

ORIGINAL RESEARCH

Ultrasound Measurement of Placental Thickness: A Reliable Estimation of Gestational Age in Normal Singleton Pregnancies

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Received: 23 March, 2023

Accepted: 28 April, 2023

ABSTRACT

Background: Placenta is the vital support organ for the developing fetus which provides the physiological link between a pregnant woman and the fetus. Placental thickness was measured at the level of insertion of umbilical cord and is correlated to gestational age measured by known parameters like BPD, HC, AC and FL. **Materials & Methods:** A total of 100 women between 20–40 years of age group and 11–40 weeks of gestation with singleton pregnancy were included in the study. PHILIPS EPIQ 7G ultrasound machine with a curvilinear probe of 3-5 MHz frequency was used. The composite average of the gestational age was estimated automatically by software by using bi-parietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL). The placental thickness was measured at the level of the insertion of umbilical cord. **Results:** Present study shows a linear correlation between mean placental thickness and gestational age. Placental thickness lags behind gestational age from 37 weeks which is attributed to reduced blood supply to placenta near term. **Conclusion:** The estimation of the placental thickness is a significant parameter for estimation of fetal age specially in late mid trimester and early third trimester where the exact duration of pregnancy isn't known and other sonographic parameters additionally become less dependable.

Key words: placental thickness, gestational age, ultrasound

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INTRODUCTION

Placenta is the vital support organ for the developing fetus which provides the physiological link between a pregnant woman and the fetus.¹ Placenta is a highly vascularized organ that facilitates nutrient and gaseous exchange between maternal and fetal compartment. It begins to develop from the chorion frondosum and decidua basalis in the 8th week of intrauterine life.²

GA often calculated from the first day of the last menstrual period (LMP) is approximately 280 days. Although estimation of GA derived from LMP is widely used in clinical settings due to its ready availability, women often fail to accurately recall their LMP. Furthermore, pregnant women often misreport their LMP due to mid-cycle or occasional bleeding during pregnancy.³

Sonographically, the chorion frondosum can be distinguished by its thickness from the thinner, opposing chorion leave as early as 8–9 weeks of gestation. Placental thickness can be a useful sonographic parameter as it tends to gradually

increase with gestational age in a linear fashion and therefore the thickness in mm can approximate the gestational age in weeks.⁴

The measurement of the placental thickness is especially important in the late mid trimester and early third trimester, when the exact duration of pregnancy is not known and other sonographic parameters become less reliable.⁵ In the present study, placental thickness was measured at the level of insertion of umbilical cord and is correlated to gestational age measured by known parameters like BPD, HC, AC and FL.

MATERIALS & METHODS

The present study was a cross-sectional one, and the study was done in the department of Radiodiagnosis of School of Medical Sciences, Sharda University, Noida. A total of 100 women between 20–40 years of age group and 11–40 weeks of gestation with singleton pregnancy were included in the study. Informed consent was obtained before recording the data on the preformed questionnaire. Inclusion criteria

was pregnant women between 20- 40 age group, singleton pregnancy between 11-40 weeks of gestational age with no maternal or fetal complications and women with known last menstrual period (LMP) with history of regular menstruation. PHILIPS EPIQ 7G ultrasound machine with a curvilinear probe of 3-5 MHz frequency was used in this study. The composite average of the gestational

age was estimated automatically by software by using bi-parietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL). The placental thickness was measured at the level of the insertion of umbilical cord. Data was analyzed using SPSS 16 (Statistical software package for social sciences). P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Gestation age in weeks	Mean with standard deviation	Gestation age in weeks	Mean with standard deviation
12	13.8 ±0.73	27	28.9±0.07
13	14.83±0.85	28	29.9±0.11
14	16.57±0.93	29	30.4±1.39
15	17.12±1.43	30	33±0.81
16	19±1.0	31	33.4±0.98
17	19.05±1.40	32	34.45±0.91
18	22.2±1.4	33	34.62±0.81
19	21.16±1.35	34	36.8±0.22
20	23.30±0.59	35	37.0±0.23
21	22.38±1.26	36	37.0±0.24
22	24.1±0.62	37	37.8±0.25
23	26.3±1.53	38	36.9±0.26
24	26.95±1.21	39	36.5±0.27
25	27.1±1.527	40	37.7±0.28
26	29.05±1.29		

Table I shows that in the present study, 5 women (5%) were in the first trimester (<14 weeks), 53 (53%) in the second trimester (14–27 weeks), and 42 (42%) were in the third trimester (>27 weeks) of pregnancy. The mean placental thickness in the 1st, 2nd and 3rd trimester were 14.83 mm, 22.1 mm and 34.6 mm respectively.

Table II Correlation between placental thickness & gestational age

Trimester	Sample	Correlation between placental thickness & gestational age	P value
First Trimester	5	0.72	<0.0005
Second Trimester	53	0.943	<0.0005
Third Trimester	42	0.927 between 27 to 37 weeks and 0.67 in >37-40 weeks	<0.0005

Table II shows that correlation coefficient between placental thickness and the gestational age for 1st and 2nd trimester was 0.72 and 0.943 respectively with p value <0.0005 which is statistically significant. Correlational coefficient for >27-37 weeks was 0.972 and >37-40 weeks was 0.67 with p value <0.0005. The minimum placental thickness was 13.8 mm at 12 weeks and maximum was 37.8 mm at 37 weeks with an average of 27.84mm for all trimester.

Fig- 1 The placental thickness was measured at the level of the insertion of umbilical cord



DISCUSSION

The accurate calculation of gestational age (GA) is essential for providing effective prenatal care and having a successful delivery. The assessment of intrauterine growth restriction (IUGR) and the interpretation of biochemical tests (such as human chorionic gonadotropin and alpha-fetoprotein) for the risk assessment of congenital abnormalities and disordered foetal development both need the use of GA estimate.⁶ Furthermore, when a foetal anomaly is discovered, the manner of intervention is also decided by proper understanding of GA. The majority of clinical choices relating to pregnancy care demand correct GA knowledge. These include, among others, the management of premature birth, caesarean sections, pregnancy haemorrhage, and labour problems.⁷

The placenta is a materno-foetal unit which forms a little later than the foetus, it nourishes and protects the foetus and it dies out after the delivery of the baby. Since it is closely related to the foetus and the mother, it acts like a mirror, reflecting the status of both the mother and the foetus. The best possible antepartum care and the successful deliveries of babies always revolve around the accurate knowledge of the gestational Age (GA).⁸

Placental thickness (PT) has been demonstrated to be a significant biometric measure strongly correlated with GA, particularly in the second half of pregnancy. The role of PT measurement in GA determination has not been adequately investigated, despite being reasonably straightforward and therapeutically useful.⁹ Additionally, in some circumstances, the well-being of the foetus may be compromised by employing a normogram from a group with a different demographic make-up (such as the Caucasian population) to guide obstetric care decisions. A study on the precision of PT in determining GA and their comparisons to recognised foetal biometric markers in our local community is therefore required.¹⁰ In the present study, placental thickness was measured at the level of insertion of umbilical cord and is correlated to gestational age measured by known parameters like BPD, HC, AC and FL.

It was found that the mean placental thickness increased in proportion to the advancing gestational age and has linear correlation with gestational age from 11 to 37 weeks. Ohagwu C et al¹⁰ conducted similar study on Nigerian antenatal population. Mittal et al¹¹, also found a direct proportion in the values of mean placental thickness (in mm) with increase in gestational age (in weeks) and found that the placenta thickness (in mm) coincides almost exactly with the gestational age in weeks, and recommends that more studies are required to establish this new parameter in calculating gestational age or confirming the fetal age using this parameter.

Similar study conducted by Ismail et al¹², reported that placental thickness can be used to estimate the gestational age of the fetus. In our study, the mean

placental thickness gradually increased with gestational age, from 13.8 mm at 12 weeks to 37.80 mm at 37 weeks which almost matched with the observations of the study conducted by Dudley et al¹³, where placental thickness gradually increased from 15 mm at 11 weeks of gestation to 37.5 mm at 39 weeks. Olaleye et al¹⁴ evaluated the accuracy of placental thickness (PT) in determination of gestational age (GA) in normal singleton fetuses. A total of 406 pregnant women with singleton pregnancies (at 15–40 weeks of gestation), referred for routine obstetric ultrasound (US) scan were studied. Biparietal diameter (BPD), femur length (FL), head circumference (HC), abdominal circumference (AC), and PT were measured using standard protocols. The mean age was 31.8 ± 4.8 years. The mean PTs in the second and third trimesters were 23.2 ± 3.1 and 34.1 ± 3.7 mm, respectively. PT had a linear relationship and a statistically significant positive correlation with GA. There was also a statistically significant positive correlation between PT on the one hand, and BPD, AC, HC, FL, PT, and GA, on the other hand.

CONCLUSION

Authors found that the estimation of the placental thickness is a significant parameter for estimation of fetal age specially in late mid trimester and early third trimester where the exact duration of pregnancy isn't known and other sonographic parameters additionally become less dependable.

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