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Ultrasonographic correlation of placental thickness in third trimester with fetal parameters, birth weight and fetal outcome

[1]Dr. Nikhil Arora, [2]Dr. Sahil Arora, [3]Dr. Yashaswi Sharma, [4]Dr. Navkiran Dhanota, [5]Dr. Priyanka Arora, [6]Dr. Gunraj Singh Mehta

[1,3,6]Resident Radiodiagnosis, Maharishi Markandeshwar Medical College and Hospital, Solan, Himachal Pradesh, India

[2,5]Consultant Radiologist, ANH Ultrasound Clinic, Sector 7, Chandigarh, Punjab, India

[4]MBBS, Maharishi Markandeshwar Medical College and Hospital, Solan, Himachal Pradesh, India

Corresponding Author:
Dr. Sahil Arora

Abstract

Introduction: Despite careful antenatal surveillance involving scrupulous examination, an issue of considerable disappointment is that a majority of low-birth-weight infants are not diagnosed until delivery. Low birth weight infants are susceptible to hypoxia and fetal distress, long-term handicap, and fetal death.

Objectives: The present study will be undertaken in our institution to study the correlation of placental thickness, measured at the level of the umbilical cord insertion, with the ultrasonographic gestational age in normal women and fetal weight and outcome.

Methods: Present study was a single centric, observational, cohort, follow up, hospital-based study in which 100 pregnant women who will come for ultrasound in third trimester during the study period was recruited in the study. The relationship between placental thickness with fetal parameters, birth weight and fetal outcome at delivery was investigated in this study. Correlation between placental thickness with the fetal parameters, average gestational age, gestation at delivery, neonatal birth weight & APGAR score, and placental weight was investigated during this study.

Results: Significant positive correction of placenta thickness was found with the gestation age, estimated and actual fetal birth weight, and placenta weight. APGAR score showed negative correlation with the placenta thickness. Positive correlation of placenta thickness was also found with the Biparietal diameter (BPD), Head Circumference (HC), abdominal circumference (AC) and Femur length (FL).

Conclusion: Ultrasonography serves a significant role in estimating foetal weight, which is a crucial component of prenatal care. Because of its linear association, placental thickness evaluated at the level of umbilical cord insertion can be utilised as a reliable sonographic indication in the evaluation of. As a result, it can be utilised as a secondary sonographic method for determining foetal weight.

Keywords: Ultrasound, gestation, fetus, placenta, correlation

Introduction

Ultrasonography has played a significant part in obstetric care. Over time, this has progressed from basic

2-D imaging to Doppler imaging to measure foetal and maternal circulation, and finally to 3-D imaging of foetal anatomy [1]. Obstetric ultrasonography has proved to be beneficial in a variety of ways, including more precise pregnancy dating and the identification of foetal abnormalities. Several studies have shown that a sonographically determined gestational age is more accurate than one based on the previous menstrual cycle. Accurate dating can also change how a pregnancy is terminated. Various formulae and nomograms are used to accurately determine gestational age and characterise typical foetal structural growth [2]. When numerous factors are utilised and nomograms are obtained from foetuses of the same ethnic or racial origin living at a similar altitude, estimates are usually the most accurate [3].

Despite careful prenatal observation and examination, the majority of low-birth-weight infants are not detected until after delivery, which is a significant disappointment. Hypoxia and foetal discomfort, as well as long-term disability and foetal mortality, are all risks for low-birth-weight babies. As a result, detecting intrauterine growth retardation (IUGR) at an early stage will benefit obstetric and neonatal care [4]. As IUGR is linked to poor villous development and fetoplacental angiogenesis, studies have demonstrated that reduced placental size precedes foetal growth retardation [5].

Placental thickness more than 5 cm before 40 weeks is considered abnormal. Beside that large placenta may indicate an infection or Triploid [6]. Increased mortality rate related to fetal anomalies and higher rates of both small for gestational age, and large for gestational age infants at term also related to Thickened placentas [7]. Placental thickness also appears to be a promising parameter for estimation of gestational age of the fetus as several studies have reported a linear increase in placental thickness with gestational age [8]. The gestational age is of utmost importance in the interpretation of biochemical tests such as the screening for the expanded maternal serum biomarkers (Human Chorionic Gonadotrophin, Alfa Foeto protein and the oestrogen and progesterone levels) for the risk assessment of various foetal anomalies, in evaluating the foetal growth by distinguishing the normal from the pathological foetal development. This allows obstetrician to institute measures that will optimize the fetal outcome [9].

As such, few studies have been done to correlate placental thickness with the fetal weight. Thus, the aim of this study is to measure the placental thickness in centimeters at 28-32 weeks and 36 weeks till term and to determine whether this measurement should be correlated with the estimated fetal weight. Despite careful antenatal surveillance involving scrupulous examination, an issue of considerable disappointment is that a majority of low-birth-weight infants are not diagnosed until delivery. Low birth weight infants are susceptible to hypoxia and fetal distress, long-term handicap, and fetal death. Therefore, an early detection of IUGR (intrauterine growth retardation) will be beneficial to obstetric and neonatal care (7). The present study will be undertaken in our institution to study the correlation of placental thickness, measured at the level of the umbilical cord insertion, with the ultrasonographic gestational age in normal women and fetal weight and outcome.

Material and Methods

Patient recruitment: Present study was a single centric, observational, cohort, follow up, hospital-based study in which 100 pregnant women who will come for ultrasound in third trimester during the study period was recruited in the study. The relationship between placental thickness with fetal parameters, birth weight and fetal outcome at delivery was investigated in this study. Correlation between placental thickness with the fetal parameters, average gestational age, gestation at delivery, neonatal birth weight & APGAR score and placental weight was investigated during this study.

Sonography procedure: The sonography was performed on a Philips affiniti 70 G ultrasound machine using a curvilinear probe with a 1-5 MHz frequency. The fetus was scanned, and the gestational age was estimated using growth parameters BPD, FL, AC and HC devised by Hadlock. The composite average of the gestational age was estimated by these growth parameters for each fetus. At the level of cord insertion site, the placental thickness in cm was measured between 28-32 weeks and again between 36 weeks till term. Placental thickness was calculated from the echogenic chorionic plate to placental

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myometrial interface near the mid-placental portion. Assessment of fetal outcome will include live birth/still birth, gestational age at delivery, birth weight, birth weight category, neonatal length and APGAR score at 1 min and 5 min. Placental weight in grams was noted.

Statistical Analysis: Statistical analysis was performed using SPS student version (SPSS Inc, Chicago, USA) software. Mean and standard deviation was calculated and groups were compared by taking p value <0.05 as significant. Pearson correlation was used for correlation analysis.

Results

Placental thickness found to be increased significantly with increase in gestation age (p=0.0001****, figure 1). Estimated fetal birth weight found to be increased significantly with increase in gestation age (p=0.0001****, figure 2). The mean APGAR score was 7.850 ±1.690. At 5 minutes, the APGAR score was 8.420 ±1.545. Correlation analysis of placental thickness with APGAR score revealed r= -0.03926 at 1 minute and r=0.03926 at 5 minutes.

Corelation between placental thickness and estimated fetal birth weight at 28-32 weeks revealed r= 0.3479 and P Value: 0.0004***; and at 36 weeks-term revealed r= 0.4010 (p= 0.0001****). Corelation between placental thickness and actual fetal birth weight at 36 weeks-term revealed r= 0.4498 (p=0.0001****). Corelation between placental thickness and Biparietal diameter (BPD) at 28-32 weeks revealed r= 0.3600 (p=0.0003***); and at 36 weeks-term revealed r= 0.3154 (p= 0.0014**). Corelation between placental thickness and Head Circumference (HC) at 28-32 weeks revealed r= 0.3694 (p=0.0002***); and at 36 weeks-term revealed r= 0.2639 (p=0.0080**). Corelation between placental thickness and Abdominal circumference (AC) at 28-32 weeks revealed r= 0.3110 (p=0.0017**); and at 36 weeks-term revealed r= 0.3881 (p=0.0001****). Corelation between placental thickness and Femur length (FL) at 28-32 weeks revealed r= 0.3924 (p=0.0001****); and at 36 weeks-term revealed r= 0.3088 (p=0.0018**) (Table 1).

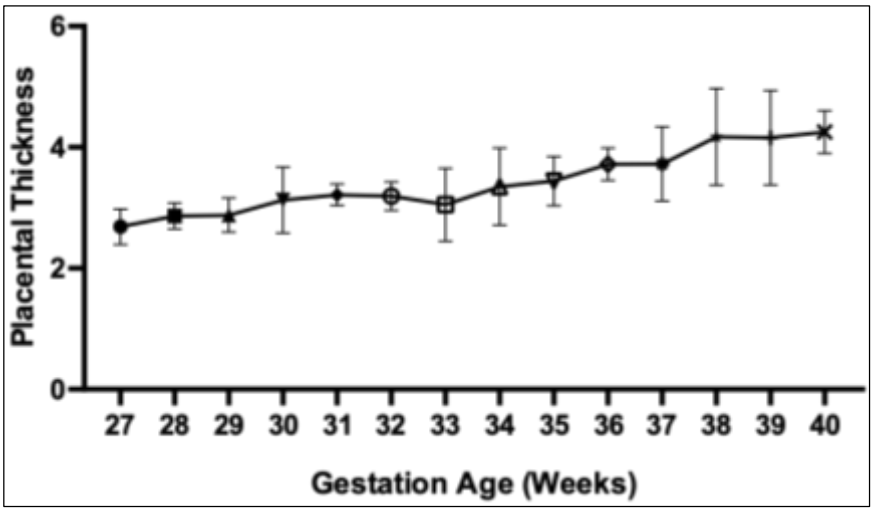

Fig 1: Gestation age by USG and placental thickness

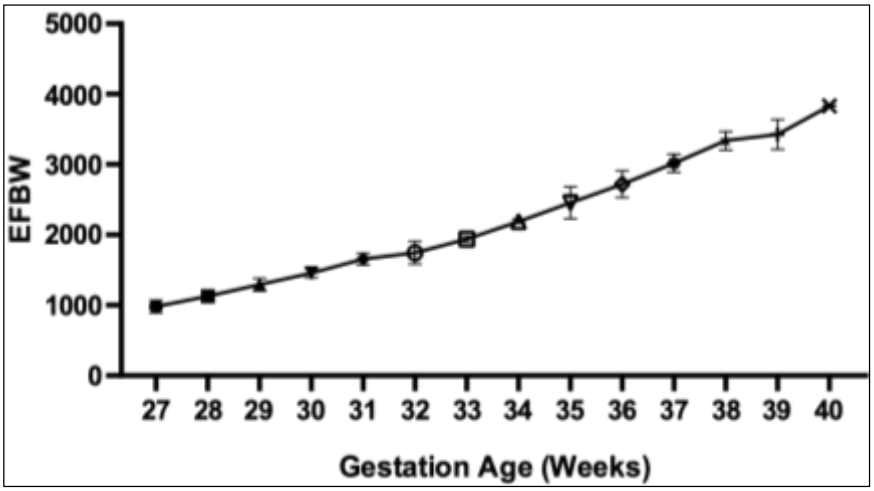

Fig 2: Gestation age and estimated fetal birth weight

Table 1: Correction between placental thickness and foetal outcomes

Variable	Gestation age	Pearson correlation (r)	P value
Estimated fetal birth weight	28-32 weeks	0.3479	0.0004***
	36 weeks-term	0.4010	0.0001****
Actual fetal birth weight	36 weeks-term	0.4498	0.0001****
Biparietal diameter (BPD)	28-32 weeks	0.3600	0.0003***
	36 weeks-term	0.3154	0.0014**
Head Circumference (HC)	28-32 weeks	0.3694	0.0002***
	36 weeks-term	0.2639	0.0080**
Abdominal circumference (AC)	28-32 weeks	0.3110	0.0017**
	36 weeks-term	0.3881	0.0001****
Femur length (FL)	28-32 weeks	0.3924	0.0001****
	36 weeks-term	0.3088	0.0018**

Discussion

In the present study, we found that estimated fetal birth weight found to be increased significantly with increase in gestation age. Kinnare *et al*. discovered that midpregnancy placental volume was significantly related to placental weight at birth [10]. Our findings are also consistent with those of Nagpal *et al*. [11], who reported that Apgar score and newborn outcome were satisfactory in women with normal placental thickness but were affected in women with thin and thick placentae. According to Pearson's correlation analysis, there was a good correlation between placental thickness and birth weight (r = 0.405 at 32 weeks and r = 0.740 at 36 weeks). The Pearson's correlation coefficient (r) between placental thickness and Apgar score was 0.281 at 32 weeks and 0.303 at 36 weeks (p value = 0.003), both statistically significant. As a result, researchers found that placental thickness is a useful prognostic factor in predicting newborn outcome and that it should be assessed alongside biometric data in pregnant women having ultrasonography [12].

In the present study, Corelation between placental thickness and Biparietal diameter (BPD) at 28-32 weeks and 36 weeks-term revealed Pearson correlation coefficient (r)= 0.3600 and 0.3154 respectively. Corelation between placental thickness and Head Circumference (HC) at 28-32 weeks and 36 weeks-term was 0.3694 and 0.2639 respectively. Corelation between placental thickness and abdominal circumference (AC) at 28-32 weeks and 36 weeks-term was 0.3110 and 0.3881 respectively. Corelation between placental thickness and Femur length (FL) at 28-32 weeks and 36 weeks-term was 0.3924 and 0.3088 respectively.

In the study conducted by Jinadu *et al*. the PT had a significant Pearson's correlation of 0.953 with AC,

and with the BPD had a Pearson's correlation of 0.815. With the FL there was Pearson's correlation of 0.762. In the estimate of GA, the least correlation was seen with HC [13]. This might be because the foetal head is highly pliable and is exposed to moulding based on the stage of pregnancy and the foetal head location. The FL, on the other hand, fluctuates according on the foetus' genetic composition; short FL may result from genetically short parents, whereas long FL may result from tall parents. The AC tends to rise continuously throughout pregnancy. It's possible that this is due to the fact that the abdominal circumference is less impacted by moulding and is unaffected by parental genetic composition. Arafa *et al*. [14] and Ismail *et al*. [12] both came to similar conclusions. Our research differs from that of Suresh *et al*. [15] in India, who found a substantial connection between PT and FL ($r = 0.982$, $p = 0.000$) in a hundred normal singleton pregnancies with GA 12–24 weeks.

Our study had a few flaws, including a limited number of patients and no intervention. Interventions might be used in future research to examine how dietary, lifestyle, and anticoagulant variables affect placental thickness and foetal outcome.

Conclusion

Present study was a single centric, observational, cohort, follow up, hospital-based study in which 100 pregnant women who will come for ultrasound in third trimester during the study period was recruited in the study. Significant positive correction of placenta thickness was found with the gestation age, estimated and actual fetal birth weight, and placenta weight. APGAR score showed negative correlation with the placenta thickness. Positive correlation of placenta thickness was also found with the Biparietal diameter (BPD), Head Circumference (HC), abdominal circumference (AC) and Femur length (FL). Ultrasonography serves a significant role in estimating foetal weight, which is a crucial component of prenatal care. Because of its linear association, placental thickness evaluated at the level of umbilical cord insertion can be utilised as a reliable sonographic indication in the evaluation of. As a result, it can be utilised as a secondary sonographic method for determining foetal weight.

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