 DOI: 10.18231/2394-2126.2017.0100

Placental study and gestational age- a cross sectional study

Sudakshina Chakrabarti[1,*], Gunapriya Raghunath[2], Vijayalakshmi S[3], Shilpakala LB[4]

[1,4]Assistant Professor, [2]Professor & HOD, [3]Professor, Dept. of Anatomy, Saveetha Medical College, Chennai

***Corresponding Author:**
Email: sudhianat@gmail.com

Abstract

Introduction: The placenta is a fetal organ with important metabolic, endocrine and immunologic functions besides being responsible for nutrition, respiration and excretion for the fetus. With advances in grey scale and Doppler sonography presently the most effective method to date pregnancy is by ultrasound. Placental thickness measured at the level of insertion of umbilical cord can be used as a parameter to estimate gestational age. The thickness, diameter and volume of the placenta appears to be of prognostic value in identifying the subsequent occurrence of fetal growth restriction.

Aim: To determine gestational age of fetus by using placental thickness as sonographic parameter and determine the correlation of the placental thickness to gestational age.

Objectives: To use placental thickness as a parameter to determine gestational age.
To correlate the placental thickness to the LMP derived and ultrasound derived gestational age using fetal parameters.
To determine subnormal placental thickness for the corresponding gestational age.

Materials and Method: 250 singleton normal pregnant women (10-40weeks of gestation) attending antenatal OPD whose gestational age was determined by LMP method were included in this study. On ultrasound examination the placental thickness was measured at insertion of umbilical cord. The data were collected and tabulated for analysis.

Results: The gestational age increased by 1.054 week per unit increase in the placental thickness. Based on correlation coefficient it was determined that nearly 94% of change in GA was determined by the placental thickness. This study showed a strong and significant positive correlation between placental thickness and gestational age. Correlation coefficient between PT and GA overall in 3 trimesters is 0.96.

Conclusion: Placental thickness can be considered as an important sonographic parameter to determine gestational age as concluded by this study.

Keywords: Placental thickness, Gestational age, Ultrasound.

Received: 3rd March, 2017 **Accepted:** 6th May, 2017

Introduction

The placenta is a fetal organ with important metabolic endocrine and immunologic functions besides being responsible for nutrition, respiration and excretion for the fetus. Presently the most effective way to date pregnancy is by use of ultrasound. Placental thickness measured at the level of umbilical cord insertion can be used as a new parameter to estimate gestational age of the fetus.(1) The placenta is a highly vascular organ. At term placenta is discoid with a diameter of 15 to 25cms and is approximately 3cm thick and weighs about 500-600gms. The placenta is a materno- fetal organ which nourishes and protects the fetus and it dies out after the delivery of the baby. Since it is closely related to the fetus and the mother, it acts like a mirror reflecting the status of both the mother and the fetus. The placental diameter and thickness measurements appear to be of prognostic value in identifying the subsequent occurrence of fetal growth retardation.(2) The placenta develops from villi at the site of implantation at about five weeks of gestation and by 9-10 weeks gestation, the diffuse echo texture of the placenta is clearly apparent at ultrasound.(3) Several investigators have demonstrated that an estimated gestational age determined sonographically is more accurate than one based on last menstrual period. Accurate dating is important to take decisions in terminating pregnancies. Various formulas and nomograms allow accurate assessment of gestational age and describe normal growth of fetal structures.(4) Estimates are typically most accurate when multiple parameters are used and when nomograms are obtained from fetus of more or less same racial, ethnic and regional background.(5)

Aim

To measure the placental thickness by ultrasonography and correlate the thickness with the gestational age of the fetus.

Objectives

1. To determine the gestational age of 250 singleton normal pregnant women on the basis of last menstrual period and correlate with the ultrasound estimated gestational age.
2. To determine the placental thickness by ultrasonography
3. The placental thickness is correlated with the gestational age for all the 100 pregnant women.

4. All parameters were tabulated and analysed with SPSS software for calculating mean, standard deviation, and correlation coefficient.

Materials and Method

250 singleton normal pregnant women attending antenatal OPD whose gestational age was determined by LMP method were included in this study. They underwent a transabdominal ultrasonographic examination for ultrasonographic gestational age using suitable parameters for each trimester which was correlated with their LMP derived gestational age and the women were then placed in 3 groups according to trimesters. The placental thickness at the insertion of umbilical cord as in Fig. 1 was noted during the ultrasonographic examination. Pregnant women with history of irregular periods, LMP not known, placental and fetal anomalies, medical conditions complicating pregnancy, pre-ecclamsia, multiple pregnancy were excluded from the study. The study population was divided into 3 groups

Group 1- 10-12 weeks (1st trimester)
Group 2- 13-28 weeks (2nd trimester)
Group 3- 29-40 weeks (3rd trimester)

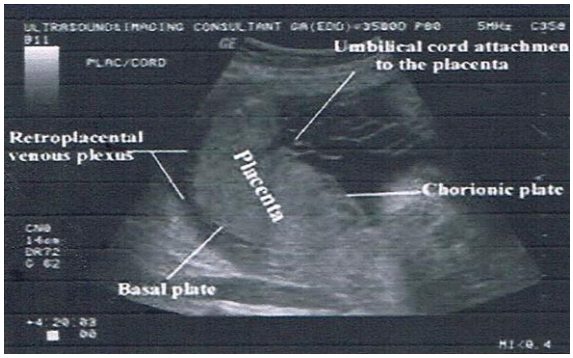

Fig. 1

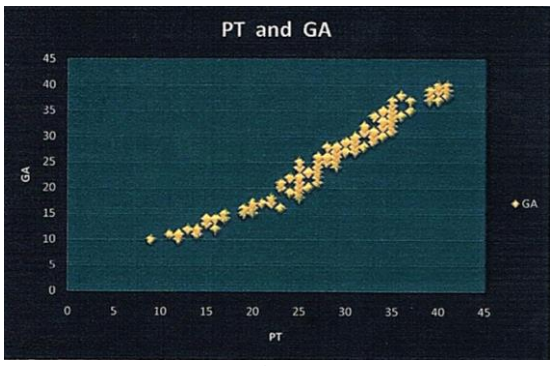

Fig. 2

The placental thickness was correlated with the gestational age of the fetus as determined by LMP .All the parameters studied were tabulated and analysed with SPSS software for calculating Mean, Standard deviation and Correlation coefficient. The statistical analysis used was Correlation and Regression analysis. Karl Pearson's correlation coefficient was used to measure the extent of association between placental thickness and gestational age. Assuming the gestational age (GA) is linearly related to the placental thickness(PT), a linear regression equation was used to estimate the GA from PT. Coefficient of determination (r2) was also estimates to explain the extent of variation in the GA explained by the PT.

Observation and Results

The Table 1 shows the break up of the subjects studied according to their gestational age. Table 2 shows the mean placental thickness of all the three groups with the standard deviation. The placental thickness was correlated with the gestational age of the fetus and its being shown in Table 3. Using regression equation the mean placental thickness was correlated with gestational age and the values were obtained and represented in Table 4. The interpretation of Table 4 was the gestational age increased by 1.054 week per unit increase in the placental thickness. Based on correlation coefficient it was determined that nearly 94% of change in GA was determined by the placental thickness.

Table 1: Breakup of subjects studied

Groups	Weeks	Number of Subjects
Group 1	10-12	42
Group 2	13-28	70
Group 3	29-40	138
Total		250

Table 2: Mean placental thickness of all three groups

Sl No	Groups	Range	Mean	Standard Deviation
1	Group 1	9mm-15mm	12.62mm	2.11
2	Group 2	15mm-31mm	24.50mm	4.52
3	Group 3	30mm-40mm	35.72mm	3.13

Table 3: Extent of Association (Correlation coefficient)

S No.	Groups	Correlation coefficient between PT and GA
1	Group 1 (1st trimester)	0.74 (P < 0.001)
2	Group 2 (2nd trimester)	0.93 (P <0.001)
3	Group 3 (3rd trimester)	0.88 (P< 0.001)
4	Overall	0.96 (P<0.001)

Table 4: Regression Analysis

Y	X	Regression coefficient	t value	P value	Regression line
GA	PT	1.054	45.66	< 0.001	Y= -3.827+ 1.054 X

This study showed a strong and significant positive correlation between placental thickness and gestational age. The correlation coefficient between PT and GA in the first trimester (10-12 weeks) is 0.74. The correlation coefficient between PT and GA in the second trimester (13 – 28 weeks) is 0.93. The correlation coefficient between PT and GA in third trimester (29- 40 weeks) is 0.88. The correlation coefficient between PT and GA overall in 3 trimesters is 0.96. In Fig. 2 the placental thickness and gestational age of selected cases have been plotted to show the linear relation between both the parameters.

Discussion

In this study placental thickness was obtained by ultrasound examination of a total of 100 sigleton normal pregnancies. Group 1 which consists of women in 1st trimester the placental thickness ranged from 9 mm to 15 mm the mean and standard deviation was 12.62± 2.11mm. In group 2 which consist of women in 2nd trimester placental thickness ranged from 15mm to 31mm, mean and standard deviation was 24.50 ± 4.52mm. In group 3 the placental thickness was ranging from 30mm – 40mm and mean and standard deviation was found to be 35.72± 3.13 mm. From the above result it is clear that the placental thickness increases with gestational age. The statistical analysis also showed that there was significant and strong correlation ($P < 0.001$) between placental thickness and gestational age.

In the study conducted by BM Mathai et al.[4] 2013 to study the correlation of placental thickness with gestational age in normal and IUGR pregnancies in late 2nd and 3rd trimesters i.e. from 24th to 39th week of gestation, a positive correlation was observed between placental thickness and USG gestational age was observed.

A similar study as our study conducted by Aditi Tiwari et al.[5] on 754 pregnant women of all gestational ages showed that placental thickness gradually increased from 15mm at 11 weeks of gestation to 36.3 mm at 39 weeks of gestation. This study also observed that the placental thickness in mm correspond to gestational age in weeks from 22nd to 35th weeks of gestation. In the study conducted by Karthikeyan et al 2012.[6] there was a strong positive correlation between PT and GA with correlation coefficient values for 1st, 2nd, 3rd trimesters being r= 0.609, r= 0.812 and r= 0.814 respectively. It was inferred in their study that the correlation between gestational age and placental thickness was r= 0.968 which was significant at 5% confidence interval.

C C Ohagwu et al 2008[7] conducted a similar study on Nigerian women and found that the maximum mean placental of 45.1 ± 6.4 mm was recorded at 39 weeks gestation. There was significant and strong positive correlation between placental thickness and gestational age. The correlation coefficient was found to be r= 0.729, r=0.671, r=0. 557 for 1st, 2nd, 3rd trimesters and r=0.872 for overall all 3 trimesters. In this study the maximum placental thickness recorded was 40.7mm at 40th week gestation. This study showed significant and strong positive correlation between placental thickness and gestational age. The correlation coefficient was found to be r=0.74, r= 0.93, r= 0.88 and r=0.96 for 1st, 2nd, 3rd, overall trimesters respectively. The value of mean placental thickness increased with advancing gestational age almost matching 22nd to 35th week and 27th to 33 weeks in two separate studies conducted in India.[1,8]

Conclusion

This study thus shows a positive correlation of placental thickness with gestational age of fetus. Thus placental thickness can be considered as an important sonographic parameter to determine gestational age. Placental thickness measurement also helps in detecting certain conditions like gestational diabetes, intrauterine growth restriction, hypertension complication pregnancy etc. Thus measuring placental thickness needs to be routinely done during ultrasound examination. This study has its own limitations being a cross sectional study and sample size being small still it calls for further longitudinal studies.

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