"COMPARISON OF PLACENTAL GRADING BY ULTRASONOGRAPHIC STUDY IN NORMAL AND HIGH RISK PREGNANCY IN NORTH INDIAN POPULATION"

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ABSTRACTThe relationship of the placenta as seen after birth, to infant outcome is very important. By ultrasonography we visualize the placenta in-situ and describe progressive sonographic changes in the placenta. The placenta undergoes series of progressive changes that relate to gestational age and fetal maturity. The purpose of the present study was to relate the placental growth in normal and high-risk pregnancy for predicting neonatal outcome. This study was conducted on total number of 42 patients coming to antenatal clinic of obstetrics & gynecology and in the department of Radiodiagnosis, at Sardar Vallabh Bhai Patel Hospital, Meerut, Uttar Pradesh.

Detailed personal and family history was taken; general examination of the patient was done to include the high risk cases. Morphology of placenta was studied under following heading a) chorionic plate b) echotexture of placental substance c) basal layer of placenta. The placental grading was done according to Grannum's classification.

It was observed that between 32 to 37 week, grade II placenta were found more common as compared to grade I, whereas with >37 weeks grade III placenta was found in normal pregnancy. Acceleration and deceleration of placental growth were observed in high risk cases.

Key Words: placental grading, gestational age, placental morphology, Grannum's study

INTRODUCTION

Ultrasound evidence of the developing placenta can be seen as early as 6 weeks of gestation. It appears as an area of high-level echoes surrounding a border representing the developing gestational sac. The echoes represent the chorion frondosum, which develops into the definitive placenta. Approximately 12 weeks of gestation the structures of the placenta can be more clearly discerned.

Grannum et al (1979)[1] devised systemic classification of ultrasonographic morphology of placenta, based on the changes occurring in the chorionic plate, placental substance and the basal layer, the three separate zones of placenta. The placenta was grouped into four grades from zero to three.

Grade 0: Chorionic plate Straight and well defined
(Fig.1) Placental substance Homogenous
Basal layer No densities

Grade I: Chorionic plate-Subtle undulations
(Fig. 2) Placental substance Scattered echogenic areas Basal layer No densities

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Grade II: Chorionic plate- indentation extending into placenta but not to the basal layer
(Fig. 3) Placental substance Linear echogenic densities (comma-like)

Basal layer- Linear small acrogenic areas (basal stippling)

Grade III: Chorionic plate-Indentations that extend all the way to the basal layer
(Fig. 4) Placental substance Circular densities with echo- speared areas in center,
Large irregular densities which cast acoustic shadow
Basal layer- echogenic densities persist and become larger and denser

According to Petrucha and Piatt (1982)[2] all placenta start as grade zero. The mean gestational age at which the placenta matures to a Grade I is 31.11 weeks, Grade II, 36.36weeks and Grade III, 38.04 weeks.

Winsberg (1973)[3] describe a distinct ultrasonic appearance of the placenta occurring after 36 weeks gestation, appearance of rounded transonic areas correspond to the placental tissue and a villous space between the interlobular septa show as white echoes due to their calcium content.

The objective of the present study was to investigate the value of placental grading in predicting neonatal outcome in individual subgroups of normal and

complicated pregnancies.

MATERIALS AND METHODS

This study was carried out on a total no. of 42 cases after 28 weeks of pregnancy attending the department of Obstetrics & Gynecology and Radiodiagnosis at Sardar Vallabh Bhai Patel Hospital, Meerut, Uttar Pradesh. Clearance of institutional ethical committee was obtained before starting the work. The present cases were divided into normal and high-risk groups according to the presence of having medical and obstetrical complication. Detailed personal & family history was recorded, and general examinations of the patients were carried out. High-risk cases we included were hypertensive (HT), intra uterine growth retardation (IUGR.), Rhesus incompatibility (negative) and antepartum hemorrhage (APH).

Women attending the antenatal clinic in the Department of Obstetrics and Gynecology who were referred for routine ultrasonography and those women referred as high risk patients were selected for the study. After explaining the procedure and obtaining consent these patients were subjected to USG examination. Patients were scanned using LOGO 100 CL real time USG machine with a sector array 3.5MHz frequency transducers. Patients were asked to maintain a full bladder, for obtaining a better window for the USG examination.

Scanning Technique

With the patients in supine position, jelly was applied over the abdomen and examination was carried out.

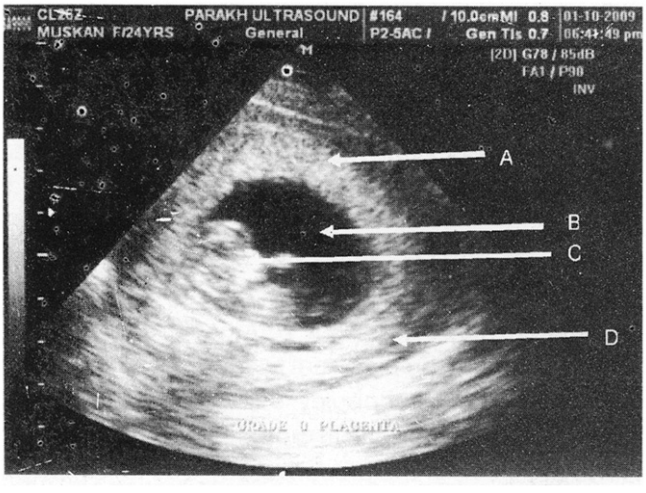

Fig- 1 Grade 0 Placenta- A=placenta; B=liquor amnii; C=fetus; D=uterine wall.

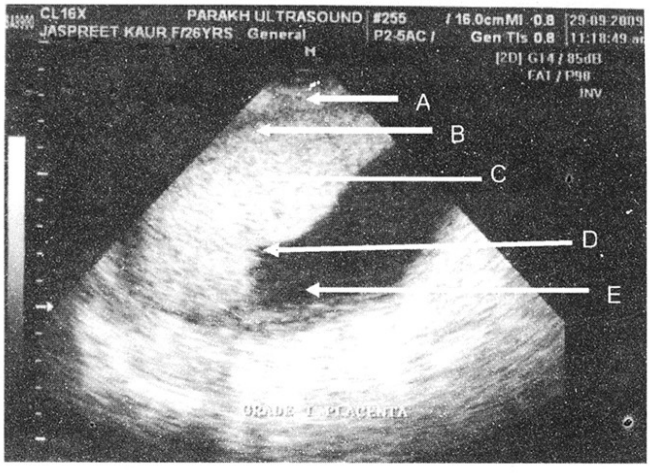

Fig- 2 Grade I Placenta- A=uterine wall; B=basal plate; C=placental substance; D= indentation in chorionic plate; E=liquor amnii

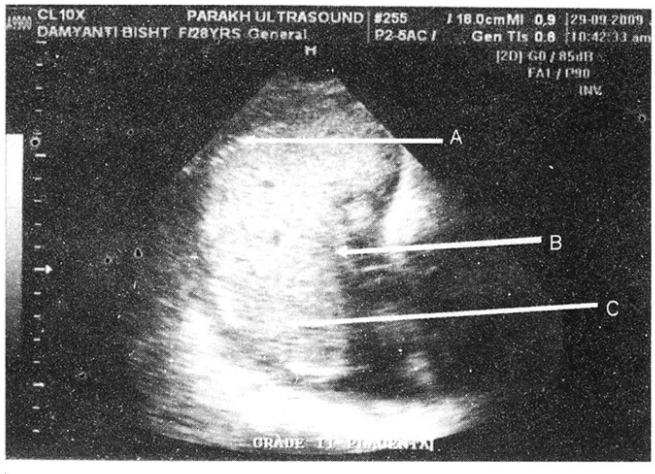

Fig- 3 Grade II Placenta- A=basal plate echoes; B= chorionic plate indentation extending up to placental substance. ; C=placental substance comma like echoes.

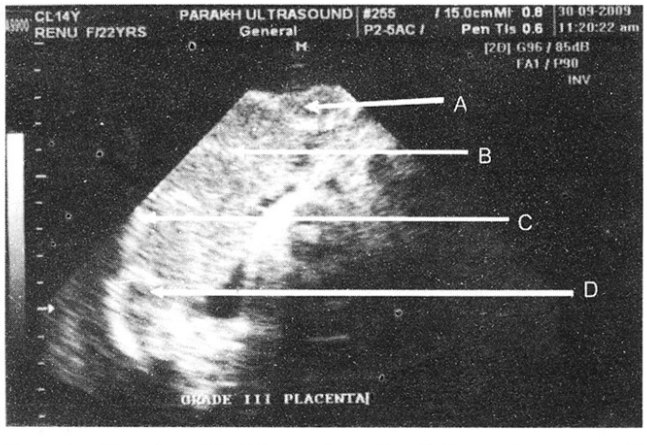

Fig- 4 Grade III Placenta- A=fall out area of cotyledons; B= densities in placental substance; C= basal layer echoes; D=chorionic plate indentation extending up to basal plate.

S. No.	Gestational age (weeks)	No.of pregnant women	Placental Grading			
			Grade 0	Grade I	Grade II	Grade III
1	28-31	8	2	4	2	0
2	32-37	11	0	3	6	2
3	>37	7	0	1	3	3

Table I: Correlation of placental grading with gestational age in normal pregnancy

S. No.	High risk factors	Gestational age (weeks)	G 0	G I	G II	G III
1.	Hypertension (n=10)	28-31	0	0	3	1
		32-37	0	0	2	2
		>37	0	0	1	1
2	I.U.G.R. (n=2)	28-31	0	0	2	0
		32-37	0	0	0	0
		>37	0	0	0	0
3	Rh-ve (n=1)	28-31	0	0	0	0
		32-37	1	0	0	0
		>37	0	0	0	0
4	A.P.H. (n=3)	28-31	0	0	0	0
		32-37	0	0	2	1
		>37	0	0	0	0

Table II: Placental grading in different high risk cases

S.N.	Placental Grading	Grannum's study	Present Study
1	G 0	43 (33.3%)	2 (7.6%)
2	G I	31 (24%)	8 (30.7%)
3	G II	32 (24.8%)	11 (42.31%)
4	G III	23 (18%)	5 (19.2%)

Table-III: Comparison of placental grading with Grannum's study

S. No.	Gestational age (weeks)	Normal cases (n=26)	High risk cases (n=13)
1	28-31	G 0 -2 G I - 4 G II -2 G III -0	G 0 -0 G I -0 G II-5 (HT & IUGR) G III -1(HT)
2	32-37	G 0 -0 G I -3 G II -6 G III-2	G 0-1(Rh) G I-0 G II -2 (HT &APH) G III-2 (HT & APH)
3	>37	G 0-0 G I-1 G II-3 G III-3	G 0-0 G I-0 G II-1(HT) G III-1(HT)

Table-IV: Placental grading at different gestational age in normal and high risk pregnancies

To scan the placenta in reference to placental grading, morphology of placenta was studied under following headings: chorionic plate, echotexture of placental substance and basal layer. At sonography, the placenta is uniformly of intermediate echogenecity, with a deep hypoechoic band at the interface between the myometrium and the basilar deciduas Khaled M. Friedkin et.al (2009)[4]. The gestational age was assessed by USG, by measuring crown-rump length (CRL), bi-parietal diameter (BPD) and femur length (FL) as described by Campbell (1969)[5] and Anderson (1981)[6], Hertz (1978)[7], to correlate the placental grade.

OBSERVATION & RESULTS

Present study included 42 patients out of which 16 were included in high-risk category and 26 were in normal category.

Table-I shows the correlation of placental grading with gestational age in normal pregnancy in present study. In gestational age of 28-31 weeks out of 8 cases mostly (4) are of grade I placenta. While in gestational age of 32-37 weeks out of 11 cases 6 are of grade II placenta and at more than 37 weeks out of 7 cases 3-3 are of grade II and III placenta.

Table-II shows placental grading in different high-risk cases. At the gestation age of 28-31 weeks, Grade II and III placenta in hypertensive and IUGR. At the 31-36 weeks grade II and III placenta in APH cases might be a result of uteroplacental ischemia. One Rhesus negative woman with gestational age between 32 to 37 weeks showed grade 0 placenta.

In present study of high risk cases majority of all cases are of hypertensive group, i.e. 10 (62.5%). Placental maturity increases with gestational age in normal and high-risk cases, but in high-risk cases placenta matures earlier. Normally at gestational age of 28-31 weeks grade III placenta is not found, but in our study out of 4 cases of HT instead of grade 0, one showed grade III, 3 showed grade II placenta.

There were two cases of IUGR, i.e.12.5%, in which also placenta matures earlier so there is grade II placenta found at the gestational age of 28-31 weeks. And three cases of APH were found in which at 32-37 weeks of gestation grade II and grade III placenta were found, indicating acceleration of placental maturity

There was one case of Rhesus negative women with gestational age of 32-37 weeks in which grade 0 placenta was found. It indicates that there is delayed maturation of placenta.

DISCUSSION

Grannum et al.[1] classified placental maturity into four grades, 0-III, according to the ultrasonographic appearances of the chorionic plate, the placental substance and the basal layer. The placenta can be graded from about 12 weeks, when the chorionic plate can be identified.

In grade 0 chorionic plate appears as a smooth line with no indentations. The placental substance and the basal layer are homogenous (Fig. 1). In grade I the chorionic plate develops subtle indentation and in the placental substance echogenic densities (Fig. 2). In grade II placenta the echoes in the substance of the placenta become numerous and confluent. According to Grannum et al. the basal echoes should be regarded as the hallmark of a grade II placenta (Fig. 3)1and in grade III the comma- like indentations reach the basal plate dividing the placenta into compartments (cotyledons), basal layer echoes become more prominent (Fig. 4).

In the present study we have tried to compare

morphological changes in placenta by USG at different gestational age in normal and high-risk pregnancies. In high-risk pregnancy it is essential to know gestational age before making decision about interventions such as amniocentesis, intrauterine fetal exchange transfusion and the time of elective delivery as in high-risk mothers.

Spirt et al (1982)[8] proposed that during the growth of the placenta few textural changes take place and tried to correlate them with gestational age and maternal disease and also presented the result of the relationship of placental calcification to gestational age, parity and maternal age by sonographic study. It is evident that decreased incidence of calcification in multiparous women and no significant relationship were found between placental calcification and maternal age[7]. In our study Parity and maternal age have not been taken into consideration.

Hopper et al (1984)[9] noted that if the placenta appeared to be grade I prior to 27 weeks, grade II prior to 32 weeks and grade III prior to 34 weeks of gestation, the pregnancy would likely to be complicated with intrauterine growth retardation and preeclampsia. Kazzi et al (1983)[10], Kumari et al (2001)[11]and Dudley et al (1993)[12] also reported the association of grade III placenta with small for gestational age infants. Zhang LY et al (2005)[13] maintain the grade III placenta maturation before 37 weeks of gestation is associated with oligohydramnios and low birth weight and might help predict placental dysfunction, which needs close monitoring for the benefits of the mother and fetus. Ultrasound detection of a grade III placenta at 36 weeks gestation in a low- risk population helps to predict subsequent development of proteinuric pregnancy- induced hypertension and may help in identifying the growth- restricted baby (Mckenna et al 2005)[14].

Proud and Grant (1987)[15] observed in a study of 2000 unselected pregnant women the development of mature placental appearance (grade 3) on USG by 34-36 weeks gestation in high risk (HT and APH) cases was associated with increased risk of low birth weight and perinatal death.

Hills et al (1984)[16] reported that a delayed change from a grade 0 to a grade I configuration, i.e. a grade 0 placenta presented after 32-33 weeks, might be associated with the onset of gestational diabetes and Rh sensitization, whereas hypertension and intrauterine growth retardation showed a strong correlation with accelerated placental maturation. According to Shweni (1986)[17] finding of grade I or II placentas at term in high risk pregnancy as Rh iso-immune disease also support this study.

Comparison of normal cases of our study with Grannum et al (1979) showed almost same pattern of percentage among grade I, and III placenta, except in grade 0 which was found to be less and grade II which is more (Table-III).

In present study it was observed that HT, APH & IUGR cases showed acceleration in maturity of placenta, i. e. grade II & III were predominant. However Rhesus negative cases showed delay in maturation of placenta, thus supports the previous study (Table-IV). This study alone does not justify routine scanning in late pregnancy. Furthermore, larger randomized trials of placental grading are required. Nevertheless these results do provide a basis for recommending that placental grading should be one of the indices reported during ultrasound examination in the third trimester.

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