VIA MEDICA

ORIGINAL PAPER / OBSTETRICS

Ginekologia Polska
2023, vol. 94, no. 7, 532–538

ISSN 0017–0011, e-ISSN 2543–6767

DOI 10.5603/GP.a2023.0050

Placenta accreta spectrum surgery with the Joel Cohen incision for abdominal access: a single-center experience

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ABSTRACT

Objectives: Placenta accreta spectrum (PAS) is usually treated by hysterectomy performed through a midline incision. We hypothesize that PAS surgery can be performed through a Joel-Cohen incision with adequate sight and safety.

Material and methods: The data on women having a hysterectomy due to PAS between 2013–2021 was collected retrospectively. Operation length, baby's pre-delivery general anesthesia exposure time, transfusion rates, complication rates, postoperative admission to the intensive care unit (ICU), postoperative hospital stay, and neonatal outcomes were collected. In addition, the data investigated whether the operation was performed under emergent conditions and in the early (2013–2016) or late (2017–2021) years.

Results: 161 patients met the inclusion criteria. The median gestational age at delivery was 34 weeks (27–39). The mean operation length was 150 minutes (75–420), and the anesthesia–to–delivery interval was 32 minutes (5–95). Twenty-three (14%) patients did not receive any blood product, 73 (45%) received less than three packs of erythrocyte, and only seven (4%) had a massive transfusion. Bladder injuries occurred in 24 (15%). Preoperative anemia, hypogastric artery ligation, transfusion, ICU admission, and maternal and neonatal complications were more frequent in emergent cases. Comparison between the early and late groups showed a decrease in the rate of anemia, maternal ICU admission, hypogastric artery ligation, and neonatal complications. In addition, infectious complications were relatively rare in all groups.

Conclusions: The Joel-Cohen incision and bladder dissection before the baby's delivery reduce transfusion rates and avoid midline incision, which is prone to complications and unpleasant cosmetic appearance while performing a hysterectomy for PAS surgery.

Key words: cesarean section; hysterectomy; placenta accreta; postpartum hemorrhage

Ginekologia Polska 2023; 94, 7: 532–538

INTRODUCTION

Low abdominal transverse or midline incisions are commonly preferred in pelvic surgery. The midline incision provides more prominent sight, less bleeding, faster entry, and allows cranial extension. It is usually preferred for oncological or emergency cases. However, midline incision makes infection and wound breakdown more frequent [1–5]. In obstetric patients, the primary way for accessing the abdominal cavity is a low abdominal transverse incision. There are some nuances between them. H.J. Pfannenstiel defined the first low abdominal transverse incision in 1900. It is made 2–3 cm above the pubic symphysis. Its upward lateral extensions end 2–3 cm to the anterior superior iliac spine. It is frequently used in cesarean sections and benign gynecological operations. Maylard (defined in 1907) and Cherney (defined in 1940) have similar skin incisions, but additionally, the rectus muscle is transected. These two incisions provide a more extensive view than the Pfannenstiel incision. Joel-Cohen incision was defined in 1972 [6]. It is a straight incision between the two anterior superior iliac spines. When the incision reaches the fascia level, the rest

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Received: 7.01.2023 Accepted: 19.04.2023 Early publication date: 30.05.2023

is opened by pulling the lateral edges. Major branches of epigastric vessels are away from the surgical field.

Many studies compare Pfannenstiel and Joel-Cohen or median and low transverse incisions in cesarean sections [7–14]. While these publications are unsuitable for a meta-analysis, the Joel-Cohen incision provides faster entry, less hemorrhage, less febrile morbidity, fewer adhesions, and fewer analgesic requirements than the Pfannenstiel incision [15]. The placenta accreta spectrum (PAS) defines an abnormally developed interface between the placenta and uterus. Current data indicates an incidence of 3 in 1000 [16], and as a consequence of the worldwide cesarean outbreak, it continues to increase. PAS poses a real challenge to the mother and newborn well-being, the surgical team, and hospital charges. The complications affecting the mother and newborn in PAS surgery are related to vascular connections between the uterus, placenta, and bladder, excess bleeding, and prolonged operative times. Many experts propose performing midline incisions to obtain a good view of the surgical field for managing these difficulties. However, we hypothesize that the Joel-Cohen incision is a suitable way for performing a hysterectomy in PAS surgery.

MATERIAL AND METHODS

This retrospective study subjects surgical and neonatal outcomes of the patients who had a prenatal diagnosis of PAS with placenta previa between 2013–2021, operated through a Joel-Cohen incision. All patients had a peripartum hysterectomy, and the histopathological analysis confirmed the prenatal sonographic diagnosis. Histopathological confirmation of all cases revealed placenta increta or percreta. Magnetic resonance was not utilized in any circumstances. Patients included in the study had placenta previa with PAS. Subjects of PAS without placenta previa and having only placenta accreta were excluded because our research aims to investigate the usefulness of the low transverse incision in cases requiring extensive bladder dissection. In patients with superficial placental invasion, the placenta was removed, and intrauterine hemostatic sutures were used to control bleeding. If the bleeding ceases, the uterus is preserved, and these patients are excluded. Pre-viable pregnancies and fetuses with congenital malformations were also excluded. Our institution does not have the capability of intra-operative embolization.

Demographic, surgical, and neonatal outcomes were collected from the digital recording system of the high-risk pregnancy unit. All cases were managed by an expert obstetric anesthesiologist (HU). The delivery time in the non-emergent situation was determined by counseling with the neonatology department. PAS surgery was usually scheduled at 34 weeks of gestation in our institution. We do not use glucocorticoids routinely after 34 weeks of pregnancy. Massive transfusion is defined as having ten units of erythrocyte suspension within 24 hours of surgery. The anemia threshold in the third trimester is 10.5 or 11 g/dL, depending on the source [17]. The institutional review board at the School of Medicine at Cukurova University approved this study (# 29/118/2022).

Many parameters influence the decision to perform a hysterectomy: desire for future fertility, wish to preserve the uterus, pre-operative and intra-operative appearance of the invasion, pre-operative hemoglobin level, the number of pre-operatively reserved pack of erythrocyte suspension, condition of surgery (emergent or scheduled) and the hemodynamic conditions of the woman during operation. If the pre-operative evaluation revealed hysterectomy, any attempt for placental removal was made. However, the final decision was made during the surgery if the pre-operative evaluation did not impose an immediate hysterectomy. The experienced primary surgeons (SB, MS, CE, and CD) in complicated obstetric operations managed pre-, intra-, and post-operative courses. In addition, two residents in the obstetrics and two nurses (one is circulating) participated in the surgery.

One gram of cefazolin sodium was given intravenously 30–60 minutes before the skin incision. The patients were in a supine position. General anesthesia was induced with propofol or thiopental and maintained with sevoflurane or desflurane in a mixture of nitrous oxide and oxygen. The neuromuscular blockade was obtained and maintained by injection of rocuronium bromide. Following the peritoneal entry via Joel-Cohen incision, the bladder was inflated with 150–200 mL of sterile saline solution. We did not add any dye because the dye may impede the dissection plans in case of bladder injury. The fibrovascular connections are ligated or coagulated with electrocautery according to their size. The bladder flap was prepared before the uterine incision to distinguish all sized vessels before their collapse. If uncontrollable bleeding occurred, the preparation of the bladder flap was abandoned. Otherwise, the uterine incision was made after the bladder dissection from the lower uterine segment.

The upper pole of the placenta was determined by either prenatal sonography reports or the visualization of the highly vascularized invasion of the trophoblastic tissue. The upper edge of the abdominal incision was pulled cranially by the first assistant to identify a non-invaded area. Then a vertical uterine incision was made away from the placenta. This incision was enlarged bluntly in the cranial direction. A caudal extension of the uterine incision may harm the placenta. To protect vessels running on the lateral side of the womb, we do not propose a transverse uterine incision to the uterine corpus. Following the delivery of the fetus, the uterus was exteriorized from the Joel-Cohen incision.

The edges of the uterine incision were grasped circularly with ovarian forceps. This move has two benefits: it quickly stops the bleeding and helps to manipulate the uterus. Simultaneously, the umbilical cord was milked towards the newborn for 20 seconds. Five IU of oxytocin was given intravenously, and 10 IU of oxytocin was infused. Opioids were given after the delivery of the baby. At this stage, the surgeon decides to remove the placenta or perform a hysterectomy. All cases in this cohort had hysterectomies without any attempt to remove the placenta. An automatic abdominal retractor was not used. Instead, we positioned one bladder retractor constantly at the lower edge of the incision. Depending on the stage of surgery, one or two lateral retractors were used. If the bladder dissection were not terminated yet, cranial traction of the uterus would help to perform it. When the bladder flap was free from the anterior uterine wall, the saline in the bladder would be evacuated. After the preparation of the bladder flap, the hysterectomy was performed quickly. A second dose of 1 g cefazolin sodium was given at the end of the operation. Massive blood transfusion, inadequate respiratory effort, or unstable hemodynamics were the indications of admission to the intensive care unit. If the patient would not be transferred to the intensive care unit, oral intake of fluids and mobilization was allowed 6–8 hours after surgery. After the first day of surgery, only painkillers were given according to her request. Parenteral fluids and antibiotics were not passed from the following day of the operation. They were allowed to feed normally and encouraged to walk. Anti-coagulants were considered if the patients could not mobilize or had to stay in the intensive care unit. The patients were discharged when they could mobilize without assistance, tolerate complete oral nutrition, and feel recovered.

The normality of data is checked with the Kolmogorov-Smirnov test. Mann–Whitney U-test or Fisher's exact test was used to compare data between groups. For all statistical tests $p < 0.05$ was accepted as significant. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) 17.0 for Windows.

RESULTS

During the study interval, 546 women have diagnosed and treated for PAS ± placenta previa. 161 women had hysterectomies due to PAS disorders and met the inclusion criteria (Fig. 1). All hysterectomies were performed by following the surgical steps stated above. The demographic features of patients are depicted in Table 1. Twenty-six operated in emergency conditions, and the remaining had a scheduled operation. Indications for emergency surgery were sudden massive hemorrhage, continuous attacks of bleeding with uterine contractions, and non-reassuring fetal status. The data comparing the emergent and scheduled surgeries are presented in Table 2. In 21 patients, the surgery is performed at < 34th week of gestation. The remaining five had a cesarean hysterectomy at ≥ 34th week in emergent conditions. All these patients had late admission. In addition, we created two episodes to see the development of the technique. Table 3 compares the early (2013–2016) and late (2017–2021) groups. Any maternal and neonatal mortality occurred in our cohort.

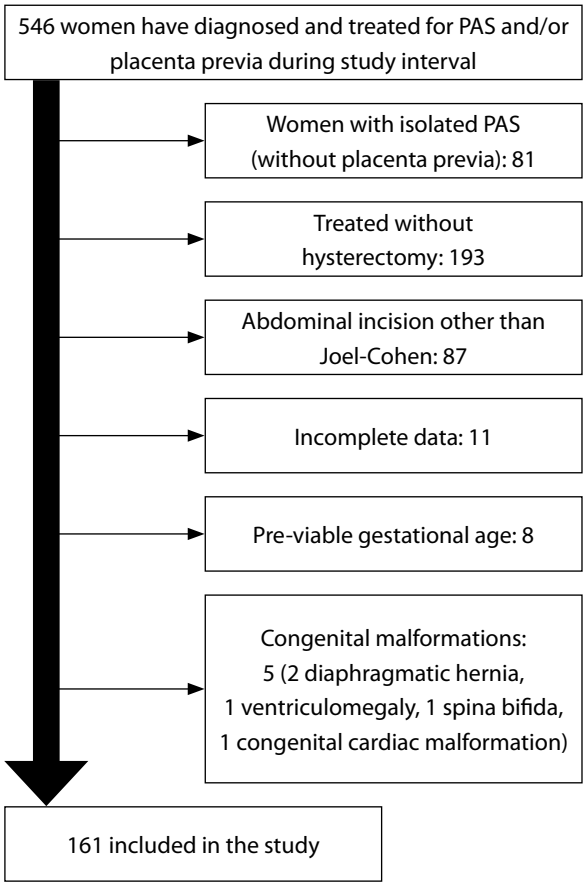

Figure 1. Flowchart demonstrating the patients' recruitment; PAS — placenta accreta spectrum

DISCUSSION

Many complications may occur during PAS surgery, including bleeding and related problems, adjacent tissue damage, prolonged exposure to anesthesia of newborns, wound complications, and psychiatric consequences of surgery. The last two are not readily considered during the pre-operative arrangements. Many surgeons prefer the midline incision because it is supposed that the midline incision is the only one that provides enough exposition [18]. Consequently, it is assumed as the best way to control bleeding, prevent tissue damage, and reduce delivery time. However, midline incisions are more prone to surgical site infection, wound breakdown, and bed cosmetic appearance

Table 1. Demographic features	
Maternal age [years] (median, min–max)	33 (19–45)
BMI [kg/m^2] (median, min–max)	28.5 (22.4–37.1)
Previous cesarean (n) (median, min–max)	2 (1–5)
Interval from the last cesarean [years] (median, min–max)	4 (1–14)
Pre-operative hemoglobin < 10.5 g/dL (n, %)	47 (29.2)
Pre-operative hemoglobin < 11 g/dL (n, %)	73 (45.3)
Gestational age at delivery [weeks] (median, min–max)	34 (27–39)
Total operation length [min] (median, min–max)	150 (75–420)
Anesthesia-delivery interval [min] [median, min–max]	32 (5–95)
Hypogastric artery ligation (n, %)	46 (28.6)
Cases without transfusion (n, %)	23 (14.3)
Erythrocyte transfusion < 3 packs (n, %)	73 (45.3)
Erythrocyte transfusion ≥ 5 packs (n, %)	46 (28.6)
Massive transfusion (n, %)	7 (4.3)
ICU admission (n, %)	14 (8.7)
Complications (n, %)	38 (23.6)
Non-complicated bladder injury	24 (14.9)
Ureter injury	3 (1.9)
Re-laparotomy due to bleeding	8 (4.9)
Surgical site infection	3 (1.9)
Post-operative hospital stay [day] (median, min-max)	3 (2–28)
Neonatal outcomes	
APGAR < 7 at 5th minute (n, %)	25 (15.5)
Lactate level < 2.5 mmol/L at 1 hour (n, %)	10 (6.2)

BMI — body mass index; ICU — Intensive Care Unit

[1–5]. A comparison of midline and low abdominal transverse incisions was made for the endometrial and cervical cancer surgery [1–5, 19–22]. They found similar performance on lymph node dissection with better wound healing. We believe the difficulty in PAS surgery may not be comparable to cancer surgery; consideration of fetal well-being, protection of highly vascularized pelvic vessels, and dissection of irregularly disseminated vessels make it more complicated. We found very little information about the low abdominal incisions in PAS surgery. Collins et al. [23] have reviewed the literature for creating an evidence-based guideline. They held the abdominal incision type issue and stated that there is no sufficient data to propose one. Ghaleb et al. [24] published a series of 62 cases operated via a "wide Pfannenstiel" incision. They could control bleeding and preserve the uterus in 80%. However, they focused on their technic of hemostasis, not the abdominal incision. Recently Soyer-Caliskan et al. [25] compared low abdominal transverse incision to midline incision in PAS surgery. However, their data lacks the neonatal outcomes, outcomes in emergency conditions, and some cases did not have hysterectomies. In these few publications, infectious morbidity in PAS surgery was not taken into consideration. Our study shows that Joel-Cohen incision gives at least the same opportunities with possibly better-wound healing.

The main problem in PAS surgery is abundant bleeding. The source of hemorrhage is various: utero-vesical interface, edge of uterine incision, uterine atony, partial placental separation, and transected pedicles like utero-ovarian ligament, the stump of the uterine artery, etc. The prevention and treatment of abnormal bleeding requires good sight and strategy. We are proposing a preventive move for all these steps; dissection of the bladder before the uterine incision, vertical uterine incision without harming the placenta and great vessels running on both sides, holding the edges of the uterine incision with ovarian forceps, use of uterotonics, and delivery of the uterus from the abdomen. After these steps, the surgeon can collapse the vessels running in the cardinal or sacrouterine ligament, draw away the ureters from the uterus and help with dissection by the reverse pull of the uterus from the ovarian forceps.

Another typical complication in PAS surgery is bladder injury. The overall incidence of bladder injury occurred at 15%, and the majority were in the early group. During the dissection of the bladder, we inflated it with saline solution. All these injuries were diagnosed intraoperatively and repaired by the primary surgeon. Urology consultation is reserved for ureteral injuries. Recently Turan et al. [16] have proposed an intelligent technic to minimize the bleeding from the dissection area of the bladder flap and uterine incision. They used a small hand-held vessel sealing system for bladder dissection and a linear cutter for uterine edges [16]. Due to economic reasons, we did not use such technology. However, we were able to complete the preparation of the bladder flap with an acceptable transfusion and bladder injury rate.

Blood loss determination is usually over or under-estimated [26, 27]. Due to the study's retrospective nature, we could not precisely calculate the estimated blood loss. Instead of this, we evaluated the amount of transfused erythrocyte suspension. Nearly half received less than three packs of red cells, and only 5% had a massive transfusion. Wright et al. [28] stated that only 44% of women had < 5 units of packed red cells. We agree that comparing the data of different studies is not always suitable. Moreover, many factors contribute to transfusion rates, including the presence of a multidisciplinary experienced team, emergency or planned surgery, preoperative hemoglobin level, presence of predetermined transfusion policy, presence of auto-transfusion or cell-saver, presence of intraoperative complications, and degree of placental invasion. Still, at least

Table 2. Characteristics of procedures

	Emergent (n = 26)	Scheduled (n = 135)	p value
Maternal age [years] (median, min–max)	31.5 (19–39)	33 (19–45)	NS
BMI [kg/m^2] (median, min–max)	29.4 (26.7–34.2)	28.4 (22.4–37.1)	NS
Previous cesarean (n) (median, min–max)	2 (1–5)	2 (1–5)	NS
Interval from the last cesarean [years] (median, min–max)	4 (1–9)	5 (1–14)	NS
Pre-operative hemoglobin < 10.5 g/dL (n, %)	17 (65.4)	37 (27.4)	< 0.05
Pre-operative hemoglobin < 11 g/dL (n, %)	21 (80.8)	59 (43.7)	< 0.05
Gestational age at delivery [weeks] (median, min–max)	32.5 (27–38)	35 (34–39)	< 0.05
Total operation length [min] (median, min–max)	180 (90–310)	140 (75–420)	< 0.05
Anesthesia-to-delivery interval [min] (median, min–max)	31.5 (10–95)	32 (5–80)	NS
Hypogastric artery ligation (n, %)	12 (46.2)	34 (25.2)	< 0.05
Cases without transfusion (n, %)	2 (7.7)	21 (15.5)	< 0.05
Erythrocyte transfusion < 3 packs (n, %)	6 (23.1)	67 (49.6)	< 0.05
Erythrocyte transfusion ≥ 5 packs (n, %)	12 (46.1)	34 (25.2)	< 0.05
Massive transfusion (n, %)	3 (11.5)	4 (3)	< 0.05
ICU admission (n, %)	6 (23.1)	8 (5.9)	< 0.05
Complications (n, %)	11 (42.3)	34 (25.2)	< 0.05
Non-complicated bladder injury	5 (19.2)	19 (14.7)	NS
Ureter injury	– (0)	3 (2.2)	NS
Re-laparotomy due to bleeding	3 (11.5)	5 (3.7)	< 0.05
Surgical site infection	1 (3.8)	2 (1.5)	NS
Post-operative hospital stay [day] (median, min–max)	4 (2–14)	3 (2–28)	NS
Neonatal outcomes			
APGAR < 7 at 5th minute (n, %)	8 (30.8)	17 (12.6)	< 0.05
Lactate in level < 2,5 mmol/L at 1 hour (n, %)	3 (11.5)	7 (5.2)	< 0.05

NS — not significant; BMI — body mass index; ICU — Intensive Care Unit

our data demonstrate that the PAS surgery performed with Joel-Cohen incision has comparable transfusion rates with previous reports. The transfusion rate in emergent cases may be attributed to the high incidence of anemia in this group and the unplanned nature of the surgery.

Postponing the baby's delivery following the bladder flap preparation may make the surgeon anxious due to prolonged fetal exposure to general anesthesia. Data on pre-delivery anesthetic exposure comes from studies evaluating the effect of multiple cesareans, non-reassuring cardiotocography, and type of anesthesia [29–34]. The median time interval of anesthesia induction-to-delivery is 32 minutes in our cohort, whether the operation is emergent or scheduled (31.5 and 32 minutes, respectively). While this is more prolonged than the data presented in the literature, some discrepancies impede comparing it. The infants in our cohort are premature but usually have category one cardiotocography tracing. Most of the low Apgar scores and high lactic acid levels are in the emergent group. To our knowledge, this is the first data concerning neonatal status after prolonged exposure to general anesthesia in PAS surgery.

We also observed a progression in neonatal outcomes and maternal admission to the intensive care unit between the early and late groups. It may be attributed to development in our surgical setting gained by experience. However, the low incidence of anemia in the late group may also contribute.

This study has several strengths. First, our data shows that PAS surgery could be successfully performed using a Joel-Cohen incision. The outcomes of this incision are comparable with the surgery performed through a midline incision. Second, our technic could be achieved with simple instruments available in all resource settings. Third, the learning interval is unnecessary for low abdominal transverse incisions because the obstetricians are familiar with performing cesareans and even hysterectomies in urgent conditions from low abdominal transverse incisions. The retrospective nature and lack of a control group with midline incision are the limitations of our data.

Table 3. Comparison of early and late group

	2013–2016 (n = 83)	2017–2021 (n = 78)	p value
Maternal age [years] (median, min–max)	34 (19–45)	33 (19–42)	NS
BMI [kg/m^2] (median, min–max)	29.4 (22.4–37.1)	28.1 (24.6–32.8)	NS
Previous cesarean (n) (median, min–max)	2 (1–5)	2 (1–5)	NS
Interval from the last cesarean [years] (median, min–max)	4 (1–12)	5 (1–14)	NS
Pre-operative hemoglobin < 10,5 g/dL (n, %)	28 (33.7)	19 (24.4)	< 0.05
Pre-operative hemoglobin < 11 g/dL (n, %)	42 (50.6)	31 (39.7)	< 0.05
Gestational age at delivery [weeks] (median, min–max)	34 (27–39)	34 (28–38)	NS
Total operation length [min] (median, min–max)	130 (75–420)	165 (90–270)	NS
Anesthesia-to-delivery interval [min] (median, min–max)	28 (5–95)	36 (11–75)	NS
Hypogastric artery ligation (n, %)	35 (42.2)	11 (14.1)	< 0.05
Cases without transfusion (n, %)	13 (15.6)	10 (12.8)	NS
Erythrocyte transfusion < 3 packs (n, %)	40 (48.2)	33 (42.3)	NS
Erythrocyte transfusion ≥ 5 packs (n, %)	27 (32.5)	19 (24.4)	NS
Massive transfusion (n, %)	6 (7.2)	1 (1.3)	NS
ICU admission (n, %)	11 (13.3)	3 (3.8)	< 0.05
Complications (n, %)	24 (28.9)	14 (17.9)	< 0.05
Non-complicated bladder injury	17 (20.5)	7 (9)	< 0.05
Ureter injury	2 (2.4)	1 (1.3)	NS
Re-laparotomy due to bleeding	6 (7.2)	2 (2.6)	< 0.05
Surgical site infection	3 (3.6)	–	NS
Post-operative hospital stay [day] (median, min–max)	3 (2–28)	3 (2–14)	NS
Neonatal outcomes			
APGAR < 7 at 5th minute (n, %)	18 (21.7)	7 (9)	< 0.05
Lactate in level < 2,5 mmol/L at 1 hour (n, %)	7 (8.4)	3 (3.8)	< 0.05

NS — not significant; BMI — body mass index; ICU — Intensive Care Unit

CONCLUSIONS

In conclusion, we propose using the Joel-Cohen incision to avoid unnecessary midline incision, which is prone to complications and unpleasant cosmetic appearance, while performing a hysterectomy for PAS surgery, even in emergent conditions.

Article informations and declarations

Conflict of interest

Authors declare no conflict of interest.

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