

## PLACENTAL MIGRATION AND ITS ROLE IN PREDICTION OF ROUTE OF DELIVERY

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### ABSTRACT

**Introduction:** The presence of a lowlying in the second trimester of pregnancy can be converted to an upper uterine segment placenta by the end of the third trimester. This phenomenon is important when a complete or marginal placenta previa is encountered in the second trimester of gestation because of the need to predict possible antepartum complications and mode of delivery. **Aim:** To examine the migration of placenta and the placental marginal sinus to predict the eventual route of delivery in low-lying placenta. **Methodology:** Women with a low-lying placenta with 30 weeks of gestation were included for study. The distance between the internal os and leading edge of the placenta was measured fortnightly using transvaginal ultrasonography until 36 weeks gestation. The relationship between the rate of placental migration, the presence of a placental marginal sinus and the eventual mode of delivery was investigated. **Results:** In the present study cesarean section rate was 60 % (39/65) in the slow migration group (0 – 2.0 mm/week) group, six patients (6/35) in the fast (more than 2.0 mm/week) migration group underwent a cesarean section ( $p < 0.01$ ) because of other problems. The cesarean section rate was 75.9 % (22/29) in patients with a placental marginal sinus, significantly greater than the rate of 11.3 % (8/71) in patients without a marginal sinus ( $p < 0.01$ ). **Conclusion:** A decreased rate of placental migration until 36 weeks' gestation and the presence of a placental marginal sinus were associated with subsequent cesarean delivery because of antepartum vaginal hemorrhage. These parameters may be useful for predicting the route of delivery in women with a lowlying placenta.

**Keywords:** Lowlying placenta; Placenta previa; Placental migration; Placental marginal sinus.

### INTRODUCTION

Placental migration is a phenomenon that was described by serial sonographic examinations by many authors. The presence of a lowlying also termed as placenta previa in the second trimester of pregnancy can be converted to an upper uterine segment placenta by the end of the third trimester [1]. This phenomenon is important when a complete or marginal placenta previa is encountered in the second trimester of gestation because of the need to predict possible antepartum complications and mode of delivery [2]. Placenta previa can be defined as one that covers the internal os of the cervix and lowlying placenta as one of which the edge is 1mm to 20mm of the internal os [3]. A distance of more than 20 mm from the lower placental edge and cervical internal os in the second trimester is a normal finding that does not represent a lowlying

placenta and does not require followup.

In cases of suspected placenta previa or lowlying placenta, the first step in determining accurate placental position in relation to the cervix is to perform a trans-vaginal-ultrasound-scan (TVUS) on patient whose bladder is empty [4,5,6,7]. In at least one quarter of all cases of placenta previa or lowlying placenta suspected on the basis of transabdominal sonography in the second trimester, the diagnosis will change after TVU is performed [3,5,7].

Those patients who do not have placenta previa or lowlying placenta can then be reassured and will require no further follow up. The aim of the present study was to compare the rates and patterns of placental migration in the third trimester of pregnancy and to correlate these findings with the mode of delivery.

### MATERIALS AND METHODS

**Study design:** Prospective analytical study

**Ethics approval:** The study was approved by the Institutional Ethics Committee, and informed consent was obtained from each participant. **Place of research:** The



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present study was conducted at Karpaga Vinayaga Institute of Medical Sciences, Madhurantagam and Tamilnadu.

**Study period:** during the period of September 2016 to May 2017.

**Inclusion criteria:** A total of 100 patients of 22-34 weeks or up to 8 months of pregnancy with lowlying placenta (Figure 3) were recruited for the study. The location of the placenta and proximity of the placental edge to the internal cervical os was evaluated as a standard TVUS examination during the third trimester [8-10]. We regarded a placenta located within 30 mm of the internal os after 30 weeks' gestation as low-lying [6]. Cases with a low-lying placenta were tagged prospectively during performance of the examination, and were subsequently reviewed for this study.

**Exclusion criteria:** Normal subjects, subjects other than lowlying placenta

**Sample size:** One Hundred

**Methodology:** All ultrasound examinations were performed by qualified radiologists and the films of TVUS were later inspected for quality and accuracy by gynecologists as well. The ultrasound equipment used included the Voluson 730 Expert (GE Healthcare Japan, Tokyo, Japan). To predict the eventual route of delivery in low-lying placenta, at the age of 30 weeks of gestation until 36 weeks of gestation, the distance between the center of the internal os and leading edge of the placenta was measured by TVUS fortnightly until 36 (or 37) weeks of gestation. These measurements were obtained from the portion of the placenta closest to the internal os. When the uterine contraction was observed, TVUS examination was postponed until the contraction disappeared. In cases when a marginal sinus identified as a hypoechoic area with slow and whirl-like blood flow was present, the distance between the internal os and the edge of the sinus was measured (Figure 1). The rate of placental migration was calculated by dividing the total distance migrated by the number of weeks between the first and last scans [7].

The patients were divided into 3 groups depending upon the distance between the lower margins of placenta to the internal cervical os center at the gestation age of 30/31 weeks.

**Group1:** Includes patients diagnosed as placental edge overlapping or greater part of placenta is lying over the internal os and the maximum distance between internal OS to lower margin of placenta is 0.5 cm.

**Group 2:** Includes patients diagnosed with a distance of 6 mm to 20 mm

Group 3: Includes patients diagnosed with more a distance greater than 20 mm from the lower margin of placenta to internal os. When the placenta was more than 2cm from internal cervical os there was no indication of LSCS due to ante partum hemorrhage (APH).

Patients with a low-lying placenta were divided into

two groups according to the rate of placental migration, i.e., a "slow" group (0 – 2.0 mm/week) and a "fast" group (>2.0 mm/week), because the mean rate of migration was approximately 2 mm/week according to a previous study [7].

**Statistical analysis:** The statistical analyses were performed using SPSS version 16.0.  $P < 0.05$  was considered statistically significant. To evaluate the effect of the rate of placental migration on cesarean section rates, a statistical analysis of the mode of delivery (cesarean vs. vaginal delivery) and rate of migration (slow vs. fast) was performed with a  $2 \times 2$  contingency table using Fisher's exact test. To evaluate the effect of the placental edge-internal os distance on cesarean section rates, a statistical analysis of the mode of delivery and placental edge distance at 36 or 37 weeks of gestation (0 – 20 vs. > 20 mm) (Figure 2) was also performed. Moreover, patients were grouped by the presence or absence of a placental marginal sinus, and a statistical analysis of the mode of delivery and presence or absence of a marginal sinus was performed with a  $2 \times 2$  contingency table using Fisher's exact test.



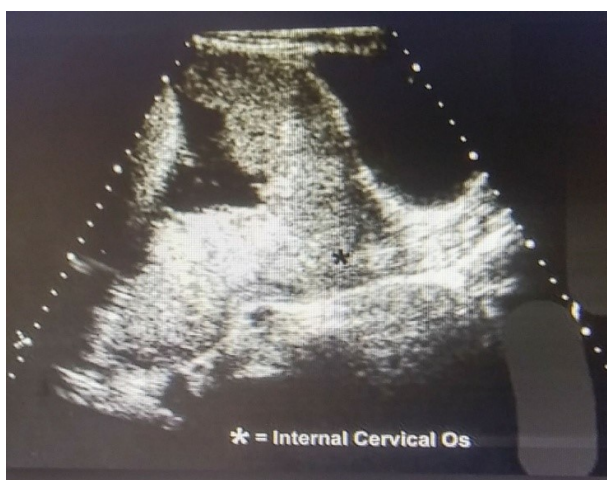
Figure 1. An ultrasound image showing normal placenta in anterior position



Figure 2. An ultrasound image showing normal placenta in posterior position



**Figure 3. Ultrasound image showing lowlying placenta**



**Figure 4. An ultrasound image showing complete placenta previa**

## RESULTS

The mean gestational age at entry to the study was 30 weeks. All patients underwent two to four TVUS assessments before delivery from 30 weeks of gestation to 36/37 weeks of gestation. All 100 women in this study had singleton pregnancies, and delivered between 36 and 39 weeks of gestation. The maternal age of these patients was  $39.8 \pm 2.2$  (mean  $\pm$  SD) years. The median of gravidity was 1 (range, 0-7) and the median of parity was 0 (range, 0-2). The median of gestational age at delivery was 37 weeks and 14 days. Since spontaneous labor was attempted in all patients, none had inductions of labor.

The mean rate of migration for all cases was  $5.7 \pm 5.3$  mm/week (95 % CI = 4.14-7.16), and there were no cases where the placental edge-internal os distance actually decreased and the rate of migration was negative. The fast migration group contained 35 patients with a mean rate of  $7.9 \pm 5.0$  mm/week (95 % CI = 6.14-9.69). The slow migration group had 16 patients with a mean rate of  $1.0 \pm 0.8$  mm/week (95 % CI = 0.57-1.37). According to the location of the placenta (anterior or

posterior wall), the mean rate of migration in the anterior wall group (n = 10) was  $7.8 \pm 5.8$  mm/week (95 % CI = 3.67-11.99), whereas that in the posterior wall group (n = 36) was  $4.7 \pm 4.7$  mm/week (95 % CI = 3.12-6.32) (p = 0.06).

Of the 100 patients, 71 delivered vaginally and 29 underwent an emergent cesarean section because of acute antepartum hemorrhage. The location of the placenta of all patients with an emergent cesarean section was posterior. If the amount of acute vaginal bleeding was 300 g or more, LSCS was performed as an emergency. The cesarean section rate was 60% (39/65) in patients with a placental edge-internal os distance of less than 20 mm at 36/37 weeks of gestation. It was 10% (3/30) when this distance was greater than 20 mm (p < 0.01). A cut-off point of 20 mm for the placental edge-internal os distance at 36/37 weeks predicted a cesarean section with 88.9 % sensitivity and 75.0 % specificity (Table 1).

The cesarean section rate was 60% (39/65) in patients with slow migration, 6 of the 35 fast migration patients (6/35) underwent a cesarean section (p < 0.01). A cut-off point of = 2.0 mm/week for the rate of placental migration predicted a cesarean section with 100 % sensitivity and 82.5 % specificity (Table 2).

The present study identified a total of 29 patients with a placental marginal sinus. The location of the placenta of all patients with a marginal sinus was posterior. The cesarean section rate was 75 % (21/29) in those with a placental marginal sinus and 11.3% (8/71) in those without (p < 0.01). The presence of the placental marginal sinus predicted cesarean section with 55% sensitivity and 95% specificity (Table 3). Moreover, all 8 patients with slow migration and a marginal sinus required an emergent cesarean section because of acute massive vaginal bleeding. The cesarean section rate was 100 % (11/11) in patients with slow migration and a marginal sinus and 9.1 % (9/89) in the other patients (p < 0.01). Slow migration and a marginal sinus predicted cesarean section with 55.6 % sensitivity and 100 % specificity (Table 4).

**Table 1. Prediction of mode of delivery based on the distance between the placental edge and internal OS at the age of 31 weeks of gestation**

Mode of delivery	Placental edge – Internal OS distance		
	Group 1 0 – 5.0 mm (n = 8)	Group 2 6.0 – 20 mm (n = 62)	Group 3 > 20 mm (n = 30)
Vaginal	Nil (0%)	39 (62.9%)	27 (90%)
Cesarean	8 (100%)*	23 (37.1%)*	3 (10%)

Values are n (%). P < 0.01 vs. cesarean section in > 20 mm.



**Table 2. Route of delivery according to the rate of migration at 36 weeks of gestation**

Mode of delivery	Rate of migration	
	Slow migration group < 20 mm (n = 65)	Fast migration group > 20 mm (n = 35)
Vaginal	26 (40%)	29 (82.8%)
Cesarean	39 (60%)*	6 (17.2%)

Values are n (%). P < 0.01 vs. cesarean section in > 20 mm.

**Table 3. Route of delivery according to presence or absence of placental marginal sinus**

Mode of delivery	Placental Marginal sinus	
	Presence (n = 29)	Absence (n = 71)
Vaginal	8 (25%)	63 (88.7%)
Cesarean	21 (75%)*	8 (11.3%)

Values are n (%). P < 0.01 vs. cesarean section in > 20 mm.

**Table 4. Route of delivery according to the rate of migration and the presence of placental marginal sinus**

Mode of delivery	Slow migration + Marginal sinus (n = 11)	Other cases (n = 89)
Vaginal	0 (0%)	80 (89.9%)
Cesarean	11 (100%)*	9 (9.1%)

Values are n (%). P < 0.01 vs. cesarean section in > 20 mm.

The mean rates of migration in patients who had (n = 7) and who did not have (n = 29) Cesarean section for placenta previa (Figure 4) were +0.3 mm/week and +5.4 mm/week, respectively (P < 0.0001). When the placental edge was initially >20 mm from the internal os, migration occurred in all cases and no Cesarean section for placenta previa was performed. For those between -20 mm and +20 mm, sufficient migration to avoid Cesarean section occurred in 88.5% of cases. Beyond a 20 mm overlap, significant placental migration did not occur and all patients required cesarean section.

Where the placental edge was initially > 20 mm from the internal os (n = 6), migration occurred in all cases and no Cesarean sections for placenta previa were performed. Between -20 mm and +20 mm

(n = 26), sufficient migration occurred in 23 cases at an average of +6.5 mm/week, such that only 11.5% (n = 3) required Cesarean section for bleeding characteristic of placenta previa. Beyond a 20 mm overlap (n = 4), placental migration did not occur and all patients required

elective cesarean section. There was no case of vaginal bleeding induced by transvaginal sonography and the procedure was well tolerated by all patients.

## DISCUSSION

Sonography has been used to observe and document the phenomenon of placental migration from the less preferable uterine location, such as the lower uterine segment, toward the uterine areas with better vascular perfusion [6]. It is thought that this process is not a true migration of placental tissue but, rather, a degeneration of the peripheral placental tissue that receives a suboptimal vascular supply and has slow placental growth in better-perfused uterine areas at the same time, so-called placental trophotropism [4-6]. By the nature of the process that involves placental tissue growth, it should be exponential and dependent only on gestational age. Indeed, it was noted that placenta previa resolved at a steady rate from 20 weeks gestation until delivery.

In terms of the clinical management of a patient with placenta previa, it was proposed that all placentas previa with a placenta-to-internal cervical os distance of 2.0 cm or greater, by the last sonographic examination 1 to 2 weeks before delivery, should be defined as low-lying placentas [7, 9, 10-12]. In these patients, vaginal delivery should be allowed because of the low likelihood of surgical delivery for substantial bleeding in labor and major postpartum hemorrhage. Although it was clear that complete and marginal placentas previa with a placenta to internal cervical os distance of less than 1.0 cm required surgical delivery, some women achieved a successful vaginal delivery with a final placental distance of 1.0 to 2.0 cm away from the internal cervical os. This group of patients had a likelihood of antepartum hemorrhage of 28%, compared with 30% of patients who had CD because of substantial bleeding in labor [13]. In this study, we observed a mean rate of placental migration of 2.7 mm/wk from 28 to 36 weeks gestation.

We also observed a scale of different rates of migration that has been associated with different final placental distance from the internal cervical os. Those Placentas that were observed to be complete placentas previa, with an overlap of more than 1.0 cm over the internal cervical os, persisted as complete placentas previa until delivery, with a minimal placental rate of migration of 0.1 mm/wk [14]. In contrast, those placentas previa that yielded a placental distance from the internal cervical os of more than 3.0 cm at final examination had a mean rate of migration of 4.1 mm/wk. A slower rate of placental migration was directly related to a lesser placental distance from the internal cervical os [8, 13-15]. These findings are similar to those of a previous report in which the mean rates of placental migration were 0.3 and 5.4 mm/wk for those patients who had CD versus normal vaginal delivery, respectively [5, 7, 9-10].

In our study, all cases of interventional CD for the reason of substantial bleeding in labor occurred in those patients

in whom the placental distance was less than 2.0 cm away from the internal cervical os, which is in agreement with a previously cited observation by Bhide et al about permitting a trial of labor in those patients with a final placental distance of greater than 2.0 cm away from the internal cervical os [11]. In addition, we observed 2 different patterns of placental migration.

## CONCLUSION

Present study confirmed previously established correlation between the rate of placental migration and final placental distance from the internal cervical os. In addition, we observed a different pattern of placental migration that was dependent on the acceleration or deceleration of placental migration rates toward the end of pregnancy. Although these rates of placental migration were minimal, and likely irrelevant at the clinical level, they correlated with increased rates of interventional cesarean delivery and manual placental removal and a higher prevalence of placenta accreta.

**Clinical implications:** These observations will provide additional insight into the understanding of placenta previa migration patterns in pregnancy. The present study also suggest that the rate of migration based on TVS repeated at 4-week intervals, together with the initial placental position, can give an indication early in the third trimester as to whether or not migration is likely to take place. This information will assist in patient counseling and allow greater confidence in outpatient management.

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