



ORIGINAL RESEARCH PAPER

Radiodiagnosis

ESTIMATION OF GESTATIONAL AGE BY ULTRASONOGRAPHIC MEASUREMENT OF PLACENTAL THICKNESS AT THE LEVEL OF UMBILICAL CORD INSERTION

KEY WORDS: GA – Gestational age, US- Ultrasound , PT- Placental thickness

Dr. Tanvi Khanna	Resident, Department of Radio diagnosis, Imaging & Interventional Radiology, Subharti Medical College ,Meerut, U.P
Dr. Mukta Mital*	M.D., Professor Department of Radio diagnosis, Imaging & Interventional Radiology, Subharti Medical College, Meerut, U.P *Corresponding Author
Dr. Pradeep Bansal	M.D, Associate professor, Department of Radio diagnosis, Imaging & Interventional Radiology, Subharti Medical College, Meerut, U.P
Dr. Mamta Tyagi	M.D., Professor & Head, Department of Obstetrics & Gynaecology, Subharti Medical College, Meerut, U.P

ABSTRACT	Aim: To estimate gestational age by ultra sonographic measurement of placental thickness, at the level of umbilical cord insertion.
	Material & Method : A prospective study was conducted on 272 antenatal women with gestational age from 11 weeks to 40 weeks, from October 2017-June 2019, who came for normal antenatal ultrasound to Subharti Medical Hospital, Meerut.
	Result: In our study, the placental thickness gradually increased from 11.47 mm at 11 weeks to 36.55mm at 40 weeks. From 11 to 35 weeks of gestation, the placental thickness (in mm) almost matched the gestational age in weeks. Thereafter from 36 – 40 weeks the growth of placental thickness was lower by 1–3 mm.
	Conclusion: The relationship between the placental thickness and gestational age is linear and direct. Placental thickness (in mm) measurement can be an important additional parameter for estimating gestational age along with other parameters especially from 11 to 35 weeks of gestation.

INTRODUCTION

The placenta is a highly vascularised vital support organ for the developing fetus and its main functions are to supply nutrients, oxygen, and hormones to the fetus.⁽¹⁾ The placenta is visible by 10 weeks gestation at transabdominal US, as a thickened echogenic rim of tissue surrounding the gestational sac. Color Doppler imaging can be used to detect intervillous blood flow by 12–14 weeks gestation. By 15 weeks gestation, the placenta is well formed and the retroplacental hypochoic zone is visualized. The fetal side of the placenta is called the chorionic plate, and the maternal side is called the basal plate.⁽²⁾

Ultrasonography has also been used to characterize placental position and morphologic changes as it matures and also has a role in the detection of placental abnormalities. Small placentas are associated with preeclampsia, chromosomal abnormalities, severe maternal diabetes mellitus, chronic fetal infections and intrauterine growth restriction. Thick placentas at term have been observed in conditions like DM , perinatal infections, hydrops fetalis.⁽³⁾

Ultrasonography is used to estimate the gestational age by measuring Crown Rump Length in the first trimester and fetal measurements like BPD, HC, AC, FL in the second and third trimesters⁽⁴⁾. The present study was undertaken to evaluate the relationship between placental thickness and gestational age and study the role of PT as an additional parameter for estimating GA.

AIMS & OBJECTIVES

To estimate gestational age by ultrasonographic measurement of placental thickness, at the level of umbilical cord insertion.

MATERIALS AND METHODS

A prospective study was conducted on 272 antenatal women of gestational age between 11- 40 weeks from October 2017 to June 2019 referred to the department of Radiodiagnosis at

Subharti Medical Hospital, Meerut. The US were performed on SAMSUNG MEDISON ACCUVIX A30 machine . A 3.5MHz convex array transducer was used.

INCLUSION CRITERIA

Normal singleton pregnancies from 11 to 40 weeks of gestation who were referred for a routine antenatal ultrasound.

EXCLUSION CRITERIA

Patients with pregnancy-induced hypertension, DM, intrauterine growth retardation, hydrops fetalis, congenital malformations and twins, Polyhydramnios, Oligohydramnios , succenturiate lobe, circumvallate placentas, marginal or battledore placentas and velamentous cord insertions, poor visualization of the cord insertion site and poor sonographic visualization of the placenta

DATA COLLECTION

The subject was scanned with a moderately distended bladder in the supine position. The placental thickness, in mm, was measured at the level of cord insertion site from the echogenic chorionic plate to placental myometrial interface. The myometrium and sub placental veins were excluded in the measurements. The gestational age at 11-12 weeks of pregnancy was determined by measuring CRL and calculations using Hadlock tables and from 13 to 40 weeks of pregnancy was determined by composite fetal measurements of BPD, HC, AC, and FL.

DATA ANALYSIS

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD. 95% Confidence Interval has been developed for placental thickness according to GA in weeks. Pearson correlation coefficient was used to assess the association of GA and PT . Univariate linear regression was used to find out the equation for prediction of GA from PT. A p value of <0.01 was considered statistically significant.

RESULTS

In the total study group of 272 normal antenatal women, the age ranged from 19- 40years. The mean age was 25.4years. Majority of antenatal women were in the age group between 21 and 25 years. The most common location of placenta was anterior, seen in 101cases (37.13%), followed by fundal, which were seen in 63 cases (23.16%). Posterior and lateral placental were seen in 61cases (22.43%) and 47 cases(17.28%) respectively. In the present study, 28 (10.29%) subjects had Grade 0 placenta, Grade 1 placenta in 145(53.31%), grade 2 in 84 (30.89%) while grade 3 in 15(5.51%) subjects.

It is observed that the placental thickness gradually increased from 11.47mm at 11 weeks to 36.55mm at 40 weeks. From 11 to 35 weeks of gestation, the placental thickness (in mm) almost matched the gestational age in weeks. Thereafter from 36 – 40 weeks the placental thickness was lower by 1 – 3 mm. At no stage of pregnancy was the normal placenta greater than 38mm. A linear relationship between PT (in mm) and GA (in weeks) was observed. The mean values of PT show a perfect increasing linear trend with increasing GA and almost matching it.

The values of mean PT were also correlated with GA between (11- 35 weeks) with linear regression modeling yielding the following equation

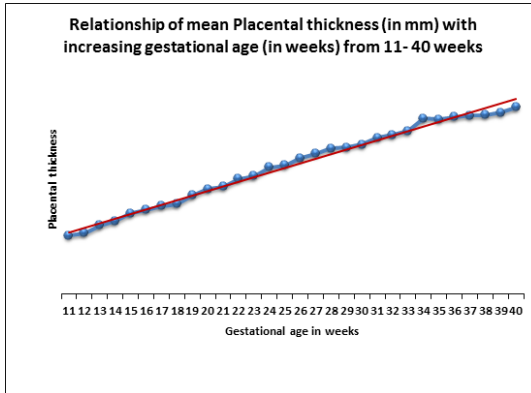
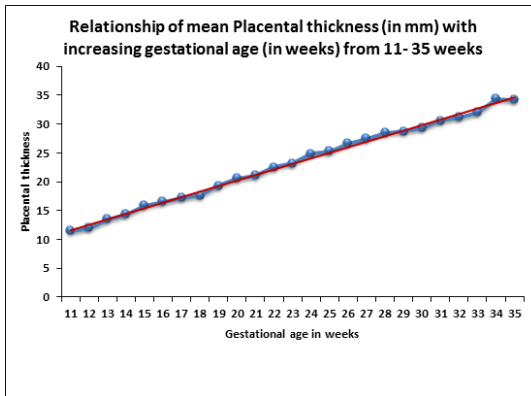
GA= .315+ 1.001* placental thickness (r=0.975), r= Pearson correlation coefficient

For (11-40 weeks)

GA= -0.756+ 1.057* placental thickness (r=0.978), r= Pearson correlation coefficient.

Table 1: Increasing trend of placental thickness with advancing gestational age

Gestational age (weeks)	No of subjects	Placental Thickness (Mean+ SD)	95% confidence interval (lower-upper)
11	6	11.47+0.43	11.01-11.91
12	4	12.00+ 0.08	11.87-12.13
13	7	13.51+ 1.50	12.13-14.90
14	4	14.33+ 0.75	13.13-15.52
15	7	15.81+ 1.03	14.86-16.76
16	4	16.55+ 1.03	14.91-18.19
17	6	17.23+ 0.55	16.66-17.81
18	12	17.64+1.05	16.98-18.3
19	15	19.33+1.22	18.65-20.00
20	16	20.56+1.13	19.95-21.16
21	14	21.09+1.07	20.47-21.71
22	18	22.52+1.14	21.95-23.08
23	11	23.17+1.07	22.46-23.89
24	8	24.86+0.87	21.14-25.57
25	7	25.23+ 1.30	24.03-26.43
26	8	26.61+1.52	25.34 -27.89
27	9	27.47+ 1.66	26.19-28.74
28	4	28.50+ 0.94	27.01-29.99
29	5	28.74+ 1.53	26.83-30.64
30	7	29.29+3.28	26.25-32.32
31	5	30.60+1.53	28.7-32.5
32	13	31.15+1.92	29.99-32.31
33	7	31.97+1.02	31.03-32.91
34	12	34.38+1.13	33.6-35.08
35	20	34.19+1.62	33.43-34.94
36	13	34.68+1.72	33.64-35.73
37	9	34.97+1.25	34-35.93
38	14	35.05+1.37	34.14-35.97
39	5	35.54+1.49	33.69-37.39
40	2	36.55+2.05	18.13-54.97



DISCUSSION

Placental thickness changes is an expression of normal growth of the fetoplacental unit amenable to measurement by ultrasonography and is of value in describing normal physiology. The estimation of PT has gained momentum as a non-invasive technique. It is a well-proven and most accepted due to the accuracy in estimating the gestational age. It is also useful in detecting intrauterine growth retardation, small for gestational age babies. The usefulness of this relationship between PT and GA may be the earliest indication of fetal growth retardation⁽⁵⁾. A genuinely straight increment in mean PT with GA was seen in previous relationship investigational studies, which has led to focus our study on the relationship between PT and GA.

In the present study, it was observed that the PT gradually increased from 11.47mm at 11 weeks to 36.55mm at 40 weeks. From 11 to 35 weeks of gestation, the placental thickness (in mm) almost matched the gestational age in weeks. Thereafter from 36–40 weeks the growth of placental thickness was lower by 1 – 3 mm. At no stage of pregnancy was the normal placenta greater than 38mm. The mean values of PT show a perfect increasing linear trend with increasing GA and almost matching it. The correlation coefficient was found to be r =0.975, thereby establishing a positive correlation between the two variables.

The results of the present study are consistent with the observations made by Noor N et al⁽¹⁾, Mital et al⁽⁴⁾, Nagwani et⁽⁶⁾, Karthikeyan et al⁽⁷⁾ & Jain et al⁽⁸⁾ who also found an increasing trend in the values of a mean PT (in mm) with an increase in GA (in weeks) and that the PT (in mm) coincides almost exactly with the GA in weeks and placental thickness can be used as a predictor of the gestational age, in the women in whom the date of Last menstrual period is unreliable or is not known.

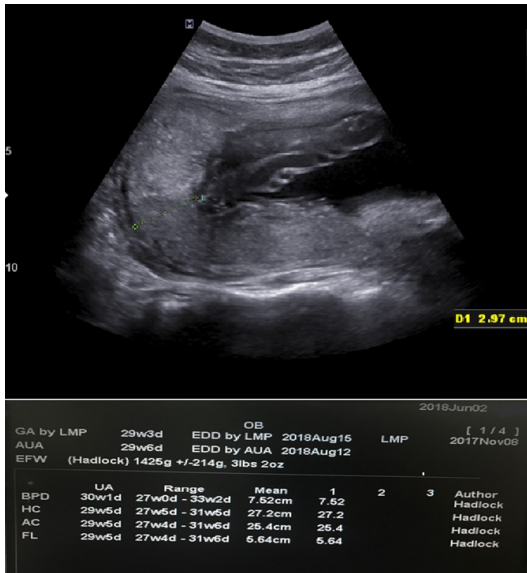
SUMMARY & CONCLUSION

The relationship between the placental thickness and gestational age is linear and direct .PT (in mm) increase with increasing GA (in weeks) and almost matching it from 11 to 35 weeks of gestation. Placental thickness (in mm) measurement can be important additional parameter for

estimating gestational age along with other parameters especially from 11 to 35 weeks of gestation.

2012;6(10):1732-35.

- 8) Jain A, Kumar G, Agarwal U, Kharakwal S. Placental thickness—a sonographic indicator of gestational age. *J ObstetGynaecol Ind.* 2001;51:48-9.



Placental thickness measured at 29wks of gestation



Placental thickness measured at 16 weeks of gestation

REFERENCES

- 1) Noor N, Jain A, Parveen S, Ali SM, Khalid M. Ultrasonographic measurement of placental thickness and its correlation with gestational age. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* 2017; 6(4):68–71.
- 2) Kanne JP, Lalani TA, Fligner CL. The placenta revisited: radiologic-pathologic correlation. *CurrProblDiagnRadiol.* 2005;34(6):238–255.
- 3) Baghel P, Bahel V, Paramhans R, Sachdev P, Onkar S. Correlation of placental thickness estimated by ultrasonography with gestational age and fetal outcome. *Indian Journal of Neonatal Medicine and Research.* 2015;3(3):19-24.
- 4) Jeanty P. Fetal biometry. In: Fleischer AC, Romero R, Manning FA, Jeanty P, James AE, Eds. *The principles and practice of ultrasonography in Obstetrics and Gynaecology*, 4th ed. Norwalk;Connecticut Appleton and Lange. 1991. 88-93p.
- 5) Mital P, Hooja N, Mehndiratta K. Placental thickness: a sonographic parameter for estimating gestational age of the fetus. *Indian J Radiol Imaging* 2002; 12: 553-4.
- 6) Nagwani M, Sharma PK, Singh U, Rani A, Mehrotra S. Ultrasonographic measurement of placental thickness and its correlation with gestational age – a cross-sectional ultrasonographic study. *International Journal of Advanced Research.* 2014;2:354-360.
- 7) Karthikeyan T, Subramaniam RK, Johnson WM, Prabhu K. Placental thickness & its correlation to gestational age & foetal growth parameters-a cross sectional ultrasonographic study. *Journal of clinical and diagnostic research: JCDR.*