

Lateral Placentation by Ultrasonography: A Simple Predictor of Preeclampsia

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ABSTRACT

Introduction: Preeclampsia is a disease of trophoblastic tissue. It is a complex clinical syndrome involving multiple organ systems and still remains the principle cause of maternal and perinatal morbidity and mortality. The search for an ideal predictive test is still on, and preventive measures for preeclampsia remain a challenging entity.

Aims and objectives:

1. To examine the relation between placental location and development of preeclampsia.
2. To study the pregnancy outcome in terms of mode of delivery and birth weight of all babies.

Research question: Does lateral placentation on ultrasonography at 20 to 24 weeks of gestation predict development of preeclampsia?

A detailed demographic history, gravidity, parity, history of abruptio placenta, hypertension, preeclampsia, IUD, gestational diabetes were taken. General examination, including weight, blood pressure, vital signs was done. Detailed obstetric examination was done.

Ultrasonography was done for all women between 20 and 24 weeks of gestation, and placenta was classified as central when it was between the RT and LT side of uterus irrespective of being anterior, posterior or fundal. When 75% or more of placenta was on one side of midline, it was classified as lateral.

All women with central and lateral placenta were followed up till development of preeclampsia as per ACOG guidelines and later till delivery to see the outcome of pregnancy.

Observations: While recruiting, there was no bias on low-risk and high-risk groups but, at the end of the study, we found 182 women with high-risk factors and 281 women with low-risk factors.

A total of 71 pregnant women developed preeclampsia, of whom 52/71 (73.23%) had laterally situated placenta. This relationship seems to be significant. There was no relation of placental position and mode of delivery. The cesarean rate was 26.78% and normal deliveries being 73.21%. Of the cesareans, 76 (16.41%) were having centrally located placenta and 48 (10.36%) had laterally located placenta.

In our study, the sensitivity was 75, specificity was 81, the positive predictive value was 48 and the negative predictive value was 96.

Conclusion: As yet, there is no practical, acceptable and reliable method for screening for preeclampsia that has been thoroughly tested and tried.

In view of the results of our study, ultrasonography in pregnant woman during 20 to 24 weeks of gestation can be a easy, noninvasive, useful and cost-effective tool as a predictor of preeclampsia.

Keywords: Preeclampsia, Predictor, Placenta.

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INTRODUCTION

Preeclampsia is a disease of trophoblastic tissue.¹ It is a complex clinical syndrome involving multiple organ systems and still remains the principle cause of maternal and perinatal morbidity and mortality.

The search for an ideal predictive test is still on, and preventive measures for preeclampsia remain challenging.

Uterus receives most of the blood supply from uterine arteries—a branch of internal iliac artery. During pregnancy, the uterine site of placental implantation may be an important determinant of placental blood flow. Noninvasive Doppler studies of uterine arteries in second trimester reveal abnormal waveforms suggestive of defective uterine perfusion due to placental implantation, when one artery is the dominant supply of the intervillous flow.^{2,3}

Placental location can be documented by various means, like X-ray, isotopic placentography, etc. In the past two decades, ultrasound has proved to be the safest, easiest and most accurate method for assessing placental location. Placenta may be lateral in women with abnormal waveforms and this has been implicated in preeclampsia, IUGR, etc.^{4,5}

AIMS AND OBJECTIVES

1. To examine the relation between placental location and development of preeclampsia.
2. To study the pregnancy outcome in terms of mode of delivery and birth weight of all babies.

Research Question

Does lateral placentation on ultrasonography at 20 to 24 weeks of gestation predict development of preeclampsia?

MATERIALS AND METHODS

After taking College Ethical Committee approval and after consent and counseling, a total of 486 pregnant women attending antenatal clinic of a tertiary care hospital were recruited in the study over a period of 2 years as per inclusion/exclusion criteria.

Inclusion Criteria

Pregnant women with 20 to 24 weeks of gestation, with singleton pregnancy, attending antenatal clinic and ready for follow-up.

Exclusion Criteria

1. Pregnant women less than 20 to 24 weeks of gestation.
2. Pregnant women with chronic hypertension, multiple pregnancy, uterine anomalies, previous cesarean section.
3. Women not willing for follow-up.

A detailed demographic history, gravidity, parity, history of abruption placenta, hypertension, preeclampsia, IUD, gestational diabetes were taken. General examination, including weight, blood pressure, vital signs, was done. Detailed obstetric examination was done.

Ultrasonography was done for all women between 20 and 24 weeks of gestation and placenta was classified as central when it was between the RT and LT side of uterus irrespective of being anterior, posterior or fundal. When 75% or more of placenta was on one side of midline, it was classified as lateral.

All women with central and lateral placenta were followed up till development of preeclampsia as per ACOG guidelines and later till delivery to see the outcome of pregnancy.

Pregnancy outcome thus was assessed to see

1. Incidence of preeclampsia with lateral location of placenta.
2. Incidence of lateral location of placenta in preeclampsia.

Data analysis was done using SPSS software, statistical significance less than 0.05 was significant. Sensitivity, specificity, positive predictive value, negative predictive value were found.

OBSERVATIONS

Of the 486 women, 23 women dropped out.

The maternal characteristics, like age, gravidity, parity, were compared in the centrally and laterally located placenta groups as shown in Table 1.

While recruiting, there was no bias on low-risk and high-risk groups but, at the end of the study we found 182 women with high-risk factors and 281 women with low-risk factors as shown in Table 2.

A total of 71 pregnant women developed preeclampsia, of whom 52/71(73.23%) had laterally situated placenta. This relationship seems to be significant as shown in Table 3.

Table 1: The various characteristics

Characteristics	Centrally located placenta	Laterally located placenta	p-value
Age	24 ± 6.1 yrs	23 ± 6.3 yrs	0.12
Gravidity	2 ± 1.2 yrs	1.9 ± 1.3 yrs	0.44
Parity	0.6 ± 0.8 yrs	0.6 ± 0.7 yrs	1.0

Table 2: The characteristics of study population

Characteristics	Number
Primigravida	162
Previous history of preeclampsia, abruption	06
Previous history of IUGR, IUD	09
Diabetes	03
High-risk factors	182
Low-risk factors	281

Table 3: Placental position and development of preeclampsia

Placental position	Development of preeclampsia	
	Yes (n = 71)	No (n = 392)
Centrally located (n = 342)	19 (26.76%)	323 (82.39%)
Laterally located (n = 121)	52 (73.23%)	69 (17.60%)
	Chi-square—96.39	p-value—0.001

To see the effect of placental laterality in low risk and high risk groups the data was further analyzed and it was found that of the 281 women in low-risk group, 14 developed preeclampsia and in high-risk group 32 developed preeclampsia as shown in Tables 4 and 5.

As shown in Table 6, there was no relation of placental position and mode of delivery. The cesarean rate was 26.78% and normal deliveries being 73.21%. Of the cesareans, 76 (16.41%) were having centrally located placenta and 48 (10.36%) had laterally located placenta.

Tables 7 and 8 show no association between the placentation and birth weight in all women and women who developed preeclampsia.

DISCUSSION

Preeclampsia is a multiorgan system clinical syndrome responsible for maternal and perinatal morbidity and mortality.

Table 4: Placental position and development of preeclampsia in low-risk cases

Placental position (n = 281)	Development of preeclampsia	
	Yes (n = 23)	No (n = 258)
Centrally located	9 (39.13%)	234 (90.69%)
Laterally located	14 (60.86%)	24 (9.30%)
	Chi-square—48.02	p-value—0.001

Table 5: Placental position and development of preeclampsia in high-risk cases

Placental position (n = 182)	Development of preeclampsia	
	Yes (n = 48)	No (n = 134)
Centrally located	16 (33.33%)	126 (94.02%)
Laterally located	32 (66.66%)	8 (5.97%)
	Chi-square—75.93	p-value—0.001

Table 6: The mode of delivery in all women

Placental position (n = 463)	Mode of delivery	
	LSCS (n = 124)	ND (n = 339)
Centrally located	76 (16.41%)	266 (57.45%)
Laterally located	48 (10.36%)	73 (15.76%)

Table 7: Relation between placental position and the birth weight

Placental position (n = 463)	Birth weight	
	Less than 2.5 kg	More than 2.5 kg
Centrally located (342)	188 (54.97)	154 (45.02)
Laterally located (121)	68 (56.19)	53 (43.80)

Table 8: Relation between placental position and the birth weight in cases of preeclampsia

Placental position (n = 71)	Birth weight	
	Less than 2.5 kg	More than 2.5 kg
Centrally located (n = 19)	9 (47.36)	10 (52.63)
Laterally located (n = 52)	34 (65.38)	18 (34.61)

In our systematic review of literature, location of placenta as a potential predictor of preeclampsia dates back to first study by Kofinas et al.⁴ They have reported 2.7 times high risk of developing preeclampsia in laterally located placenta so it is the likelihood of abnormal uterine artery waveforms in lateral placentas.

When the placenta is central, there is low resistance in both uterines. When the placenta is lateral, the uterine artery close to placenta has lower resistance than the opposite side. The placental blood flow needs are met with one of the uterine arteries and some contribution from other side uterine artery via the collateral circulation. The degree of collaterals may be deficient facilitating development of preeclampsia, IUGR, etc. and for normal cytotrophoblastic invasion normal placentation is essential.

Lieberman et al⁶ found that placenta previa was associated with lower rate of preeclampsia due to wider and freer course of isthmic component of uterine artery.

In present study, out of 463 women, 71(15.33%) developed preeclampsia, of these 52 (73.23%) had unilaterally located placenta and 19 (26.76%) had centrally located placenta. This coincides with the study by Pai M et al¹⁴ 52/426 (73%) and Kofinas et al^{4,5} 20/34 (74%).

Present study shows that women with lateral placenta have a 2.7 times more risk of developing preeclampsia which is same by Pai M et al,¹⁴ and Kofinas et al⁴ (2.8 times).

In our study, the sensitivity was 75, specificity was 81, the positive predictive value was 48 and the negative predictive value was 96. These can be compared with other tests mentioned by Chan et al.¹⁵

There was no association between placentation and mode of delivery. Birth weight was also not associated with placental location, this coincides with all the studies shown in the table below. As yet, there is no practical, acceptable and reliable method (Table 9) for screening for preeclampsia that has been thoroughly tested and tried.

In view of the results of our study, ultrasonography in pregnant woman during 20 to 24 weeks of gestation can be a

Study	Sample size	Ultrasound timing (weeks)	IUGR/SGA	Preeclampsia
Kofinas et al, 1989 ⁴	311 total 153 normal	24-40	IUGR 2.7 × more likely in cases with lateral placenta	PIH 2.8 × more likely in cases with lateral placenta
Lieberman et al, 1991 ⁶	106 866 491 placenta previa 106 375 not	Not defined	NA	Decrease incidence of preeclampsia in women with placenta previa Excluded pregnancies with preeclampsia
Wolf et al, 1991 ⁷	342 total 171 placenta previa 171 not	Not defined	No significant association	Excluded pregnancies with preeclampsia
Liberati et al, 1997 ⁸	732 total 481 lateral 251 central	22-24	No significant association between IUGR and lateral placenta	No significant association between PIH and lateral placenta
Ito et al, 1998 ⁹	106 total 86 normal 20 IUGR	33-38	Higher UARI on placental side in cases with lateral placenta than in central placenta in IUGR infants	No significant association
Kalaniti et al, 2007 ¹⁰	272 total 67 IUGR 205 normal	16-20	IUGR babies 3.8 × more likely to have lateral placenta	NA
Present study	463 total, 342 central 121 lateral	20-24	No significant association	2.7 times increased risk of preeclampsia in lateral placenta
Magann et al, 2007 ¹¹	3336 total, 2914 fundal, 328 lateral 93 low	14-40	No significant association	No significant association
Belogolovkin et al, ¹² 2007	292 twins	20	No significant association	No significant association
Devrajan K et al, 2012 ¹³	799 total, 133 lateral 663 fundal	6-24	No significant association	No significant association
Pai M et al, 2005 ¹⁴	426 total, 324 central 102 lateral	20-24	—	2.7 times increased risk of preeclampsia in lateral placenta

Table 9: Screening tests for preeclampsia

Screening test	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Mid-trimester BP	44	87	9	98
Urinary alb/creat. ratio	64	84	43	94
Platelet angiotensin 2 binding	81	96	81	96
Abnormal RI on Doppler	47	81	44	83
Placental laterality	73	86	51	94

easy, noninvasive, useful and cost-effective tool as a predictor of preeclampsia.

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