IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 6, Issue 4 Ver. VI. (Jul. -Aug .2017), PP 68-71
www.iosrjournals.org

Ultrasonographic Measurement of Placental Thickness and its Correlation with Gestational age

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Abstract
OBJECTIVES: *To assess the relationship between placental thickness with gestational age.*
MATERIAL AND METHODS: *The present study was a prospective observational study and includes 152 pregnant women with known last menstrual period, history of regular menstruation, singleton pregnancy and aged between 20 and 35 years. After approval by Institutional Ethics Committee all recruited women were observed for baseline demographic and obstetric data including age, parity and past medical events at first antenatal visit. All women provided an informed written consent and underwent ultrasound evaluation of placental thickness at 18 to 40 weeks of gestation.*
RESULTS: *At 18-37weeks of gestational age there is no statistical significance between the mean difference of gestational age (29.8±5.5) and placental thickness (29.5±4.9), after 37 wks of gestational age there is high mean difference between gestational age (38.07±1.42) and placental thickness (34.36±2.86). Thus, there is high positive correlation between the gestational age and placental thickness at 18-37 weeks as correlation coefficient 'r' is 0.860 but after 37 weeks there is poor correlation between gestational age and placental thickness with correlation coefficient of 0.031.*
CONCLUSION: *Estimation of gestational age is a very important component of antenatal care in which ultrasonography plays an important role. Placental thickness measured at the level of umblical cord insertion can be used as an accurate sonographic indicator in the assessment of gestational age because of its linear correlation. Therefore, it can be used as an additional sonographic tool in correlating gestational age in cases where last menstrual period is not known.*
Keywords: *Placental thickness, Gestational Age, Umblical cord insertion*

Date of Submission: 15-07-2017 Date of acceptance: 05-09-2017

I. Introduction

Placenta is the vital support organ for the developing fetus which provides the physiological link between a pregnant woman and the fetus[1]. The placenta is a highly vascularized organ and its main functions are supplying of nutrient, oxygen, and hormones to the fetus[2]. The placenta is formed by the interaction of decidua basalis of the endometrium and chorionic villi of the fetus at implanation site at about 8-10 weeks. True definition of placenta is possible at about 10-11weeks after conception[3].

The best possible antepartum care and successful labor outcome always revolve around the accurate knowledge of gestational age determination, and is an important component of antenatal care. Gestational age is frequently over and under estimated, as the conventional gestational age estimation is based on the last menstrual period and ultrasonography. Many females are unaware of their last menstrual period and irregular menstruation and ultrasonography bound to have a bias, thereby posing difficulties in the estimation of gestational age. Accurate determination of gestational age has become important for deciding the appropriate time for termination of pregnancy as well as to monitor the fetal growth during the entire period of pregnancy. Gestational age assessment is useful in appropriate scheduling of invasive procedures such as chorionic villus sampling, amniocentesis and interpretation of biochemical tests such as the screening for maternal serum biomarkers such as alpha fetoprotein levels.

In addition to the routine fetal biometry parameters, various studies were done trying to deduce a relationship between the placental thickness and gestational age . Placental thickness measured at the level of umblical cord insertion appears to be a new promising parameter for estimation of gestational age of fetus as placenta is a materno-fetal organ and its size is a refraction of health and size of fetus. Thus, the present study was aimed to evaluate the relationship between the placental thickness (measured at the level of umblical cord insertion) and gestational age.

II. Material And Methods:

The present study was a prospective observational study and includes 152 pregnant women with known last menstrual period, history of regular menstruation, singleton pregnancy and aged between 20 and 35 years. After approval by Institutional Ethics Committee all recruited women were observed for baseline demographic and obstetric data including age, parity and past medical events at first antenatal visit. All women provided an informed written consent and underwent ultrasound evaluation of placental thickness was done trans-abdominally by using color Doppler scanner with a 3.5-MHz convex transducer placing it perpendicularly to the plane of the placenta, in the area of insertion of umbilical cord at 18 to 40 weeks of gestation. Placental thickness as obtained by ultrasonography and correlated with fetal parameters such as femur length (FL), biparietal diameter (BPD), head circumference (HC) and the abdominal circumference. The data collected in this study was analysed statistically. The correlation between gestational age & placenta thickness was computed. Pearson's correlation analysis was used to establish the degree of relationship between placental thickness and gestational age. 'P' values of less than 0.05 were considered statistically significant.

III. Observations

The present study was conducted in the Department of Obstetrics and Gynaecology in collaboration with Department of Radiology and Department of Paediatrics, J.N. Medical College and Hospital, Aligarh . Total of 152 women were included in the study. The mean maternal age in our study was 25.21±4.67. Maximum number of women were in the group range 20-24 years i.e. 66 (43.5%) while 3(1.9%) women were in the age group of >35yrs ***(Table. I)*** The mean gestational age of women was 33.36±5.90. Maximum number of women belong to gestational age group range of 36-40weeks while the minimum women were in the gestational age group of 21-25weeks ***(Table.II).*** The placental thickness (Mean±SD) was found to be 18.5±0.7mm at 18weeks, 21.6±0.0mm at 21weeks, 25.2±.2mm at 24weeks, 28.6 ± 1.1mm at 27weeks. Thus placental thickness increases with gestational age till 37week. Thereafter placental thickness decreases by 1-2mm till 40weeks ***(Table.III).*** At 18-37weeks of gestational age there is no statistical significance between the mean difference of gestational age (29.8±5.5) and placental thickness (29.5±4.9), which indicates that there is a high degree of positive correlation between gestational age(weeks) and placental thickness(mm). After 37 wks of gestational age there is high mean difference between gestational age (38.07±1.42) and placental thickness (34.36±2.86) which is statistically significant and indicates that there is poor positive correlation between gestational age(weeks) and placental thickness(mm) beyond 37weeks of gestational age ***(Table IV).***

As shown in ***Table-V*** there is high positive correlation between the gestational age and placental thickness at 18-37 weeks as correlation coefficient 'r' is 0.860 but after 37 weeks there is poor correlation between gestational age and placental thickness with correlation coefficient of 0.031.

IV. Discussion

Placental thickness appears to be a promising parameter for estimation of gestational age of the fetus because of increase in placental thickness with gestational age. In addition to the routine fetal biometry parameters, various studies were done trying to deduce a relationship between the placental thickness and gestational age . Studies by Mittal et al[4] and Jain et al[5] have reported the use of placental thickness as an indicator of gestational age. Thus, this study was undertaken to correlate the relationship between placental thickness with gestational age.In the present study it has been observed that the placental thickness linearly increases with the gestational age uptill 37wks of gestation. After 37wks of gestation, the placental thickness decreases by 1-2mm . Between 38-40wks of gestation the mean gestational age was 38.07±1.42 while the mean placental thickness was 34.36±2.86. This high mean difference indicates that there is poor positive correlation between gestational age and placental thickness (p-value <0.05, r-0.031).

A fairly linear increase in mean placental thickness with gestational was observed in correlation analysis studies conducted to determine the relationship between placental thickness and gestational age. The value of the mean placental thickness increased with advancing gestational age, almost matching from the 22nd to the 35th week and 27 to 33 weeks in two separate studies conducted in India. Preeti Baghel et al 2015[6] observed a largely positive correlation between placental thickness and gestational age. Arafa Ahmed et al 2014[7] mentioned positive correlation between placental thickness and gestational age with regression value of 0.96 which are coherent with our results. Our findings were not similar with Anu Kapoor et al 2016[8] as they observed that the placental thickness increases with increasing gestational age. Placental gradually increases from 9.9mm at 10wks to 40mm at 38 wks of gestation. The dissimilarity could be contributed to the selection of cases as they have included 10weeks of gestational age. Mumal Nagwani et al 2014[9] showed the increasing trend of placental thickness uptill 38wks of gestational age which goes with our findings while they observed a decreasing trend upto 42wks of gestation which is not comparable with our study as we have included gestational age upto 40weeks and not upto 42weeks.

V. Conclusion

stimation of gestational age is a very important component of antenatal care in which ultrasonography plays an important role. Placental thickness measured at the level of umblical cord insertion can be used as an accurate sonographic indicator in the assessment of gestational age because of its linear correlation. Therefore, it can be used as an additional sonographic tool in correlating gestational age in cases where last menstrual period is not known. Including placental thickness into routine fetal biometry might also minimize the discrepancy of gestational age even late in second and third trimester.

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Table I: Maternal age distribution

S. No.	Age group (Years)	No. of cases	Percentage (%)
1	<20	06	03.9
2	20-24	66	43.5
3	25-29	53	34.9
4	30-35	24	15.8
5	>35	03	01.9
	Total	152	100.0

Table II: Gestational age distribution

S. No.	Gestational age (weeks)	No. of cases	Percentage (%)
1	≤20	12	07.8
2	21-25	10	06.6
3	26 – 30	13	08.6
4	31 – 35	52	34.2
5	36 – 40	65	42.8
	Total	152	100.0

Table III: Relationship between gestational age and placental thickness

S. No.	Gestational age(weeks)	No. of cases (n)	Placental thickness (mm) Mean ± SD	95% Confidence interval
1	18	2	18.5 ± 0.7	12.1 – 24.2
2	19	2	22.5 ± 3.5	9.2 – 54.2
3	20	8	21.6 ± 1.7	20.1 – 23.1
4	21	1	21.0 ± 0.0	-
5	22	1	27.0 ± 0.0	-
6	23	1	26.0 ± 0.0	-
7	24	4	25.2 ± 0.9	23.7 – 26.7
8	25	3	26.3 ± 3.2	18.3 – 34.3
9	26	3	26.6 ± 1.1	23.7 – 29.5
10	27	3	28.6 ± 1.1	25.7 – 31.5
11	29	3	29.0 ± 1.7	24.6 – 33.3

12	30	4	29.7 ± 0.5	28.9 – 30.5
13	32	9	30.7 ± 3.0	28.4 – 33.1
14	33	12	32.7 ± 2.3	31.2 – 34.2
15	34	10	31.6 ± 3.4	29.1 – 34.0
16	35	21	33.6 ± 2.6	32.3 – 35.0
17	36	11	34.1 ± 2.5	32.4 – 35.8
18	37	14	35.1 ± 2.9	33.4 – 36.8
19	38	15	33.2 ± 2.4	31.9 – 34.6
20	39	9	34.4 ± 3.4	31.8 – 37.0
21	40	16	34.0 ± 3.0	33.1 – 36.4
	Total	152		

.**Table IV** : Comparison between gestational age(18-40wks) and placental thickness

	Total cases	**Range**	**Mean**	**S.D.**	**P-value**	**T-value**
Gestational age (weeks)	112	18-37	29.8	5.5	>0.05	0.832
Placental thickness (mm)	112	18-38	29.5	4.9		
Gestational age (weeks)	65	36-40	38.07	01.42	<0.05	9.457
Placental thickness (mm)	65	29-40	34.36	02.86		

Table V: Correlation between gestational age and placental thickness

Correlation between	**Pearson's correlation**	**P- Value**
Gestational age (18-37) and placental thickness	0.960	<0.05
Gestational age (>37) and placental thickness	0.031	>0.05

Nasreen Noor. "Ultrasonographic Measurement of Placental Thickness and its Correlation with Gestational age." IOSR Journal of Nursing and Health Science (IOSR-JNHS) , vol. 6, no. 4, 2017, pp. 68–71.