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ORIGINAL ARTICLE

ULTRASONOGRAPHIC PLACENTAL GRADING-A PREDICTOR OF FETAL MATURITY IN NORMAL AND HIGH RISK PREGANANCY

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ABSTRACT: The placental maturity is associated with advancing gestational age. Factors such as chronic hypertension, pre-eclampsia, intra-uterine growth retardation and maternal smoking are associated with accelerated placental maturation, whereas diabetes and fetomaternal immunization are associated with delayed placental maturation. Ultra sonographical placental grading is a safe, non-invasive method of assessment of fetal gestational age. **AIM:** To determine the placental grading in all the patients presenting to the department of Obstetrics and Gynaecology after 32 weeks of pregnancy. To note the amniotic fluid index in all these patients and to analyse factors associated in all cases, show a grade III placenta. To compare the perinatal outcome in patient with grade II and III placenta. **MATERIAL AND METHOD:** A Prospective Study to 149 Antenatal case in whose pregnancy 32 weeks or more in N.S.C.B. Medical College, Jabalpur during June 2011 to September 2012. **INCLUSION CRITERIA:** Antenatal case whose pregnancy 32 weeks or more and in whom USG was done within 1 wk prior to delivery. **EXCLUSION CRITERIA:** Antenatal case whose pregnancy less than 32 weeks. All ANC patient came to the OPD at or after 32 weeks were thoroughly examined after taking detail history date of last menstrual period was correctly known in all cases and gestational age were calculated by naegles formula. On abdominal examination height of the uterus was noted and compared with weeks of gestation. Routine investigation, such as hemoglobin, blood group and Rh factor and qualitative examination for albumin in urine, microscopic examination of urine were carried out in every patient. Technique for scanning the biparietal diameter-biparietal diameter was calculated in trans thalamic plane. Central echogenic falx with two short parallel lines representing cavum septum pellucid and bilateral hypoechoic thalami were seen on either side of mid line falx. After delivery baby was examined carefully for still or live birth, cry, respiration, heart sound, sex, weight and maturity. **RESULTS:** All the patients who were sure of date subjected to USG for placental grading and AFI in every patient, to attempt was made to correlate placental grading and neonatal outcome and analyze the risk factor in placental grade — III, all these patients USG was done within one week of delivery. A grade-III placenta was not associated with poor perinatal outcome, Presence of grade-III placenta definitely correlated with good pulmonary maturity as seen by good APGAR score in normal pregnancy. Detection of higher grade early in third trimester can alert the obstetrician for closer observation for risk factor to decrease uteroplacental circulation. In present study it is observed that HT, APH, IUGR. cases showed acceleration in maturity of placenta i.e. grade II and III were predominant, however Rh-incompatibility cases showed delayed in maturation of placenta, this supports the previous study. **CONCLUSION:** A grade-III placenta was not associated with poor perinatal outcome, Presence of grade-III placenta definitely correlated with good pulmonary maturity as seen by good APGAR score in normal pregnancy. Detection of higher grade early in third trimester can alert the obstetrician for closer observation for risk factor to decrease uteroplacental circulation. In present study it is observed that HT, APH, IUGR. cases showed

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acceleration in maturity of placenta i.e. grade II and III were predominant, however Rh-incompatibility cases showed delayed in maturation of placenta, this supports the previous study.
KEYWORD: Placenta, Pre-eclampsia, Sonography, Chorion, Pregnancy.

INTRODUCTION: The placenta is the most vital supporting organ for the developing fetus and is the transfer site of oxygen, carbon dioxide and nutrition and serves as a prolific synthesizer of hormones and prostaglandins. The developing placenta can be observed by transvaginal ultrasound from 5 weeks gestation.

The three basic placental structures are the chorionic or fetal plate, the placental villous tissue or substance, and the basal or maternal plate. The placental mass is divided into 20-40 cotyledons or functional units, determined by the branching pattern of the villous tree and the primary villous trunk with its derivatives. The typical diffuse granular texture of the placenta is produced by echoes emanating from the villous tree which is bathes in maternal blood, this appearance being retained throughout pregnancy with some variations.

Classification of placenta is a physiological phenomenon which occurs throughout pregnancy. It has been divided into grades according to sonographicechotexture.

Grade 0: The placental tissue and the basal plate are homogeneous without the presence of linear highly reflective foci. The chorionic plate is smooth and well defined. Late first trimester early second trimester (10-16wks).

Grade I: The placental tissue contains a few linear highly reflective areas parallel to the basal plate, which remains unchanged. The chorionic plate presents subtle undulations. Mid second trimester early third trimester (18-29wks).

Grade II: The placental tissue contains randomly dispersed echoes and is divided by comma like reflective structures continuous with the chorionic plate. The marked indentations of the chorionic plate do not reach the basal plate, which is well defined by small linear highly reflective areas. Late third trimester (30wks to delivery).

Grade III: The placental tissue is divided into compartments containing central echo free areas. The chorionic plate indentation reaches the basal plate, which contains almost confluent, very reflective areas. 39 wks to post date.

The placental maturity is associated with advancing gestational age. Factors such as chronic hypertension, pre-eclampsia, intra-uterine growth retardation and maternal smoking are associated with accelerated placental maturation, whereas diabetes and fetomaternal immunization are associated with delayed placental maturation. Ultra sonographical placental grading is a safe, non-invasive method of assessment of fetal gestational age.

AIM: To determine the placental grading in all the patients presenting to the department of Obstetrics and Gynaecology after 32 weeks of pregnancy. To note the amniotic fluid index in all these patients and to analyse factors associated in all cases, show a grade III placenta. To compare the perinatal outcome in patient with grade II and III placenta.

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MATERIAL AND METHOD: The present study was carried out on 149 patients admitted between June 2011 to June 2012, whose pregnancies were advanced to 32wks or more, in the Department Obstetrics & Gynaecology, N.S.C.B. Medical College, Jabalpur (M. P).

Inclusion Criteria: Antenatal case whose pregnancy 32 weeks or more and in whom USG was done within 1wk prior to delivery.

Exclusion Criteria: Antenatal case whose pregnancy less than 32 weeks.

All ANC patient came to the OPD at or after 32 weeks were thoroughly examined after taking detail history date of last menstrual period was correctly known in all cases and gestational age were calculated by naegle's formula. On abdominal examination height of the uterus was noted and compared with weeks of gestation. Routine investigation, such as hemoglobin, blood group and Rh factor and qualitative examination for albumin in urine, microscopic examination of urine were carried out in every patient. Special investigations were done according to the risk factor in patient. All patients had subjected to ultra sonographic examination to study details of fetal and placental profile.

Technique for scanning the biparietal diameter-biparietal diameter was calculated in trans thalamic plane. Central echogenic falx with two short parallel lines representing cavum septum pellucid and bilateral hypoechoic thalami were seen on either side of mid line falx. The biparietal diameter was measured from outer table of nearest parietal bone to the table of farthest parietal bone with the midline falx perpendicular to the ultrasonic beam.

Technique for scanning abdominal circumference-The transducer was moved along the fetal spine to see for the cardiac activity, lungs and diaphragms. Distal to the diaphragm stomach was identifying as an anechoic ovoid structure. The transducer was then rotated by 90 to obtain a transaxial scan.

Technique for scanning Femur length- Moving down along the spine, fetal pelvis was identified by visualization of anechoic fetal bladder at the lower end of the fetal spine. After delivery baby was examined carefully for still or live birth, cry, respiration, heart sound, sex, weight and maturity. The weight of the baby was measured on standard weighing machine and the same machine was used for entire study. The birth of SGA infant (less than the tenth birth weight percentile for gestational age) was taken as an indicator of IUGR.

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RESULTS:

Age (Years)	Frequency	Percentages
20-24	103	69.1%
25-29	39	26.2%
30-34	7	4.7%
Booking Status		
Booked	73	49.0%
Unbooked	76	51.0%
Locality		
Rural	81	54.4%
Urban	68	45.6%
Socioeconomic Status		
Low	99	66.4%
Middle	50	33.6%
Gravida		
1	81	55.1%
2	55	37.4%
3	10	6.8%
4	0	0%
5	0	0%
6	3	2%
Para		
3	4	6.2%
1	55	84.6%
2	6	9.2%
Gestational Age		
<28	7	4.7%
28-32	10	6.7%
32-36	94	63.1%
>36	38	25.5%
Educational Status		
Graduate	1	0.7%
High School	32	21.5%
Higher Secondary	8	5.4%
Illiterate	6	4.0%
Middle	59	32.2%
Primary	54	36.2%
Placental Grading		
2	66	44.3%
3	83	55.7%
AFI		
<5	25	16.8%
Adequate	122	81.9%
>30	2	1.3%
Fetal Maturity		
Full Term	140	94%
Pre Term	09	6%

Table 1

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High Risk	Placental Grading		Percentage
	II	III	
Anemia	2(3.0%)	4(4.8%)	6(4.0%)
APH	1(1.5%)	0(0%)	1(0.7%)
BOH	1(1.5%)	1(1.2%)	2(1.3%)
Breech	1(1.5%)	5(6.0%)	6(4.0%)
CPD	0(0%)	2(2.4%)	2(1.3%)
FD	0(0%)	1(1.2%)	1(0.7%)
Heart Disease	0(0%)	1(1.2%)	1(0.7%)
HIV+	0(0%)	1(1.2%)	1(0.7%)
Hypothyroidism	2(3.0%)	0(0%)	2(1.3%)
Normal	36(54.5%)	43(51.8%)	49(53.0%)
Oligo	3(4.5%)	2(2.4%)	5(3.4%)
PE	5(7.6%)	8(9.6%)	13(8.7%)
Poly Hydramnios	2(3.0%)	0(0%)	2(1.3%)
Post Datism	1(1.5%)	2(2.4%)	3(2.0%)
Previous Section	3(4.5%)	4(4.8%)	7(4.7%)
PROM	5(7.6%)	7(8.4%)	12(8.1%)
RH in compatibility	1(1.5%)	0(0%)	1(.7%)
Twin	3(4.5%)	2(2.4%)	5(3.4%)
Total	**66(100%)**	**83(100%)**	**149(100%)**

Table 2

High Risk	Placenta Grading							
	2				3			
	Gestational Age				Gestational			
	<37		>37					
	No. of Cases	(%)	No. of Cases	(%)	No. of Cases	(%)	No. of Cases	(%)
Anemia	2	100	0	0	0	0	4	100
APH	1	100	0	0	0	0	0	0
BOH	1	100	0	0	0	0	1	100
Breech	0	0	1	100	1	20	4	80
CPD	0	0	0	0	0	0	2	80
FD	0	0	0	0	0	0	1	100
Heart disease	0	0	0	0	0	0	1	100
HIV+	0	0	0	0	0	0	1	100
Hypothyroids	2	100	0	0	0	0	0	0
Normal	13	36.1	23	63.9	6	14	37	86
Oligo	2	66.7	1	33.3	1	50	1	50
PE	4	80	1	20.0	4	50	4	50
Poly Hydramnios	2	100	0	0	0	0	0	0
Post Datism	1	100	0	0	0	0	2	100
Previous Section	2	66.7	1	33.3	0	0	4	100
PROM	3	60	2	40	1	14.3	6	85.7
RH in Compatibility	0	0	1	100	0	0	0	0
Twin	3	100	0	0	1	50	1	50

Table 3

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DISCUSSION: In our study majority of the cases were 22-24 years of age group (69.1%). Mazumdar et al (2005)[1] in their study conducted at Kolkata had their maximum subjects in the age group 20-28 yrs. In our study we found 33.6% cases were middle socioeconomic status and 66.4% had low socioeconomic status.

In this study group we found 36.2% cases were primary standard education status and 32.2% cases were middle class education and 21.5% cases were High school and 5.4% cases had higher secondary education and 0.7% cases were Graduate and 4% cases were Illiterate group.

In this study group 75.8% cases were 36-38 weeks, 19.5% cases were 32-36 weeks, 4.7% cases were >38wks because our studied criteria in whose pregnancies >32 weeks with LMP was confirmed and USG was done within 1 week of delivery. In our study majority 63.1% of cases were 32-36 weeks, 25.5% cases had >36 weeks, 6.7% cases had 28-32 weeks, 4.7% cases had <28 weeks as per by USG gestational age.

In our study we found 16.9% cases of placenta grade-III, 54.5% cases of placenta grade-II in <37 gestational weeks, 45.5% cases of placenta grade-II and 83.1% cases of placenta grade-III in >37 week gestational age.

In our study we found 81.9% cases were adequate AFI, 16.8% cases were oligohydramnios and 1.3% cases had poly hydraminos.

In our study 75.8% cases are delivered by vaginally and 24.2% cases are delivered by cesarean section. In present study 65.1% belong to >2.5 kg fetal weight out of which 57.6% belong to placental grade-II, 71.1% cases belong to grade-III placenta.

In our study 34.9% cases belong to <2.5 kg fetal weight out of which 42.4% belong to placenta grade-II and 28.9% belong to placenta grade-III. This study correlate with the study of Veena Agrawal et al. (2000).[2]

According to the ultrasonic appearance of chorionic plate, the placental substance and the basal layer. Grannum et al (1979)[3] classified placental maturity into four grades 0-III. In grade 0, the chorionic plate appears as a smooth line with no indentation. The placental substance and the basal layer are homogenous, with no high level echoes.

APGAR at 1 min. >7 in our study 53% cases were placental grade-II, 56.6% were placental grade-III.

APGAR at 5min. >7 in our study 87.9% cases were grade-II placenta and 94% cases were grade- III placenta.

APGAR at 5 min. <7 in our study 12.1% cases had grade-II placenta and 6% cases were placenta grade-III.

This study correlate well with the study of N. Agrawal et al. (1986)[4] in which they observed 100% good neonatal outcome with grade- II and grade-III placenta.

Preterm labour in our study was found due to early induction of labour in these group in these patients were prone to develop complication like oligohydramnios. IUGR, eclampsia and abruption.

In Present study we found 4% cases of anemia out of which 3% cases were placenta grade-II. 4.8% cases had placenta grade-III

In our study we found that.7% cases of APH out of which 1.5% cases of Placenta Grade- II and no one case of Placenta Grade- III.

1.3% cases were CPD out of which 2.4% cases Placenta Grade-III, no case of Placenta Grade:II, 0.7% cases were found as Fetal distress out of which 1.2% Placenta Grade-III, no case of Placenta

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Grade-II, 0.7% cases of HIV out of which 1.2% cases were Placenta Grade-III and no case of Placenta Grade- II.

1.3% of hypothyroidism out of which 3% cases were Placenta Grade- no case of Placenta Grade-III.

0.7% cases of Heart Disease out of which 1.2% cases Placenta Grade-III no case of Placenta Grade-II.

8.7% cases of Pre-eclampsia out of which 7.6% were Placenta Grade-II and 9.6% cases were Placenta Grade-III, 1.3% cases polyhydramnios out of which 3% cases were Placenta Grade-II and no case of Placenta Grade-III, 2% cases of Postdatism out of which 1.5% cases were Placenta Grade-II, 2.4% cases had Placenta Grade-III.

4.7% cases of previous section out of which 4.5% were Placenta Grade-II and 4.8% had Placenta Grade-III.

8.1% cases of premature rupture of membrane (PROM) out of which 7.6% Placenta Grade-II and 8.4% were Placenta Grade-III.

0.7% cases of RH in compatibility cases out of which 1.5% cases Placenta Grade-II, no case of Placenta Grade-III.

3.4% cases were twin pregnancy out of which 4.5% cases were Placenta Grade-II and 2.4% cases had Placenta Grade-III.

In present study total number of cases of placental grade-II is 66 cases out of which 2 cases of anemia, 1 case of APH, one case BOH, one case breech, 2cases of hypothyroidism, 3 cases oligohydramnios, 5 cases pre-eclampsia, 2 cases poly hydramnios, 1 case post datism, 3 cases of previous section 5 cases of PROM, 1 case of Rh incompatibility, 3 cases of twins and 36 cases without any risk factor.

Total number of placental grade-III cases with high risk factor are 83 out of which 4 cases of anemia, 1 case of BOH, 5 case breech. 2 cases CPD, 1 case fetal distress, 1 case of heart disease, 1 case of HIV, 2 case of hydramnios, 8 cases preeclampsia, 2 cases of post datism, 4 cases of previous section, 1 cases of PROM, 2 cases of twins.

This is supported by study of Kazzi et al. (1982)[5] in which they observed 109 pregnancies, 44 had grade-III placenta which was developed <2.5kg of baby weight, therefore, placental maturity as detected sonographically appear to be accelerated in association with IUGR.

Therefore ultrasound evaluation of grading of placenta may give valuable information about fetal maturity and wellbeing.

Proud J. and Grant A.M. (1987)[6] in this study found placenta grade-III maturity by 34-36 weeks gestational is associated with poor perinatal outcome.

In our study we found that delayed maturation of placenta in case of Rh-incompatibility, and early maturation occurred in HT, Twin and APH.

SUMMARY: Age wise distribution of studied cases, from this table it was observed that the maximum number of cases (69.1%) were found in the age group 22-24 yrs. (26.2%) cases were found between 25-29 years, and 4.7% cases were found between 30-34 yrs. ANC registration to approximate equal distribution seen in this study. Booked cases were 49% and unbooked cases were 51%. 54.4% cases were from rural and 45.6% belong to urban locality majority of the cases belongs to Rural area in our study.

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Low socio-economic-status cases 66.4% middle socioeconomic status cases 33.6% and no case of upper socioeconomic status was found. According to all study group majority of the cases belongs to low socioeconomic status. Majority (55.1%) of the cases were gravid I. Next larger group is 37.4% were gravid-II, 2% cases were gravid-VI and there was no case of gravida-IV and V. 8436% cases of primipara, 932% cases of para 2 and 6.2% cases of para 3, in our study majority (84.6%)of the cases were primipara. Gestational age, 75.8% cases were 36-38 weeks, 19.5% cases were 32-36 weeks, 4.7% cases were >38 weeks, majority of the cases were 36 weeks and above. Gestational age B/U, 63.1% cases were 32-36 weeks, 25.5% cases were>36 weeks, 6.7% cases were 28-32 weeks, 4.7% cases were <28 weeks, majority of the cases were 32-36 weeks. 36.2% cases were primary education, 32.2% cases were middle education, 21.5% cases were high education, 5.4% cases of higher secondary, 0.7% cases of graduate, 4% cases of illiterate, majority (36.2%) of cases were Primary Education. 55.7% cases were placental grade-III and 44.3% cases were placental grade-II, in this study majority (55.7%)of cases of Placental Grading-III. Majority of the cases were adequate AFI 81.9%, 16.8% cases were <5 AFI, 1.3% cases of >30 AFI. Majority of the cases of full term (Mature) 94% and 6% cases of preterm. Placental grading with high risk factor with gestational age.

CONCLUSION: Placental grading has potential utility in the evaluation of fetal pulmonary maturity. It was found that placental grading advances with the gestational age both in normal and high risk cases.

Placental maturity accelerates due to compromised uteroplacental circulation over all higher grade of placenta are associated with higher birth weight but this does not hold good for cases of IUGR.

Presence of grade-III placenta definitely correlated with good pulmonary maturity as seen by good APGAR score in normal pregnancy. Detection of higher grade early in third trimester can alert the obstetrician for closer observation for risk factor to decrease uteroplacental circulation.

In present study it is observed that HT, APH, IUGR. cases showed acceleration in maturity of placenta i.e. grade II and III were predominant, however Rh-incompatibility cases showed delayed in maturation of placenta, this supports the previous study.

This study alone does not justify routine scanning in late pregnancy. Furthermore, larger randomized trials of placental grading are required, nevertheless there result do provide a basis for recommendation that placental grading should be one of the indices reported during ultrasound examination in third trimester.

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