



ESTIMATION OF GESTATIONAL AGE BY ULTRASONOGRAPHIC MEASUREMENT OF PLACENTAL THICKNESS IN SECOND AND THIRD TRIMESTER OF PREGNANCY.

Radiodiagnosis

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ABSTRACT

Introduction: Placental evaluation by ultrasonography has been used to characterize placental position and morphologic changes as the placenta matures.⁽¹⁾

The most common indication for obstetric sonograms is related to uncertainty regarding the gestational age. The purpose of the present study of measuring placental thickness at the level of umbilical cord insertion site was to assess the relationship of placental thickness with gestational age.

Material and Methods: Ultrasonography was performed in the pregnant women aged between 18 and 35 years to measure placental thickness at 13 to 40 weeks of gestation.

Results: Among 500 pregnant women. Majority were between 20 and 30 years. Anterior placenta was noted in 183(36.6%) cases, posterior 120(24.0%) cases, fundal in 89(17.8%) cases and lateral in 108(21.6%) cases respectively. It is observed that the placental thickness gradually increased from 13.27±2.88 at 13 weeks to 36.50 at 40 weeks, almost matched the gestational age in weeks.

Conclusion: The relationship between the placental thickness and gestational age is linear and direct, can be important additional parameter for estimating gestational age along with other parameters.

KEYWORDS

Placental thickness, Gestational age,

INTRODUCTION

The placenta is a fetal organ with important metabolic, endocrine and immunological functions and has a role in protecting the fetus from noxious agents. Placental evaluation by ultrasonography has been used to characterize placental position and morphologic changes as the placenta matures.⁽¹⁾

The measurement of placental thickness is relatively simple and clinically useful.⁽²⁾ Placental thickness measurement can differentiate normal from abnormal pregnancy.⁽³⁾

Objective knowledge of the expected date of delivery is essential in the management of all pregnancies.

It is difficult to assess accurate gestational age in our country, where most of the patients do not have an accurate idea of the date of their last menstrual cycle.

Presently the most effective way to date pregnancy is by use of ultrasound. Accurate assessment of gestational age is an important part of any obstetric examination and presently the most effective way to date pregnancy is by the use of ultrasound. Several sonographically derived fetal parameters are used to date pregnancy. They are fetal crown-rump length (CRL), biparietal diameter (BPD), head circumference (HC), femur length (FL) and abdominal circumference (AC). Placental thickness measurement can be used as a new parameter to estimate gestational age.⁽⁴⁾

Knowledge of menstrual age is important to obstetricians because it affects clinical management, invasive procedures such as chorionic villous sampling, amniocentesis and in the interpretation of biochemical tests such as expanded maternal serum alpha-fetoprotein screening in which the normal range of values changes over time, anticipate normal spontaneous delivery or to plan elective delivery at term.

Menstrual history could be misleading for a number of reasons, such as:-

- Many women may not accurately recall the first day of last menstrual period.
- LMP may be unreliable or misleading because of oligomenorrhea,

abnormal bleeding events and use of oral contraceptives.

- Ovulating very early (< day 11) or very late (> day 21) in the menstrual cycle.⁽⁵⁾

The purpose of the present study of measuring placental thickness at the level of umbilical cord insertion site was to assess the relationship of placental thickness with gestational age.

MATERIAL AND METHODS

Source of data

Pregnant patients in age group of 18-35 years referred from the Obstetrics and Gynaecology departments to department of Radio diagnosis, Father Muller Medical College Hospital, Mangalore for antenatal ultrasound were included in this study. The study period was 18 months from January 2017 to June 2018.

Method of collection of data

This study is a prospective cross-sectional study.

Plan of study:

Equipment and protocol Transabdominal Ultrasonography

The study was performed using Philips IU 22 & Philips Affinity 50 ultrasound scanning machine using convex probes of frequency ranging from 2 to 6 MHz.

Preparation and the procedure included

- Patient will be made to lie in the supine position. The transducer was placed on the skin surface after applying the coupling agent. Fetus will be examined for viability, fetal congenital abnormalities and various growth parameters.
- From various combinations of measurements, based on Hadlock tables and using regression equations, the composite average of the gestational age will be estimated for each fetus by taking various growth parameters by the ultrasound machine.
- All placental measurements were taken during the relaxed phase of the uterus as contractions can spuriously increase the placental thickness.
- The thickness, length and surface of placenta increases during uterine contractions due to distention of intervillous space by maternal blood.

- **Placental myometrial interface:** Correct identification of placental myometrial interface is important for proper measurements of placenta. Focal myometrial thickening due to contractions or myomata may spuriously suggest placental thickening but attention to the placental myometrial echogenicity difference should confirm that the placenta drapes over these regions of myometrial thickening.
- **Cord insertion:** The identification of cord insertion site is vitally important for obtaining correct measurements of placental thickness. The site is usually central, but slightly eccentric position may be normal
- 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 placenta.
- Placental thickness was calculated from the echogenic chorionic plate to placental myometrial interface. The myometrium and subplacental veins were excluded in the measurements.
- Placental thickness tends to gradually increase with gestational age in a linear fashion. Sonographically, this can be seen to be approximately 1 mm per week and the thickness of the placenta can be used to approximate gestational age i.e As a general rule, the placental thickness in millimeters roughly approximates the gestational age in weeks¹.

Normal range approximate gestational age (in weeks) = placental thickness $\pm$ 10 mm.⁶

It does not normally exceed 4cm/40mm in the second trimester or 6cm/60mm in the third trimester.¹

The maximum thickness of a normal placenta at any point during pregnancy is often considered to be 40-60 mm.

INCLUSION CRITERIA:

- All pregnant patients in second and third trimester pregnancy.
- All pregnant women aged between 18 and 35 years for routine antenatal ultrasound.
- Known Last Menstrual period(LMP).
- Singleton Pregnancy.

Exclusion Criteria:

- Patient >35 years,
- Patients with Diabetes mellitus & pregnancy induced hypertension,
- twin pregnancy, intrauterine growth retardation, diagnosed cases of fetal hydrops (hydrops fetalis), pregnancy with chromosomal anomaly,
- Placenta previa & placenta abruptio.
- Polyhydramnios
- Oligohydramnios.
- Placenta with morphological variations in size and shape like lobed placenta, succenturiate lobe, etc.
- Placenta with variations in insertions of umbilical cord like marginal or battledore placentas and Velamentous cord insertions.
- Poor sonographic visualization of the placenta: Due to maternal obesity and posterior shadowing from fetal structures especially in late third trimester.

RESULTS

In the total study group of 500 normal antenatal women, the age ranged from 18- 35 years. The mean age distribution was 25 years. Majority were in the age group between 20 and 30 years

Anterior placenta was noted in 183(36.6%) cases, posterior 120(24.0% cases, fundal in 89(17.8%) cases and lateral in 108(21.6%) cases respectively.

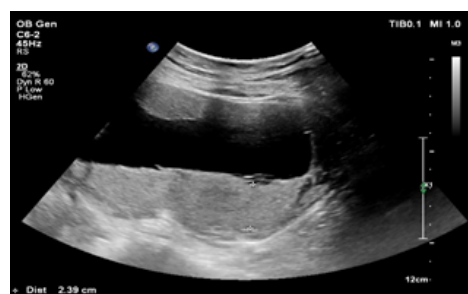
Number of cases measurements ranged from 2 to 31 for each week of gestational age. A total of 500 measurements were obtained from as many cases.

It is observed that the placental thickness gradually increased from 13.27 $\pm$ 2.88 at 13 weeks to 36.50 at 40 weeks.

From 13 to 35 weeks of gestation, the placental thickness (mm) almost matched the gestational age in weeks.

Thereafter from 36 – 40 weeks the placental thickness was lower by 1 – 3 mm.

IMAGES



Placental Thickness at 23 Weeks



Placental Thickness at 22 Weeks

Gestational Age (weeks)	Number of subjects	% of subjects	Placental thickness(mm) Mean $\pm$ SD
13	22	4.4	13.27 $\pm$ 2.88
14	20	4.0	14.00 $\pm$ 0.73
15	16	3.2	15.75 $\pm$ 1.06
16	14	2.8	16.07 $\pm$ 1.21
17	18	3.6	17.06 $\pm$ 0.24
18	10	2.0	17.70 $\pm$ 1.06
19	20	4.0	19.45 $\pm$ 1.19
20	26	5.2	20.73 $\pm$ 1.28
21	23	4.6	21.00 $\pm$ 1.35
22	24	4.8	22.58 $\pm$ 1.28
23	20	4.0	23.30 $\pm$ 1.13
24	12	2.4	24.83 $\pm$ 0.94
25	20	4.0	24.80 $\pm$ 1.36
26	16	3.2	26.63 $\pm$ 1.45
27	18	3.6	27.28 $\pm$ 1.71
28	15	3.0	28.47 $\pm$ 0.92
29	12	2.4	28.67 $\pm$ 1.44
30	14	2.8	28.57 $\pm$ 3.63
31	11	2.2	30.55 $\pm$ 1.44
32	16	3.2	31.19 $\pm$ 1.87
33	23	4.6	31.91 $\pm$ 1.04
34	17	3.4	34.41 $\pm$ 1.12
35	31	6.2	34.13 $\pm$ 1.41
36	22	4.4	34.86 $\pm$ 1.78
37	17	3.4	34.88 $\pm$ 1.27
38	17	3.4	35.06 $\pm$ 1.29
39	7	1.4	35.57 $\pm$ 1.39
40	2	0.4	36.50 $\pm$ 2.12

DISCUSSION

Before the advent of prenatal investigation techniques morphological examination of the placenta was limited to retrospective information and had little influence on pregnancy management. With the improvement of ultrasound equipment, it is now possible to examine the placenta in detail from the beginning of first trimester of pregnancy. Donald introduced placental localization by ultrasound in 1965.⁷ This method of ultrasound placentography was found to be highly accurate for localization of placenta. 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.

For many years sonographers have approached the placenta as a 'static' feature in a dynamic system. While all measurements of fetus

were related to menstrual age, the placental thickness was judged as normal or abnormal based on a single "cut off" point. The present study data confirm that placental thickness is a function of age. Abnormal thickening or thinning must be correlated with estimates of pregnancy duration.

Sonographic measurements of the placenta during pregnancy have been described previously. To determine whether a given placental thickness is normal or abnormal, normal placental thickness must be defined for each week of gestational age throughout pregnancy.

The present study assessed the relationship of placenta thickness (in mm) with sonographic gestational age (in weeks) and also the growth pattern with advancing gestational age. The study showed that the placental thickness (in mm) increases steadily with increasing gestational age in (in weeks) in a linear fashion and almost matching the gestational age from 13-35 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 (in 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).⁸ 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.⁹ 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.¹⁰

Grannum et al reported that placental thickness would increase linearly until 33 weeks of pregnancy, after which there was gradual thinning.¹¹ Other authors reported similar findings. Berkowitz et al reported gradual decrease in placental size after 32 weeks until term.¹²

C.C.Ohagwu, P.O. Abu et al reported that placental thickness has a strong positive correlation with BPD and AC; with both parameters having identical relationship with placental thickness.¹³

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 placenta were similar to posterior and fundal placentas as seen in the present study. Similar observations were made by Hoddick et al (1985).⁸

CONCLUSION

The relationship between the placental thickness and gestational age is linear and direct.

Placental thickness (in mm) measurement can be important additional parameter for estimating gestational age along with other parameters especially from 13 to 35 weeks of gestation.

Placental thickness (in mm) increase with increasing gestational age (in weeks) and almost matching it from 13 to 35 weeks of gestation.

The relationship of placental thickness with gestational age falls marginally and the rate of growth of placental thickness decreased after 36 weeks of gestation and was lower by 1-3 mm.

The thickness of the placenta and growth pattern did not vary relative to the placental location.

Normal placental thickness nomograms have been established in the present study to determine whether a given placental thickness is normal or abnormal for a particular gestational age.

Thoughtful attention to technical detail and correlation of placental thickness with gestational age should facilitate the detection of abnormal placental thickness associated with IUGR, hydrops fetalis and diabetes mellitus in early stages.

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