

CORRELATION OF PLACENTAL THICKNESS WITH ACTUAL BIRTH WEIGHT AND GESTATIONAL AGE

Radio-Diagnosis

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ABSTRACT

Background: Placenta being an important connection between fetus and mother, its measurements can be used to predict fetal outcome. **Aim** of the study was to study the correlation of placental thickness with actual birth weight and gestational age. **Methods:** In this study, total 296 patients were included. The study was conducted on pregnant women with pregnancy between 28 weeks to 40 weeks who were unequivocal about the LMP. The antenatal subjects attending the antenatal clinic at Kamla Nehru State hospital for mother and child and IGMC Shimla were enrolled for the study. All antenatal mothers with known LMP at their antenatal visit between 28- 40 weeks of gestation irrespective of their prior scans, who satisfied the inclusion and exclusion criteria were subjected to ultrasonographic examination. The placental thickness was measured with gestational age along with the actual birth weight of newborn was accurately measured and recorded. **Results:** We observed that mean placenta thickness was 3.66 ± 0.92 cm. We observed a mild positive and statistically significant correlation between birth weight and placental thickness ($r=0.160$; $P=0.006$). **Conclusion:** The sonographic measurement of placental thickness is an important tool. This study concludes that ultrasonographic measurement of placental thickness can be used as a tool to predict neonatal birth weight.

KEYWORDS

Placental Thickness, obstetric sonography, actual birth weight, gestational age

INTRODUCTION

Placenta is a complex vascular organ with main function to support fetus during pregnancy. Adequate fetal growth and subsequent normal birth weight depends on the efficient delivery of nutrients from the mother to the fetus via normally functioning utero-placental organ. Placental size is a reflection of health and size of the fetus. The human placenta develops with the principal function of providing nutrients and oxygen to the fetus. Adequate fetal growth, development and subsequent normal birth weight depends on the efficient delivery of nutrients from the mother to the fetus via normally function in utero-placental organ. The placenta develops from chorionic villi at the implantation site at about fifth week of gestation and by then in the tenth week, it is clearly apparent at sonography as diffuse granular echotexture.¹ It is typically 2-4 cm thick and weighs around 600 grams at full term.² Ultrasound measurement of placental thickness is a relatively simple, reproducible and a clinical useful way. Most of the placental growth occurs in the third trimester. It seems reasonable that evaluation of placental thickness in third trimester could help to determine normal development and placental functions and deserves to be a good predictor of fetal growth and birth weight. As a general rule, the placental thickness in millimeters should be equal to the gestational age in weeks ± 10 mm.

Placental thickness less than 2.5 cm at term is associated with intrauterine growth retardation of the fetus, preeclampsia, prematurity, fetal malformation or trisomy, small for date fetus and neonatal polycythemia.^{3,4} An enlarged placenta (placentomegaly) is suspected if the placental thickness is >4 cm thick at term and if it is associated with gestational diabetes mellitus, intrauterine infections, hydrops foetalis and alpha- thalassaemia type.^{3,5,6} This prediction of growth restricted pregnancies from placental size is based on the fact that diminished placental size precedes fetal growth restriction. Placental thickness is very much related to fetal development and may be a key in perinatal outcome. Birth-weight is the single most important parameter that determines neonatal survival. So, this study was focused on correlation of placental thickness and actual birth weight and gestational age.

MATERIAL AND METHODS

An observational cohort study was conducted in the department of radiodiagnosis at IGMC Shimla and Deptt. Of obstetrics and gynaecology at Kamla Nehru Hospital for mother and child, Shimla over a period of one-year w.e.f 1 st July 2018 to 30th June 2019. The study was conducted on pregnant women with pregnancy between 28 weeks to 40 weeks who were unequivocal about the LMP. The antenatal subjects attending the antenatal clinic at Kamla Nehru State hospital for mother and child and IGMC Shimla were enrolled for the study irrespective of the parity. The research procedure was in

accordance with the approved ethical standards of Indira Gandhi Medical College and Hospital, Shimla, Ethics Committee. An informed written consent was taken from all participants (Appendix I) and cooperation was requested for the study.

A detailed history was taken to check following inclusion and exclusion criteria, and all the participants underwent a thorough general physical and detailed obstetrical examination, and findings were recorded on predesigned patient proforma.

Research Question

1. Is there any correlation of Placental thickness on ultrasonography with actual Birth weight and gestational age?
2. Can the placental thickness on ultrasonography be used as a predictor of fetal birth weight?

A detailed history was taken to check following inclusion and exclusion criteria, and all the participants underwent a thorough general physical and detailed obstetrical examination, and findings were recorded on predesigned patient proforma.

Inclusion Criteria

1. Singleton uncomplicated pregnancies with confirmed LMP
2. Gestation between 28 to 40 weeks.

Exclusion Criteria

1. Gestational diabetes
2. Anemia
3. Foetal anomalies
4. Multiple pregnancies
5. Irregular menstrual cycles
6. Last menstrual period not known
7. Chorioamnionitis
8. Maternal infections
9. Hydrops foetalis

All antenatal mothers with known LMP at their antenatal visit between 28- 40 weeks of gestation irrespective of their prior scans, who satisfied the inclusion and exclusion criteria were subjected to ultrasonographic examination. The placental thickness was measured and recorded. Ultrasonographic examination was performed in the Kamla Nehru State Hospital and IGMC Hospital and performed using a 3.5MHz convex transducer on Logiq P6(GE) machine. This scan was performed with optimally filled bladder with the mother in the supine position.

Placental thickness was measured in millimeters at the level of

umbilical cord insertion in its longitudinal direction and the mean of 3 readings was taken ($\text{mean} = R1 + R2 + R3 / 3$) and were recorded. While measuring the thickness of placenta, the calipers were perpendicularly placed. Measurement was done when uterus was fully relaxed at level of cord insertion. All enrolled women were followed up till delivery and those with institutional delivery occurring between 38-40 weeks of POG, their POG at delivery, type of delivery, need for induction, actual birth weight of newborn, APGAR scores were noted and recorded on proforma.

The actual birth weight of newborn was accurately measured in accordance with WHO standardized guidelines using appropriate technique and calibrated equipment.

Newborns were weighed nude on a calibrated weighing scale immediately after delivery. Newborns were positioned in center of the scale tray and weighed to the nearest of 0.01 kg. Then newborns were repositioned and weight measurement were repeated, the readings were compared and agreed tolerance limit of 0.1 kg.

Statistical Analysis

Data were presented as frequency, percentage, mean, and standard deviation. Quantitative variables between 2 groups and more than 2 groups were compared using Student t-test and one-way ANOVA respectively. Two variables were correlated using Spearman correlation coefficient. P value <0.05 was considered significant. Statistical analysis was performed using SPSS v21.

OBSERVATIONS AND RESULTS

The present study was aimed to determine the utility of ultrasonographic placental thickness as a predictor of fetal birth weight. A total of 296 patients were included in the study over the period of one year in Department of Radiodiagnosis, Indira Gandhi Medical College (IGMC), Shimla (Himachal Pradesh). Results of the study are described as follows:

We observed that mean placenta thickness was 3.66 ± 0.92 cm. We observed that mean placental thickness was significantly higher in newborns with birth weight >2.5 Kg in comparison to the newborns with birth weight ≤ 2.5 Kg that is 3.75 ± 0.93 cm vs. 3.51 ± 0.81 cm; ($P=0.017$).

Table 1: Placental Thickness And Birth Weight

Birth weight	Placental thickness	P Value
≤ 2.5 Kg	3.51 ± 0.81	0.017
>2.5 Kg	3.75 ± 0.93	

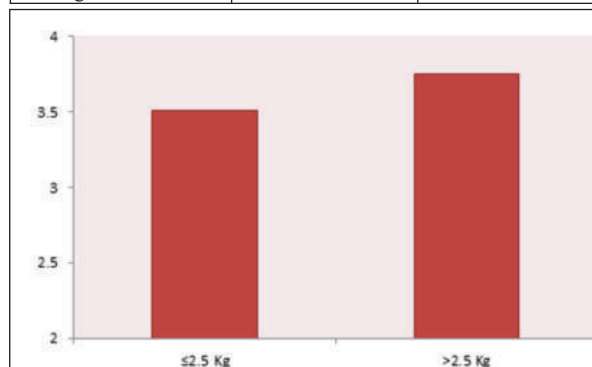


Figure 1a: Placental Thickness And Birth Weight

We also observed a mild positive and statistically significant correlation between birth weight and placental thickness ($r=0.160$; $P=0.006$) (Figure 1b)

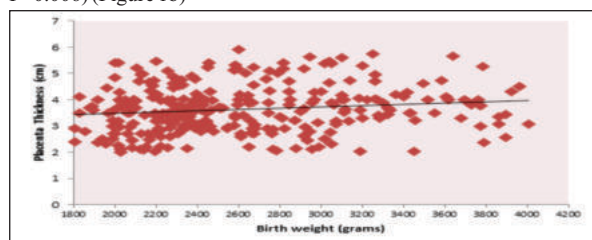


Figure 1b: Relationship Between Placental Thickness And Birth Weight

Relationship Between Gestational Age And Placental Thickness

We observed that mean placental thickness was significantly different among different gestational ages ($P<0.0001$). We observed that the mean placental thickness was comparable between gestational ages from 28 to 38 weeks. However, the mean placental thickness was significantly higher at gestational age of 38 to 40 weeks in comparison to gestational ages <38 weeks ($P<0.0001$).

Table 2: Placental Thickness And Gestational Age

Gestational age (weeks)	Placental thickness	P Value
28-30 (n=11)	3.26 ± 0.61	<0.0001
30-32 (n=38)	3.54 ± 0.85	
32-34 (n=66)	3.62 ± 0.8	
34-36 (n=65)	3.64 ± 0.89	
36-38 (n=53)	3.74 ± 0.99	
38-40 (n=63)	4.36 ± 1.13	

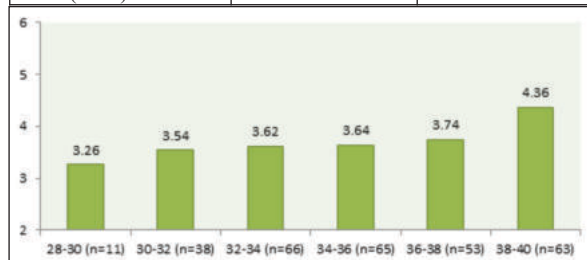


Figure 2a: Placental thickness (CMS) and gestational age (WEEKS)

We also observed a mild positive and statistically significant correlation between gestational age and placental thickness ($r=0.261$; $P<0.0001$) (Figure 2b)

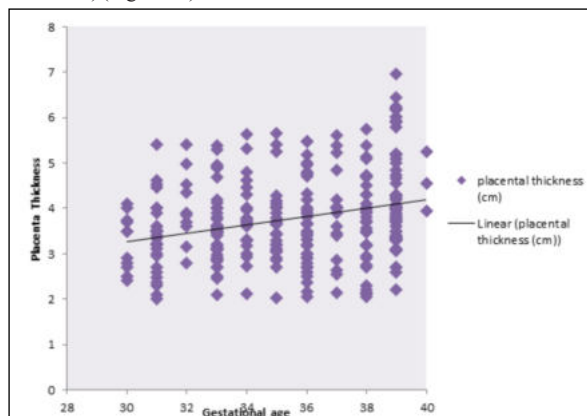


Figure 2b: Relationship Between Placental Thickness And Gestational Age

DISCUSSION

A normally functioning placenta is required for normal fetal growth and development. It has been historically documented that placental weight in a normal pregnancy at term is about one-fifth of the fetal weight. The placental measurement such as placental thickness must reflect the nutritional status of the fetus and the fetal outcome. The simplest estimation of placental size is done by measuring its thickness. The size of placenta increases during fetal growth period 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.⁸ Placental thickness is very much related to fetal development and may be a key in perinatal outcome. According to Sadler et al., (2004), at term placenta is approximately 3 cm thick and measures 15-25 cm in diameter.⁹ Small placentas are associated with preeclampsia, chromosomal abnormalities, severe maternal diabetes mellitus, chronic fetal infections and intrauterine growth restriction.¹⁰ The placentas over 4 cm thick at term have been observed in conditions like diabetes mellitus, perinatal infections and hydrops fetalis (both immune and non-immune). The incidence of perinatal morbidity and mortality was considerably higher among gravida with thick placenta, related to higher rates of fetal anomalies and higher rates of both small for gestational age and large for gestational age neonates at term.¹¹ We observed mean placental thickness was 3.66 ± 0.92 cm. A 'warning

limit' of placental diameter of 18 cm and placental thickness of 2 cm at 36 weeks predicts low birth weight neonates.¹² Mathai et al. in 2013 studied the correlation of placental thickness in 498 subjects with ultrasonographic gestational age and fetal outcome by dividing them into two groups—Group A (outcome fetal weight 2500 g, n = 376). They found a positive correlation between placental thickness and ultrasonographic gestational age in both groups.¹³ Balla et al. studied ultrasonographic placental thickness in 53 Sudanese pregnant women in second and third trimesters.¹⁴ They concluded that thickness of less than 25 mm during third trimester is less than normal and might be an indication of intrauterine growth restriction and thickness of more than 45 mm was considered thicker than normal, which might be an indication of maternal diabetes, hypertension, fetal hydrops and other abnormalities. Normal values of placental thickness in normal singleton fetuses were in range of 25–45 mm in the 3rd trimester, and between 18 and 24 mm, in the second trimester.¹⁵ Normal placental thickness in Indian women was found to be 30.1–36.7 mm at 32 weeks and at 31.1–39.9 mm at 36 weeks in our study. Our study also observed a mild positive and statistically significant correlation between actual birth weight and placental thickness, also a mild positive and statistically significant correlation between gestational age and placenta thickness.

CONCLUSION

The sonographic measurement of placental thickness is an important tool. Placental thickness has close relation with gestational age and also impacts fetal weight. This study concludes that ultrasonographic measurement of placental thickness can be used as a tool to predict neonatal birth weight.

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