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The effect of placenta previa localization upon maternal and fetal-neonatal outcome

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1 Introduction

Patients with placenta previa (PP) provide an important practical problem in obstetrics with regard both to mother and fetus-neonate [11]. The functional efficiency of the placenta in women with PP could be reduced because of an unfavorable implantation site or because of areas of fibrosis related to repeated bleeding episodes [13]. These pregnancies may be complicated by placental insufficiency and intrauterine fetal death because of extensive placental damage from separation and infarction [14].

Previous studies [3, 4, 7, 8] have dealt with the problem whether major types of PP are associated with worsening of maternal and fetal-neonatal prognosis. It has been difficult to draw definitive conclusions because results have been contradictory. Most studies have not included the low lying type of PP [3, 4, 7], and use was made of different parameters for purposes of evaluation. The studies of MORGAN [8], HIBBARD [7], and CRENSHAW et al. [4] present data of women treated 2 to 3 decades ago, while that of COTTON et al. [3] present data of women treated during 1975–1978, using modern diagnostic techniques, as well as different management modalities. It is not surprising to find different results including perinatal mortality rate of 39% [4] vs. 12.6% [3].

The present study was undertaken to clarify the association of maternal and fetal-neonatal outcomes with different types of PP.

2 Material and methods

This study is based on our experience with treatment of PP in 164 consecutive patients (165 pregnancies) over a period of 11 years ending in 1983 with an incidence of 0.5% (1 in 200 deliveries). PP was diagnosed if the placenta was sited in the lower uterine segment (low lying), if the placental margin extended to the internal os of the cervix (marginal), or if it covered the dilating cervix partially (partial) or totally (total).

The management policy with PP was classified as "conservative – active" as follows:

1. The premature patient, i.e. 37 menstrual weeks gestation or less, was managed expectantly whenever possible.
2. Early placental localization was obtained by various radiological and ultrasonographic methods.
3. There was avoidance of vaginal or rectal examinations except under very unusual circumstances (see 5).
4. Frequent hospitalizations and liberal blood transfusions (Hb < 10 gr% or protracted vaginal bleeding) were used.
5. With severe hemorrhage, premature rupture of membranes, premature labor or other conditions necessitating urgent delivery, vaginal examination was performed under "double set up" conditions.
6. Cesarean section was indicated electively in cases of marginal posterior, partial and total PP.

7. Neonates were hospitalized when indicated in a modern neonatal intensive care unit.

The study group consisted of cases of PP identified by a documented history of vaginal bleeding and ultrasonographic placental imaging using the full bladder technique. In all these women the site of PP was confirmed at vaginal examination or during manual removal of the placenta in cases of vaginal delivery or by inspection at cesarean section. Ten women were excluded from the study because of lack of information.

The following parameters were evaluated with respect to placental localization: maternal age, previous obstetrical performance and present pregnancy, the latter with respect to maternal and perinatal outcome.

The following parameters were used to evaluate blood loss: onset of bleeding, number of bleeding episodes and the amount of antepartum blood transfusions. A bleeding episode was defined as a period of hospitalization associated with antenatal vaginal bleeding and lasting no more than 7 days. We found the use of these parameters more accurate than a rough estimation of blood loss in ml in defining the clinical condition and laboratory status of the patient when blood less occurred.

The control group was composed of women without PP, who were arbitrarily selected from among the parturients in the same years and who were matched by the day of confinement. There were two controls for each test subject: one who delivered before and one who delivered after the index case.

Statistical analysis of the data was performed by conducting the chi-square analysis for differences in incidence between groups, and the Students' t test for differences in means between groups.

3 Results

The study group consisted of 155 pregnancies with PP and 159 newborns. This group included 2 sets of twins and one set of triplets. One woman delivered twice during this period with recurrent PP. The distribution of women with respect to the type of PP is presented in table I.

The control group consisted of 300 women who delivered a total of 305 newborns, including 5 sets of twins.

Maternal age: Women with PP were older than women in the control group. A clear cut association was demonstrated between an older age and major types of PP (figure 1).

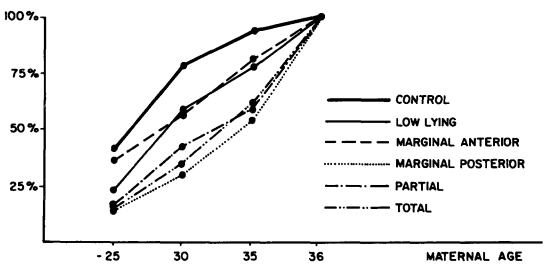

Figure 1. Cumulative destribution curves of various types of placenta previa with respect to maternal age.

Table I. Composition of the study group by the type of placenta previa (PP).

Type of placenta previa	Low lying	Marginal anterior	Marginal posterior	Partial	Total	Total number
Number of women	41	33	29	12*	40*	155
Number of newborns	42**	33	30**	12	42***	159

* – Same woman in 2 episodes
** – Set of twins
*** – Set of triplets

Previous obstetrical performance: Women with PP had greater gravidity and parity, and they had higher rates of previous cesarean sections as compared to women in the control group. We could not establish a connection between any of these findings and the type of PP (table II).

Present pregnancy — maternal aspects: Ninety-nine women (64%) presented with bleeding episodes during the first to third trimesters and were managed "expectantly" (table III). Fifty-three women (34%) were delivered following a single, usually severe antepartum hemorrhage, while in 3 (2%) no symptoms of antepartum bleeding were documented and the PP was diagnosed incidentally either at cesarean section (1 patient with low-lying and 2 with marginal posterior), or during vaginal delivery (marginal anterior). In women who presented with multiple antenatal bleeding episodes, we found no significant association between the number of bleeding episodes or number of antepartum transfusions and the major types of PP. In 8 women with PP an additional placental pathological state, namely focal accretion, was diagnosed; 7 out of 8 of these women had minor types of PP (table III). The rate of pathological positions and presentations was higher in women with PP compared to the control group but was not influenced by the type of PP (table IV). Seventy-three percent of women with PP were delivered by cesarean section as compared to 12% of the controls; 96% of the women with marginal posterior, partial or total PP were delivered by cesarean section in comparison with 47% of those with low lying or marginal anterior PP (table V). In this latter group of 35 women who were operated upon, 29 presented with severe antepartum hemorrhage (including 10 with abnormal presentations), and 2 underwent repeat caesarean section. In the PP group as a whole, severe antepartum bleeding was the main indication for cesarean section (table VI). Postnatal maternal complications occurred in 4 women, 1 with low lying placenta and 3 with marginal anterior, and included postpartum hemorrhage in all with disseminated intravascular coagulopathy (DIC) in 2 women. The only maternal death occurred in a woman with low lying placenta who developed postpartum hemorrhage, DIC and histologically confirmed amniotic fluid embolism.

Present pregnancy — fetal-neonatal aspects: The male : female ratio was slightly higher in women with PP than in the control group, but this finding was not associated specifically with any type of PP (table VII). The median delivery date in women with PP was 36.3 weeks gesta-

Table II. Previous obstetrical performance in women with placenta previa (PP) and the control group.

Type of placenta previa (number)	Low lying (41)	Marginal anterior (33)	Marginal posterior (29)	Partial (12)	Total (40)	Total number PP (155)	Control group (300)	Significance
Gravidity								
−0 (%)	6 (15%)	3 (9%)	3 (10%)	0	3 (7.5%)	15 (9.7%)	80 (27%)	$p < 0.01$
Parity								
−0 (%)	12 (29%)	10 (30%)	5 (17%)	1 (8%)	8 (20%)	36 (23%)	119 (39%)	$p < 0.05$
1−3 (%)	28 (68%)	20 (60%)	21 (72%)	7 (59%)	25 (62.5%)	101 (65%)	167 (56%)	$p < 0.5$
4 + (%)	1 (3%)	3 (10%)	3 (11%)	4 (33%)	7 (17.5%)	18 (12%)	14 (5%)	$p < 0.025$
Abortions								
−0 (%)	18 (44%)	18 (55%)	13 (45%)	2 (17%)	13 (33%)	64 (41%)	212 (72%)	$p < 0.01$
1−2 (%)	16 (39%)	10 (30%)	10 (34%)	8 (67%)	20 (50%)	64 (41%)	71 (24%)	$p < 0.025$
3 + (%)	7 (17%)	5 (15%)	6 (21%)	2 (16%)	7 (17%)	27 (18%)	12 (4%)	$p < 0.05$
Previous cesarean section (%)	7 (17%)	1 (3%)	3 (10%)	2 (17%)	5 (12.5%)	18 (11.6%)	9 (3%)	$p < 0.05$

tion (from last menstrual period) in contrast to 38.1 in the control group ($p < 0.05$) (figure 2). The median weight of the newborns in women with PP was 2530 g vs 3180 g in the control group ($p < 0.05$) (figure 3). Neonatal morbidity occurred in 51.5% of infants born to PP patients vs. 44% in the control group. The increase was due to higher rates of anemia,

Table III. Antenatal and postnatal maternal course and complications in the women with placenta previa and in the control group.

Type of placenta previa (Number)	Low lying (41)	Marginal anterior (33)	Marginal posterior (29)	Partial (12)	Total (40)	Total number PP (155)	Control group (300)
Accidental finding at delivery	1 (2.5%)	1 (3%)	1 (3.5%)	0	0	3 (2%)	–
Intrapartum bleeding*	13 (325)	16 (48%)	6 (21%)	3 (25%)	15 (37.5%)	53 (34%)	0
Antepartum bleeding	27 (66%)	16 (48%)	22 (76%)	9 (75%)	25 (62.5%)	99 (64%)	4 (1.5%)
– from 1st trimester	1	3	3	3	4	14	2
– from 2nd trimester	13	4	3	1	12	33	1
– from 3rd trimester	4	5	5	1	9	15	1
– from last month of pregnancy	9	4	11	4	0	37	0
Number of bleeding episodes per patient (mean)	1–5 (2)	1–6 (1.9)	1–6 (1.7)	1–6 (2.1)	1–6 (2.4)	1–6 (2.0)	–
Antepartum hospitalization in days (mean)	0–24 (7.2)	4–12 (6.4)	4–16 (7.6)	4–12 (7.6)	4–16 (9.6)	0–24 (7.7)	0–11 (0.2)
Antepartum or intrapartum hemotransfusion	0–4	0–4	0–4	0–4	0–4	0–4	
– blood units/patient (mean)	(0.8)	(1.25)	(1.75)	(1.2)	(1.4)	(1.25)	
Placenta previa with focal accretion	3 (7%)	2 (6%)	2 (7%)	1 (8%)	0	8 (5%)	0
Postpartum hemorrhage	1 (2.5%)	3 (9%)	0	0	0	4 (2.5%)	2 (0.5%)**
Disseminated intravascular coagulopathy	2 (2.5%)	1 (3%)	0	0	0	2 (1.5%)	0
Maternal death	1 (2.5%)	0	0	0	0	1 (0.6%)	0

* – As the first episode of uterine bleeding; ** – $p < 0.01$

Table IV. Pathological positions and presentations in women with placenta previa and in the control group (excluding twins and triplets).

Type of placenta previa (Number)	Low lying (40)	Marginal anterior (33)	Marginal posterior (28)	Partial (12)	Total (39)	Total number PP (155)	Control group (300)
Head presentation	27 (67.5%)	25 (76%)	19 (68%)	6 (50%)	25 (64%)	102 (67%)	274 (93%)
Breech	5 (12.5%)	4 (12%)	4 (14%)	1 (8.5%)	2 (5%)	16 (10.5%)	18 (6%)
Transverse lie	8 (20%)	3 (9%)	5 (18%)	4 (33%)	7 (18%)	27 (18%)	3 (1%)
Oblique lie	0	0	0	1 (8.5%)	3 (8%)	4 (2.6%)	0
Compound presentation	0	1 (3%)	0	0	0	1 (2.6%)	0
Unstable lie	0	0	0	0	2 (5%)	2 (1.3%)	0
% pathological positions and presentations (excluding head presentation)	32.5% NS	24% NS	32% NS	50% NS	36% NS	33%	7%

NS = not significant

Table V. Mode of delivery of women with placenta previa and of women in the control group.

Type of placenta previa (Number)	Low lying (41)	Marginal anterior (33)	Marginal posterior (29)	Partial (12)	Total (40)	Total number PP (155)	Control group (300)	Significance
Vaginal delivery	12 (29.2%)	23 (70%)		2* (17%)		37 (24%)	232 (77%)	$p < 0.01$
Assisted breech	1 (2.6%)		1 (3%)			2 (1.2%)	5 (2%)	$p > 0.05$
Braxton Hicks version		2 (3%)				1 (0.6%)		–
Forceps	1 (2.6%)					1 (0.6%)	27 (9%)	$p < 0.01$
Vacuum	1 (2.6%)					1 (0.6%)		–
Cesarean section	26 (63%)	9 (27%)	28 (97%)	10 (83%)	40 (100%)	113 (73%)	36 (12%)	$p < 0.01$

* 1 – prolapse of cord

Table VI. Indications for cesarean section in women with placenta previa and in the control group.

Type of placenta previa (Number)	Low lying (41)	Marginal anterior (33)	Marginal posterior (29)	Partial (12)	Total (40)	Total number PP (155)	Control group (300)	Significance
Labor			8 (28%)	3 (25%)	10 (25%)	21 (14%)		
Antepartum hemorrhage	21 (51%)	8 (24%)	16 (55%)	7 (58%)	25 (63%)	77 (50%)		
Acute fetal distress	2 (5%)		2 (8%)			4 (2.5%)	6 (2%)	$p > 0.05$
Repeated section	2 (5%)		1 (3%)		5 (12%)	8 (5%)	15 (5%)	$p > 0.05$
Toxemia	1 (2%)		1 (3%)			2 (1%)	4 (1.3%)	$p > 0.05$
Dystocia							10 (3%)	
Others		1 (3%)*				1 (0.5%)	1 (0.7%)	$p > 0.05$
Total	26 (63%)	9 (27%)	28 (87%)	10 (83%)	40 (100%)	113 (73%)	36 (12%)	$p < 0.05$

* – failed Braxton Hicks version

Table VII. Fetal/neonatal outcome in the placenta previa and the control group.

Type of placenta previa (Number)	Low lying (42)	Marginal anterior (33)	Marginal posterior (30)	Partial (12)	Total (42)	Total number PP (159)	Control group (305)	Significance
Male/female ratio	1.625	1.20	1.00	0.70	1.80	1.34	1.13	No
Neonatal morbidity								
– Anemia	5	0	4	0	5	14 (8.8%)	2 (0.7%)	$p < 0.01$
– Hypoglycemia	1	0	1	0	0	2 (1.3%)	4 (1.3%)	$p > 0.05$
– Hypocalcemia	4	1	3	1	5	14 (8.8%)	2 (0.7%)	$p < 0.01$
– Jaundice	4	4	4	4	6	22 (14%)	84 (27.4%)	$p < 0.05$
– RDS*	3	3	4	2	3	15 (9.4%)	0	$p < 0.01$
– Asphyxia	4	0	0	0	2	6 (3.7%)	13 (4.3%)	$p > 0.05$
– Infection	1	0	1	0	1	3 (1.9%)	2 (0.7%)	$p > 0.05$
– Trauma	1	0	0	0	0	1 (0.6%)	2 (0.7%)	$p > 0.05$
– Meconium aspiration	0	0	0	0	0	0	15 (5.1%)	$p < 0.025$
– Cranial hemorrhage	0	2	0	0	0	2 (1.3%)	2 (0.7%)	$p > 0.05$
– Secondary hydrocephalus	0	1	0	0	0	1 (0.6%)	0	–
– Congenital malformation	0	3	2	0	3	8 (5.0%)	9 (2.8%)	$p > 0.05$
– Miscellaneous	0	0	0	0	0	0	7 (2.3%)	$p < 0.05$
– Subtotal	23 (55%)	12 (36%)	19 (63%)	7 (58%)	21 (50%)	88 (55.3%)	142 (46.7%)	$p > 0.05$
Perinatal mortality								
– Stillborns	1	1	1	0	1	4 (2.5%)	1 (0.35%)	$p < 0.025$
– Neonatal death	3	4	1	0	5	13 (8.3%)	2 (0.65%)	$p < 0.01$
– Subtotal	4 (9.5%)	5 (15%)	2 (7%)	0	6 (14%)	17 (10.7%)	3 (1%)	$p < 0.01$

* – Respiratory distress syndrome

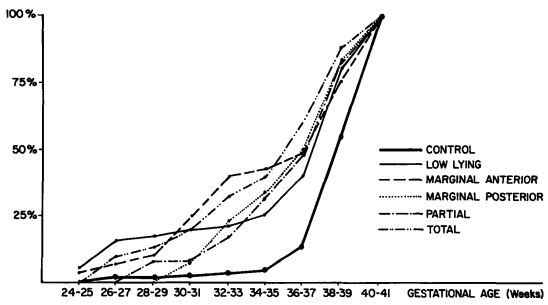

Figure 2. Cumulative distribution curves of various types of placenta previa with respect to gestational age (weeks from last menstrual period).

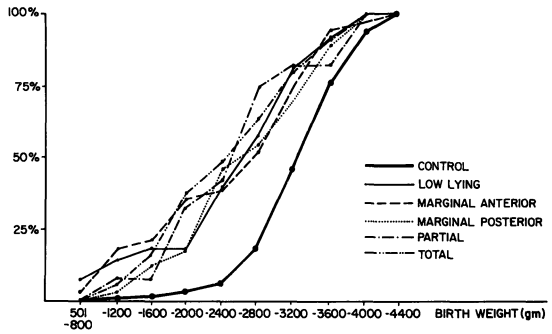

Figure 3. Cumulative distribution curves of various types of placenta previa with respect to birth weight (g).

respiratory distress syndrome, hypocalcemia and congenital malformations (table VII). The perinatal mortality rate with PP was 10.7% vs. 1% in the control group ($p < 0.01$, table VII). There were 4 stillborns and 13 neonatal deaths in the former group. Of the neonatal deaths, 9 were due to respiratory distress syndrome and 2 to major malformations. Seven of the 17 perinatal deaths in the PP group were of newborns under 1000 g and 4 under 1500 g.

None of these findings, namely gestational age, birth weight, neonatal morbidity and perinatal mortality rates were associated specifically with any type of PP (table VII, figures 2 and 3). As is depicted in table VIII, neonatal mortality was increased when associated with vaginal delivery in the lesser degrees of PP, i.e. the low lying and marginal anterior types.

4 Discussion

The etiology of PP is obscure and it appears that implantation over the cervical os is not just a chance happening. A higher incidence of PP would be expected if implantation were random rather than preferentially in the fundus.

The primary factors which have been reported as influencing maternal and fetal-neonatal outcome are blood loss, premature delivery and intrauterine growth retardation. Hypoxic episodes to the premature fetus are highly dangerous considering that approximately 10% of blood loss will be fetal in origin [5].

The following findings were found in previous as well as in the present report to be associated with PP pregnancies: advanced maternal age,

Table VIII. The association between perinatal morbidity and mortality and the mode of delivery, with respect to minor types of placenta previa.

Mode of delivery	Distribution of 74 women with low lying or marginal anterior PP	Perinatal outcome – 75 newborns		
		Neonatal morbidity	Stillborns	Neonatal deaths
Vaginal delivery	39 (53%)	8 (20.5%)	1 (2.6%)	6 (15%)**
Cesarean section	35 (47%)	0	1 (2.8%)	1 (2.8%)

* Including breech, forceps, vacuum and Braxton Hicks version
** $p < 0.01$

obstetrical history of multiparity, abortions and cesarean sections, placenta accreta, multiple fetuses, abnormal positions and presentations, higher male to female newborns ratio, congenital malformations, prematurity and intrauterine growth retardation [2–4, 7, 8, 10–13]. We could not confirm NAEYE's [9] findings of increased incidence of PP among heavy cigarette smokers because of lack of information.

The results of the present study indicate that of the various parameters that were examined, 3 were associated with PP localization: advanced maternal age was associated with major types of PP while focal accretion of the placenta and neonatal mortality in cases of vaginal delivery were associated with the lesser degrees of PP.

PP and maternal age: This parameter appears to be a critical factor for the occurrence of PP [4], recurrent PP [6], and placenta accreta [1]. We cannot state what is the explanation of this finding, whether it is associated with multiparity and previous procedures that might have caused an additive damage to the lower uterine segment, or with "weakening" of the lower segment (both are associated with increasing maternal age), or even if it is part of a "reproductive failure" that is more prevalent in older age as is Down syndrome.

PP with focal accretion: Although the association between PP and different forms of placenta accreta have been previously described [12], we have no apparent explanation for the finding that 7 of 8 cases of PP with focal accretion had minor types of PP.

PP and neonatal mortality: Most of the neonatal deaths in the present report were associated with vaginal delivery in women with minor types of PP and the principal cause of death was respiratory distress syndrome. CRENSHAW et al. [4] reported similar findings, but it must be stated that the perinatal mortality rates reported by them were 20–30% in contrast to 10.7% in our study. It seems that an elective cesarean delivery in women with minor types of PP might reduce the perinatal mortality results.

In the present study we found no association between antepartum, intrapartum or postpartum bleeding and major types of PP. This is contradictory to previous reports by MORGAN [8], HIBBARD [7] and CRENSHAW et al. [4] who demonstrated an association between major types of PP and antepartum bleeding, to those of COTTON et al. [3] who found a similar association with intrapartum bleeding and to those of Morgan [8] who described increased rates of postpartum bleeding in women with total PP after cesarean section. Our findings are in accordance with the recent report of COTTON et al. [3] on women with PP who underwent "aggressive conservative" management. This reduction in the relative incidence of blood loss associated with major types of PP is probably part of the trend of improving maternal and perinatal results in women with PP, being due to the modern management policy that combines both conservative and active approaches. Nevertheless, in accordance with these changes, the clinical importance of the minor types of PP increased [3, 8], a fact that was demonstrated in the present study.

The following conclusions can be drawn from the present work: A) Maternal age is the most important etiological factor in women with PP; B) The use of the "conservative-active" management protocol in cases of PP has significantly reduced the maternal and fetal-neonatal complication rates, has decreased the relative importance of the major types of PP and concimitantly increased the relative importance of the minor types of PP; and C) Performing more cesarean sections to deliver patients with minor types of PP may further reduce the rates of perinatal mortality in cases of PP.

Summary

The present study evaluated the association between maternal and fetal-neonatal outcome in women with placenta previa (PP) and the site of PP, i.e. low lying, marginal, partial or total. The study group was composed of 154 women (159 newborns) and the control group of 300 woman (305 newborns). Of the various

parameters examined, the following 3 were associated with PP localization: advanced maternal age was associated with major types of PP, while focal accretion of the placenta and neonatal mortality in cases of vaginal delivery were associated with minor types of PP. No connection was found between antepartum, intrapartum or postpartum blood loss and any specific type of PP. A review of the literature and the results of the present study revealed that the use of the modern aggressive (conservative – active) management protocol in women with PP has resulted in a significant reduction in the maternal and perinatal complication rates, as well as a relative decrease in the importance of major types of PP and a relative increase of that of the minor types.

Keywords: Placenta previa localization.

Zusammenfassung

Einfluß der Plazentalokalisation auf das maternale und fetale/neonatale Outcome
In der vorliegenden Studie wurden die Beziehungen zwischen maternalem und fetalem/neonatalem Outcome bei Frauen mit Plazenta praevia untersucht, was sowohl tiefliegende Plazenten wie auch eine Plazenta praevia marginalis, partialis und totalis einschloß. Das Kollektiv bestand aus 154 Frauen (159 Neugeborene), die Kontrollgruppe aus 300 Frauen (305 Neugeborene). Von den verschiedenen Untersuchungsparametern ergab sich bei den folgenden 3 eine deutliche Beziehung: bei fortgeschrittenem mütterlichem Alter gab es häufiger schwerwiegende Fälle von atypischen Plazentalokalisationen, während bei leichteren Fällen von atypischen Lokalisationen häufiger eine fokale Plazenta accreta auftrat und auch die neonatale Mortalität bei vaginaler Entbindung erhöht war. Bezüglich des antepartalen, intrapartalen und postpartalen Blutverlustes gab es zwischen den einzelnen abweichenden Plazentalokalisationen keine Unterschiede. Nach Durchsicht der Literatur und Berücksichtigung der vorliegenden Ergebnisse kommen wir zu der Feststellung, daß das moderne geburtshilfliche Management bei Frauen mit Plazenta praevia zu einer deutlichen Reduktion der maternalen und perinatalen Komplikationsrate geführt hat. Die Bedeutung der echten Plazenta praevia scheint abzunehmen, während leichteren Fällen von atypischen Plazentalokalisationen eine zunehmende Bedeutung zukommt.

Schlüsselwörter: Plazenta-praevia-Lokalisation.

Résumé

Effet de l'emplacement du placenta praevia sur le devenir maternel et fœtal-néonatal
Cette étude évalue l'association entre le devenir maternel et fetal-néonatal chez les femmes présentant un placenta praevia (PP) et le type du PP, c'est-à-dire: bas, marginal, partiel ou total. Le groupe étudié est composé de 154 femmes (avec 159 nouveaux-nés) et le groupe contrôle de 300 femmes (305 nouveaux-nés). Parmis les nombreux paramètres étudiés, les 3 suivants sont correlés avec la localisation du PP: l'âge maternel élevé est correlé avec les PP les plus importants, tandis que le caractère accreta localisé du placenta et la mortalité néonatale lors d'accouchements par voie basse sont correlés avec les PP les moins importants. On n'a pas trouvé de relation entre la perte sanguine avant, pendant ou après l'accouchement et un type particulier de PP. La revue de la littérature et les résultats de cette étude mettent en évidence que la mise en service des protocoles de prise en charge moderne et aggressifs (conservateurs-actifs) chez les femmes présentant un PP a entrainé une diminution significative du taux de complications maternelles et périnatales, de même qu'une diminution relative de l'importance des PP les plus graves et une augmentation relative de celle des PP les moins graves.

Mots-clés: Localisation du placenta praevia.

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