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ONE STEP TOWARDS SAVING MOTHERHOOD IN PLACENTA ACCRETA SPECTRUM: AN INNOVATIVE SURGICAL APPROACH

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ABSTRACT

Background: Placenta accreta spectrum (PAS), or morbidly adherent placenta, is a pathologic adherence and excessive penetration of placenta into myometrium, including accreta, increta, or percreta, which continues to be challenging for obstetricians worldwide. We present an innovative conservative surgical technique in patients with PAS disorders that can significantly reduce maternal morbidity and mortality. **Methods:** Study was conducted at a tertiary care centre in Maharashtra, India, and included 53 cases of PAS. The technique uses a transverse skin incision and uterine incisions, followed by uterus repositioned anteriorly with placenta in situ, stepwise devascularization with B/L internal iliac artery ligation and B/L uterine artery ligation, reducing blood supply to uterus up to 80%. Placenta is allowed to separate spontaneously, or manual removal done. If needed, hemostatic sutures on placental bed or cervicoisthmic sutures taken. Uterus and abdomen then closed as usual. **Results:** Among 29,778 deliveries, 53 cases of PAS seen with incidence of 0.17% i.e., 1.7:1000 births, including 31 cases of accreta, 19 of increta, and 03 of percreta cases. The gestational age of termination of pregnancy was at 37 to 38 weeks, there was less estimated blood loss, fewer ICU admissions, no incidences of secondary PPH, DIC, bladder injury, or need for re-exploration or delayed hysterectomy, and no maternal mortality.**Conclusions:** We recommend this procedure as a novel technique and safe alternative to peripartum hysterectomy and other conservative surgical management procedures for PAS. This technique preserves uterus as well as reduces blood loss, transfusion requirement, and maternal morbidity and mortality while preserving fertility.

KEYWORDS: Placenta accreta, conservative surgery, stepwise devascularization.

INTRODUCTION

Placenta accreta spectrum (PAS), formerly known as morbidly adherent placenta, is pathologic adherence and excessive penetration of part or all of the placenta into the myometrium. This condition encompasses placenta accreta, increta, or percreta.[1] Accreta refers to abnormal attachment of placental villi to the myometrium without intervening decidua; increta when there is invasion of trophoblastic villi into the myometrium, and percreta when placental invasion reaches the uterine serosa with or without invasion into adjacent organs such as the bladder. The global incidence of Placenta Accreta Spectrum (PAS) is rapidly rising, closely following the increasing rate of cesarean deliveries. Current estimates suggest that PAS occurs in approximately 1 to 3 out of every 1,000 births. Given the concerning rise in cesarean section rates in our country, PAS is likely to contribute to maternal mortality in the future. Placenta previa, previous cesarean sections, uterine surgeries, multiparity, older maternal age, and in vitro fertilization are risk factors linked to the global rise in placental accreta spectrum (PAS).[2] Placenta Accreta Spectrum (PAS) is known to cause significant hemorrhage during delivery due to the placenta's inability to separate spontaneously. This often requires a caesarean hysterectomy to effectively control the severe bleeding. Intraoperative blood loss typically ranges from 2,000 to 5,000 ml, making blood transfusions a common necessity. In the most severe cases, PAS can result in maternal death, with a mortality rate that can reach 6–7%.[3,4] PAS disorders represent significant life-threatening concerns due to their elevated incidence rates, morbidity, and mortality, and these conditions are commonly referred to as the "obstetrician's nightmare.".[5]

The management of placental accreta spectrum (PAS) involves early prenatal screening and referrals to specialized tertiary centers equipped with experienced multidisciplinary teams. Obstetrical ultrasound, conducted during the second or third trimester, serves as

the primary method for screening and diagnosing PAS and remains the cornerstone of diagnosis. Additionally, with advancements in imaging technology that enhance visualization of pelvic organs and provide further insight into the uteroplacental relationship, magnetic resonance imaging (MRI) has been increasingly adopted as a valuable antenatal diagnostic tool.[6] There are still controversies regarding the benefits of MRI, particularly given its increased cost.

To avoid an emergency caesarean and to decrease the complications of prematurity, it is justifiable to schedule a caesarean at 34 to 35 weeks of gestation.[7] A multidisciplinary team approach and effective delivery within a resource-equipped center, particularly one capable of facilitating massive transfusions, are crucial for reducing neonatal and maternal morbidity and mortality. However, the optimal management of neonates immediately after delivery remains unclear due to the absence of randomized controlled trials and large cohort studies. While the Federation of International Societies of Gynaecologists and Obstetricians (FIGO) has released a consensus statement regarding the diagnosis and management of Placenta Accreta Spectrum (PAS), many of their recommendations seem to be far from reality in low and middle-income countries.[8]

The currently available treatment options for PAS include

a. Caesarean hysterectomy- According to International Federation of Gynaecology and Obstetrics (FIGO) guidelines, the primary surgical approach to prevent excessive hemorrhage related to PAS is to leave the placenta in situ and perform a primary peripartum hysterectomy.[8] A hysterectomy may not be the preferred option for patients who wish to preserve their fertility, as it can adversely affect various aspects of pelvic floor health, as well as bowel, bladder, and physical functions. Additionally, in certain cultures, the removal of a woman's uterus can diminish her societal status, potentially leading to a negative impact on her self-esteem.[8]
b. Conservative management leaving the placenta in situ.[9] Following the delivery of the baby, the entire placenta is retained in situ, and the uterus is closed while monitoring for autolysis of the placenta. However, the conservative approach has been associated with several postoperative complications, including severe postpartum hemorrhage, disseminated intravascular coagulation, and infections resistant to antimicrobial therapy. These complications may require a laparotomy and, in some cases, could lead to a hysterectomy in the future, necessitating an extended period of follow-up care.
c. Interventional radiology procedures - Recently, the utilization of intravascular balloon catheters and arterial embolization techniques has emerged as a novel invasive adjuvant therapy aimed at minimizing hemorrhage during caesarean hysterectomy. These methods are also being explored in conjunction with conservative management strategies, with the primary objective of averting the need for hysterectomy.[10] The key obstacles are limited availability, high costs, necessary expertise, and the lack of proven effectiveness, repeated hospitalization.

d. Uterine sparing surgery- By employing the one-step conservative surgery for treating invasive placenta, it is possible to preserve the uterus with minimal complications and decreased blood loss in nearly 80% of cases. This approach helps to avoid hysterectomy in 80% of instances of the placenta accreta spectrum. Additionally, the technique not only maintains uterine integrity but also lowers blood loss and the need for transfusions, thereby reducing maternal morbidity and mortality in cases of PAS.

In recent years, various modified conservative strategies have been employed to address placental accreta spectrum (PAS) disorders, achieving reductions in maternal morbidity and mortality. However, these methods remain limited, and PAS disorders continue to challenge obstetricians globally. In this study, we aimed to present a conservative surgical technique in patients with PAS disorders and to contribute to the literature with a new perspective.

MATERIALS AND METHODOLOGY

a. Study Design and Participants

This observational study was conducted at Dr Shankarrao Chavan Government Medical College, Nanded, Maharashtra, India, a leading tertiary care centre in the area. The study included 53 cases of Placenta Accreta Spectrum, which were diagnosed on ultrasonography and/or MRI, who were operated on using this innovative conservative surgical technique. The cases were classified into 3 groups- Accreta (grade 1), Increta (grade 2), and Percreta (grade 3) according to FIGO Clinical classification.[1] All 53 cases of PAS in a 3-year period from January 2022 to December 2024, who were delivered by caesarean section, were selected, and this surgical technique was applied.

The inclusion criteria of this study were as follows

i. Placenta Accreta Spectrum, which was diagnosed on transvaginal/transabdominal Doppler ultrasonography or MRI and was also confirmed intraoperatively.
ii. All cases had at least one previous caesarean section.
iii. In all cases, the uterus was conserved.

Ethical clearance was obtained from the hospital's Institutional Review Board and Ethics Committee. Consent from patients was obtained for photography and publication.

b. Details of Surgical Technique

All cases were delivered by a single surgeon who is trained and experienced with more than 18 years in surgery for PAS disorders.

An innovative surgical approach was tried for all these cases, which was done in the following steps :

- **PREOPERATIVE ASSESSMENT**

For antenatally diagnosed cases of PAS, surgery was usually preplanned when the patient completed term. According to our clinical protocol, patients with PAS in the third trimester were scheduled to undergo a cesarean delivery between 37 $^{0/7}$ and 38 $^{0/7}$ weeks of pregnancy. All patients and their relatives were informed about the condition and were hospitalized or stayed close to the healthcare facility as much as possible in the last trimester. All multidisciplinary team members were informed of the scheduled day to ensure the availability of staff and the operating room. An antenatal ultrasound was done to confirm placenta location, liquor, and baby weight. The patient was counseled on the surgical approach, associated risks, existing comorbidities, need for blood transfusions, written consent taken, and pre-anesthetic evaluation done.

- **INCISION**

Sites of both abdominal and uterine incisions need careful consideration when performing any caesarean section for suspected PAS cases. Most surgeons practice the longitudinal skin incision placed subumbilically, which is not only less cosmetically acceptable but also associated with more postoperative morbidity than a transverse scar. Hence, our approach involves a Pfannensteil incision placed at 2 finger widths above the pubic symphysis, or at the existing scar of previous LSCS, which offers the advantages of being cosmetically better, less painful, greater postoperative strength, and lesser future complications like incisional hernia. The abdomen is then opened in layers.

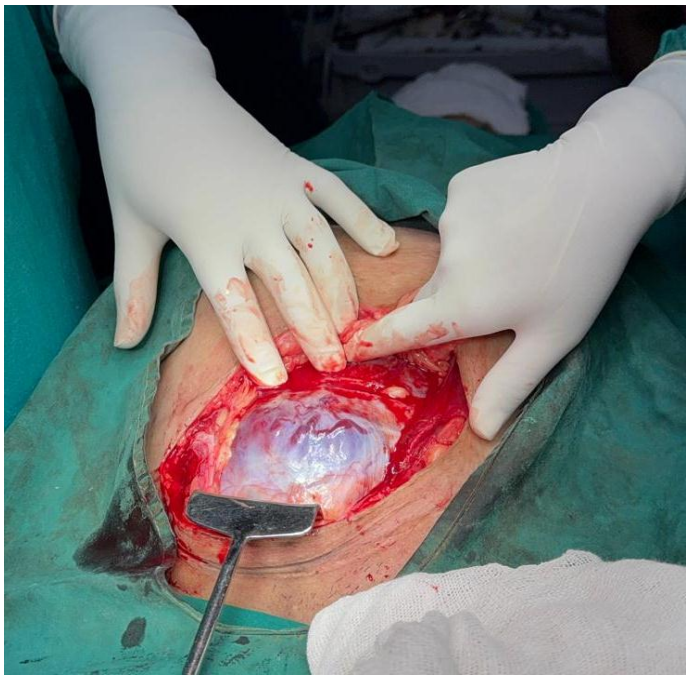

Fig 1: Evidence of anterior placenta accreta as seen intraoperatively.

- **UTERINE INCISION**

Most methods for caesarean section in suspected PAS cases advise a classical uterine incision on the upper segment or a fundal incision. These contribute to a greater loss of blood, increase the likelihood of uterine rupture in future pregnancies, and may obscure the degree of placental separation. Additionally, they can make it challenging to access the placental bed in cases of PAS with a low-lying placenta or placenta previa. Our approach advocates a lower-segment uterine incision. The uterine incision is created transversely, just above the upper border of the placenta, ensuring that the myometrium's natural thickness is preserved. When the border of the placenta extends higher, the incision is placed where the myometrial tissue is thicker, if possible. It offers several compelling advantages: it significantly reduces blood loss, promotes accelerated healing, decreases the risk of subsequent uterine rupture, lowers the incidence of adhesions, and enhances the preservation of uterine function.

- **DELIVERY OF BABY**

Once the uterus has been entered, delivery is conducted in the usual way but needs to be expeditious. The neonate was grasped and then delivered smoothly through the uterine incision. After delivery of the baby, the cord is clamped and cut, and the uterus is exteriorized with the placenta in situ. This improves visualization of the operative field and provides access to the posterior of the uterus and also the retroperitoneum.

- STEPWISE UTERINE DEVASCULARISATION

Stepwise uterine devascularisation is a surgical technique that helps to reduce the blood flow to the uterus. This involves.

i. Application of nontraumatic Kocher's Intestinal Clamps bilaterally at the level of the uterine artery, i.e., at the level of the isthmus.

This implies the same action as we get from bilateral uterine artery ligation, and we can proceed to the next step of devascularization within seconds.

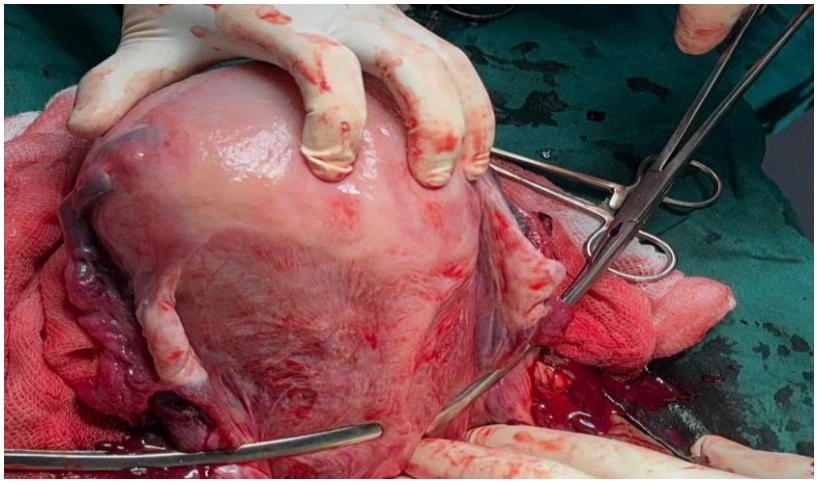

Fig 2: Application of nontraumatic Kocher's Intestinal Clamps.

ii. Bilateral internal iliac artery ligation

The uterus is re-positioned anteriorly, and the retro-uterine area is visualized. After identifying the ureter at the pelvic brim, the posterior peritoneum was opened. Incision was extended gently with finger dissection. Ureters identified. The ureter and peritoneal flap are retracted medially. Blunt dissection was done, and the common iliac artery was seen bifurcating into internal and external iliac arteries. The fascia around the internal iliac artery was dissected. Identification of the anterior and posterior branches of the internal iliac artery was done. Mixter was passed beneath the internal iliac artery from the lateral to medial side about 3-4 cm distal to its origin. With the help of vicryl no 1-0, two ligatures are usually planned around the anterior division of the internal iliac artery. Pulsation of the external iliac artery must be checked to confirm that the blood supply to this vessel has not been compromised. This controls bleeding by decreasing the pulse pressure to the uterus by as much as 85%. It is important that ILAL be performed bilaterally to adequately decrease the systolic pressure to the uterus. The bilateral ligation of the internal iliac arteries does not result in complete blockage of blood supply to the female pelvic organs, but contributes to a significant decrease in blood loss. To conclude, IIAL is useful in the treatment and prevention of postpartum haemorrhage from any cause.[11]

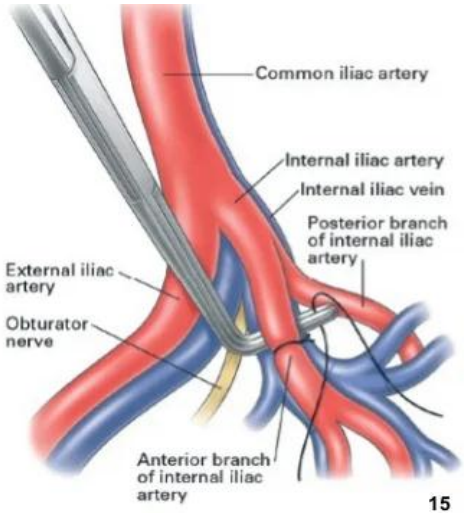

Figure 3: Diagrammatic representation of internal iliac artery ligation.

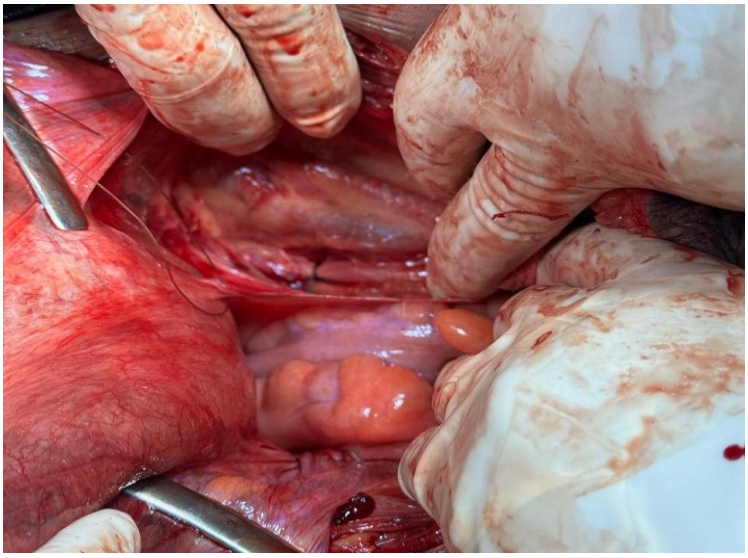

Fig 4: Anterior branch of the internal iliac artery ligated.

iii. Bilateral uterine artery ligation

The uterine arteries are then ligated after removing the non-traumatic Kocher's Intestinal Clamps and placing the O'Leary sutures bilaterally at the cervico-uterine isthmus to control any retrograde blood loss after internal iliac artery ligation.

- **DELIVERY OF PLACENTA**

The placenta might be low lying, or it may be attached to the previous scar. Uterotonic infusion started, and adequate time is to be given for spontaneous separation of the placenta. In cases of PAS, spontaneous separation of the placenta is not seen even after administering uterotonics, hence necessitating manual removal in most cases. We recommend a posterior rather than an anterior approach for manual removal of the placenta to reduce the risk of bleeding from the aberrant vessels present anteriorly. This has the added advantage of reducing the risk of bladder injury and helps in identifying any focally adherent area at the previous scar site.

In most cases, entire placental cotyledons are removed, leaving the placental beds with open sinuses due to anastomosis of placental vessels with branches of the descending cervical artery and vesical artery. If haemostasis is not achieved in the underlying placental bed and surrounding structures, multiple haemostatic sutures are directly placed to cease the bleeding from these sinuses. Haemostasis needs to be confirmed before starting uterine closure. In some cases of PAS where there is an inability to separate the placenta by manual removal, like in cases of placenta percreta, the bits of placenta are left in situ; A single dose of injection Methotrexate is given postoperatively.[12,13]

In some cases with persistent bleeding from the placental bed site, a cervico-isthmic stitch needs to be taken as shown below.

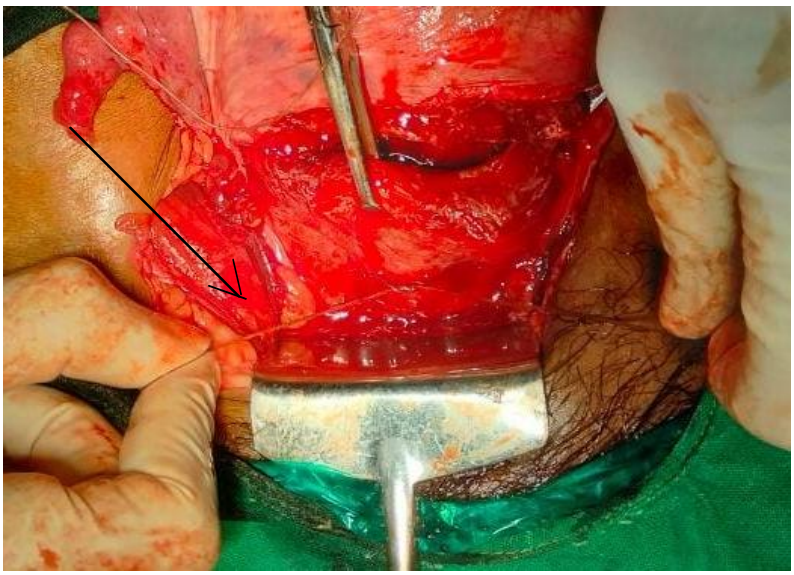

Fig 5: Cervico-isthmic stitch.

- **UTERINE CLOSURE**

Once hemostasis of the placental bed is confirmed uterus is closed in a double-layer fashion, starting the suturing from the left or right corner of the uterus, with continuous locked sutures, followed by the closure of the abdominal layer in layers.

- **POST-OPERATIVE CARE AND FOLLOW-UP**

The patient was given IV antibiotics for 5 days, and suture removal was done on day 7. In the post-op period, the patient was observed for any signs of sepsis, infection, or secondary PPH. A review USG was done before discharge to rule out any residual products of conception (RPOCs). The patient was counseled on contraception and permanent sterilization and was followed up for a period of 12 months.

c. Statistical Analysis

Maternal demographic data were noted preoperatively. Intraoperative data on placental location, estimated blood loss, units of blood transfusion required, and the surgical procedure carried out to control bleeding were retrieved. Post-operative ICU admission, fetal outcome, and maternal and fetal mortality were recorded.

Categorical variables were presented in numbers and percentages (%), and continuous variables were presented as mean (minimum and maximum). The data was entered in an MS Excel spreadsheet, and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. Table 1 illustrates the maternal characteristics and the risk factors for PAS.

Table 1: Maternal characteristics and risk factors for PAS (n=53).

Variable	Description
Maternal age in years at delivery (mean, minimum–maximum)	28 (24–36)
Gravidity (mean, minimum–maximum)	3 (2–5)
Parity (mean, minimum–maximum)	1 (1–3)
Number of previous CSs (n,%) 0 1 2 3 or more	 0 (0%) 24(47.1%) 22(41.5%) 7(13.2%)
Body mass index in kg/m^2 (n,%) <18.5 kg/m^2 18.5 – 24.9 kg/m^2 25–29.9 kg/m^2 >30 kg/m^2	 13(24.5%) 29(54.7%) 10(18.9%) 1(1.88%)
Mode of conception (n,%) Spontaneous Medical treatment	 49(92.5%) 4(7.5%)
Location of the placenta (n,%) Anterior Posterior	 48(90.5%) 5(9.4%)
Significant previous history (n, %) History of D&C[a] alone History of LSCS[b] and D&C	 2(3.7%) 10(18.8%)
Placenta praevia (n,%) Yes No	 37(69.8%) 16(30.1%)
[a]Dilatation and curettage [b]Lower segment CS.	

Table 2: Intraoperative surgical management of PAS (n=53).

	Variable	Description
Type of LSCS	Planned Emergency	38(71.6%) 15(28.3%)
Gestational age	>37 weeks 36 $^{0/7}$ to 37 $^{0/7}$ weeks 34 $^{0/7}$ to 35 $^{6/7}$ weeks	39(73.5%) 10(18.8%) 04(07%)
Skin incision	Pfannelstein Vertical	53(100%) 0
Uterine incision	Transverse Vertical	53(100%) 0

Ancillary measures used intraoperatively	Internal iliac artery ligation and bilateral uterine artery ligation	53(100%)
	Haemostatic sutures on placental bed	41(77.3%)
	Cervico-isthmic stitch	09(16.9%)
Removal of the placenta	Spontaneous	7(13%)
	Manual	46(86.8%)

Table 3: Relative characteristics of surgery.

Variable	Description (mean, minimum–maximum)
Pre-operative Hb (g/dl)	9.5(7-12)
Post-operative Hb (g/dl)	8(6-11)
Duration of surgery (minutes)	64(48-110)
Estimated blood loss/patient (L)	1200(900-2100)
Blood transfusion (units/patient)	2(1-4)
Blood transfused patients, n (%)	51 (96.2%)

Table 4: Post-operative morbidities.

Variable	Description (mean, minimum–maximum) or n (%)
Mean duration of hospital stay (days)	6 (5-13)
ICU admission	11(20.7%)
Bladder injury	0
Secondary PPH	0
DIC	0
Delayed hysterectomy/ Need for re-exploration	0
Surgical site infection	1 (1.8%)
Maternal mortality	0

RESULTS

Among 29,778 deliveries, there were 53 cases of PAS or morbidly adherent placenta with an incidence of 0.17%, i.e., 1.7:1000 births. These included 31 cases of accreta, 19 of increta, and 03 of percreta cases.

Table 1 depicts that all (53/53: 100%) had a history of previous LSCS, with 22 (41.5%) having had two LSCS and 7 (13.2%) having more than two. About 2 patients (3.7%) had a uterine dilatation and curettage (D&C) before, and 10(18.8%) had had both LSCS and D&C performed previously. The placenta was located anteriorly in 90.5% of cases, and about 70% of cases were associated with placenta previa along with PAS. According to table 2, the majority of the patients underwent planned LSCS (71.6%) while the others (28.3%) underwent emergency LSCS as they presented with chief complaint of bleeding/ spotting per vagina. The statistics support our suggested gestational age of termination of pregnancy at $37^{0/7}$ to $38^{0/7}$ weeks. All patients were operated on using Pfannenstiel incision, with ancillary measures used intraoperatively, like internal iliac artery ligation in all cases, and hemostatic sutures on the placental bed were needed in 41 cases, and additionally, cervico-isthmic sutures in 9 cases. Table 3 states that all cases were operated on using the above-mentioned surgical technique, with a mean duration of 64 minutes per surgery. The mean estimated blood loss was 1200 ml, with blood transfusion of a mean of 2 units per patient, required in about 96.2% of patients. The mean duration of hospital stay was 6 days, with ICU admission required in about 11 (20.7%) patients. 1 patient had a surgical site infection presenting as discharge from the suture site, which was managed conservatively with appropriate antibiotics as per the culture sensitivity report. There were no incidences of secondary PPH, DIC, bladder injury, or the need for re-exploration or delayed hysterectomy. There was no associated maternal mortality, as evident in Table 4.

In our follow-up with the most severe form of PAS, the majority of PAS patients (n = 47) resumed normal menstrual cycles within 12 months with normal menstrual fluid volume. As PAS is closely related to previous C-sections and parity, most of the patients have had two or more than two children, and they usually would not consider fertility issues.

DISCUSSION

Four different conservative surgical treatment methods and interventional radiological methods for PAS disorders are described in the FIGO guidelines.[14] However, when these methods are compared with our technique, it is seen that none of them is a completely conservative and practical method. All the availableoptions either carry major complications or require advanced facilities and higher cost of treatment. Peripartum hysterectomy has been associated with 7%

risk of ureteric injury and 15% bladder injury.[14] Uterus conserving approaches are limited. The Triple-P procedure involving Perioperative placental localization, Pelvic devascularization and Placental non-separation with myometrial excision and reconstruction has fewer bladder injuries and no ureteric injuries but was complicated by delayed primary haemorrhage due to myometrial excision.[14] Other conservative surgical techniques are time consuming and associated with higher operative risk.

In the current study, we described our simplified conservative surgery approach and presented the favourable outcomes of our surgical technique in patients with PAS disorders. We think that this technique will significantly reduce maternal morbidity and mortality while preserving fertility. This technique provides many benefits such as fertility preservation, lesser blood loss, shorter operating time, length of hospital stay, and recovery time. In our case series, we preserve the uterus in all patients with a low rate of maternal morbidity. Moreover, no maternal mortality was detected in our study.

Strengths and limitations

Our conservative surgical approach for placenta accreta spectrum disorder has a favorable surgical outcome, but it does depend on a full understanding of the pathophysiology of the placental condition and the steps required for optimal surgical correction of the myometrial deficiencies. The approach has the strength of conserving the uterus with adequate myometrium thickness, reducing the risks of gynecological and obstetrical complications later. The limitations relate to the need for a comprehensive multidisciplinary team with experience in addressing large blood loss, careful fluid management, and anesthetic input, a practice that may be difficult to achieve in a non-tertiary setting. In such a situation, a regional network could be beneficial. Our study is also a small consecutive series, but it can be extrapolated to benefit a large population of patients with PAS.

CONCLUSION

Placenta accreta is becoming an increasingly common complication of pregnancy. An era of advanced maternal intensive care encourages conservative rather than radical surgical procedures in PAS cases. We recommend this procedure as a novel technique and a robust and safe alternative to peripartum hysterectomy and other conservative surgical management procedures for cases of PAS. This technique preserves the uterus as well as reduces blood loss, and transfusion requirement, and thus maternal morbidity and mortality in PAS cases. The surgical method is reproducible and generalized; thus, many patients could benefit from the conservative surgery. However, we recommend that surgeons dealing with this surgery should receive practical training and develop their operative experience and surgical skills for utilizing this procedure.

Conflicts of Interest

The authors declare no conflicts of interest.

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