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Original Research Article

A prospective Study to Assess the Role of Third Trimester Ultrasound in Evaluating the Risk of Haemorrhage and Emergency Caesarean Section in Low- Lying Placenta and Determining the Mode of Delivery

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Abstract

Introduction: To follow up the patients with low-lying placenta in the third trimester and to do a detail placental study and determine its characteristics which may aid us to determine the occurrence of Antepartum Hemorrhage and mode of delivery they undergo – Vaginal Delivery or Caesarean Section and also to determine the consequences of low-lying placenta like Postpartum Hemorrhage, Peripartum Hysterectomy, Blood loss and the need for Blood Transfusion.

Methods: This is a prospective observational study which was carried out in the Department of Obstetrics and Gynaecology, Eden Hospital, MCH, Kolkata. A total of 56 patients were included in this study.

Results: Anterior placentation was seen in 32 (57.1%) patients and its strongly associated with previous Caesarean section. The mean distance between placental edge and internal os (Mean ± SD) is 1.44 ± 0.66. The mean placental edge thickness (Mean ± SD) is 1.96 ± 1.083. The incidence of APH in patients with edge thickness > 1 cm is 66.7% and 88.9% had a caesarean delivery in the same. In patients with marginal sinus – the incidence of APH is 70% and 93.3% had a Caesarean delivery. The estimated mean blood loss during delivery (Mean ± SD) is 645 ± 279.28. The incidence of PPH is 44.6% (25 patients), Peripartum hysterectomy is 7.1% (4 patients) and Still birth is 3.6% (2 patients).

Conclusion: Our study concluded that patients having a low-lying placenta with placental – os distance 1 – 10mm, thick edge and a marginal sinus have a risk of significant bleeding which can result in an increased rate of Caesarean Section. Anterior placentation is influenced by previous caesarean section and anterior low-lying placenta itself is an independent risk factor for increased blood loss, increased rates of blood transfusion, postpartum haemorrhage and prolonged hospitalisation.

Keywords: Low lying placenta, Antepartum Hemorrhage (APH), Transvaginal Sonography (TVS), Postpartum Hemorrhage (PPH)

Introduction

In Obstetrics placenta previa describes a placenta that is implanted in the lower uterine segment either over or very near the internal cervical os [1]. A recent multidisciplinary workshop of American Institute of Ultrasound in Medicine (AIUM) [2] has suggested that the term "Placenta Previa" to be used when the placenta lies directly over internal os. For pregnancies greater than 16 weeks of gestation with placental edge less than 20 mm from the internal os [3-5] the term "Low-Lying Placenta" to be used. The estimated incidence of low-lying Placenta at term is around 1.6% [6].

The incidence of placenta previa and low-lying placentas are increasing due to increasing rates of caesarean deliveries [5] and the risk increases more if it's a previous prelabour caesarean section, [7] increased maternal age and high parity and use of assisted reproductive technology (ART) [8]. There are contradictory reports regarding the incidence of placenta previa and low-lying placenta in multiple pregnancies. These conditions are of greater concern as they are associated with adverse maternal and fetal outcomes.

Antepartum Haemorrhage with different severity of shock is the most common and inevitable complication of placenta previa and low lying placenta. Antepartum haemorrhage is defined as bleeding from or in the genital tract occurring from 24^{+0} weeks of pregnancy prior to birth of the baby [9]. It is also associated with higher incidence of preterm births, low birth weight, small for gestational age and the chronic placental insufficiency can result in fetal growth restriction [10]. There are higher chances of Congenital malformations. Maternal mortality rates have been reduced throughout the world but the rates in developing countries ranges from 1% to 5% [12]. On the other hand, perinatal mortality ranges from 7% to 25% [11].

Determining Placental Location is one of the first aims of routine mid pregnancy (18^{+6} to 21^{+6} weeks of gestation) obstetric ultrasound examination [13]. TVS has a high accuracy (positive predictive value of 93.3% and negative predictive value of 97.6% and false negative rate of 2.33%) in women suspected of having a low-lying placenta on TAS in the second or early third trimester with a sensitivity of 87.5% and specificity of 98.8% [15]. TVS improves the accuracy of placental localisation particularly when the placenta is posterior or if TAS is unclear. Also an added advantage is the measurement of cervical length which may help facilitate decisions in asymptomatic women with low lying placenta [14]. Women with low lying placenta in the mid trimester ultrasound will be re-evaluated again at 32 weeks and if there is persistent low-lying placenta (edge less than 2 cm from the IO; majority will resolve) TVS is repeated again at 36 weeks [16] (as Migration is still possible even after 32 weeks of gestation about 50% resolve) [4].

If a low lying persists more than 36 weeks the chances of it resolving is very less and hence the mode of delivery is to be determined. Although the mode of delivery for placenta previa is established as Caesarean Section that in cases of Low Lying Placenta is debatable [17]. Studies have proved that Vaginal Delivery can be allowed in a case of low lying placenta but it depends on certain ultrasound features of the placenta [17,18]. Many observational and retrospective studies for making the recommendation for a specific mode of delivery based on the ultrasound finding were conducted.

Thus, we decided to conduct a study in low-lying placenta in order to determine the relation with antepartum haemorrhage and to define the mode of delivery in these patients. A detailed ultrasound of the placenta is done noting the placental

location, distance of placental edge from the internal os, presence of marginal sinus and placental edge thickness. The incidence of antepartum haemorrhage in each category is compared and the mode of delivery is noted. Also, we noted the outcome of these patients. Thus, the aim of the study is for better understanding of low-lying placenta and regarding their outcomes.

Materials and Methods

The study was carried out in the Department of Obstetrics and Gynaecology, Eden Hospital, MCH, Kolkata from May 2020 to October 2021 after obtaining approval from Institutional Ethics Committee. The study was conducted to determine the placental characteristics in detail and determine its association with the occurrence of antepartum haemorrhage and how it influences the mode of delivery. Also, the incidence of adverse outcomes like postpartum haemorrhage, peripartum hysterectomy were also studied. Written informed consent was taken from the patient. A total of 56 patients were included in this study.

Inclusion Criteria:

- Patient of any gravida with a low-lying placenta in the second trimester ultrasound.

Exclusion Criteria:

- Patients delivered before 32 weeks.
- Patients with Placenta Previa, Placenta Accrete Syndromes like Placenta Accreta, Placenta Increta, Placenta Percreta.
- Follow up scan at 32 weeks shows Placenta in the upper segment i.e., Placental resolution.
- Patients not willing for any third trimester ultrasound.

The patients who are having a low-lying placenta again in this repeat ultrasound at 32 weeks were subjected to a TVS at 36 weeks and in those with persistent low lying placenta a detailed ultrasound study such as – Placental Location, Distance of the Placental Edge from the Internal os of the cervix (1-20 mm), Presence or absence of a Marginal Sinus – a sonographic echo-free space in the lower edge of the placenta, [19-21] Placental Edge Thickness noted. In addition to these, the Gestational Age at the time of the scan is also noted. Patient followed up for any occurrence of APH and its relation to the placental characteristics noted. During admission, a detailed history, systemic examination and obstetric examination was carried out. Blood Investigations – Blood grouping and Rh typing, complete blood count, blood sugar, urea, creatinine, liver function test, PT, aPTT, INR, HIV, HBsAg, Anti HCV, urine analysis. All those patients who had previous Caesarean births were planned for an Elective Repeat Caesarean Section at around 38 weeks. Rest all patients were allowed for a trial of labour. During trial of labour, patients were monitored for any significant bleeding and fetal heart rate monitoring was also done – for any compromise in the mother or fetus Emergency Caesarean Section is done. Occurrence of PPH is noted and blood loss estimated by standard methods of blood loss estimation. Blood loss estimation gave us an idea regarding the need for blood transfusion for the patients. Apart from this, the number of units transfused for the patients were documented. The status of the neonate – live birth/ still birth was documented. Birth weight of the neonates were noted. The total duration of hospitalisation – from admission till discharge was calculated in days.

Analysis of Data

For statistical analysis data were entered into a Microsoft excel spreadsheet. Continuous data were expressed as Mean ± SD. Discrete categorical data were presented as number of patients (n) and percentage (%). All statistical analysis of the study is done using InStat. Chi-square test, Fischer's exact test and Mann–Whitney U test are used appropriately.

Results

The mean age (Mean ± SD) is 30 ± 4.476 and majority of patients – 37 (66.1%) were in the age group ≤ 30 year. 44 patients (78.6%) were Multigravida – 26 patients (59.1%) had previous Caesarean section and 15 patients (34.1%) had previous vaginal delivery. The mean gestational age at delivery (Mean ± SD) is 38 ± 1.259. TVS done at 36 weeks showed a mean gestational age (Mean ± SD) of 36 ± 0.271. The mean interval between last scan and delivery (Mean ± SD) is 12 ± 8.121. The mean values are summarised in Table 1. Anterior placentation was seen in 32 (57.1%) patients and its strongly associated with previous Caesarean section (p value = 0.001). There is no association between placentation and mode of delivery.

The mean distance between placental edge and internal os (Mean ± SD) is 1.44 ± 0.66. Based on the distance patients are divided into two groups – a) 1 – 10 mm and b) 11 – 20 mm. In the former group the incidence of APH is 100% while in the latter it is 28.6% (p value = 0.0001, RR = 3.500, 95% CI = 2.169 to 5.647). In group (a) – the incidence of Caesarean section is 100% while in group (b) – 40.5% had vaginal delivery (p value = 0.0053, RR = 0, 95% CI = infinity to infinity). The mean placental edge thickness (Mean ± SD) is 1.96 ± 1.083. Based on the edge thickness two groups have been devised – a) ≤ 1 cm and b) > 1 cm. In the former group the incidence of APH is 10% while in the latter it is 66.7% (p value = 0.0012, RR = 0.15, 95% CI = 0.039 to 0.570).

In group (a) – 65% had vaginal delivery whereas in group (b) – 88.9% had a caesarean delivery (p value = 0.0001, RR = 5.850, 95% CI = 2.199 to 15.564). In patients with marginal sinus – the incidence of APH is 70% (p value = 0.0002, RR = 3.640, 95% CI = 1.600 to 8.282). 93.3% patients with marginal sinus had a Caesarean delivery while in those without a marginal sinus 57.7% had a vaginal delivery (p value = 0.0001, RR = 0.1156 and 95% CI = 0.029 to 0.458). In the group with APH – 96.2% had a caesarean delivery (p value = 0.0001). These are summarised in Table 2 and 3.

The estimated mean blood loss during delivery (Mean ± SD) is 645 ± 279.28. Caesarean delivery has resulted in increased blood loss i.e., more than 500 ml in 82.1% patients (p value = 0.027, Chi square value = 7.156). Also majority of patient with anterior placentation – 78.1% had blood loss more than 500 ml (p value = 0.0001). The mean blood transfusion units (Mean ± SD) is 2.655 ± 1.565. The mean birth weight of the baby (Mean ± SD) is 2.682± 0.3231. The mean duration of hospitalisation (Mean ± SD) is 10.46 ± 4.60. The mean values are summarised in Table 1.

The incidence of PPH is 44.6% (25 patients), Peripartum hysterectomy is 7.1% (4 patients) and Still birth is 3.6% (2 patients). About 66.1% (37 patients) needed a prolonged hospital stay (>8 days).

Table 1

Parameter	Mean ± SD
Age (in years)	30 ± 4.476
Gestational age at delivery (in weeks)	38 ± 1.259
Gestational age at last scan (in weeks)	36 ± 0.271
Interval between last scan and delivery (in days)	12 ± 8.121
Distance between placental edge and internal os (in cm)	1.44 ± 0.66
Placental Edge thickness (in cm)	1.96 ± 1.083
Estimated Blood Loss (in ml)	645 ± 279.28
Transfusion Units (in unit)	2.655 ± 1.565
Birth Weight (in kg)	2.682 ± 0.3231
Duration of Hospital Stay (in days)	10.46 ± 4.60

Table 2

Parameter	APH		Mode of Delivery	
	Present	Absent	VD	CS
Distance between Placental Edge and Internal Os				
1 – 10 mm (14)	14 (100%)	0	0	14 (100%)
11 – 20 mm (42)	12 (28.6%)	30 (71.4%)	17 (40.5%)	25 (59.5%)
Placental Marginal Sinus				
Present (30)	21 (70%)	9 (30%)	2 (6.7%)	28 (93.3%)
Absent (26)	5 (19.2%)	21 (80.8%)	15 (57.7%)	11 (42.3%)
Placental Edge Thickness				
≤ 1 cm (20)	2 (10%)	18 (90%)	13 (65%)	7 (35%)
> 1 cm (36)	24 (66.7%)	12 (33.3%)	4 (11.1%)	32 (88.9%)

Table 3

APH	Mode of Delivery	
	VD	CS
Present (26)	1 (3.8%)	25 (96.2%)
Absent (30)	16 (53.3%)	14 (46.7%)

Discussion

In our study, the mean age is (Mean ± SD) of patients is 30 ± 4.476 years. 21.4% were Primigravida and 78.6% were Multigravida. Among the patients who are multigravida, 34.1% had a previous vaginal delivery, 59.1% had previous caesarean section and 6.8% had previous abortion. None of the 26 patients who had a previous caesarean section were allowed for a trial of labour – all were delivered by caesarean section. The mean gestational age at delivery (Mean ± SD) is 38 ± 1.259.

TVS done at 36 weeks showed a mean gestational age (Mean ± SD) of 36 ± 0.271. The mean interval between last scan and delivery (Mean ± SD) is 12 ± 8.121. The range varies between 0 and 38 days. The percentage of VD in our study is 30.4% and the percentage of Caesarean Section is 69.6%. Anterior placentation was seen in 32 (57.1%) patients 24 (42.9%) patients had posterior placentation. Wortman AC *et al* in his study had 18.4% with anterior placentation and 81.6% with posterior placentation [19]. Placentation was strongly associated with previous Caesarean section – among those 26 patients 69.2% had anterior placentation (p value = 0.001).

There is no association between placentation and mode of delivery. Among those 32 patients with anterior placentation – 75% undergone caesarean section and 25% had a successful vaginal delivery. 78.1% had an estimated blood loss of ≥ 500 ml. 56.3% had postpartum haemorrhage. Out of 24 patients with posterior placentation – 62.5% undergone caesarean section and 37.5% had a successful vaginal delivery. 62.5% had an estimated blood loss of ≥ 500 ml. 29.2% had postpartum haemorrhage. In our study, out of the 56 patients, 25% (14 patients) had a placental edge which is 1 – 10 mm from the internal os and 75% (42 patients) had a placental edge which is 11 – 20 mm from the internal os. The mean distance between placental edge and internal os (Mean ± SD) is 1.44 ± 0.66 cm.

In the group with Placental – Internal os distance 1 – 10 mm (which included 14 patients) – 100% had significant antepartum haemorrhage. On the other hand, the group in which the Placental – Internal os distance is 11 – 20 mm (which included 42 patients) – 28.6% had significant antepartum haemorrhage. The

association is statistically significant (p value = 0.0001).

Among those 14 patients in 1-10mm group, 100% had caesarean section. Out of those 42 patients in 11-20mm, 40.5% had a vaginal delivery and 59.5% had Caesarean section – statistically significant (p value = 0.0053). Wadi AK *et al* in 17 patients with Placental – Internal os distance between 11 and 20 mm, 14 patients undergone Trial of Labour and among them 13 patients delivered vaginally and 1 undergone an emergency caesarean section due to intrapartum bleeding. 3 patients undergone elective caesarean section.18 Hence our study, and those of others helps us to arrive in a conclusion that,

- if the Distance between the Placental Edge and the Internal Os is 1 – 10 mm, it is better to deliver the patient by Elective Caesarean Section as the risk of APH is high.
- If the Distance between the Placental Edge and the Internal Os is 11 – 20 mm, Trail of Labour can be allowed with intense monitoring and Caesarean Section reserved for those who develop an indication intrapartum.

In our study, out of 56 patients, 53.6% (30 patients) had Marginal Sinus – a sonographic echo-free space in the lower edge of the placenta. Among them, 70% had significant antepartum haemorrhage. The association is statistically significant (p value = 0.0002). In the group where there is a marginal sinus, 93.3% had caesarean section, 6.7% had vaginal delivery.

On the other hand, in the group without a marginal sinus – 57.7% had vaginal delivery. The association is statistically significant (p value = 0.0001). Satoshi Ohira *et al* conducted a study with 49 patients, 7 patients had Marginal Sinus and 42 did not have any sinus. 5 patients (71.4%) with marginal sinus undergone a Caesarean Section because of antepartum vaginal bleeding (may be due to rupture of the marginal sinus) and 38 patients (90.5%) without a marginal sinus had a successful Vaginal Delivery[21]. Hence our study and other supporting studies helped to arrive at a conclusion that,

- if there is presence of Marginal Sinus, it is better to deliver the patient by Elective Caesarean Section due to risk of APH.
- If there is absence of Marginal Sinus, a Trial of Labour can be allowed with intense monitoring and Caesarean Section reserved for those who develop an indication intrapartum.

In our study, out of 56 patients, 35.7% (20 patients) had a Thin Placental Edge (≤ 1 cm) and 64.3% (36 patients) had a Thick Placental Edge (> 1 cm) – based on the previous studies. The mean edge thickness (Mean ± SD) is 1.96 ± 1.08 cm. The range of Thin Placental Edge is 0.4 cm to 1 cm and the range of Thick Placental Edge is 1.3 cm to 4.2 cm. 66.7% with Thick Placental Edge had significant antepartum haemorrhage but only 10% had significant antepartum haemorrhage in the thin edge group. The association is statistically significant (p value = 0.0012). 88.9% among those with thick edge had caesarean section. Among those with Thin Placental Edge, 65% had vaginal delivery, 35% had caesarean section. The association is statistically significant (p value = 0.0001). Ghourab S *et al* evaluated the clinical significance of the shape of the lower placental edge in 71 women.

The women were divided into two groups – those with Thin Placental Edge (0.4 to 1 cm and Thick Placental Edge (1.1 to 3.2 cm. 15 out of 17 patients (88.2%) with thick edge had significant Antepartum Haemorrhage and 11 out of 17 (64.7%) undergone Emergency Caesarean Section before 36 weeks. 22 out of 54 patients (40.7%) with thin edge had significant Antepartum Haemorrhage and 19 out of 54 (35.2%) had a successful Vaginal Delivery [20]. Our study and others have helped us to arrive in a conclusion that,

- If there is a Thick Placental Edge (> 1 cm) – better to deliver them by Elective

Caesarean Section due to risk of Antepartum Haemorrhage.

- If there is a Thin Placental Edge (≤ 1 cm) – a Trial of Labour can be allowed but with intense monitoring and Caesarean Section reserved for those who develop an indication intrapartum.

In our study with 56 patients, we assessed APH and the Mode of Delivery. Out of those 26 patients (46.4%) who had a significant antepartum bleeding, 96.2% (22 patients) had caesarean section. Out of those 30 patients (53.6%) who did not have a significant antepartum bleeding, 53.3% (16 patients) had a successful vaginal delivery. The association is statistically significant (p value = 0.0001). The percentage of VD in our study is 30.4% and the percentage of Caesarean Section is 69.6%.

In our study, the mean blood loss (Mean ± SD) is 645 ± 279.3 ml. We also compared the Mode of Delivery and the Blood Loss at Delivery. In vaginal delivery group 47.1% had blood loss more than 500 ml. In, Caesarean Section group 82.1% had a blood loss more than 500 ml. The mean blood loss in Caesarean section (Mean ± SD) is 690.25 ± 249 ml. The association between the mode of delivery and blood loss is statistically significant (p value = 0.0279). Wortman AC *et al* concluded that 20% in the group with placental – os distance less than 10 mm and 44.8% in the group with placental – os distance 11 to 20 mm needed blood transfusion. 62.5% in group 1 and 26.9% in group2 needed more than 2 units [19].

We also assessed the incidence of PPH and Peripartum Hysterectomy. In our study among the 56 patients, 44.6% (25 patients) had PPH. 7.1% (4 patients) had undergone Peripartum Hysterectomy. Wortman AC *et al* reported 32.5% had postpartum haemorrhage in group with placental – os distance less than 10mm and 50% had postpartum haemorrhage in group with placental – os distance between 10 and 20 mm.19 Also, We also analysed the duration of hospitalisation of the patients. The duration of stay is divided into two groups as 1) up to 8 days (≤ 8 days) and 2) more than 8 days (> 8 days). The mean days of stay in the hospital is (Mean ± SD) is 10.5 ± 4.6 days. 66.1% needed hospitalization for more than 8 days and only 33.9% needed a shorter hospital stay (≤ 8 days). Hence our study invariably concludes that a low-lying placenta can result in an increased Blood Loss in the antepartum, intrapartum states, increased rates of Caesarean Section, increased incidence of PPH and Peripartum Hysterectomy, increased incidence of Blood Transfusion which can result in transfusion related complications in the mother and an increased duration of Hospitalisation thereby increasing the rate of Maternal Morbidity and Mortality.

Birth Weight of the 56 new born were analysed and the mean Birth Weight (Mean ± SD) is 2.68 ± 0.32 kg. The incidence of Still Birth was 3.6% (2 babies). But Ghourab S *et al* in his study had a mean birth weight of 2.72 ± 0.86 kg in the thin edge group and the thick edge group had a mean of 1.93 ± 0.47 kg [20]

To conclude, a detail study of the characteristics of a low-lying placenta after 36 weeks helps us to predict the patients who can have significant antepartum haemorrhage, plan the mode of delivery accordingly and thereby preventing the rates of adverse outcomes in the mother.

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