

Ultra Sonographic Measurement of Placental Thickness during Pregnancy as a Parameter for Estimating Gestational Age of the Fetus

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ABSTRACT

Background: The most effective prenatal care and successful births are always dependent on accurate gestational age estimation (GA). The gestational age play important role in biochemical tests interpretation.

Objective: The study was carried out to find the ultra-sonographic measurements done to check the placental thickness. It is an important factor for the gestational age estimation.

Study design: This is a cross-sectional study conducted at Al Nafees Medical College and Hospital, Islamabad for the duration of one year from June 2021 to May 2022.

Material and Methods: The study was conducted on 325 pregnant women that visited tertiary care unit for a period of one year. All women were fully aware of the study and written consent was taken from them.

Results: the thickness of placenta found at different gestational age. From 15 to 39 weeks of gestation the data was collected and no. of cases having placental thickness were recorded. Maximum and minimum placental thickness in mm was measured and average was taken. The age range of the women was 18-36 years. The 26 years was the mean age. The statistical significance was found by SPSS tool

Conclusions: In this study there was found a strong link between week of gestational age and thickness of placenta. Placental thickness along with other parameters were studied in each week by ultrasound and the results were analyzed. In case where the exact duration of pregnancy is unknown, placental thickness can give information about age of fetus and other features like intrauterine stunted growth.

Keywords: Placental thickness and gestational age.

INTRODUCTION

The most effective prenatal care and successful births are always dependent on accurate gestational age estimation (GA). For the interpretation of the biochemical test the gestational age is considered as an utmost importance factor. This helps the gynecologist to implement measures that maximize fetal outcome. The use of interventional modality after detection of anomaly/complication is also dependent on the gestational age¹⁻². Almost all critical clinical decisions, including caesarean section, elective labor induction are determined by test data. The gestational age is calculated by using the first day of the last menstruation. This means that the pregnancy can be dated prior to fertilization of the egg. Clinicians frequently have difficulty determining the gestational age of a pregnancy. Ultrasonography is frequently used to assess gestational age by measuring fetal Abdominal Circumference, Biparietal Diameter, Femur Length and Head Circumference³.

The ultrasonograph might be modified by the technical expertise of the observer. Also, the fetal characteristics, different methods of measurement, and the baby's position can make it difficult to determine the baby's age. Gestational age (GA) is essential for monitoring fetal development and delivery. The placenta is a source of nutrients for the fetus and may disclose information about its health and development. According to research, placental changes during midpregnancy, particularly between 17 and 20 weeks, can indicate fetal malformations. Currently, ultrasound characteristics are the most accurate method for dating a pregnancy⁴⁻⁵. Sonographic fetal parameters aid in pregnancy dating. The placental features can be used to assess GA and IUGR that require early care. The gestational age can be estimated by measuring the thickness of placenta.

The blastocyst that forms during implantation is delivered along with the infant. The placenta resembles a disc-shaped, flattened cake created from the uterine endometrial lining. The placenta is a fetal organ that is responsible for the fetus' nutrition, breathing, and excretion in addition to important metabolic, endocrine, and immunological activity. It serves as a barrier, preventing dangerous chemicals from reaching the embryo.

Typically, formation of the placenta begins in the second half of the second month and concludes in the fourth month⁶⁻⁷. It reaches its maximal growth at maturity. In cases of maternal complications such severe pre-eclampsia, placental values are significantly lower than in the control group. The diagnostic value of abnormal placental thickness across a broad range of pathologic conditions is well established. The thickness of the placenta can help doctors decide how to care for a high-risk fetus and distinguish between a healthy and unhealthy pregnancy. In both IUGR and pre-eclampsia⁸⁻⁹, there is a marked decrease in placental thickness. Placental parameters evaluated by ultrasonography have been found to be useful in determining the severity of pregnancy complications in high-risk cases. Due to its low cost, high success rate, and little risk to the mother and child, ultrasound continues to be the method of choice for detecting placental anomalies¹⁰.

The evaluation of fetal growth relies heavily on gestational age knowledge of the baby. The study was carried out to find the ultra-sonographic measurements done to check the placental thickness. It is an important factor for the gestational age estimation.

MATERIAL AND METHODS

This study was carried out by the collaboration between the two departments of hospital one is Radiology and the other one is Gynecology department. There were 325 pregnant women at least 15 or more weeks of pregnancy period who had scheduled prenatal checkups at an obstetrics and gynecology clinic. Before participating, patients were given a comprehensive explanation of the study and its potential benefits, and only those with informed consent were considered. Patients with repeated pregnancies, fetuses with intrauterine growth retardation were not included in the study.

This research was conducted by using a curvilinear array, real-time, B-mode ultrasound system with 3.5 MHz and 5 MHz frequency probes with Doppler capability. During the transabdominal ultrasonography, the patient was positioned supine. Color Doppler imaging detected the branching point of the umbilical artery from the main blood flow. The location,

echopattern in the parenchyma, and thickness of the placenta were determined by ultrasonography. At the highest position of the placenta, above where the umbilical cord begins to emerge, the placental thickness was measured. Following approval by the department heads of Radiology & Imaging and Obstetrics & Gynecology, the TUTH Ethical Review Board authorized the protocol. The detail information was gathered after the informed consent and detailed explanation of the procedure.

RESULTS

The cross-sectional study was carried out to find the ultrasonographic measurements done to check the placental thickness. It can be used as an effective parameter for gestational age estimation. The study was done on 325 pregnant women that visited tertiary care unit for a period of one year. All women were fully aware of the study and written consent was taken from them. Table no.1 represents the thickness of placenta found at different gestational age. From 15 to 39 weeks of gestation the data was collected and no. of cases having placental thickness were recorded. Maximum and minimum placental thickness in mm was measured and average was taken. The standard deviation was calculated by using software SPSS. In this cross sectional study, the gestational age was compared to sonographic measurements from 15 to 39 weeks of pregnancy. A total of 325 women participated in this study. The age range of the included women was between 18-36 years. The mean age of the women was 26 years. The statistical significance was found by SPSS tool.

Table 1: The thickness of placenta at different gestational age

Gestational week	No. of cases	Placental thickness (mm) (Minimum)	Placental thickness (mm) (Maximum)	Average	Standard deviation
15	5	13.00	18.00	15.5	1.123
16	6	15.00	20.00	17.5	0.959
17	11	15.90	19.00	17.45	1.548
18	14	16.00	20.00	18	0.955
19	17	14.00	24.00	19	1.211
20	13	15.00	24.00	19.5	2.221
21	16	15.00	27.00	21	1.399
22	14	20.00	28.00	24	2.668
23	11	20.00	24.00	22	0.211
24	9	23.00	27.00	25	2.121
25	9	22.00	28.00	25	1.901
26	9	24.00	29.50	26.5	1.378
27	18	24.00	30.15	27	1.712
28	13	25.00	31.00	28	1.591
29	17	28.00	32.00	30	1.087
30	15	26.00	31.00	28.5	1.312
31	14	29.00	41.00	35	1.034
32	10	29.00	38.00	33.5	1.231
33	15	30.00	37.00	33.5	1.076
34	18	30.41	38.00	34	1.321
35	19	31.05	39.00	35	1.012
36	13	32.00	40.00	36	1.791
37	15	31.00	48.00	39.5	1.421
38	13	34.00	47.00	40.5	1.781
39	11	35.00	45.00	40	1.991
Total cases	325				

The maximum placental thickness was measured to be 48mm and minimum was found to be 13mm. The average placental thickness was found to be increasing as the gestational age of the patient was increasing.

DISCUSSION

The gestational age of the fetus can be estimated by measurement of various parts of the fetus. The Robinson used ultrasonography for this purpose in 1970 for the first time, it has been in use since then for fetus age estimation¹¹. There are various other features that are measured during pregnancy to estimate the foetus age like CRL,FL,HC,BPD and AC. These features are routinely measured and the structures that usually exclude any structure that gets crop up during pregnancy¹²⁻¹³. The mortality and morbidity of foetus and mother is reduced significantly this way. The length of crown lump (CRL) is one important factor that estimates about foetus age accurately, is usually used between 7 to 12 weeks of pregnancy¹⁴. So for first trimester dating this can be measured. But in the

second trimester other factors like Biparietal diameter, abdominal circumference and transcerebellar diameter are measured to get idea about the gestational age of foetus¹⁵. As per previous studies head circumference (HC) is far better factor that indicate about age of foetus than the BPD as the former one can tell you about various other features of foetus as well. HC can help you estimate about the multiple shapes of the growing skull of foetus¹⁶⁻¹⁷. 325 patients were included in the study, any case of retarded growth of foetus and any malformation was excluded from the study following the exclusion criteria. After 32 weeks of gestation age the factors like HC, AC are accurate but still the previous ultrasound findings are preferred for assessment. As per previous studies some other factors that can date pregnancy are embryonic trunk circumference. Scapular length, foot length and thigh circumference¹⁸. All these features can fairly estimate about the age of foetus. In this study the gestational age of foetus was estimated in each week by measuring the thickness of placenta by using ultrasound. The data was collected from 15 weeks to 39 weeks of pregnancy. The gestational week for pregnancy was obtained from BPD, AC and FL by making use of HADLOCK formula. It was found that there was a very strong link found between gestational age of foetus and placental thickness.

A similar study was carried out there were 600 women who visited tertiary care unit for more than 10 weeks during their pregnancy. The gestational age of foetus and placental thickness in all these weeks was significantly linked to each other. It was found that from 22 to 35 week the direct correlation was found between gestational age and placental thickness¹⁹. In addition to this, the intrauterine growth retardation can also be predicted from this factor. The low birth weight infants can be predicted from the second trimester if these factors along with uterine artery Doppler was carried out. All these findings strongly showed that there is a strong relation found between the age of fetus and placental thickness²⁰. The maximum thickness was found at 48mm and minimum thickness was obtained as 13mm during the 37 and 13 week of gestation respectively.

As per our studies throughout all weeks especially after 31 weeks the correlation between foetus age and placental thickness was found so the third trimester mothers can use this factor to predict about the exact age of their foetus. Placental thickness also give clue about the intrauterine stunted growth which is one very important factor to look out during pregnancy. In this study the ultrasound was used for measurements it included the measurement of parenchymal echo pattern and the placental thickness²¹. The thickness of placenta was measured by taking vertical length of cord insertion. Previous studies also measured the placental thickness by this method. The thickness of placenta was measured in mm. The freeze picture on ultrasound machine was used to get other parameter measured like BPD, HC and FL. Using HADLOCK formula these were measured. Our studies sued the same old technique to measure all these factors. The factor like thickness of placenta can be used to measure the age of foetus in the third trimester as our studies have supported the point that the age of foetus correlates with the thickness of placenta. It will also give information regarding the stunted growth in the uterus.

CONCLUSION

In this study there was found a strong link between placental thickness and gestational age(week). Placental thickness along with other parameters were studied in each week by ultrasound and the results were analyzed. In case where the exact duration of pregnancy is unknown, placental thickness can give information about age of foetus and other features like intrauterine stunted growth. Thus it can be speculated that the insertion of umbilical cord can help us give information about the biometric measurements of the foetus. However, there is need for further studies to find the precise results.

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