Evaluation Of Gestational Age By Sonological Measurement Of Placenta Thickness

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ABSTRACT

Background: The Gestational Age is frequently over or under estimated, as the conventional gestational estimation is based on the Last Menstrual Period and on Ultrasonography. Many people are unaware of their Last Menstrual Period and irregular menstruations and Ultrasonography is bound to have a bias, thereby posing difficulties in the Gestational Age estimation.

Objectives: To evaluate placental thickness, measured at the insertion of the umbilical cord, as a parameter for estimating gestational age of the fetus.

Materials And Method: Two hundred pregnant women were recruited in a cross sectional prospective study. The normal pregnancies of more than 26 weeks of gestation were taken. Various measurements like Biparietal Diameter, Head Circumference, Abdominal Circumference, Femur Length and Placenta Thickness done by Ultrasonography by using a 3.5 Megahertz transducer.

Results: In the study it is observed that there is high positive correlation between the Gestational Age and placental thickness at 26-35 weeks. After 36 weeks correlation occurs between the Placental Thickness and gestational age. For every week of increase in Gestational Age, there is an average increase of placental thickness by 0.007 mm. After 38 weeks of gestational age the P value is 0.70 suggest that no correlation exists.

Conclusion: We conclude that Placenta Thickness measured at the level of umbilical cord insertion can be used as an accurate sonographic indicator in assessment of gestational age in singleton pregnancies because of its linear correlation. So, the measurement of Placenta Thickness should therefore be carried out routinely during the obstetric ultrasonography.
INTRODUCTION:

Placenta represents a transient organ that plays an important role during gestation, as the major determinant of pregnancy maintenance, fetal growth and labor onset. The placenta is named for its appearance (Greek plakuos, meaning “flat cake”) and is responsible for the nutritive, respiratory and excretory functions of the fetus.

Placenta has been noted to increase as pregnancy advances in age. The size of placenta increases during fetal growth period to allow it to carry out its vital functions. Placental size is expressed in terms of thickness in the mid portion of the organ, and it reflects health and size of the fetus.

Studies have reported the use of placental thickness as an indicator of gestational age (GA). As there is an increase in placental thickness with gestational age, it seems to be a potential parameter for assessment of gestational age of the fetus. It tends to gradually increase with gestational age in a linear fashion (~1 mm per week) and therefore the thickness in mm can approximate the gestational age (in weeks). The placenta must be localized in longitudinal section and its anteroposterior thickness measured at the level of insertion of the umbilical cord.

The best possible antepartum care and the successful deliveries of babies always revolve around the accurate knowledge of the GA. GA estimation is an important aspect of routine obstetric scanning. Knowing GA accurately is essential for optimal prenatal delivery and postnatal care. GA was initially estimated using only the woman’s Last Menstrual Period (LMP) and clinical methods such as uterine size assessment, time of quickening/initial perception of fetal movement and fundal height measurement. These methods have many limitations such as dating the LMP may be difficult because of poor recollection, irregular menstrual cycle of varying duration, lactational amenorrhea, bleeding in early pregnancy or hormonal contraceptive use prior to conception.

The accuracy of symphysis fundal height may be diminished by multiple pregnancies, maternal size, Intrauterine growth restriction, fetal position and other maternal and fetal characteristics. Initial perception of fetal movement varies greatly among pregnant women.

Use of Ultrasonography (USG) is the most effective method to estimate the GA. Placental evaluation by USG has been used to characterize placental position and morphologic changes as the placenta matures. One additional ultrasonographic parameter used to assess the placenta can be placental thickness. The measurement of placental thickness is relatively simple and clinically useful.

MATERIAL AND METHODS

Two hundred pregnant women were recruited in a cross sectional prospective study. The normal pregnancies of more than 26 weeks of gestation were taken. Detail history taking & clinical examination as per the proforma. The gestational age was determined by measuring the Biparietal Diameter (BPD), Head Circumference (HC), Abdominal Circumference (AC), and Femur Length (FL). The placental thickness was measured at the level of the cord insertion. The grey scale real time USG examinations were performed using a Philips 11 HD XE ultrasound scanner and the probe used for the study was 3.5 MHz (megahertz) convex array transducer.

The patient was scanned in supine position. The transducer was placed on the skin surface after applying the coupling agent. The placental thickness in mm was measured at the level of cord insertion site. The transducer was oriented to scan perpendicular to both the chorionic and basal plates as tangential scan will distort the measurement of the thickness of the placenta. The identification of the cord insertion site is important for obtaining correct measurements. The site is usually central but slightly eccentric position may be normal. The ultrasonic appearance of the cord insertion appears either as hypoechogenic areas closest to the chorionic plate in the thickest portion of the placenta with a “V” shape or as linear echoes emanating at right angles from the placental surface. Placental thickness was calculated from the echogenic chorionic plate to placental myometrial interface. The myometrium and subplacental veins were excluded in the measurements. All placental measurements were taken during the relaxed phase of the uterus as contractions can spuriously increase the placental thickness.
RESULT

Amongst the 200 cases under study, anterior placenta was noted in 128 cases fundal placenta was noted in 9 cases, fundo-anterior placenta in 5 cases, fundo-posterior placenta in 16 cases and posterior placenta in 42 cases (Table 1). Distribution of cases according to gestational age is depicted in (Table 2). It is observed that placental thickness gradually increases from approximately 26.4 mm at 26 weeks to 37.9 mm at 40 weeks of gestational age. It is found that at 26-35 weeks of gestational age there is statistical significance (Graph 1). Between the mean difference of gestational age (32.26±2.5) and placental thickness (32.66±2.53), which indicates that there is a high degree positive Correlation between gestational age and placental thickness (r =0.972) which is significant ie., p<0.001.

After 35 weeks of gestational age there is mean difference between gestational age (37.15±0.97) and placental thickness (37.14±0.773), which is statistically significant (t=443.91, p<0.001), indicates that there is positive correlation. Between gestational age and placental thickness (r =0.723, p<0.001) which statistically significant. In the study it is observed that there is high positive correlation between the gestational age and placental thickness at 26-35 weeks(Figure:1-6). After 36 weeks correlation occurs between the placental thickness and gestational age. For every week of increase in gestational age, there is an average increase of placental thickness by 0.007 mm. After 38 weeks of gestational age the P value is 0.70 suggest that no correlation exists.

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DISCUSSION

The placenta ‘the sprightliness of foetus in utero’ functions diversely to reinforce the maturation of the foetus and interacts with the two individuals - mother and developing fetus.\(^3\) J.C. Arantius (1530-1589) was the first to describe separate maternal-fetal circulation in dissected specimens. In the following century, John Mayow (1643–1679) proposed that the placenta was the respiratory organ of the foetus and shifted the concept of the placenta from HeparUterinum to PulmoUterinus.\(^4\) The 19th century witnessed a fast growth in understanding the structure of the placenta.\(^5\) William Hunter was the first to give a sophisticated description of the structure of the placenta. Biscoff (1842) made many contributions to the understanding of placental barrier. In the 20th century, the placenta was recognized for the first time as an endocrine organ and the new focus became the transfer of solutes across the placenta.\(^6\)

Placental localization by ultrasound was introduced by Donald (1965) and first reported by Gottesfeld et al (1966).\(^7\) A major breakthrough in USG imaging occurred early in the 1970s when B-mode (brightness-mode) static imaging was developed. By the late 1970s and early 1980s, real-time imaging replaced static B-scans. Real-time USG imaging was enormously valuable for the obstetric patient as well as the precise location of the placenta could be determined.\(^8\) The method of localization of the placenta by ultrasound was found to be highly accurate. Until recently, the placenta was evaluated purely to determine its position or to ascertain premature separation. A more detailed USG evaluation of the placenta has led to the understanding of possible morphologic changes as the placenta matures.

Before the advent of prenatal investigation techniques morphological examination of the placenta was limited to retrospective information and had a little influence on pregnancy management. With the improvement of ultrasound equipment’s, it is now possible to examine the placenta in detail from the beginning of first trimester. For many years ultrasonologists have approached the placenta as a 'static' feature in a dynamic system. While all measurements of foetus were related to menstrual age, the placental thickness was judged as normal or abnormal based on a single “cut off ” point.\(^9\) The present study data confirm that placental thickness is a function of age. Abnormal thickening or thinning must be correlated with other estimates of pregnancy duration.

The present study assessed the relationship of placental thickness (in mm) with sonographic gestational age (in weeks). The study showed that the placental thickness (in mm) increases steadily with increasing gestational age (in weeks) in a linear fashion and almost matching the gestational age from 26-35 weeks of gestation. The rate of increase of placental thickness gradually diminished from 36-40 weeks and was less by 1-4 mm compared to gestational age from 26-35 weeks. The results of the present study are consistent with the observations made by authors of previous studies.
Hoddick et al (1985) found average placental thickness (in mm) to be roughly equivalent to gestational age (in weeks).\(^{(13)}\) Mital P and Hooja N also found an increasing trend in the values of mean placental thickness (in mm) with increase in gestational age (in weeks) and the placental thickness (in mm) coincides almost exactly with the gestational age in weeks.\(^{(14)}\) Kaushal L et al reported similar correlation of Placental thickness which increases steadily with increasing GA (in weeks) in a linear fashion and almost matching the GA from 11–37 weeks of gestation. For every week of increase in GA, there is an average increase of PT by 0.98 mm.\(^{(15)}\) Karthikeyan T et al reported similar correlations of PT which increases with the GA and that the PT is a GA-dependant variable.\(^{(16)}\) Anupama Jain et al reported similar correlations between placental thickness and gestational age. They found placental thickness (in mm) almost matched gestational age (in weeks) from 27 weeks to 33 Weeks of gestation.\(^{(17)}\) Pregnancy, after which there was gradual thinning. Other authors reported similar findings. The rate of growth of placental thickness did not vary relative to the placental location as observed in the present study. The growth patterns of anterior and lateral placentas were similar to posterior and fundal placentas as seen in the present study. Similar observations were made by Hoddick et al (1985).\(^{(14)}\)

**CONCLUSION**

Ultrasonography measurement of placental thickness, at the level of cord insertion site and estimation of foetal weight is relatively simple and is clinically useful. It enables the evaluation and detection of placental abnormalities and intrauterine growth restriction that can significantly affect the management and outcome of pregnancy. Placental thickness (in mm) increases in a linear fashion with advancing gestational age (in weeks) and almost matching it from 26 - 35 weeks of gestation (Figure: 1-6). It can be an additional indicator of estimating gestational age especially where the duration of pregnancy is unknown or uncertain.

It was observed that the relationship of Placental thickness with gestational age falls marginally and the rate of growth of Placental thickness decreased after 36 weeks of gestation.

**Figure 1:** USG showing anteriorly located placenta with thickness of 2.64 cm of foetus with average GA of 26 weeks 2 days.

**Figure 2:** USG showing anteriorly located placenta with thickness of 3.21 cm of foetus with average GA of 32 weeks 2 days.
Figure 3: USG showing anteriorly located placenta with thickness of 2.87 cm of foetus with average GA of 28 weeks 3 days.

Figure 4: USG showing anteriorly located placenta with thickness of 3.33 cm of foetus with average GA of 33 weeks 1 day.

Figure 5: USG showing anteriorly located placenta with thickness of 3.43 cm of foetus with average GA of 34 weeks 1 day.
Figure 6: USG showing anteriorly located placenta with thickness of 3.53 cm of foetus with average GA of 35 weeks 2 days.

REFERENCES


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