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Comparison of Early and Late Fetal Extraction on Maternal Outcome in Placenta Accreta Spectrum

Mohammad A. Taymour[1], Amira Alasmer[1]*, Ahmed Mahmoud[1], Ibrahim Fawzy Ibrahim Fawzy[1], Yasmeen Mansi[2], Abdalla Y. El-Kateb[1]

[1] Obstetrics and Gynecology Department, Faculty of Medicine, Cairo University, Cairo, Egypt

[2] Pediatrics Department, Faculty of Medicine, Cairo University, Cairo, Egypt

[1]Assistant Professor of Obstetrics and Gynecology Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

Email ID: mohammadtaymour@gmail.com

[1]Assistant Lecturer of Obstetrics and Gynecology Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

Email ID: amirasa992@gmaiI.com

[1]Professor of Obstetrics and Gynecology Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

Email ID: amhusseinl979@gmaiI.com

[1]Lecturer of Obstetrics and Gynecology Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

Email ID: Ibrahim_fawzy@kasralainy.edu.eg

[1]Professor of Pediatrics Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

Email ID: Y_mansi@yahoo.com

[1]Professor of Obstetrics and Gynecology Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

Email ID: aelkateb@hotmail.com

***Corresponding Author:**

Amira Alasmer

Assistant Lecturer of Obstetrics and Gynecology Department, Faculty of Medicine, Cairo University, Cairo, Egypt, Address: 24 Manial museum-Cairo Postcode: 11555

Email ID: amirasa992@gmaiI.com,

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ABSTRACT

Background: Placenta accreta spectrum (PAS) is one of the devastating obstetric complications owing to massive bleeding that may lead to peripartum hysterectomy, need for massive blood transfusion, maternal intensive care admission and maternal mortality. The aim of this work was to investigate the effect of late fetal extraction on the maternal and neonatal outcomes in patients diagnosed with PAS.

Methods: This prospective cohort study was carried out on 60 pregnant women with age from 18 to 40 years old with PAS diagnosed by ultrasound, operative findings and histopathological examination. Patients were divided into two equal groups: Group (A): Late fetal extraction and Group (B): Early fetal extraction.

Results: Time from induction of anesthesia to peritoneal entry and from peritoneal entry till cord clamping were significantly higher in group (A) than group (B) (P <0.001). Blood loss, blood transfusion and bladder injuries were significantly lower in group (A) compared to group (B) (P<0.05). Hospital stay and intensive care unit admission were insignificantly different between both groups. In both groups no cases of maternal mortalities, the estimated fetal weight, APGAR score at 1 min and 5 min, neonatal intensive care unit and neonatal respiratory support were insignificantly different between both groups.

Conclusions: The late fetal extraction technique was superior to early fetal extraction as it showed lower blood loss, blood transfusion and lower bladder injury for cases with PAS without affecting neonatal outcome.

Keywords: *Placenta Accreta, Early Fetal Extraction, Late Fetal Extraction, Neonatal Outcomes*

1. INTRODUCTION

Placenta accreta spectrum disorders (PAS) are terms used to describe the spectrum of placentation pathology that occurs when villous tissue is abnormally attached to the underlying myometrium or invasive into the uterine wall [1].

This definition was first proposed by Luke et al., who described the 3 main PAS grades, i.e., placenta "vera" or "creta" which described the abnormal attachment of placental villi to the underlying myometrium without interposing decidua, placenta "increta" where the myometrium under the placental bed is invaded by villous tissue, and placenta percreta when placental villi invade the full thickness of the myometrium and the uterine serosa with possible extension to the surrounding nearby organs [2].

Currently, more than 90% of women diagnosed with PAS also have a placenta previa [3].

Correlations of the ultrasound imaging from early in pregnancy with clinical and histopathologic examinations at birth are pivotal to better understand the natural evolution of PAS and are essential to improve the diagnosis and management of this obstetric condition [4].

PAS is one of the devastating obstetric complications owing to massive hemorrhage that may lead to peripartum hysterectomy, need for massive blood transfusion, maternal intensive care admission and maternal mortality [5, 6].

Cesarean hysterectomy in women with PAS is technically challenging, and the reported risk of adjacent organ injury is relevant. Urinary tract injuries are described in 29% of the procedures performed in women with PAS, with a reported rate of 76% for bladder lacerations, 17% for ureteral injuries, and 5% for genitourinary fistulas [7].

The occurrence of injury to other abdominal organs, such as the bowel and the pelvic vessels and nerves, has also been reported, but these complications are less common [8].

Maternal mortality of placenta previa with percreta has been reported to be as high as 7% of cases [3].

In a middle-income country like Egypt, university hospitals may be able to provide the necessary settings, equipment, and personnel to manage such cases, different criteria should be placed for assessing centers of excellence in middle/low-income countries as not all resources are available, in addition they receive a higher number of cases when compared with their US and UK counterparts [9].

In another study by Hussein et al., the average skin-to-skin operative time was 203.90±36 min [10].

Our study aimed to investigate the effect of late fetal extraction on the maternal and neonatal outcomes in patients diagnosed with PAS.

2. PATIENTS AND METHODS

This prospective cohort study was carried out on 60 pregnant women , with age from 18 to 40 years old pregnant in a singleton living fetus with repeated cesarean sections (CS), the following ultrasound markers, such as 'Loss of the 'clear zone', 'Abnormal placental lacunae', 'Bladder wall interruption', 'Myometrial thinning', 'Placental bulge', and 'Focal exophytic mass', were used, also Color Doppler markers, such as 'Uterovesical hypervascularity', 'Subplacental hypervascularity', and 'Bridging vessels' [11] should be present and termination was done between 35-37 weeks. The study was done from July 2021 to January 2023 after approval from the Ethical Committee Cairo University Hospitals, Cairo, Egypt. An informed written consent was obtained from the patients.

Exclusion criteria were unprepared patients done as emergency procedures, medical disorders, like hypertension, diabetes mellitus and bleeding tendency, suspected intrauterine growth restriction, maternal drug intake prior to delivery as anticoagulants, multifetal pregnancy and fetuses with congenital anomalies.

Patients were divided into two equal groups: Group (A): late fetal extraction was done (Getting the baby out after careful bladder dissection through proper surgical planes at the utero-vesical interface allowing devascularization of hypervascular utero-vesical interface whether doing cesarean hysterectomy or conservative management) and group (B): early fetal extraction was done (Getting the baby out before starting bladder dissection through the proper surgical planes at the utero-vesical interface).

All patients were subjected to history taking, clinical examination, laboratory investigations [hemoglobin, hematocrit, platelets, total leukocyte count, prothrombin time (PT), prothrombin concentration (PC), liver function tests (aspartate aminotransferase (AST) and alanine transaminase (ALT)) and kidney function tests (creatinine and urea) and ultrasound examination.

3. ULTRASOUND EXAMINATION

In all cases, detailed transabdominal sonography and transvaginal sonography examinations were scheduled and conducted one day before the date of delivery. Scanning was done using Voluson E10® GE Healthcare Tiefenbach 15, 4871 Zipf,

Austria. Placental localization, the placenta was recorded as "low lying" when the edge was 0.5-2 cm from the internal os of the uterine cervix. When the placenta was <0.5cm from the internal os or completely covering it, it was defined as placenta previa (marginal or complete respectively) [12]. The following ultrasound markers were examined, such as loss of the clear zone, abnormal placental lacunae, bladder wall interruption, myometrial thinning, placental bulge and focal exophytic mass.

Color Doppler markers, such as uterovesical hypervascularity, subplacental hypervascularity

Bridging vessels and lacunae feeder vessels with high velocity.

Transvaginal ultrasound was performed to confirm abdominal ultrasound findings, measure the cervical length and to assess the lower uterine segment. Fetal biometry and estimated fetal weight were documented. Amniotic fluid index was documented. A normal amniotic fluid index was 5 cm to 25 cm using the standard assessment method. Less than 5 cm was considered oligohydramnios, and greater than 25 cm was considered polyhydramnios.

4. DELIVERY DETAILS

All enrolled participants were operated upon in a scheduled elective setting between 35 -37 weeks of gestation after receiving a course of antenatal corticosteroids as per the regulations of the hospital. Termination was then performed by the managing obstetrician under general anesthesia (narcotics were given on fetal extraction). Two-time intervals (in minutes) were recorded: [From the start of induction of anesthesia till peritoneal entry and the time from peritoneal entry till cord clamping].

Midline versus transverse skin incision, upper segment versus lower segment cesarean delivery, cesarean hysterectomy or conservative management, intraoperative blood loss, bladder injury, ureteric injury, bowel injury, operative time, need for blood transfusion, pre- and 24-h post-operative Hb and total duration of hospital stay were recorded.

Blood loss was calculated according to the work done by Kamel et al., where the volume of blood in the suction apparatus was added to the calculated volume of blood from the measured weight of the soaked towels and drapes placed beneath the patients using the following formula: (WET item gram weight − DRY item gram weight= milliliters of blood within the item) [13].

Following fetal delivery, Apgar score was assessed at 1 and 5 minutes. The Apgar score provides an accepted and convenient method for reporting the status of the newborn infant immediately after birth and the response to resuscitation if needed. The Apgar score alone cannot be considered to be evidence of or a consequence of asphyxia, does not predict individual neonatal mortality or neurologic outcome, and should not be used for that purpose. An Apgar score assigned during resuscitation was not equivalent to a score assigned to a spontaneously breathing infant [14]. The need for neonatal intensive care unit (NICU) admission and need for ventilation were recorded. The maternal intensive care unit (ICU) or mortality was recorded.

5. SAMPLE SIZE CALCULATION

The calculated sample size was 11 participants. By calculating the non-response rate which was 10% based on previous studies, the required sample size was at least 12 participants in each group, however we assume that the mean and the standard deviation were more, so we included 60 patients. (30 in each group) **[15]**.

Statistical analysis

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Shapiro-Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric variables were presented as mean and standard deviation (SD) and compared between the two groups utilizing unpaired Student's t- test. Quantitative non-parametric data were presented as median and interquartile range (IQR) and were analyzed by Mann Whitney-test. Qualitative variables were presented as frequency and percentage (%) and were analyzed utilizing the Chi-square test or Fisher's exact test when appropriate. A two-tailed P value < 0.05 was considered statistically significant.

6. RESULTS

Age, number of C-sections and gestational age were insignificantly different between both groups. **Table 1**

Table 1: Demographics of the studied groups

		Group (A) (n=30)	Group (B) (n=30)	P
Age (years)		31.3 ± 3.63	33.1 ± 3.6	0.068
BMI (kg/m^2)		32.6 ± 4.27	31.8 ± 3.83	0.491
Number of CS	**1**	3 (10%)	3 (10%)	0.557
	2	9 (30%)	13 (43.33%)	

	3	11 (36.67%)	7 (23.33%)	
	4	7 (23.33%)	5 (16.67%)	
	5	0 (0%)	1 (3.33%)	
	6	0 (0%)	1 (3.33%)	
Gestational age (weeks)		36.4 ± 0.58	36.5 ± 0.48	0.198

Data are presented as mean ± SD or frequency (%). BMI: body mass index, CS: cesarean sections

Preoperative and postoperative Hb and HCT were insignificantly different between both groups. Preoperative Hb and HCT were significantly higher than postoperative Hb and HCT in both groups (A) and (B) (P <0.001). Time from induction of anesthesia to peritoneal entry and time from peritoneal entry till cord clamping were significantly higher in group (A) than group (B) (P <0.001). Regarding patients in group (A), devascularization of most of vessels through the proper surgical planes allowed us to minimize the intraoperative blood loss and carefully dissecte the bladder, so improving the maternal outcome. **Table 2**

Table 2: Hemoglobin, hematocrit, time from induction of anesthesia till peritoneal entry and time from peritoneal entry till cord clamping of the studied groups

	Group (A) (n=30)	**Group (B) (n=30)**	**P value #**
Pre-Hb (g/dl)	10.8 ± 0.9	11.1 ± 0.93	0.135
Post-Hb (g/dl)	9.8 ± 1.08	9.6 ± 1.08	0.477
P value ##	**<0.001***	**<0.001***	
Pre-HCT (%)	32.49 ± 2.46	33.63 ± 2.30	0.068
Post-HCT (%)	29.4 ± 3.42	29 ± 3.24	0.723
P value ##	**0.001***	**<0.001***	
Time from induction of anesthesia till peritoneal entry (min)	17.3 ± 6.84	9.4 ± 3.77	**<0.001***
Time from peritoneal entry till cord clamping (min)	41.4 ± 18.19	10 ± 2.86	**<0.001***

Data are presented as mean ± SD. *: significant as P value ≤ 0.05, #: P value between group (A) and group (B), ##: P value between pre and post in the same group, Hb: hemoglobin, HCT: hematocrit.

Operative time, skin incision, uterine incision, technique, and plasma transfusion were insignificantly different between both groups. Blood loss and blood transfusion were significantly lower in group (A) compared to group (B) (P<0.05).

Table 3

Table 3: Operative data of the studied groups

		Group (A) (n=30)	**Group (B) (n=30)**	**P**
Operative time (min)		207.6 ± 57.88	184.7 ± 84.72	0.226
Skin incision	**Pfannenstiel**	4 (13.33%)	4 (13.33%)	1
	Midline	26 (86.67%)	26 (86.67%)	
Uterine incision	**Transverse**	14 (46.67%)	13 (43.33%)	0.795
	Vertical	16 (53.33%)	17 (56.67%)	
Blood loss (ml)		2226.67±1268.7	2846.67±885.8	**0.032***
Technique	**Conservative**	12 (40%)	13 (43.33%)	0.793
	Hysterectomy	18 (60%)	17 (56.67%)	

Blood transfusion	0-9	1-8	**0.028***
Plasma transfusion	0.5 (0 – 2)	2 (0.25 – 3)	0.184

Data are presented as mean ± SD or median (IQR) or frequency (%). *: significant as P value ≤ 0.05.

Regarding maternal outcome, Bladder injuries were significantly lower in group (A) than group (B) (P =0.041). Hospital stay and ICU admission were insignificantly different between both groups. In both groups, there were no cases of maternal mortalities. Regarding fetal outcome, estimated fetal weight, APGAR at 1 min, APGAR at 5 min, NICU and neonatal respiratory support were insignificantly different between both groups. NICU admission and neonatal respiratory support were insignificantly different (P<0.05). No neonatal mortality in both groups.

Table 4: Maternal and fetal outcome of the studied groups

	Group (A) (n=30)	**Group (B) (n=30)**	**P**
Hospital stays (days)	3.9 ± 3.85	5.2 ± 5.57	0.285
ICU admission	1 (3.33%)	2 (6.67%)	1
Bladder injury	2 (6.67%)	9 (30.0%)	**0.041***
Estimated fetal weight (g)	2944.9 ± 264.8	2904.1 ± 193.96	0.499
APGAR at 1 min	5.4 ± 1.43	5.7 ± 1.57	0.394
APGAR at 5 min	8.5 ± 1.22	8.7 ± 0.98	0.356
NICU	0.3 ± 0.83	0 ± 0.18	0.137
Neonatal respiratory support	0.2 ± 0.73	0 ± 0.18	0.150

Data are presented as mean ± SD or frequency (%). *: significant as P value ≤ 0.05. ICU: intensive care unit, APGAR: appearance, pulse, grimace, activity, and respiration, NICU: neonatal intensive care unit.

7. DISCUSSION

PAS are terms used to describe the spectrum of placentation pathology that occurs when villous tissue is abnormally attached to the underlying myometrium [1].

In the present study, preoperative and postoperative Hb and HCT were insignificantly different between both groups. Preoperative Hb and HCT were significantly higher than postoperative Hb and HCT in both groups (A) and (B). Our results came in line with a previous study by Hussein et al. [16] observed that pre-operative hemoglobin (g/ dl) was significantly higher than post-operative (10.8± 0.8 vs. 9.9± 0.5). In the same context, Am Ahmed and Khodry [17] reported that preoperative Hb was higher than post-operative Hb in both groups.

In the present study, the time from induction of anesthesia to peritoneal entry and time from peritoneal entry to cord clamping were significantly higher in group (A) than group (B). Regarding patients in group (A), devascularization of most of vessels through the proper surgical plans allowed us to minimize the intraoperative blood loss and carefully dissect the bladder, thus improving the maternal outcome. Our results revealed that operative time, skin incision, uterine incision, technique, and plasma transfusion were insignificantly different between both groups. Our results are in disagreement with Am Ahmed and Khodry [17] stated that ureteric injury was significantly higher in the historical group than modified triple P group.

According to our results, blood loss and blood transfusion were significantly lower in group (A) compared to group (B). Our results are comparable to Hussein et al. [16] reported that estimated blood loss (ml) was 1673±958 in which early fetal extraction before bladder dissection was done. Also, Am Ahmed and Khodry [17] reported that the estimated blood loss and units of backed RBCs transfusion were significantly lower in modified triple P group compared to the historical group. Varlas et al. [18] reported that 4 (33.3%) of cases reported >2500 ml loss of blood.

According to our results, bladder injury was significantly lower in group (A) than group (B) (P value =0.041). In group (A): only 2 cases (6.67%) had domal bladder injuries about 4 cm, urethral catheters for 14 days were needed ,2 patients were discharged when the ascending cystography was done, and no leakage was confirmed. In group (B):9 cases of bladder injuries (30%) occurred after fetal extraction bleeding started so bladder dissection was more difficult resulting in more bladder injuries including the dome and posterior bladder wall that was sometimes removed with the hysterectomy specimen that led to increase morbidity and more difficult suturing. Also, Zhong et al. [19] documented that PAS patients undergoing planned

deliveries, required fewer units of transfused blood, experienced shorter hospital stay durations, and presented reduced risks for maternal ICU admission and severe maternal morbidity.

Our results revealed that, the mean hospital stay in group A was 3.9 ± 3.85 and, 5.2 ± 5.57 in group B. ICU admission was for 1 (3.33%) vs.2 (6.67%) in group A and B respectively. Hospital stay and ICU admission were insignificantly different between both groups. In both groups no cases of maternal mortalities. Also, Bluth et al. [20] stated that 6 (13%) of PAS cases required admission to ICU with 6 (4-8) days duration. However, Am Ahmed and Khodry [17] reported that hospital stay was significantly lower in modified triple P group compared to historical group. Different techniques may be the reason for this difference.

In agreement with our results about fetal outcomes, Zhong et al. [19] study, neonates born to mothers undergoing planned deliveries had higher birth weights and lower NICU admission risk. A higher rate of admission to NICU was estimated by Bluth et al. [20] as they documented that 19 (41%) of neonates required admission to NICU.

The study's limitations included the fact that the sample size was relatively small. It was a single-center study, and the results may differ elsewhere. In group (B) the surgeries were done by different surgeons.

8. CONCLUSIONS

The late fetal extraction technique was superior to early fetal extraction in cases diagnosed with PAS as it showed lower blood loss, blood transfusion and lower bladder injury without affecting neonatal outcome.

9. STATEMENT AND DECLARATION

Authors' contribution: All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [M. A.T.], [A. A.], [A. M.], [I. F. I. F], [Y. M.] and [A. Y. E.]. The first draft of the manuscript was written by [A. Al.] and all authors commented on previous versions of the manuscript. All authors read and approved of the final manuscript.

Data availability: Data is available upon resonable request from corresponding auther.

Consent to participate: An informed written consent was obtained from the patients.

Consent to publication: Not applicable.

Ethics approval: The research was carried out in the Department of Obstetrics and Gynecology, Faculty of Medicine, University of Cairo, Egypt, from July 2021 to January 2023.

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Conflict of Interest: Nil

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