

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20184518>

Original Research Article

Placental thickness: an important parameter in determining gestational age and fetal growth during ANC scan

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Received: 31 July 2018

Accepted: 28 September 2018

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ABSTRACT

Background: Gestational Age (GA) is one of the most imperative parameters required for proper management in pregnancy. Routinely GA is estimated by sonography utilising Biparietal Diameter (BPD), Femur Length (FL), Abdominal Circumference (AC) and Head Circumference (HC). In any case, these parameters have some limitations. Hence, there is need to find other parameters that may complement the established fetal biometric parameters in predicting GA. The objective of the present study was to assess placental thickness in second and third trimester pregnancies and its relationship with fetal gestational age and its role in detecting LBW and IUGR

Methods: A cross sectional prospective study was carried out in three hundred pregnant women between 13 to 40 weeks of gestation, who came for routine antenatal sonography. Placental thickness was measured along with routine parameters. Placental thickness was measured at the level of umbilical cord insertion by two-dimensional ultrasonography.

Results: Correlation between the GA by LMP and Placental thickness by ultrasound was done by using Karl Pearson's Correlation(r). The values were expressed as mean + standard deviation. Correlation between placental thickness and gestational age was statistically significant as p value is <0.01. Placental thickness measured in millimetres increases with gestational age in second and third trimester.

Conclusions: The correlation between the placental thickness and gestational age was linear and direct. Therefore, Placental thickness is used as a predictor for estimation of gestational age of the fetus in cases where LMP is not known and in detecting developing IUGR and low birth weight.

Keywords: IUGR, Gestational age, Placental thickness, Ultrasonography

INTRODUCTION

Last menstrual period (LMP) has been a dependable indicator in evaluating GA, yet numerous pregnant ladies can't review the correct date of their LMP.¹ Exact appraisal of the gestational age (GA) is basic in prenatal medicine to predict fetal wellbeing and management of pregnancy.

Blunders in deciding the correct GA may meddle with proper management choices, for example, in preterm

labor and also development issue that is viewed as the main source of neonatal morbidity and mortality.² In the first trimester, the mean gestational sac diameter and crown-rump length (CRL) are reliable measurements for this purpose.³

In the second trimester, Biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL) are feasible useful parameters.³ However as gestational age progresses, these parameters got some limitations.⁴

Hence, there is need to find other parameters that may complement the established fetal biometric parameters in predicting GA. The placenta is a highly vascular fetal organ, maintains the feto-maternal circulation via umbilical cord. A normally functioning placenta is critical for normal fetal growth and development.

With increasing fetal growth period, size of placenta increases to allow it to carry out its vital functions. If the fetal growth is compromised, it is due to the abnormal functioning of the placenta which can be detected by the abnormal placental measurements. Small placentas are associated with preeclampsia, chromosomal abnormalities, severe maternal diabetes mellitus, chronic fetal infections and intrauterine growth restriction.

The placentas with 4 cm thickness at term have been observed in conditions like diabetes mellitus, perinatal infections, hydrops fetalis (both immune and non-immune).⁵⁻⁷ So, the purpose of this study was to estimate placental thickness in second and third trimester pregnancies and its correlation with fetal gestational age and fetal outcome in Indian population.

METHODS

This cross-sectional study was carried out between July and December 2017 on 300 pregnant women between 13 to 40 weeks of pregnancy, attending antenatal clinics in the Department of Obstetrics and Gynecology and referred in Department of Radio-diagnosis of our institute.

Protocol of this study was submitted to ethical committee of the institute and necessary approval was obtained. Each patient gave an informed consent in local language before joining the study.

Inclusion criteria

- Singleton gestation
- Viable fetus
- GA estimated from patient's LMP of 13 weeks and above.

Exclusion criteria

- Chronic medical diseases like diabetes, hypertension, chronic renal disease, unknown LMP, multiple pregnancy, and congenital anomalies of fetus.

The bi-parietal diameter (BPD), the abdominal circumference (AC), the head circumference (HC), the femur length (FL) and the placental thickness (PT) were measured by trans-abdominal sonographic examinations performed with a 3.5 MHz transducer.

Placental thickness was measured at the level of umbilical cord insertion by two-dimensional ultrasonography.

Statistical analysis

Mean and standard deviation of PT at different GA were obtained. Statistical tests for significance of differences were done using t-test. Pearson's correlation (r) was used to analyse association of PT with GA.

RESULTS

A hospital based cross-sectional study was conducted with 300 pregnant females to evaluate placental thickness. The results have been summarized and presented in tabular forms under following headings. Distribution of pregnant women according to GA (by LMP) in the study.

All the ANC cases included in our study were divided into four groups according to gestational age estimated by LMP as shown in Table 1. Maximum number of pregnancies (36%) were between the GA of 21-28 weeks followed by 28-36 weeks (32%).

Table 1: Distribution of women according to GA (by LMP).

Gestational age	No. of cases	Percentage
13-20 weeks	45	15
21-28 weeks	108	36
28-36 weeks	96	32
>36 weeks	51	17
Total	300	100

Distribution of the location of placenta

Authors further made distribution between subjects according to location of placenta. Maximum pregnant women (42%) were presented with location of placenta on anterior side.

Table 2: Distribution according to location of placenta.

Location	No. of women	Percentage
Anterior	126	42
Fundal	117	39
Posterior	57	19
Total	300	100

Distribution of placental thickness according to GA

Mean placental thickness along with standard deviation for each week of gestation were calculated as shown in Table 3. Mean placental thickness is approximately same as the gestational age in weeks and can be useful in estimation of gestational age (Table 3), for example, mean PT at 18 weeks of GA is 18.15±0.61 mm, also mean PT at 35 weeks of GA 34.34±1.23 mm. The placental thickness was observed to increase linearly with advancing gestational age.

Table 3: Distribution of placental thickness according to GA.

GA (weeks)	No. of cases	PT (mm)±SD
13	8	13.38±0.21
14	12	14.12±0.42
15	11	15.23±0.90
16	9	15.87±0.46
17	7	16.89±0.40
18	8	18.15±0.61
19	14	19.18±0.60
20	5	21.13±0.83
21	10	21.32±0.79
22	13	21.88±0.38
23	11	22.96±0.51
24	10	24.23±1.07
25	10	25.11±0.53
26	07	25.91±0.70
27	11	27.39±0.51
28	08	27.87±0.62
29	12	29.11±0.55
30	18	29.91±0.56
31	11	30.65±0.73
32	19	31.55±1.19
33	18	32.01±1.21
34	12	33.41±1.21
35	16	34.34±1.23
36	13	35.19±1.21
37	12	36.71±1.44
38	07	37.07±1.51
39	07	36.68±1.99
40	01	38.1

Pearson correlation coefficient between placental thickness and gestational age (by LMP) in the study

Placental thickness dates pregnancy accurately when compared with GA obtained by other parameters at different gestational age groups like at 13-20 weeks ($r=0.706$), 21-28 weeks ($r=0.887$), 28-36 weeks ($r=0.814$) at >36 weeks ($r=0.710$) (Table 4). All these correlations were statistically significant as p value is <0.01.

Table 4: Pearson correlation coefficient between placental thickness and GA (by LMP).

Gestational age	No. of cases	Correlation coefficient (r)	p value
13-20 weeks	45	0.706	<0.01
21-28 weeks	108	0.887	<0.01
28-36 weeks	96	0.814	<0.01
>36 weeks	51	0.710	<0.01
Total	300		

Placental thickness and birth weight in patients predicted to have IUGR by biometric parameters

The mean estimated fetal weight in those with placental thickness below 10th percentile at 36 weeks was 1.92 kg.

75 % patients detected to have thin placenta (thickness below 10th percentile) at 32 and 36 weeks, had produced low birth weight neonates whereas only 5% of those with placental thickness above 10th percentile produced low birth weight neonates (Table 5).

Table 5: Placental thickness and birth weight in patients predicted to have IUGR by biometric parameters.

Gestational age (weeks)	Placental thickness	Birth weight (in kg)	Low birth weight
32	30.2	2	Yes
33	31.1	2.2	No
33	29.9	1.9	Yes
34	32.1	2.1	Yes
34	32.3	2	Yes
34	33.5	2.3	No
35	31.8	2.2	Yes
35	32.1	2.1	Yes
36	32.5	2.1	Yes
36	32.8	2.2	Yes
36	32.8	2.3	Yes
36	33.2	2.4	No

DISCUSSION

Without dependable menstrual history, there is no precise technique for calculating the expected date of delivery. With the advance of real-time high-resolution ultrasound, the ability to image various structures in utero has significantly improved. However, sometimes ultrasonography fails to determine accurate gestational age due to variability in the other biometric parameter readings. Ladies booked late in pregnancy and in especially those who are unsure of their last menstrual period, it is really hard to date pregnancies.^{1,2}

There is in this way a need to research a strategy for dating pregnancies that is straightforward, simple to characterize and reproducible. Placental thickness is one such parameter to determine exact gestational age. Placental thickness is the easiest dimension to measure, but little is known about the normal placental thickness as measured by sonography during different stages of gestation. If placental thickness can be measured properly, it would become a parameter to assess the gestational age of the fetus.

A frequently cited general guideline is that "Placental thickness in mm approximates gestational age in weeks". So, the present study is conducted to find whether placental thickness can be used as an independent parameter to calculate the gestational age like the other biometric indices (BPD, HC, FL, AC).

Authors calculated the gestational age for all using fetal biometry by measuring BPD, HC, FL and AC. Along with routine fetal biometry, placental thickness was

measured at the site of umbilical cord insertion. We observed that the mean placental thickness (in mm) almost matched the gestational age (in weeks) between 13 weeks to 30 weeks. It is clearly seen that placental thickness increasing linearly with advancing gestational age. Similar studies are conducted by Mital P, Hooja N, Mehndiratta K. et al which suggested that with advancing gestational age, the mean placental thickness also increases.⁸ Similar studies are conducted on Nigerian women by Ohagwu CC, Abu PO⁹ suggested that there is a strong positive correlation between placental thickness and gestational age, which can be an accurate indicator in singleton pregnancies.⁹

When the data was separately analyzed for each trimester, we found that the Pearson's correlation coefficient (r) was highest for the second trimester thereby suggesting most significant correlation between placental thickness and gestational age in the second trimester.

Another important finding, we came across our study was that 12 patients were having placental thickness below 10th percentile in third trimester, out of which 9 patients had low birth weight babies. This was suggesting that placental thickness could be useful in detecting IUGR babies with positive predictive value of 75%. Placental thickness is an accurate parameter in determining IUGR, suggested by Habib et al.¹⁰ He concluded that placental diameter of 18 cm and placental thickness of 2 cm at 36 weeks' gestation were calculated to predict low birth weight infants.

CONCLUSION

The findings of the present study offered normal ranges of placental thickness between second and third trimester of pregnancy and also demonstrated a strongly positive linear relationship between PT and GA. So, measurement of the placental thickness is a significant parameter for estimation of fetal age along with other parameters particularly with unreliable or unknown LMP. Thin placenta was associated with increased morbidity. As concluded, placental thickness measurement should be included as an important parameter in every ANC scan.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Garg A, Goyal N, Gorea RK, Pathak N, Mohan P. Normogram from fetal kidney length by ultrasonographically. *Journal of Punjab Academy of Foren Med Toxicol.* 2015;15(1):14-6
2. Kinney MV, Lawn JE, Howson CP, Belizan J. 15 Million preterm births annually: what has changed this year? *Reprod Health.* 2012;9:28.
3. Butt K, Lim K. Society of Obstetricians and Gynaecologists of Canada. Determination of gestational age by ultrasound. *J Obstet Gynaecol Can.* 2014;36(2):171-83.
4. Hadlock FP, Deter RL, Harrist RB, Park SK. Fetal biparietal diameter: a critical re-evaluation of the relation to menstrual age by means of real-time ultrasound. *J Ultrasound Med.* 1982;1(3):97-104
5. Pretorius DH, Chau C, Poeltler DM, Mendoza A, Catanzarite VA, Hollenbach KA. Placental cord insertion visualization with prenatal ultrasonography. *J Ultrasound Med.* 1996;15(8):585-93.
6. Hoddick WK, Mahony BS, Callen PW, et al. Placental thickness. *J Ultrasound Med.* 1985;4(9):479-82.
7. Nyberg DA, Finberg HJ. The placenta, placental membranes and umbilical cord. In: Newburgh DA, Mahony BS, Pretorius DH, Eds. *Diagnostic ultrasound of fetal anomalies.* St. Louis, Mosby year book publishers. 1990;21(4):623-75.
8. Mital P, Hooja N, Mehndiratta K. Placental thickness: a sonographic parameter for estimating gestational age of the fetus. *Indian J Radiol Imaging.* 2002; 12(4):553-4.
9. Ohagwu CC, Abu PO. Placental thickness: a sonographic indicator of gestational age in normal singleton pregnancies. *Nigeria Inter J Med Update.* 2009;4(2):9-14.
10. Habib FA. Prediction of low birth weight infants from ultrasound measurement of placental diameter and thickness. *Ann Saudi Med.* 2002;22(5-6):312-14.

Cite this article as: Kadam D, Patil S, Jain M. Placental thickness: an important parameter in determining gestational age and fetal growth during ANC scan. *Int J Reprod Contracept Obstet Gynecol* 2018;7:4619-22.