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Original Research Article

Comparative Study of Placental Grading During ThirdTrimester in Hypertensive Disorders of Pregnancy and Normal Pregnancy

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Abstract

Background: Hypertensive disorders are one of the most commonly known complicationsof pregnancy which are associated with a significant risk of both maternal and foetal morbidity and mortality. Obstetric ultrasound provides a cornerstone for assessing hypertensive disorders of pregnancy. Pregnancy induced hypertension is defined as blood pressure more than 140/90 mm of Hg after 20 weeks of gestation and oedema or proteinuria or both. Eclampsia, hypertension, proteinuria, peripheral edema and neurologic dysfunction, identifies an extremely high risk obstetric population.

Methods: The study was done in the department of Radiodiagnosis at Nalanda medical college and Hospital Patna. Study duration of two years. The study group comprised of 80 cases which were further subdivided into 40 patients with pregnancy complicated with hypertension in the third trimester and B.P. more than 140/90 mm of Hg. The control group consists of 40 normotensive patients matched with age and parity.

Results: In present study, grade III was observed in 3 cases (11.1%) of control group in <37 weeks and 8 cases (88.9%) of control group in >37 weeks gestation. In cases of PIH ie. Study group, Grade III was found in 17 cases (54.8%) of <37 weeks and 12 cases (92.3%) cases of >37 weeks gestation.

Conclusion: Accelerated maturation of placenta are more common in the hypertensivegroup and in <37 weeks of gestation.

Keywords: Placental, Grading, Third Trimester, regnancy InducedHypertension.

Introduction

Hypertensive disorders are one of the most common known complications of pregnancy which are associated with a significant risk of both maternal and foetal morbidity and mortality. Maternal hypertension is present in only 6-8% of pregnancies and in terms of mortality rate it contributes to 22% of the perinatal deaths and 30% of maternal deaths. As stated in a study by Yadav et al [1], 1997 in known hypertensive's PIH aggravates the magnitude of the disease process and that pregnancy can induce hypertension in a previously normotensive women. Pregnancy induced hypertension is defined as blood pressure more than 140/90 mm of

Hg after 20 weeks of gestation and oedema or proteinuria or both. Eclampsia, hypertension, proteinuria, peripheral edema and neurologic dysfunction, identifies an extremely high risk obstetric population. [2] In the era prior to the development of imaging modalities like the ultrasound, only retrospective information regarding the morphology of the placenta was available and the blame of the adverse effects were on the neonatal period than to the prenatal period. With advances in medical technology and improvements in ultrasound scanning machines, prenatal evaluation of the placenta in details prior to delivery is possible by the radiologist and/or the obstetricians and even possible to evaluate the various differential diagnosis of placental anomalies. [3] Studies early in past decade have in depth analysed the ultrasound findings in the placenta which continually undergoes restructuring throughout the gestation, are currently being examined as potential markers of foetal development. [4] The first visibility of the placenta sonographically is as a focal thickening along the periphery of the gestation sac around the 6th week of gestation, which by the end of the first trimester changes its morphology into fine granular disk like structure, which occupies a part of the endometrial surface and continues to grow in thickness until the fifth month with the villi continuing to proliferate and undergoes development until term. [5] As term approaches, the placenta shows changes of degeneration of some villi and deposition of fibrin like material as a result of pooling and stasis of maternal blood in the intervillous spaces which on routine obstetric sonography appear as cystic areas beneath the chorionic plate. [6] The mucofibrinoid deposits of fibrin plaques are a part of normal maturation process and seem to occur in 20-25% uncomplicated pregnancies but are of no clinical significance. [5] It is also possible to evaluate calcium content in the placenta in utero. [7] Several studies have related placental grading to maternal complications like pregnancy induced hypertension and intrauterine growth retardation. They have observed early maturation of placenta in pregnancy induced hypertension. [8-10] It is well documented that with increase in the severity of preeclampsia, premolar separation of placenta with formation of retroplacental clot and disseminants of thrombolate agents released into maternal correlation takes place leading to serious complications including DIC. [11] The placenta (derived from the Latin word translating as flat Cake) provides oxygen, nourishment, and protection to the foetus. It also has excretory and endocrine functions. Healthy placenta is responsible for maintaining pregnancy and promoting normal foetal development. It reflects the intrauterine status of the foetus. [12] As discussed above, the antenatal evaluation of placental morphology is not only of great interest but offers the possibility of selecting high risk pregnancy with improved accuracy. Modern ultrasound system provides a simple, easily available, noninvasive method which is free of any side effects for visualization of the structure of placenta and its grading.

Objectives

To compare the findings of the placenta by ultrasonography in uncomplicated pregnancies and those complicated with hypertension.

Review of Literature

Grannum et al (1979), developed a classification based on a review of multiple ultrasound evaluations of placental texture over at 4 years period. The classification graded the placenta from Grade 0 – Grade III according to specific ultrasonic changes which occur in three separate zones i.e., chorionic plate, placental substance and basal layer. [14]

Carrol (1980), observed that the hypertensive disorders in pregnancy are common complications of gestation and they are responsible for the majority of maternal deaths. Hypertensive disorders are even more important cause of perinatal mortality and severe morbidity. Ultrasonic feature of preeclampsia is accelerated placental maturation, oligohydramnios, decreased placental volume and IUGR. Although placental infarctions and abruptions occur with increased incidence in preeclampsia, the ultrasonic pathologic correlations available in this series suggest that small abruptions and infarctions may be difficult to differentiate from the lobulations and textural in homogeneities seen into the placental aging process (either normal or abnormally accelerated). [2] Iwamoto et al (1980), evaluated placental Grade in seven cases of foetal distress in labour.Using the criteria of Grannum et al (1979) they found that all had the equivalent of a Grade III placenta. [14, 15] Theyobserved that in patients with chronic hypertension, preeclampsia the maturation of placenta was accelerated in some patients. According to them, premature maturation of the placenta i.e. a Grade III prior to thirty fifth week of gestation indicated the subsequent development of preeclampsia. [16] According to petrrucha and Platt (1982), in cases where a Grade III placenta occurred before 35 weeks, intrauterine growth retardation was found in the foetus. Also 95% of Grade III placenta appeared beyond 35 weeks gestation. They also found 100% correlation between grade III placenta on ultrasound and foetal pulmonary maturity. Grade II correlated with mature L/S ratios in 97% of cases. [13] Petrucha et al (1982), in his study performed 964 ultrasounds and graded the placenta as per Grannum classification. He found 1.8 percent to be grade 0, 35.7 percent grade I, 44 percent Grade II and 18.5 percent Grade III. Like Grannum et al, he also found as association with early appearance of Grade III placenta with hypertension. [4] Hill et al (1983), Hill et al studied 128 high risk and 60 healthy gravidas between 28 weeks and term, comparing placental grade, risk factor and gestational age. They found a strong positive correlation among accelerated placental maturation with hypertension and intrauterine growth retardation. However Grade III was frequently seen in normal pregnancy after 34 weeks of gestation. [19] Quinlan and Cruz et al (1982), started that out of 41 patients studied, 3 (7%) had placental abruption in grade III placenta. [17,18] Damania et al (1989), stated that pathological changes increased as the hypertension increased. As the hypertension increases the fetoplacental ratio decreases with increased toxemia. In their study, they got value to the extent of 5.71, in the severe hypertensive group as compared to mild to hypertensive group 5.97. [20] Vintzileos et al (1992), proposed adding placental grading as a component ofthe biophysical profile for the evaluation of fetal wellbeing. In their scoring system, a finding of Grade III placenta would have the lowest score. [21] Jauniaux and Campbell (1990), also reported that premature appearance of placental aging or maturation was related to intrauterine growth retardation or poor perinatal outcome. Their observation was similar to that of present study where premature appearance of placental ageing was also associated with IUGR. [3] Hadlock FP (1985), related placental grading to parity of the pregnant woman, the grading being more advanced among the primi who subsequently gave birth to a male offspring. Unlike Grannum study they found 14.8 percent cases to have grade I placenta 36.5 percent grade II and 48.7 percent grade II at term. [25]

Material and methods

Prospective comparative descriptive study on pregnant women in third

trimester. The study was done on 80 pregnant females who were in the third trimester of pregnancy and were referred to the department of Radiodiagnosis from department of Obstetrics and Gynecology, at Nalanda medical college and Hospital, Patna, Bihar. Study duration of two years. The study was initiated after obtaining ethical clearance from the institutions ethical clearance committee, unformed consent wastaken from the patients.

Inclusion criteria:

Patients in third trimester of pregnancy. Normotensive group Pregnant women in third trimester, B.P. < 140/90mm Hg, No other medical disorders Singleton pregnancy, Hypertensive group, Pregnant women in third trimester, B.P. >140/90mm HgNo other medical disorders, Singleton pregnancy

Exclusion criteria

Pregnant women with other medical disorders and multiple pregnancy were excluded from groups. Descriptive analysis was used to determine the mean, frequency and proportion of variables describing variations. 95% Confidence Interval for the proportions was presented. Results was presented as table and graphs together with brief descriptions. Confidence level was taken as 95% ($p < 0.05$) where applicable.

Printer, black ink, USG machine, Ultrasound examination was done on with curvilinear probe. The patient in supine on the examination couch and the abdomen exposed (extending from symphysis, pubis to xiphisternum). Then contact medium gel will be applied over the abdominal area for proper contact of the transducer and skin of patient.

Recording of Blood Pressure: The pregnant women in third trimester were subjected to monitoring of blood pressure first and then were categorized as hypertensive and normotensive ones.

Results

Table 1: Placental grading

Placental grading	Study group	Control	Total
Grade 1	3(7.5)	5(12.8)	8(10%)
Grade 2	12(30.0)	20(50.0)	32(40%)
Grade 3	25(62.5)	15(37.5)	40(50%)

The groups showed 7.5% and 12.8% in the study group and controls respectively with grade 1 placenta, 30% and 50% with grade2 and 62.5% and 37.5% with grade 3 as shown in table above. There was statistical significance between them as the p value was 0.032.

Table 2: Crosstabs for Interval growth with placental grading for Cases

Interval growth	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)
Good	3(100.0)	12(100.0)	21 (72.4)
IUGR	0(0.0)	0(0.0)	8(27.6)

Showed 100% a good interval growth and no IUGR with grade I and II placenta, whereas IUGR in 22% cases with grade III placenta. There was statistical significance between them as the p value was 0.04.

Table 3: Age distribution with placental grading for controls

Age	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)
<20	2(40.0)	2(10.0)	0(0.0)
21-25	2(40.0)	12(60.0)	10(57.1)
26-30	1(20.0)	6(30.0)	3(20.0)
>30	0(0.0)	0(0.0)	2(13.3)
Total	5	20	15

Amongst the controls and the study group which included 80 pregnant mothers, the age distribution was well matched and 70% in both groups were in the age group of 20- 25years. Mean age was 25 years amongst the controls and 24 years amongst the cases with no significance other than that they were well matched groups.

Table 4: Parity distribution in study and control group

Parity	Study group	Control
Primi gravida	26(65.0)	18(45.0)
Multigravida	14(35.0)	22(55.0)
Total	40	40

In the study group 65% cases were primigravida and 35% cases were multigravida while in the control group 45% cases were primigravida and 55% cases were multigravida. This is showing a significant statistical difference with a p value of 0.02. In the study group, in <37 weeks gestational age, Grade I were seen in only II cases (9.6%), Grade 2 in 11 cases (35.4%) and Grade III in 17 cases (54.8%). There is significant association between Gestational age and placental grade as p=0.04. In the control group, in <37 weeks gestational age, Grade I were seen in only 5 cases (18.5%), Grade II in 19 cases (70.3%) and Grade III in only 3 cases (11.1%).

Table 5: Gestational age and Placental Grade Crosstabulation for >37 weeksCount

Group			Placental Grade		Total
			Grade 2	Grade 3	
Control	Gestational age	38.00	1	2	3
		39.00	0	2	2
		40.00	0	4	4
	Total		1	8	9
Cases	Gestational age	38.00	1	5	6
		39.00	0	6	6
		40.00	0	1	1
	Total		1	12	13

In the control group, in >37 weeks gestational age, no cases were seen in Grade 1, Grade 2 in only 1 case (11.1%) and Grade 3 in 8 cases (88.9%). There is no significance association between Gestational age and placental grade as p=0.532. In the Study group, in >37 weeks gestational age, no cases were seen in Grade 1, Grade 2 in 1 case (7.7%) and Grade 3 in 12 cases (92.3%). There is no significance association between Gestational age and placental grade as p=0.325. It is observed that mean placental thickness gradually increases from approximately 28.4 mm at 28 weeks

to 39.0 mm at 40 weeks of gestational age. Placental thickness increases with the gestational age and the measurement of thickness corresponds to the gestational age. There is highly significant difference between gestational age and placental thickness as $p<0.001$ at 1% level of significance.

Discussion

Amongst the controls and the study group which included 80 pregnant mothers, the age distribution was well matched and 70% in both groups were in the age group of 20-25years. The range in study group (PIH) was 19-33 and in control group 19-35. Mean age was 25 years amongst the controls and 24 years amongst the cases with no significance other than that they were well matched groups.

Interval Growth with Placental Grading

In study done by Dutta A et al (2017), 3 (7.14%) cases had IUGR in the study group which had placental Grade III changes as compared to the control group where 1 (2.38%) case had IUGR. [8] In present study, 8 (27.6%) cases had IUGR in the study group which had placental grade III changes as compared to the control group where only 1 (6.7%) case had IUGR which also was grade III placenta. According to petrrucha and Platt (1982), in cases where Grade III placenta occurred before 35 weeks, intrauterine growth retardation was found in the foetus. The results are comparable to the present study where association between IUGR and early placental maturation was observed.[13] Present study is comparable with the findings of the Petrrucha and Platt; wherein there were total 9 cases of IUGR, 8 cases in study and 1 case in control group had grade III placental maturity occurring before 35 weeks. COMPARISION OF THE MODE OF DELIVERY Study done by K. M. Sunanda (2014) showed that Spontaneous delivery was 87% in controls versus 59% in the study group. Induced delivery was 8% amongst controls and 21% in study group. Caesarean was 30% in study group and 5% in controls. [23] Nalini Mishra (2006), in their study observed that spontaneous delivery was more in control group (87%), compared to study group. Need for induction was seen in 8% of controls compared to 21% amongst study group. LSCS was 5 times more in the study group (25%). The LSCS rate showed a significant statistical difference with a p value< 0.005. [22] Raghavendra A Y et al (2014), observed that out of the 50 normotensive subjects, 48% constituted primigravida and 52% constituted multigravida. Among PIH cases 58.6% were primigravida and only 41.48%were multigravida. [24] In study group, measurements of placental thickness at each week of gestational age from 28 to 40 weeks were taken, where it was observed that the mean placental thickness was unevenly distributed with gestational age. In few cases of grade III, placental thickness was less corresponding to the gestational age and these cases showed IUGR. There is highly significant difference between gestational age and placental thickness as $p<0.001$ at 1% level of significance. In control group, measurements of placental thickness at each week of gestation from 28 to 40 weeks were taken, where it was observed that mean placental thickness gradually increases from approximately 28.4 mm at 28 weeks to 39.0 mm at 40 weeks of gestational age. Placental thickness increases as the gestational age increases and the measurement of thickness corresponds to the gestational age. There is highly significant difference between gestational age and placental thickness as $p<0.001$ at 1% level of significance. (Student‟s t-test)

Conclusion

Grade III placental changes in the study

group (PIH) and the concept of post maturity is certainly not post mature but accelerated maturation and degenerative changes of the placenta, Accelerated maturation of placenta is more common in the hypertensive group (PIH), High incidence of IUGR is seen with grade III placental mturation in <37 weeks of gestation, There was no statistical significance with placental grade III maturity beyond 37 weeks of gestation as the distribution was similar in both study (PIH) and control groups.

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