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Original Research Paper

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PLACENTAL THICKNESS MEASUREMENT BY ULTRASONOGRAPHY AND IT'S CORRELATION WITH GESTATIONAL AGE IN NORMAL AND INTRAUTERINE GROWTH RETARDED PREGNANCY

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ABSTRACT

Background- Ultrasonography is modality of choice for fetal evaluation, estimation of gestational age and detection of fetal growth restriction in pregnancies.

Objective- This study was conducted with the aim of evaluating placental thickness, its role in estimation of gestational age of the fetus and in predicting normal and fetal growth restriction as outcome.

Methods- Using Ultrasonography placental thickness was measured at cord insertion site from 18th to 40th weeks of gestation. Study participants were categorized as normal and intra uterine growth restriction based on birth weight of newborns. Correlation of placental thickness with gestational age was calculated and compared in both groups to find any significant difference.

Results- A positive correlation was observed between placental thickness and gestational age in both groups. Pearson's correlation coefficient (r) was calculated for both groups. It was 0.3221 and 0.7450 in intra uterine growth restriction and normal group respectively. In normal group placental thickness (mm) corresponds to gestational age (weeks) upto 32nd weeks. After that mean placental thickness remains nearly stationary upto 40th weeks with average thickness 31 mm. In 18th , 19th and 26th weeks of gestation, placental thickness was more in IUGR group (22.5±4.2 ,28.1±5.2 and 31±5.5) as compared to normal group (18.7±1.6, 19.6±1.9 and 26±3.1).

Conclusion- Measured placental thickness at the umbilical cord insertion site can be used as an early sonographic parameter in detection of intrauterine growth restriction in singleton normal pregnancies.

KEYWORDS : Ultrasonography, placental thickness, gestational age, intrauterine growth restriction.

INTRODUCTION-

Ultrasonography is essential investigation in obstetric management. Apart from assessment of fetal anomalies, it has a key role in assessment of placental anomalies, fetal circulation and fetal growth parameters. It has an important role in detection of intrauterine growth restriction (IUGR) pregnancies (1). IUGR is a common diagnosis in obstetrics and carries an increased risk of perinatal morbidity and mortality. Identification of IUGR is crucial because proper evaluation and management can result in a favourable outcome. Ultrasound biometry is the gold standard for assessment of fetal growth parameters and identification of IUGR.

Placenta is a fetal organ of pregnancy, which provides oxygen and nutrition to the growing fetus and carries out excretory functions as well. Ultrasound is the first line modality in imaging the placenta. Donald introduced placental localization by ultrasound in 1965 (2). Apart from site localization, measured placental thickness can be used as a gestational age indicator due to a linear increase in its thickness with advancing gestational age (3,4).

With this background, we planned to conduct a study, where we measured placental thickness in pregnant women, who were sure of their last menstrual period (LMP) and assessed the relationship of placental thickness with gestational age by LMP and compared these findings in normal and IUGR pregnancies to find whether any significant difference is present between these two groups.

MATERIAL AND METHODS-

After getting approval from Institutional ethical committee of G.S.V.M. Medical College, Kanpur, Uttar Pradesh, India; this prospective cross sectional study was conducted in the Department of Radiodiagnosis in collaboration with the Department of Obstetrics and Gynaecology of same institute between August 2016 to July 2017. All pregnant women who were sure of their LMP coming for antenatal USG between 18th to 40th weeks of gestation were enrolled. USG was performed using a SONOACE X8 system with 2-5MHz convex array transducer. Placental thickness at cord insertion site was measured keeping the plane of transducer perpendicular to the placental basal and chorionic plates. We excluded women with gestational diabetes mellitus, multiple pregnancies, polyhydromnios, diagnosed cases of fetal hydrops and pregnancies with any morphological variation in placenta or cord insertion. Women with poor visualization of cord insertion site were also excluded. Variables like maternal age, previous obstetric history, body mass index, placental position, hemoglobin level and blood pressure were also recorded. Study participants were categorized into two groups i.e. Group A (IUGR pregnancy) and Group B (Normal pregnancy) based on outcome newborn weight of <2500 grams and ≥2500 grams respectively. Data were recorded in Microsoft excel sheet and was analysed using SPSS software. Mean placental thickness (MPT) with standard deviation (SD) were computed for each gestational age in both groups. The correlation and regression coefficient were calculated to quantify the relationship between the gestational age (weeks) and placental thickness (mm) in both groups. P value <0.05 was considered significant. Unpaired't'-test was applied to compare the difference between the means of the two groups at each gestational age.

RESULTS-

Total 627 pregnant women, who were sure of their LMP, were enrolled. Out of which 445 participants completed this study and 182 were lost to follow-up. Among 445 participants, 147 were included in group A and 298 study participants in group B. Maximum study participants were observed in age group 21-25 years. (Figure 1)

Total 445 measurements were taken. Minimum number of measurements recorded (at any single gestational week) was 1 and 4 and maximum were 15 and 28 in Group A and Group B respectively. (Figure 2) MPT was calculated for each gestational week in both groups. (Table 1)

A positive correlation was observed between MPT and gestational age in both groups. Pearson's correlation coefficients (r) were 0.3221 and 0.7450 in Group A and Group B respectively; showing more strength of correlation in Group B. Mean placental thickness in different gestational age shows linear relation in both groups. (Figure 3)

In group A, MPT is higher than gestational age till 29th weeks of gestation excluding 21st, 28th and 34th week, where it corresponds to the gestational age. Beyond 29th week, MPT is lower than the gestational age till 40th week. However, in group B, placental thickness corresponds to gestational age up to 32nd week. After that it remains nearly stationary till 40th week with average thickness of 31 mm.

Regression analysis yielded a linear equation of relationship between placental thickness in mm (X) and gestational age in weeks (Y) for both groups:

Group A→ Y=22.1068+0.2692X
Group B→ Y=6.062+0.7947X

Minimal placental thickness measured in Group A and Group B were 17 mm and 16 mm respectively at 18th weeks of gestation; while maximum thickness measured was 49mm and 44mm at 36th gestational weeks.

Mean placental thickness at 18th, 19th and 26th weeks is significantly more in Group A (22.5±4.2 ,28.1±5.2 and 31±5.5) as compared to Group B (18.7±1.6, 19.6±1.9 and 26±3.1) with 'p' value <0.05. An increased placental thickness in these gestational weeks can suggest abnormal fetal outcome.

In the total 445 study participants range of haemoglobin distribution was 4.3gm% to 12.7gm%. Haemoglobin range of 9 - 10gm%is seen in maximum number of cases (35.9%) and range 12-13gm% in minimum number of cases (1.3%). (Table 2)

DISCUSSION-

From previous studies it has been seen that placental size increases linearly with advancing gestational age. Any abnormaly thin or thick placenta may be an indicator of abnormal fetal outcome or any pathological condition. Elsafi et alreported that placental thickness less than 25 mm in third trimester is subnormal and may be associated with intrauterine growth retardation and placental thickness more than 40 in third trimester is abnormally thick and may represent pathological condition like maternal diabetes mellitus, fetal hydrops, intra uterine infections (5).

Our study showed a linear relation between placental thickness and gestational age (by LMP) in both normal and IUGR cases from 18th week to 40th week. In Group B, placental thickness (mm) is almost corresponding with gestational age (weeks) from 18th to 32nd week, after that placental thickness slightly decreases and remains nearly constant with average placental thickness of 31mm till 40th week. Maximum MPT in normal group was 33mm at 36th week. Hoddick et al found average placental thickness was increasing with advancing menstrual age (6). Mital P and Hooja N also found an increasing MPT with advancing gestational age and between 22nd to 35th week of gestation, the placental thickness coincide almost exactly with the gestational age (weeks) (2,7). Anupama Jain et al reported similar correlations between placental thickness and gestational age (8). They found placental thickness (mm) almost matched gestational age (weeks) from 27th to 33rd weeks of gestation. Grannum et al reported that placental thickness would increase linearly until 33rd weeks of pregnancy, after which there was gradual thinning (9). Berkowitz et al reported gradual decrease in placental size after 32 weeks until term (10).

In Group B, we find stronger linear relation between placental thickness and gestational age. However in Group A, placental thickness does not coincides with gestational age except in 21st, 28th and 34th gestational weeks. More diverse value of placental thickness was seen in IUGR cases as compared to normal cases indicating that thin or thick both type of placenta are associated with intrauterine growth retardation. Statistically significant difference in the MPT of IUGR and normal group was seen only in 18th, 19th and 26th gestational weeks, with mean values more in IUGR as compared to normal group (22.5±4.2, 28.1±5.2 and 31±5.5 vs 18.7±1.6, 19.6±1.9 and 26±3) suggesting earliest identification of IUGR pregnancy is possible by antenatal USG in these gestational weeks.

Cross sectional prospective study of correlation between placental thickness and gestational age is done in both normal and IUGR group by Mathai et al in India (1). They also found positive correlation between placental thickness and ultrasonographic gestational age in both normal and IUGR groups. In their study statistically significant difference in the MPT in both groups were seen in 26th and 30th ultrasonographic gestational weeks with MPT lower in IUGR group as compared to normal group.

CONCLUSION-

Antenatal ultrasonographic measurement of placental thickness at cord insertion site would help in predicting outcome (normal/IUGR) of the pegnancy. Therefore, abnormal placental thickness in a particular gestational age can be used as an addition tool in early detection of IUGR in singleton pregnancy.

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Table 2. Distribution of haemoglobin concentration in both groups

Haemoglobin (gram%)	Group A (IUGR¶)	Group B (Normal)	Number of cases
4-5	10	0	10
5-6	8	1	9
6-7	14	5	19
7-8	33	39	72
8-9	42	78	120
9-10	29	131	160
10-11	6	30	36
11-12	3	10	13
12-13	2	4	6
Total no. of cases	**147**	**298**	**445**

IUGR¶- Intra uterine growth retarded

Table 1. Relationship between gestational age and placental thickness in both groups

GA* (Weeks)	Group A (IUGR¶)		Group B (Normal)		p-value
	Placental thickness (Mean±SD)	N**	Placental thickness (Mean±SD)	N**	
18-18.6	22.5±4.2	4	18.7±1.6	28	<0.05
19-19.6	28.1±5.2	6	19.6±1.9	15	<0.05

20-20.6	23.4±5.2	5	20.6±2.8	19	>0.05
21-21.6	22±1	3	21.6±2.7	12	>0.05
22-22.6	25±0	1	23.1±6.1	11	
23-23.6	29±0	1	23.8±2.6	16	
24-24.6	27±0	1	25±1.9	13	
25-25.6	27±4.8	4	25.5±3	10	>0.05
26-26.6	31±5.5	15	26±3.1	12	<0.05
27-27.6	30.2±5.2	8	27±2.1	11	>0.05
28-28.6	28.5±4	9	28.1±3.3	11	>0.05
29-29.6	31±5.3	10	28.5±2.5	6	>0.05
30-30.6	28.2±3.8	4	29.1±2.7	16	>0.05
31-31.6	27.4±5.4	5	30.7±3.3	16	>0.05
32-32.6	30.4±9.7	9	32±5.4	25	>0.05
33-33.6	28.3±3.9	5	30.9 ±5.8	15	>0.05
34-34.6	34.1±8.5	15	31.8±2.9	16	>0.05
35-35.6	30.6±7.5	9	31.2±4.8	16	>0.05
36-36.6	32.4±7.2	13	33±5.1	14	>0.05
37-37.6	33.6±8.5	11	29.8±5	8	>0.05
38-38.6	33±9.2	4	31.5±3.7	4	>0.05
39-40	28.8±6.7	5	30.5±7	4	>0.05
Total		147		298	

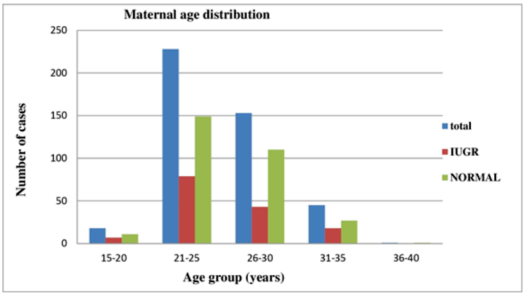

Figure-1 Maternal age distribution

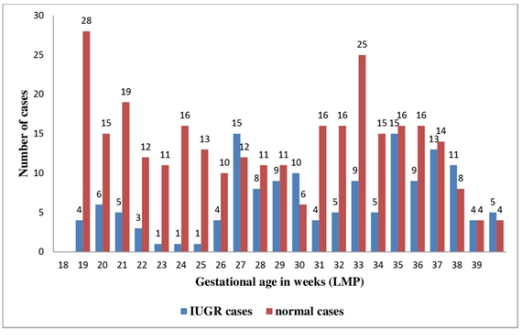

Figure-2 Number of cases at different gestational age

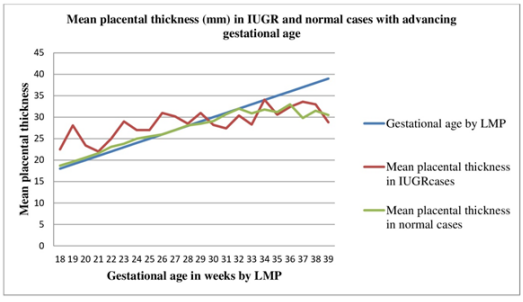

Figure-3. Mean placental thickness in different gestational age

REFERENCES-

1. Mathai BM, Singla SC, Nittala PP, Chakravarti RJ, Toppo JN. Placental thickness: its correlation with ultrasonographic gestational age in normal and intrauterine growth-retarded pregnancies in the late second and third trimester. J Obstet Gynaecol India. 2013 Aug;63(4):230-3.
2. Donald I. On launching a new diagnostic science. Am J Obstet Gynecol 1968;103:609-28.
3. Mital P, Hooja N, Mehndiratta K. Placental thickness - A sonographic parameter for estimating gestational age of the fetus. Ind J Radiol Imag 2002;12:553-4.
4. Jain A, Kumar G, Agarwal U, Kharakwal S. Placental thickness - A sonographic indicator of gestational age. J Obstet Gynaecol India 2001;51:48-9.
5. Elsafi AA, MagdoleinSA, CarolineEA, AbdelmoneimSA. Prediction of fetal growth by measuring the placental thickness using Ultrasonography. Journal of Gynecology and Obstetrics. 2014; 2(2): 26-31.
6. Hoddick WK, Mahoney BS, Callen FW, Filly RA. Placental thickness. J Ultrasound Med. 1985; 4: 479-482.
7. Mital P, Hooja N, Mehndiratta. Placental thickness – a sonographic parameter for estimating gestational age of the fetus. Ind J Radiol Imag. 2002; 12(4): 553-554.
8. Anupama Jain, Ganesh Kumar, Agarwal U, Kharakwal S. Placental thickness – a sonographic indicator of gestational age. Journal of obstetrics and gynaecology of India. 2001; 51(3): 48-49.
9. Granum PAT, Hobbins JC. The placenta. Radiol Clin North Am. 1982; 20: 353.
10. Granum PAT, Berkowitz RL, Hobbins JC. The ultrasonic changes in the maturing placenta and their relation to fetal pulmonic maturity. Am J Obstet Gynecol. 1979; 133: 915-922.