International Journal of Sciences & Applied Research

www.ijsar.in

A prospective study for the role of ultrasound placental thickness as predictor of IUGR

Bajaj Jagriti*, Nagar Pushpa, Rajoria Lata

Department of Obstetrics and Gynaecology, S.M.S. Medical College, Jaipur-302012, Rajasthan, India.
Correspondence Address: *Dr. Jagriti Bajaj, Kakkar Nursing Home, Tohana, Fatehabad-125120, Haryana, India.

Abstract

Objective: To predict intrauterine growth restriction by placental thickness ultrasonographically.
Main Outcome Measures: Correlation of ultrasonographic placental thickness and birth weight of the baby.
Method: A total of 100 patients were observed for correlation of the placental thickness with ultrasonographic gestational age and their outcomes by dividing them into Group-A {fetal weight < 2,500 g (n = 32)} and Group-B {fetal weight >2,500 g (n = 68)}. The mean placental thickness was calculated at the umbilical cord insertion in both groups along with ultrasonographic fetal age and estimated fetal weight.
Results: A positive correlation was observed between placental thickness and ultrasonographic gestational age in both groups (p-value <0.001), with correlation coefficient (''r'') values of 0.848 in Group-A and 0.910 in Group-B. Mean placental thickness is found to be lower in Group-A (<2.5 kg) between 32 to 36 weeks as compared to Group-B (>2.5 kg) (p-value < 0.05).
Conclusion: Measurement of placental thickness at the level of umbilical cord insertion may become a valuable tool to predict low birth weight babies with confirmed gestational age.

Keywords: Transabdominal ultrasonography, Placental thickness, Ultrasonographic gestational age, Intrauterine growth restriction, Estimated fetal weight

Introduction

Placenta is primarily a fetal organ and its size is a reflection of the health and size of the fetus. An ultrasonographic parameter frequently used to assess the placenta is placental thickness, which is simple to measure and is clinically useful. The placenta is a fetal organ which provides the physiologic link between a pregnant woman and the fetus. The placenta develops from the chorionic villi at the implantation site at about the fifth week of gestation and by the ninth or tenth week. 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.

Despite careful antenatal surveillance involving scrupulous examination, an issue of considerable disappointment is that a majority of low birth weight infants are not diagnosed until delivery. Low birth weight infants are susceptible to hypoxia and fetal distress, long-term handicap, and fetal death. Therefore, an early detection of intrauterine growth restriction (IUGR) will be beneficial

to obstetric and neonatal care.[1] Studies have shown that diminished placental size precedes fetal growth restriction as IUGR is associated with impoverished villous development and fetoplacental angiogenesis.[2, 3]

At term the placenta is approximately 3 cm thick at the level of cord insertion and measures 25 to 30 cm in diameter.[4] Placental thickness is closely related to fetal wellbeing and may be a key factor in perinatal outcome.

Large placentas are associated with hemolytic disease of newborn, maternal diabetes mellitus, severe anemia and intrauterine fetal infections.[5, 6]

Small placentas are associated with preeclampsia, chromosomal abnormalities, severe maternal diabetes mellitus, chronic fetal infections and intrauterine growth restriction.[4, 5, 7]

Materials and methods

The prospective correlation study was conducted in Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur from May 2014 - Aug 2015.

In this prospective study all singleton pregnancies (>24 weeks of gestation) attending the OPD with known last menstrual periods (history of regular periods) were included in the study.

Patients who had diabetes, hypertensive disease of pregnancy, placenta previa, diagnosed cases of fetal hydrops, fetal congenital anomalies, and intrauterine fetal death were excluded from the study.

Placental thickness was taken at the level of umbilical cord insertion with low frequency curvy linear probe 3.5 MHz convex array transducer. Ultrasonographic gestational age was determined by measuring the mean BPD, HC, AC and FL.

The placental thickness and gestational age were then correlated. The estimated fetal weight was determined by measurement of BPD and AC adopting the formula devised by Shepard MJ et al (1987)[8]. Subsequently, the fetal outcome was then assessed and correlated with the fetal weight (categorizing into groups of baby weights <2,500 and >2,500 g)

Results

The study was carried out on a total of 100 antenatal cases at different gestational ages and their baby birth weight was compared with the ultrasonographic placental thickness.

- A significant positive correlation was observed in mean Placental thickness (in mm) and ultrasonographic gestational age in both the groups. Placental thickness (in mm) almost matching the gestational in weeks from 24 to 35 weeks of gestation in non FGR group
- Mean placental thickness was found to be lower in Group-A between gestational age 32 to 36 weeks as compared to Group-B.
- Our study showed a statistically significant positive correlation between placental thickness and estimated fetal weight in late second and third trimester specially between 34 to 36 weeks when mean EFW in group A is lower than Group-B.
- Placental thickness also showed strong positive correlation with abdominal circumference, which is the earliest parameter to get affected in FGR.

Discussion

In present study we observed important correlation between placental thickness and gestational age. Value of mean placental thickness increases with advancement of ultrasonographic gestational age in whole study group (p-value <0.001) (Table-1). However, placental thickness doesn't increase proportionately with the gestational age in FGR group.

Table 1: Relation of the Placental Thickness (in mm) with the Gestational Age (in wks).

Gestational Age (in wks)	Placental Thickness (in mm)						
	Group-A (<2.5 kg) {N = 32}			Group-B (>2.5 kg) {N = 68}			P-Value LS
	No. of Cases	Mean Placental Thickness	Std. Deviation	No. of Cases	Mean Placental Thickness	Std. Deviation	
24 – 25	4	22.5	1	6	23.67	1.033	
25 – 26	1	25		3	26.33	1.155	
26 – 27	**4**	**24.50**	**1.915**	**4**	**27.25**	**.957**	**0.042, S**
27 – 28	1	20		1	26		
28 – 29	0	0.00		3	30.33	4.163	
29 – 30	4	24.75	1.258	2	29	2.828	0.051
30 – 31	1	24	0	2	31.5	0.707	
31 – 32	3	29.33	.577	5	30.20	1.924	0.48, NS
32 – 33	**4**	**28.5**	**1.291**	**4**	**33**	**2.16**	**0.012, S**
33 – 34	3	29.67	2.082	4	33	2.16	0.096, NS
34 – 35	**2**	**30.5**	**2.121**	**8**	**34.25**	**1.282**	**0.01, S**
35 – 36	**2**	**30.5**	**2.121**	**9**	**33.89**	**1.537**	**0.025, S**
36 – 37	1	30		5	34.8	1.304	
37 – 38	1	32		0	0.00		
38 – 39	1	30		3	35.67	1.155	
39 – 40	0	0.00		2	36	0	

A fairly linear correlation is observed between placental thickness and gestational age in non-IUGR Group-B (r = 0.910), Group-A (r = 0.848) (Table-2).

Table 2: Correlation between Placental Thickness (in mm) and Gestational Age (in wks) in Group-A and Group-B.

	R	r2	P-value
Group-A (<2.5 kg) {N = 32}	.848	0.718	<0.001, S
Group B (>2.5 kg) {N = 68}	.910	0.827	<0.001, S

Placental thickness (in mm) almost matching from 24 to 35 weeks of gestation in non IUGR group (Table-1). After 35 weeks of gestational age linear relation doesn't follow. Similar studies done by Berkowitz et al (1979)[9] showed gradual decrease in placental thickness after 32 weeks till term.

Table 3: Correlation between Placental Thickness (in mm) and Estimated Foetal Weight (in kg) in Group-A and Group-B.

	R	r2	P-value
Group-A (<2.5 kg) {N = 32}	0.789	0.623	<0.001, S
Group B (>2.5 kg) {N = 68}	0.848	0.72	<0.001, S

Table 4: Correlation between Placental Thickness (in mm) and Abdominal Circumference (in mm) in Group-A and Group-B.

	R	r2	P-value
Group-A (<2.5 kg) {N = 32}	0.857	0.736	<0.001, S
Group B (>2.5 kg) {N = 68}	0.889	0.792	<0.001, S

Hence, placental thickness is a sensitive indicator to diagnose fetal growth restriction from 24 to 35 weeks of gestation with confirmed gestational age. When gestational age is not confirmed then we require serial sonographic assessment of placental thickness for diagnosis of FGR.

It is supported by studies done by Hoddick et al (1985)[10]; Anupama Jain et al (2001)[11] who reported similar correlation between placental thickness and gestational age. Mital P et al (2002)[12] also had similar results.

In our study mean placental thickness is found to be lower in Group-A (<2.5 kg) between 32 to 36 weeks as compared to Group-B (2.5 kg) (p-value < 0.05) (Table-1). This is supported by study by Habib et al (2002)[1] which shows lower mean placental thickness at 36 week of gestation in group baby birth weight <2500 gm as compared to group with baby birth weight >2500 gm (Table-1).

In our study we found statistically significant positive correlation between estimated fetal weight and placental thickness in both the groups (Table-3)
r = 0.848 in Group-B (>2.5 kg)
r = 0.789 in Group-A (<2.5 kg)

This relationship exists in the late second and third trimesters; the period during which most of the fetal weight is gained. Similar study done by Ohagwu et al (2009)[13] shows similar results with significant positive correlation between placental thickness and estimated fetal weight with (r = 0.616) in second trimester and (r = 0.570) in third trimester (P-value < 0.05).
Study by Habib et al (2002)[1]have suggested that low-birth weight babies can be predicted from ultrasound measurements of placental diameter and thickness and showed significant statistical difference between placental thickness of an IUGR and non-IUGR group at 36 weeks with (P-value < 0.001).
Table-4 shows a statistically significant positive correlation between placental thickness and abdominal circumference in both the groups
r = 0.857 in Group-A (birth weight < 2.5kg) p-value <0.001
r = 0.889 in Group-B (birth weight >2.5kg) p-value < 0.001
Our results are consistent with study done by Ohagwu et al (2008)[14]
r = 0.626 in second trimester; p-value = 0.000
r = 0.523 in third trimester; p-value = 0.000

This implies that placental thickness is a good parameter to detect asymmetrical IUGR.

Conclusion

1. The result of this study shows a strong positive correlation between placental thickness and estimated fetal weight. Thus, measurement of placental thickness in sonographic assessment of pregnancy may become a valuable tool to predict low birth weight babies with confirmed gestational age.
2. Placental thickness measured at the level of umbilical cord insertion can be used as an accurate sonographic indicator in the assessment of gestational age in singleton pregnancies because of its linear correlation (specially between 24 to 35 weeks of gestation).
3. In our study, the placental thickness was found to be lower in Group A between and 32 to 36 weeks as compared to Group B. Thus, it is interesting to observe that mean placental thickness at these ultrasonographic gestational ages can be used in detecting FGR.
4. Our study showed a statistically significant positive correlation between placental thickness and AC. The usefulness of this relationship between

placental thickness and abdominal circumference is that subnormal placental thickness for a gestational age may be the earliest indication of foetal growth restriction. When a thin placenta is observed foetal weight should be estimated and possible medical intervention undertaken if the foetal weight is below the normal value.

References

1. Habib AF. Prediction of low-birth weight infants from ultrasound measurement of placental diameter and placental thickness. Ann of Saudi Med, 2002; 22(5–6) : 312–4.
2. Wolf H, Oosting H, Trefferes PE et al. Second trimester placental volume measurement by ultrasound: prediction of fetal outcome. Am J Obstet Gynecol, 1989; 160 : 121–6.
3. Mayhew TM, Wijesekara J, Baker PN et al. Morphometric evidence that villous development and fetoplacental angiogenesis are compromised by intrauterine growth restriction but not by pre-eclampsia. Placenta, 2004; 25(10) : 829–33.
4. Sadler TW. Longman's medical embryology. 9th edition. Baltimore, MD: Lippincott Williams and Wilkins; 2004; p. 117-48.
5. Spirt BA, Gordon LP. Sonography of the placenta. In: Fleischer AC, Manning FA, Jeanty P, Romero R, editors. Sonography in obstetrics and gynaecology: principle and practice. Appleton & Lange, 1996; p.173-202.
6. Benirschke K, Kaufmann P. Pathology of the human placenta. 2nd edtion. New York: Springer-Verlag; 1990.
7. Kuhlmann RS, Warsof S. ultrasound of the placenta. Clin Obstet Gynecol, 1996; 39 : 513-34.
8. Shepard MJ, Richard VA, Berkowitz RL, Warsof SL, Hobbins JC. An evaluation of two equations for predicting foetal weight by ultrasound. Am J Obstet Gynecol, 1987; 156 : 80-85.
9. Grannum PA, Berkowitz RL and Hobbins JC. The ultrasonic changes in the maturing placenta and their relation to fetal pulmonic maturity. Am J Obstet Gynecol, 1979; 133 : 915-922.
10. Hoddick WK, Mahony BS, Callen PW, Filly RA; Placental thickness. J Ultra Med, 1985; 4(9) : 479-482.
11. Jain A, Kumar A, Agarwal U, Kharakwal S. "Placental thickness -a sonographic indicator of gestational age". Journal of Obstetrics and Ggynaecology of India, 2001; 51: 3: 48-49.
12. Mittal P, Hooja N, Mehndiratta K. Placental thickness: a sonographic parameter for estimating gestational age of the foetus. Indian J Radiol Imaging, 2002; 12 : 553-554.
13. Abu PO, Ohagwu CC, Eze JC, Ochie K. Correlation Between Placental Thickness And Estimated Fetal Weight In Nigerian Women. Ibnosina Journal of Medicine and Biomedical Sciences, 2009; 80-85.
14. Ohagwu CC, Abu PO, Ezeokeke UO and Ugwu AC. Relationship between placental thickness and growth parameters in normal Nigerian foetuses. African Journal of Biotechnology, Jan 2009; 8(2): 133-138.