

PLACENTAL THICKNESS AS AN ADDITIONAL PARAMETER FOR GESTATIONAL AGE ESTIMATION IN NORMAL SINGLETON PREGNANCIES

*¹Dr. T. Rosalind and ²Dr. A. Vaseela Banu

¹Assistant Professor, Department of Obstetrics and Gynaecology Tirunelveli Medical College, Tirunelveli.

²Assistant Professor, Department of Obstetrics and Gynaecology Tirunelveli Medical College Tirunelveli.

Received date: 21 February 2021

Revised date: 11 March 2021

Accepted date: 31 March 2021

*Corresponding author: Dr. T. Rosalind

Assistant Professor, Department of Obstetrics and gynaecology Tirunelveli Medical College, Tirunelveli.

ABSTRACT

Introduction: Accurate estimation of gestational age is an important part of any obstetric examination and presently the most efficient way to date pregnancy is by the use of ultrasonography. There are several sonographically derived parameters like biparietal diameter, head circumference, femur length and abdominal circumference to date pregnancy, but even together their accuracy gets reduced with advancing gestation. Hence additional parameters are needed to supplement them to derive at a gestational age with more precision. The purpose of the present study of is ultrasonographically measuring placental thickness at the level of umbilical cord insertion site and assessing the relationship of placental thickness with gestational age and also to assess the growth pattern of the placenta with advancing gestational age. **Methodology:** 200 antenatal mothers attending the antenatal OPD at Tirunelveli Medical College with singleton normal pregnancies with no risk factors were included in the study. After taking a detailed history and ruling out risk factors the antenatal women were examined for placental thickness and gestational age. The placental thickness in mm was measured at the level of the cord insertion site. All placental measurements were taken during the relaxed phase of the uterus as contractions could spuriously increase the placental thickness. **Results:** In our study we found that there existed a linear relationship between the placental thickness with advancing gestational age. there was also a linear correlation between placental thickness with other ultrasonographically derived parameters which have been used for determining gestational age, thereby concluding that it could be used as an additional parameter for determining gestational age. there was no age specific or parity specific distribution of the placental thickness. there was a majority of anterior implantation site of the placenta among the study population. laterally implanted placentas had maximum thickness. there also existed a linear correlation between placental thickness and estimated fetal weight. **Conclusion:** Sonographic measurement of the placental thickness which is measured at the site of umbilical cord insertion has been found to be a simple and clinically useful method. This helps in diagnosing the placental anomalies that can significantly affect the management and outcome of pregnancy. Besides determining the gestational age it could also be used as a predictor of low birth weight, fetal growth restriction and hydrops fetalis Henceforth we conclude that placental thickness could be used as an additional parameter for gestational age estimation along with the additional parameters from 14-40wks of gestation wherein the duration of pregnancy is unknown or uncertain.

KEYWORDS: Placental Thickness, Gestational Age Estimation, Normal Singleton Pregnancies.

INTRODUCTION

In the recent era of modern obstetrics any procedure done on a pregnant woman is wholly dependent on the gestational age or the expected date of confinement. This expected date of delivery indeed plays a key role in managing obstetric high-risk deliveries. Any events like administration of a drug, interpreting the blood reports, estimation of fetal growth or any surgical procedure

planned, any indication for termination, fetal and maternal morbidity and mortality during delivery is dependent on gestational age. Hence appropriate methods are necessary to provide a more specific and accurate gestational age because management in certain high-risk pregnancies is independently dependent on the gestational age. The gestational age determined from the last menstrual period is around 280 days. But as the last menstrual period couldn't be properly remembered and

reproduced by around 20-30% of the population this constitutes a problem which is supplemented by other factors like conception during lactational amenorrhoea, conception after stopping oral contraceptive pills etc. Henceforth some of the commonly used parameters that could help predict gestational age with a reasonable accuracy are as follows: First one is method based on UPT. Pregnancy detection using the serum or urinary beta HCG can be done within 8-11 days from conception. The reliability of this test is last after 12wks.

Second method is based on the last menstrual period. For this method to be specific her menstrual cycles must be regular with excellent dates i.e the antenatal mother is very sure of her last menstrual period, the previous last 3 cycles were regular, there was no contraceptive use or the mother was not in a period of lactational amenorrhoea and it must be a 28-30 days cycle. If it fulfils the above said criteria then it is most likely that her expected date of confinement will be 280 days from her last menstrual period.

But unfortunately, many a woman cannot be sure of this clinical information which leaves us with last menstrual period being not able to be used as a more reliable tool for estimating the expected date of confinement. Hence when an antenatal mother is going to have this reliable data then the expected date of confinement could be calculated by Naegele's rule that is to add 9 months and 7 days to the first date of last menstrual period.

Another method is fundal height -this could be used as yet another parameter to determine the expected date of confinement. In order to find out the height of the uterus in relation to lunar months, the abdomen is divided into 3 equal parts from pubic symphysis to umbilicus. Until 12 weeks uterus is pelvic organ. Also done using McDonalds rule.

Quickening- It is yet another crude method for determining the expected date of confinement. If the mother is sure of her period of first perception of fetal movements correctly the expected date of delivery can be calculated by adding 20 weeks for primigravida and 22 weeks for multigravida from that period.

Symphysio-fundal height- It is yet another crude method for determining the expected date of confinement. After emptying the bladder and correcting dextro-rotation the measurement is taken. It is measured between the upper border of the pubic symphysis to the highest level of fundus[i.e the place wherein the first resistance is obtained while palpating with the ulnar border of the hand moving down from the xiphisternum]. But the accuracy of this method in identifying a small for gestational age fetus is only around 40%.

Abdominal girth- It is yet another crude method for determining the gestational age. It is measured at the level of umbilicus. It is measured only after 30 wks,

normally it is around 75 cm at 30 week and gets increased at a rate of about 2.5 cm per week to 100 cm by around 40 weeks.

Ossification centre- This is one another not very reliable method for determining the expected date of confinement. This method is based on looking in for the ossification centers using x ray.

Ultrasound- Out of above-mentioned modalities this is the best modality for estimating gestational age. The accuracy being best in first trimester and reduces sharply during the second and third trimester. A multitude of parameters are used like mean gestational sac diameter, yolk sac, crown rump length during the first trimester. During the 2nd and 3rd trimester biparietal diameter, femur length, head circumference and abdominal circumference are used.

In order to improve the accuracy of gestational age estimation in particular during the 2nd and 3rd trimester in addition to above said parameters placental thickness could also be used. Since there is an increasing disparity in obtaining accurate gestational age during the advancing weeks of pregnancy it is better to use a multitude of parameters to narrow down the expected date of confinement particularly in women who are not sure of their last menstrual period.

Based on this aim of our study is to find out the specificity of placental thickness as an additional parameter in estimating the gestational age among normal singleton pregnancies. Also, to study the usefulness of placental thickness as a sonologically derived parameter for estimating gestational age and to assess the growth pattern of the placenta with advancing gestational age. Also, to compare the relationship between placental thickness and estimated fetal weight. Additionally, to find out the differences in this ultrasonographically derived placental thickness with increasing gestational age based on the implantation site of the placenta.

MATERIAL AND METHODS

This cross-sectional study was conducted among 200 normal singleton pregnant women attending the antenatal outpatient department of Tirunelveli Medical College Hospital between august 2018- august 2019. Antenatal women with singleton pregnancies between 14-40 weeks of gestation and who are sure of their last menstrual period were included. While those who were not sure of her last menstrual period, multiple pregnancy, maternal medical disorders [diabetes mellitus, hypertension, anaemia], congenital malformation, IUGR, placental abnormalities, abnormal cord insertion and poor visualisation of the placenta were excluded.

The patient is enquired about her regularity of cycles and her last menstrual period. A detailed history to rule out any associated medical disorders or obstetric

complications is taken. After asking the patient to empty her bladder the fundal height is measured. Consent is obtained from the patient after explaining about the study in detail. Routine ultrasound scanning is done and placental thickness is measured in addition. Sonoscape ss15000 ultrasound system with 3.5mhz transducer was used. The placental thickness in mm was measured at the level of the cord insertion site. Thickness of the placenta was measured between the echogenic chorionic plate and the placental myometrial interface. All placental measurements were taken during the relaxed phase of the uterus as contractions could spuriously increase the placental thickness. Pearson’s correlation was used for correlation between placental thickness and gestational age and maternal age. Chi square test was used to test the

correlation between placental thickness with advancing maternal age.

RESULTS

In our study we included 200 antenatal women with normal singleton pregnancies attending the antenatal OPD of Tirunelveli medical college hospital, In addition to the other fetal ultrasonographic parameters placental thickness was also measured and the values compared.

The mean values of the placental thickness was calculated for each gestational age from 14-40 weeks of gestation and the correlations were calculated to quantify the relationship between the placental thickness and the gestational age, we also do a linear correlation.

Table 1:

		Age	LMP GA	BPD GA	FL GA	AC GA	Estimated Fetal Weight (Grams)
Placental Thickness	Pearson Correlation	-.009	0.974	0.966	0.956	0.968	0.931
	P value	.903	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	N	200	200	200	200	200	200

This chart depicts that there exists a linear correlation between placental thickness and the advancing gestational age.

There was also linear correlation is seen between the gestational age calculated from the biparietal diameter which is one among the sonographic parameters for determining gestational age and the placental thickness. Because there exists a linear relationship between these two parameters placental thickness could be used in places where estimation of biparietal diameter would be difficult, particularly in situations like occipito posterior position, dolicocephaly, brachycephaly, deeply engaged

head and breech presentation where biparietal diameter is less reliable.

There was also an linear relationship between the gestational age measured by the femur length with the placental thickness and also between the gestational age measured by the abdominal circumference with the femur length. There also exists a linear correlation between placental thickness and estimated fetal weight, based on this correlation it could be used as a predictor of low birth weight and has a prognostic value in determining the subsequent development of fetal growth restriction. Further we analysed the Placental thickness based on implantation sites.

Table 2: Placental Thickness Based On The Placental Implantation Sites.

	N	Mean placental thickness	Std. Deviation	P value
ANTERIOR	127	33.81	6.82	<0.0001
POSTERIOR	34	31.21	6.14	
RIGHT LATERAL	8	35.73	4.73	
LEFT LATERAL	8	36.93	4.64	
FUNDAL	23	26.97	7.46	
Total	200	32.78	7.03	

Table 2 show the distribution of the implantation site of the placenta among the study population. In the study conducted anterior uterine implantation of the placenta was found to be the maximum around 127, and right lateral wall and left lateral uterine wall implantation of the placenta was found to be the least. The mean placental thickness of the various implantation sites of the placenta with their standard deviation is seen here. It has been concluded from this study that the fundal implantation sites of the placenta has the least thickness

and the placenta implanted in the lateral wall had the maximum thickness.

Among the study population the number of primigravidas were 113 and the multigravidas were 87. The maximum study population was constituted by the primigravidas [56%]. The mean placental thickness among primigravidas was 32.86, and for the multigravidas it was 32.68. There was no statistically significant difference in the placental thickness depending on the parity of the antenatal mothers.

Also linear correlation has been documented between the gestational age calculated by the last menstrual age with that of the biparietal diameter, femur length and the abdominal circumference .hence just as these parameters

are used for gestational age determination placental thickness which has a linear correlation with these ultrasonographic parameters can be used as an additional tool for estimation of gestational age.

Table 3: Placental Thickness Based On Placental Maturity.

	N	Mean	Std. Deviation	P value
GRADE 1	35	22.54	3.08	<0.0001
GRADE 2	128	33.27	5.19	
GRADE 3	37	40.76	1.07	
Total	200	32.78	7.03	

The mean placental thickness for the various ultrasonographically determined placental maturity grading is depicted above. It has been found that the placental thickness increases with increasing placental grading [ie. As the placenta gets matured with advancing gestational age]. This indirectly depicts a correlation between placental thickness with advancing gestational age. Also the placental thickness is noted to increase with a increase in the fundal height with mean was 24.35 in 14-27 weeks and 36.38 in 28-40 weeks.

This was seen a increasing trend in all along 40 weeks, also we correlated the estimated fetal weight and gestational age with placental thickness which depicts an increase in the estimated fetal weight with gestational age which is found to have a linear relation with the placental thickness.

DISCUSSION

Determination of the gestation age is actually a challenge faced by the obstetrician especially while evaluating and treating the less educated population who do not understand the importance and fail to keep a track on their last menstrual period, in addition to this several factors mentioned above could be misleading in tracking down the last menstrual period. Accurate determination of the gestational age is a very important tool for the many reasons like determining the expected date of delivery, for determining the period of fetal lung maturity and viability, for interpreting the results of prenatal tests, for determining preterm and post term deliveries, for classifying stillbirths and infant deaths, for estimating the time of termination of various high-risk pregnancies.

Many a times last menstrual period is misleading due to oligomenorrhoea, bleeding events, use of oral contraceptives, ovulating very early [<day 11] or very late [>day 21]. Hence the accuracy of dating by ultrasound is only around 30%.

Matsumoto et al,^[1] reported that early or late ovulation occurs in approximately 20% of the population. Hence this frames a most important indication for using an obstetric ultrasound with the help of which it was quite easy to date pregnancy with various parameters, but as the pregnancy advanced to the third trimester these

parameters became less reliable. Hence the need for additional parameters which supplemented the already existing parameters were looked in for.

The changes with placental thickness are an expression of the normal growth of the fetoplacental unit amenable to measurement with ultrasound is of value in describing the normal physiology.

Placental thickness has been used for estimating gestational age. It could also be used for detecting FGR and SGA babies thereby guiding the obstetrician as on the further means of action to be taken. In this study a positive correlation has been noted between the placental thickness with advancing gestational age, and the increasing placental thickness which has also been found to correlate with the estimated fetal weight determined sonographically. This study is in par with other studies like similar observations reported by Adhikari et al.^[2]

Ganjoo et al,^[3] reported that during gestational age of 10-13wks placental thickness was higher than the gestational age by 1-2mm. Placental thickness accurately correlated with the gestational age between 12-24wks, after which a reduction of 1-4mm is expected.

Tiwari et al,^[4] noted that up to 21wks of gestation the mean placental thickness was slightly higher than the gestational age. From 22 to 35 weeks the mean placental thickness almost matched the gestational age in weeks thereafter the placental thickness was lower by 1-2mm.

According to a study which was conducted by Anupama Jain et al,^[5] he found that the placental thickness almost matched with the gestational age from 27-35weeks of gestation.

According to a study by Mumal Nagawani et al,^[6] he found out that the placental thickness was known to increase up to 38 weeks of gestation.

Another study by Grannum et al,^[7] stated that the placental thickness was found to increase until 33wks of gestation following which period it decreased in size.

Ohagwu et al,^[8] study found out that the maximum placental thickness was at 39 weeks of gestation wherein

it measured around 45.1mm. Our study observed an increase in placental thickness with increasing gestational age from 14-40 weeks of gestation.

We observed a reduced thickness of the fundal placenta compared to the other placental locations which is in contrast with the previous studies by Durnwald et al.^[9] who observed reduced thickness of anterior placenta compared to the posterior and fundal placenta. Anterior placenta [63%] was the commonest among our patients. Similar observations which were reported by Arifa et al.^[10]

We observed an increase in the placental thickness with the fundal height and the mean placental thickness during 1st trimester was 24.35 and that during second trimester was 36.38.

We also observed a linear increase in the placental thickness with the estimated fetal weight which is similar to the observations by Adhikari R et al who observed an increase in the estimated fetal weight calculated by the three sonographic parameters [BPD, FL, AC] in par with the placental thickness.

Clapp et al,^[11] in his study showed a significant correlation between placental thickness and estimated fetal weight.

There is no statistically significant correlation between the placental thickness and the maternal age which is similar to the finding observed with Elchalal et al.^[12] and Durnward et al study.

CONCLUSION

Sonographic measurement of the placental thickness which is measured at the site of umbilical cord insertion has been found to be a simple and clinically useful method. This helps in diagnosing the placental anomalies that can significantly affect the management and outcome of pregnancy. Besides determining the gestational age it could also be used as a predictor of low birth weight, foetal growth restriction and hydrops fetalis. In our study conducted at Tirunelveli medical college hospital in 2018-2019 we have found a linear correlation between the placental thickness with advancing gestational age and a linear relationship between placental thickness and estimated fetal weight. Henceforth we conclude that placental thickness could be used as an additional parameter for gestational age estimation along with the additional parameters from 14-40weeks of gestation wherein the duration of pregnancy is unknown or uncertain.

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