

A study to assess placental location by ultrasonography and evaluation of its relationship with development of preeclampsia & eclampsia

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Abstract

Objective: To compare the incidence of hypertensive disorders in pregnancy in case of central placenta and laterally situated placenta..

Material & method: It was a prospective observational study which was conducted between June 2016 and June 2017 at Burdwan Medical College, West Bengal. Participants were uncomplicated pregnant women at 18-24 weeks of gestation attending antenatal clinics and admitted in ward who underwent obstetric sonography including placental localization. Women were observed till delivery. Analysis was done for site of implantation of placenta and its correlation with preeclampsia.

Results: Total of 300 women considered for the study, 195/300 (65%) had central implantation of placenta and 105/300(35%) had lateral type of placentation. 42 patients developed preeclampsia of which 25/105(23.81%) had lateral placenta and 17/195(8.72%) had central placenta (p value 0.000). 22 women developed eclampsia of which 14/105(13.33) had lateral and 8/195(4.1) had central placentation (p value 0.003). Isolated PIH was not found in this study. This suggests high possibilities of development of preeclampsia in laterally situated placenta in comparison to central implantation.

Conclusion: Laterally located placenta is associated with increased risk of development of preeclampsia. Prediction of preeclampsia by second trimester USG guided placental localization is simple, cheap, non-invasive, safe and effective screening method for preeclampsia.

Keywords: Placental location, Preeclampsia, Eclampsia, Ultrasonography.

1. Introduction

Preeclampsia is a pregnancy specific multisystem disorder of unknown aetiology and is a principal cause of maternal & perinatal mortality and morbidity. The exact aetiology is unknown but failure of trophoblast invasion into spiral arterioles and vascular endothelial damage appear to be important causative factors. When the placenta is laterally located (defined as 75% or more of placental mass located on one side of midline), the uterine artery distal to the placenta has higher resistance than the one opposite to it because of less trophoblastic invasion making

women prone to develop preeclampsia. In women with centrally located placentas, both uterine arteries demonstrate similar resistance. There is continuous search for effective means of predicting and preventing preeclampsia which has a good sensitivity, specificity and predictive value. The present study of placental localization by ultrasound at 18-24weeks. as a predictor of hypertensive disorders was done to find out incidence of laterally situated placenta in a selected cohort, its association with hypertensive disorders in pregnancy so that early

identification and timely management of cases can be done wherever possible.

2. Materials and Method

It was a prospective observational study conducted at Burdwan Medical College & Hospital for a period extending from June 2016 to June 2017 after receiving ethical clearance from the Clinical Research Ethics Committee. Total 300 pregnant women at their 18-24 weeks of gestations including those attending antenatal clinic and ward admissions, without any high-risk factors (like chronic hypertension or essential hypertension, diabetes mellitus, thyrotoxicosis, renal disease, severe anaemia, connective tissue disorder, positive lupus anticoagulant and anticardiolipin antibodies, twin pregnancy) were included in the study after taking informed consent from them. The location of placenta was determined by sonography and classified as central or lateral. They were followed up subsequently for the rest of their pregnancies for development of preeclampsia-eclampsia.

2.1 Objective:

To find out whether placental laterality which determined by ultrasonography can be used as a predictor of preeclampsia.

3. Results & Analysis

Statistical analysis was done by percentage, chi-square test, p value, mean etc. p value <0.05 was considered statistically significant.

Out of 195 women with central placenta 132 (67.7%) women belonged to the 18-25 years age group and out of 105 women with lateral placenta 86 (81.9%) women were of 18-25 years of age (p value 0.007) suggesting that lateral placentation was more common in early age group pregnancies. This is depicted in Table 1.

Out of 300 women included in the study 195 had central and 105 had lateral placenta. 42 (14%) women developed preeclampsia. Among them 25 had lateral placenta and 17 had central placenta (p value 0.000). This is depicted in Table 2.

22 (7.33%) women developed eclampsia of which 14 had lateral and 8 had central placenta (p value 0.003). This is elaborated in Table 3. This clearly suggests that lateral placenta is more commonly associated with preeclampsia-eclampsia than its counterpart.

Table 1: Relationship between placental location and maternal age

		Placental Location		Total	p Value	Significance
		Central	Lateral			
AGE	18-20	20(10.26)	23(21.9)	43(14.33)	0.007	Significant
	21-25	112(57.44)	63(60)	175(58.33)		
	26-30	62(31.79)	18(17.14)	80(26.67)		
	31-35	1(0.51)	1(0.95)	2(0.67)		
Total		195(100)	105(100)	300(100)		

Table 2: Relationship between placental location and Preeclampsia

		Placental Location		Total	p Value	Significance
		Central	Lateral			
Preeclampsia	No	178(91.28)	80(76.19)	258(86)	0.000	Significant
	Yes	17(8.72)	25(23.81)	42(14)		
Total		195(100)	105(100)	300(100)		

Table 3: Relationship between placental location and Eclampsia

		Placental Location		Total	p Value	Significance
		Central	Lateral			
Eclampsia	No	187(95.9)	91(86.67)	278(92.67)	0.003	Significant
	Yes	8(4.1)	14(13.33)	22(7.33)		
Total		195(100)	105(100)	300(100)		

4. Discussion

Preeclampsia is a disease of placenta. It is a progressive disease and ultimately resolves with delivery. It may have grave prognosis both for the mother and fetus. Therefore both maternal and perinatal morbidity and mortality can be reduced at large if we can identify those

pregnant women who are at higher risk of developing preeclampsia. Position of placenta as determined by USG at 18-24 weeks of gestation can be an important determinant for predicting preeclampsia. When the placenta is laterally located. The uterine artery close to the placenta has lower resistance than the one opposite from it. In patients with

centrally located placentas both uterine arteries demonstrate similar resistance. It is possible that when the placenta is centrally located, the uteroplacental blood flow needs are met by equal contribution from both uterine arteries. However, when the placenta is laterally located, in the majority of patients the uteroplacental blood flow needs are to be met primarily by one of the uterine arteries, with some contribution by the other uterine artery via collateral circulation. The degree of collateral contribution, however, may not be the same in all patients and deficient contribution may facilitate the development of preeclampsia, IUCR, or both.

The existence of major vascular anastomoses in some patients may explain the normal uterine artery flow velocity waveforms and the absence of preeclampsia and IUCR despite the presence of a unilateral placenta. The pathophysiologic characteristics of preeclampsia are complex and the cause remains unknown. One of the fundamental disturbances in patients with this condition is decreased uteroplacental blood flow. However, whether this is the cause or the result of preeclampsia is yet to be discovered. Our data indicate that the presence of a unilateral placenta is strongly associated with preeclampsia. Studies are currently being conducted to evaluate the impact of aspirin in the prevention of preeclampsia. Further studies are necessary to evaluate the sensitivity of placental laterality and abnormal uterine artery flow velocity waveforms as a predictor of the development of preeclampsia. If this proves to be the case, the use of aspirin in those patients who are at increased risk will help prevent or at least ameliorate some of the severe consequences of preeclampsia.

It is evident from the above study that lateral placentation is less common than central placenta. Out of 300 women 195 (65%) had central and 105 (35%) had lateral placenta. Many of the other authors like Pai M *et al*[1], Patel A *et al*[2], Liberti *et al*[8], Bhalerao *et al*[9], Magann *et al*[10] also suggested that central placenta is more common. However various other studies found lateral placenta to be more common like Kofinas *et al*[5], Kakkar *et al*[7], Liberti *et al* [8] and Elena contro *et al*[12]. These differences may be due to differences in criteria defining central and lateral placenta.

In this study it was found that preeclampsia is more common with lateral placenta than central ones. P value 0.000 which is statistically significant.

It is also evident from this study that eclampsia is also more common in pregnancies associated with lateral placentation. P value is 0.003 which is statistically significant. It was noted that lateral placentation was more commonly seen in pregnancies of younger age (18-25 years). P value is 0.007 which is statistically significant.

Kofinas *et al* [5] studied 153 pregnant women with normal pregnancies and 147 women with complicated pregnancies (diabetes, hypertensive disorders, and intrauterine growth retardation) in Winston-Salem, North Carolina to evaluate the association of placental location and the development of preeclampsia, intrauterine growth retardation, and uterine artery resistance. The placental location was determined by real-time ultrasonography, and the uterine artery resistance was determined by continuous-wave Doppler flow velocity waveform analysis.

In the presence of preeclampsia or intrauterine growth retardation, up to 75% of the patients had unilaterally located placentas and 25% central placentas, whereas in the absence of these two conditions only 51% of the patients had unilateral and 49% central placentas ($p < 0.02$). In patients with unilateral placentas, the incidence of preeclampsia and intrauterine growth retardation was 2.8-fold and 2.7-fold greater than in patients with central placentas ($p < 0.03$ and $p < 0.01$). Among all patients unilateral placental location was more likely to be associated with abnormal uterine artery flow velocity waveforms than central placental location ($p < 0.001$). They concluded that unilateral placental location may predispose to the development of preeclampsia and intrauterine growth retardation by its effect on uterine artery resistance.

A study was carried out in the Department of Obstetrics and Gynaecology, SMGS hospital, Govt. Medical College, Jammu from 2006 to 2007 by Kakkar *et al* [7]. Out of the total 150 women, 84 (56 %) had laterally located placenta and of them, 56 (66.6 %) developed preeclampsia, while the remaining 66 (44 %) had centrally located placenta and of them, 24 (36.3 %) developed preeclampsia. So, the overall risk of developing preeclampsia with laterally located placenta was 5.09 (odds ratio) and 95 % confidence interval (2.40–10.88). The difference was found to be statistically significant, p value (0.00002) by χ^2 test.

Five thousand seven hundred and thirty (5730) antenatal patients from Jan 2012 to Dec 2012 at Chigateri General Hospital, Davanagere, were studied for placental lateral location and development of pre-eclampsia by Shivamurthy *et al*[14]. Placental location was studied from 20-24 weeks of gestation by ultrasound and the patients were closely followed up.

Patients who developed PE, were analysed for the association with placental lateralisation. The end point of the study was development of preeclampsia as per ACOG criteria. Those who developed PE were further analysed. Through ultrasonography placental location was determined. Results: Out of 5730 antenatal out patients, 485 patients developed preeclampsia at different gestational ages. Of these 485 preeclampsia patients, 286 pts (59%)

had unilateral location of placenta and 199 (41%) patients had central location of placenta.

One study was carried out in the Department of Obstetrics and Gynaecology, GMC, Jagdalpur from Jan 2012 to 2015 by Nandanwar *et al*[15]. 900 pregnant women were selected from antenatal clinic with gestational age of 18 to 24 weeks without any complication. Ultrasonic examination was done to find out site of placenta. Development of sign and symptoms of PIH were followed. Among 900 women, 365 develop Pregnancy induced hypertension (PIH) out of 549 with laterally located placenta and 128 women develop PIH out of 351 with centrally located placenta. So, the risk for development of PIH with laterally located placenta was 3.45 (odds ratio) and 95% confidence interval (2.62-4.57). The difference was statistically significant, p value ($p < 0.0001$) by chi-square test.

So, the result of our study regarding relationship between placental location on sonography and development of preeclampsia is similar to the findings of the aforementioned studies.

5. Conclusion

From our study, it is concluded that laterally located placenta on ultrasound done at 18–24 weeks is associated with increased risk of development of preeclampsia. Females with laterally located placenta have a greater risk of developing hypertensive disorders, so these pregnancies may require careful obstetric management to achieve a more favourable outcome and decrease the maternal and perinatal morbidity and mortality associated with preeclampsia.

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