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Original Research Article

Study of placental location and pregnancy outcome

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ABSTRACT

Background: Placental location can be estimated easily using ultrasonogram by 16 weeks. It can be classified based on its location into central and lateral. Central can be anterior or posterior. Lateral can be left lateral or right lateral. Placental location has been attributed to both normal and abnormal pregnancy and neonatal outcomes.
Methods: This is a prospective cohort study conducted in the department of Obstetrics and Gynecology which comprised of 450 singleton gestations between 18 and 24 weeks. The primary objective is to determine the association between placental location and pregnancy outcome and secondary objective is to find out the association between placental location and neonatal outcome. The study population was divided into two groups – central and lateral. Results were analyzed using SPSS version 20, Chi square test and independent two sample t-test.
Results: The frequency of central placenta was 377 (83.8%) and lateral placenta in 73 (16.2%). Central placentation had an abnormal outcome in 182(48.3%), lateral placentas with abnormal outcome were 44(60.3%). Abnormal maternal outcomes like hypertensive disorders (33.3%), Intra Uterine Growth Restriction (10.2%), Antepartum haemorrhage (25%), Preterm birth (16.3%) were more in lateral placentation. The number of central placentas having NICU admissions were 62(16.4%) and lateral placenta with NICU admissions were 19(26%).
Conclusions: There is a significant association between lateral placentation and abnormal pregnancy and neonatal outcomes. Second trimester ultrasound can be used as non-invasive predictor of adverse pregnancy and neonatal outcomes.

Keywords: Abnormal outcome, Lateral placenta, Neonatal outcome, Placental location, Pregnancy outcome

INTRODUCTION

Placenta is an organ for maternal and neonatal wellbeing. Placental location has been attributed to the progress of labour, preterm birth, IUGR, preeclampsia, low APGAR score and IUD or stillbirth. The size and site of placental implantation determines its blood supply and thereby the pregnancy outcome.[1]

Failure of trophoblastic invasion into spiral arteries causes faulty remodelling of utero placental arteries, inadequate perfusion and release of cytokines, immuno modulators and leukotriene's into maternal circulation resulting in endothelial dysfunction and thereby producing preeclampsia and IUGR. Non- invasive abnormal doppler waveforms of uterine arteries in second trimester would suggest defective uterine perfusion due to placental implantation when one uterine artery is the dominant supply of the inter villous flow.[2]

The placental location and uterine artery resistance bears a relationship. Centrally located placenta receives equitable distribution of blood flow from both the uterine arteries whereas in laterally located placenta, the uterine

artery closer to the side of placenta has a low resistance and a good blood flow, which causes disparity in blood distribution. The other uterine artery supplying the placenta located laterally receives less contribution from the collateral circulation and facilitates development of preeclampsia and IUGR.[3]

Posterior placental location has been attributed to preterm labour, IUD and stillbirth. Posterior wall of uterus is thicker and longer than the anterior wall and thereby its blood supply also differ between the walls. There is an attributable relationship between posterior placental location and foetal distress, increased caesarean rates, incidence of meconium stained liquor and increase in foetal heart rate decelerations.[4] Central placenta are more frequent and have a higher risk of adherent placentas, premature rupture of membranes and preterm births.

The aim of this study is to determine the pregnancy outcome and neonatal outcome depending on second trimester placental location and to determine whether it can be considered as a screening tool to predict these complications.

METHODS

This is a prospective cohort study of 450 singleton gestations between 18 and 24 weeks presenting to the Department of Obstetrics and Gynaecology at Amrita Institute of Medical Sciences and Research Centre over a period of 2 years between October 2016 and September 2018. Approval from the Institutional Ethics committee was obtained. The primary objective is to determine the association between placental location and pregnancy outcome and secondary objective is to find out the association between placental location and neonatal outcome.

Maternal demographic information including hospital number, age, parity, LMP, EDC, period of gestation at the time of scan and placental location on second trimester scan were collected. Pregnancy complications and neonatal outcomes were obtained from our hospital records during their routine follow up as per indications and Labour room registers.

Inclusion criteria

- All pregnant women between gestational age of 18-24 weeks with singleton pregnancy and willing for follow up and delivery at the hospital.

Exclusion criteria

- Patients who refused to participate, women whose foetus had a structural or chromosomal abnormality.
- Multiple pregnancies, foetus in non-cephalic presentations.
- Patients planning to visit other hospitals for delivery and those having comorbid illness prior to pregnancy.

Informed written consent were taken and then patients were enrolled for the study. All sonographic examinations were performed during the routine anomaly scan (18-24 weeks). Pregnancies were dated by the LMP if they have excellent dates or with a first trimester scan using crown rump length measurement with an error of ±7 days, if the patient had irregular cycles or LMP is not known. Trans abdominal scan was performed in maternal supine position using 3.5 MHz convex probe AB2-7 RS held in longitudinal plane (Voluson e10 compact health care systems). No cost factor was involved in the study since it was a routine anomaly scan done in second trimester.

Based on the placental location in scan, the patients were categorised into 4 groups namely anterior, posterior, left lateral and right lateral. For the ease of understanding it was simplified into two categories namely central and lateral location. Central placental location means those which are uniformly distributed, and it includes anterior or posterior locations. When the greater portions of placenta are confined to one side it is termed as lateral location which may be on left lateral location or on the right lateral location.

The following pregnancy and neonatal outcomes were studied Gestational hypertension / Preeclampsia, IUGR, Ante partum haemorrhage, IUD/ Stillbirth, Preterm delivery, Low birth weight and Low APGAR score babies. The neonatal outcomes were ascertained using birth weight measured in a standard scale, 5-minute APGAR score determined after delivery and the requirement for NICU admissions. The data were collected from NICU registers and medical records of the neonate.

In present study we included patients with central and lateral placentation. They were sub grouped as anterior and posterior location under central location and right lateral and left lateral location under lateral location. Based on the results of previous study, the proportion of abnormal outcomes in group 1 (central) – 38.37% and proportion in group 2 (lateral) – 53.5%. With power of 80% and 95% confidence and with 2-sided test the required sample size in each arm is 170.

Assuming the percentage of cases with respect to central and lateral as equal, the minimum sample size in each group was computed as 170 in each. However, in reality, the number of cases in the lateral group is less than the anticipated sample size taking the proportion of lateral to central as 1: 5. Based on this assumption, the sample size was taken as approximately 73:377 without reducing the total number of cases in the combined group as computed.

Statistical analysis

Statistical Analysis was done using IBM SPSS statistics 20 windows (SPSS Inc., Chicago, USA). For all the continuous variables the results were either given in mean±standard deviation and for categorical variables as percentage. To compare the mean difference of numerical variable between groups two sample t- test is applied. To test the statistical significance of the association of categorical variables with groups (Placental location and pregnancy outcome) chi square test was applied. Probability value (p value) less than 0.05 was considered for statistical significance.

RESULTS

The frequency of central placenta was 377 (83.8%) and lateral placenta was 73(16.2%) (Table 1).

Table 1: Frequency of placental location.

Placental location	Frequency	Percentage
Central	377	83.8
Lateral	73	16.2

Central placentation with abnormal outcome were 182(48.3%) and normal outcome were 195(51.7%). The number of lateral placentas with abnormal outcome were 44(60.3%) and with normal pregnancy outcome were 29 (39.7%). Lateral placenta had the major abnormal outcomes. The results were borderline significant with a p value of 0.06 (Table 2).

Table 2: Placental location and pregnancy outcomes.

Placental location	Pregnancy outcomes			P value
	Abnormal	Normal	Total	
Central	182 (48.3)	195 (51.7)	377	0.06
Lateral	44 (60.3)	29 (39.7)	73	

The number of anterior placenta with abnormal outcome was 95 (53.1%) and with normal outcome was 84 (46.9%). The number of posterior placentae with abnormal outcome was 87 (43.9%) and with normal outcome was 111 (56.1%). The number of right lateral placenta with abnormal outcome was 17(70.8%) and with normal outcome was 7(29.2%). The number of left lateral placenta with abnormal outcome was 27(55.1%) and with normal outcome was 22(44.9%).

Right lateral placenta had majority of abnormal outcomes. The results satisfied a significant p value of 0.04.Six cases of right lateral placenta were associated with 25% risk of ante partum haemorrhage, eight cases of right lateral placenta were associated with preeclampsia / gestational hypertension (33.3%),five cases of left lateral placenta were associated with IUGR and abnormal doppler (10.2%),eight cases of left lateral placenta were associated with 16.3% risk of preterm birth, thirteen cases of anterior placenta were associated with 7.3% risk of IUD/still birth (Figure 1).

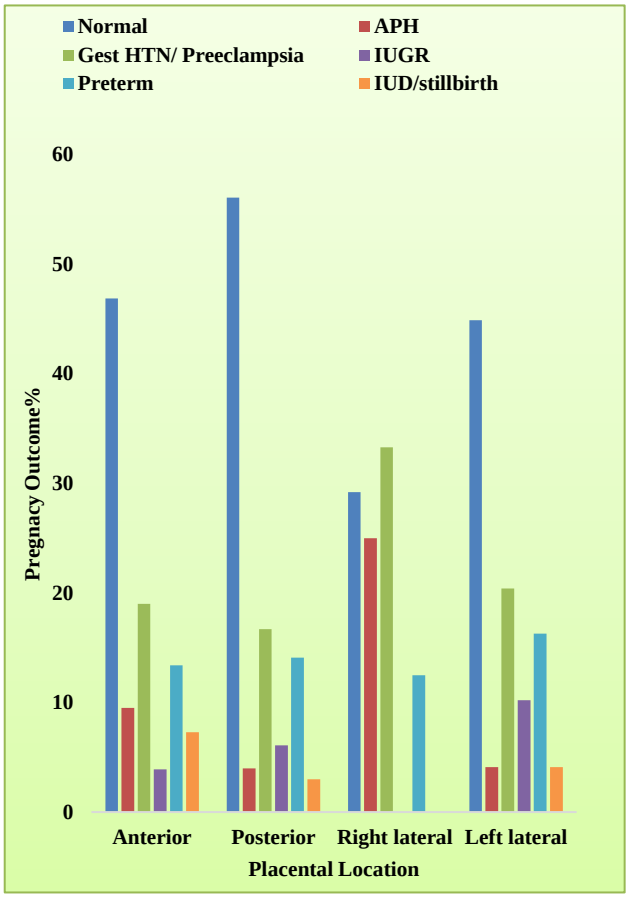

Figure 1: Different types of placental location and pregnancy outcomes.

The number of central placentas having NICU admissions were 62(16.4%) and without NICU admissions were 315(83.6%). The number of lateral placentae with NICU admissions were 19(26%) and without NICU admissions were 54(74%). Lateral placenta had major NICU admissions. Results were obtained with a just significant p value of 0.05 (Figure 2).

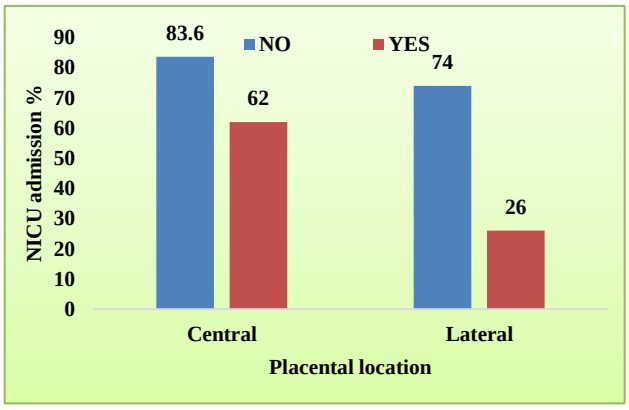

Figure 2: Placental location and NICU Admissions.

DISCUSSION

The percentage of central placenta was 83.8% and lateral placenta was 16.2%. Most common placental location was central. Similar observations were obtained in the study conducted by Singh et al where the percentage of central placenta was 61.82% and frequency of lateral placenta was 38.17%.[5] In the study of Jaiswal et al percentage of central placenta was 71.5% and percentage of lateral placenta was 28.5%.[6] Normal outcome seen in central placenta was 51.7% and normal outcome in lateral placenta was 39.7%, abnormal outcomes seen in central placenta was 48.3% and abnormal outcomes in lateral placenta constitutes 60.3%. Lateral placenta had major abnormal outcomes with a borderline significant p value of 0.06. This result was correlating with the study done by Singh et al5 which had 38.37% abnormal outcome with central placenta and 53.5% abnormal outcome with lateral placenta and the results were significant. Similarly, Jaisal et al also concluded that lateral placenta was associated with more abnormal outcomes compared to central with a significant p value of 0.020.[7] However, Devarajan et al concluded that placental location was not associated with any differences in perinatal outcome.[8] Six cases of right lateral placenta were associated with 25% risk of ante partum haemorrhage with a significant p value of 0.007. The above observation may be explained in terms of unequal distribution of blood supply in lateral placentation and increased risk of development of preeclampsia and subsequent abruption as its complication. Results were against the findings of Jang et al where anterior placentation was associated with 4.3% risk of placental abruption. Similar studies were made by Sekiguchi et al and Zia et al.[9,10,13] Eight cases of right lateral placenta were associated with preeclampsia/ gestational hypertension (33.3%) with a significant p value of 0.007. Singh et al showed lateral placentation had a risk of preeclampsia (62.9%) with a significant p value at 2.578 (odds ratio) with 95% CI (1.694-3.924).[5] Nandanwar et al conducted a prospective study on 900 patients and found that lateral placental locations had an outcome of pregnancy induced hypertension (66.4%) and a significant p value of < 0.0001.[11] Jaiswal et al conducted an observational study on 130 women and concluded that 51.3% patients with lateral placentatation developed pregnancy induced hypertension with a significant p value of <0.0001.[6] Similar studies conducted by Bhalerao et al in 2013 showed lateral placentation had 2.7 times increased risk of developing pre-eclampsia.[12] Study conducted by Pai et al14 showed 2.3 times, Fung et al showed 2 times and Kakkar et al, showed 2-fold risk of developing preeclampsia.[15,16] Contrary to present study, Shumaila Zia et al conducted a retrospective study on 474 patients and concluded that anterior placentation had 3.7 % risk of pregnancy induced hypertension with a significant p value of <0.001.[10,17] Similarly, Salvatore et al conducted a prospective cohort study on 1056 patients and concluded that posterior placental location were associated with gestational hypertension/ preeclampsia with an outcome of 5.5% and a significant p value of < 0.05. In contrast Magann et al, Devarajan et al showed no significant association between lateral placenta and preeclampsia.[3,8] In present study, five cases of left lateral placenta were associated with IUGR and abnormal dopplers (10.2%) with a significant p value of 0.007. Singh et al5 conducted a prospective study on 592 patients and concluded that lateral placental location was associated with 62.26% risk of IUGR and a significant p value of <0.0018 and 3.006 (OR) with 95% CI (1.678-5.385). These results were in accordance with the study conducted by Seadati et al which showed lateral placentation had 2.7 times risk of developing IUGR. In contrast Magann et al, Devarajan et al showed no significant association between placental location and IUGR with abnormal dopplers.[3,8,19] Eight cases of left lateral placenta were associated with 16.3% risk of preterm birth and a significant p value of 0.007. However, Singh et al concluded that posterior placental location was associated with 62.26% risk of IUGR with a significant p value of < 0.0001.[5] The results were similar to a retrospective study conducted by Jackson et al which showed lateral placenta was associated with preterm birth (a OR 2.06, 95% CI, 1.19- 3.58).[20] On the contrary, Shumaila Zia et al concluded that preterm labour were associated with posterior placenta with an outcome of 3.7% and a significant p value of <0.001.[10] Seadati et al conducted a descriptive analytical epidemiological study and concluded that preterm birth were seen in low placentation with an outcome of 7.2 % and a significant p value of 0.01.[19] Torricelli et al21 conducted a prospective study on 2354 patients and found that posterior placental location was associated with preterm labour with an outcome of 59.2% and a significant p value of <0.001. Similar observations were made by Fung et al.[15] Thirteen cases of anterior placenta were associated with 7.3% risk of IUD/still birth with a significant p value of 0.007. However, Singh et al concluded that posterior placental location had 50% risk of Still birth and a significant p value of < 0.0188.[5] Shumaila Zia et al conducted a retrospective study on 474 patients and found that anterior placental location was associated with IUD with an outcome of 1.5% and a significant p value of <0.001.[10] In contrast, studies conducted by Warland et al and Jaisal et al concluded that posterior placenta was associated with increased risk of still birth.[4,7] The number of central placentae having NICU admissions were 62 (16.4%) and the number of lateral placentae with NICU admissions were 19 (26%), the number of central placentae without NICU admission were 315 (83.6%) and lateral placenta without NICU admission were 54 (74%). Results satisfied a just significant p value of 0.05. Lateral placenta had major NICU admissions. Singh et al concluded that 16% of NICU admissions belong to the high-risk group of IUGR and Preeclampsia which is associated with lateral placentation.[5] These results are contrary to the findings of Devarajan et al which showed lateral placenta with NICU admission of 5.3% and central placenta with NICU admission of 6%.[8] Similarly, Zia et al, Jaisal et al and Jackson et al found no association with placental location and NICU admissions.[7,10,20]

CONCLUSION

Most common placental location is central location. Normal outcome is seen more in central placenta. Abnormal outcome is more associated with lateral placenta. Antepartum haemorrhage occurs more in right lateral placenta. Gestational hypertension/Preeclampsia occur more in right lateral placenta. IUGR occur more in left lateral placenta. Preterm delivery occurs more in left lateral placenta. IUD/Still birth occur more in anterior placenta. There is a significant association between NICU admissions and lateral placentation. Second trimester ultrasound can be used as one of the non - invasive predictor of adverse pregnancy and neonatal outcomes.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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