasound has been described early. We can define the average placental thickness measurement for every week of gestational age and therefore determine any abnormality.[15]

This study described the measurement of placental thickness and the correlation of placental thickness with gestational age. It showed that the placental thickness increases gradually with the advancing gestational age. Njeze *et al*,[16] concluded that the placental thickness is a good predictor for estimating gestational age. In our study the significant positive correlation of PT was noted with gestational age with Pearson Correlation of 0.985 and *p*-value of 0.001 and with all other ultrasonographic fetal growth parameters i.e., BPD, FL, AC, HC with Pearson correlation of 0.988, 0.987, 0.991 and 0.988 and *p*-values of 0.001, 0.001, 0.001 and 0.001 respectively. Mathai *et al*, [17] also studied that placental thickness coincides with gestational age from 22-35 weeks. Tiwari *et al*,[18] observed that placental thickness gradually increased from 15 weeks, 11 mm to 39 weeks of gestation, 36.3mm. Another researcher concluded that the placental thickness and placental volume significantly increased with gestational age.[19] Afrakhteh *et al*, and Noor *et al*, in two different studies, observed a significant positive correlation between placental thickness and fetal weight in the second and third trimester.[20,21] Clapp *et al*, evaluated placental growth of forty singleton pregnant women and showed a significant correlation r>0.79 between placental growth rate and birth weight.[22] Mangal *et al*, concluded a linear correlation between the placental thickness and gestational age From 11 weeks to 40 weeks.[23] The placental thickness in millimeters almost matched gestational age in weeks. Ohagwa *et al*, concluded that placental thickness is an important parameter for estimating gestational age.[24] The usefulness of this relationship between placental thickness and estimated fetal weight is that subnormal placental thickness for gestational age may be the earliest indicator of fetal growth retardation.[25]

CONCLUSION

Placental thickness has a linear relationship with gestational age. Therefore, placental thickness in millimetres can be an additional essential parameter for estimating gestational age.

Conflict of Interest: None.

Authors' Contribution

RAMJ:, JA: Direct, concept and design, data collection and analysis, ABLK: Data analysis, manuscript writing, MBK:, FA: Data collection and analysis, MKA: Proof reading and editing of manuscript.

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