Conservative Management of Placenta Accreta Spectrum

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Abstract

The purpose of this review is to assist obstetricians-gynaecologists in considering the most appropriate conservative treatment option to manage women with placenta accreta spectrum according to their individual need and local expertise of the heath care team. The issue is challenging since the quality of evidence regarding efficacy is poor and is mainly based on retrospective studies with limited sample size.

Key words: placenta accreta spectrum; morbidly adherent placenta; abnormally invasive placenta; placenta percreta; conservative management; leaving placenta in situ

Introduction

Conservative management of placenta accreta is defined as all procedures or strategies aiming to avoid a peripartum hysterectomy and its related-morbidity and consequences. The main goals are to decrease severe maternal morbidity related to the placenta accreta spectrum, especially the amount of blood loss; and consequently the risk of massive transfusion and coagulopathy as well as operative injury and its potential consequences such as vesicouterine fistula. A second goal may be to attempt to preserve the option of future pregnancies, knowing that fertility is often inextricably linked with societal status and self-esteem. Four types of conservative management have been described; extirpative treatment [1], expectant management or the leaving placenta *in situ* [2], one-step conservative surgery [3] and the triple-P procedure [4]. For each of these procedures, there is only low quality evidence available derived from retrospective case series. .

The extirpative approach

The concept of this approach is simple; the aim is to avoid leaving retained placental tissue in the uterine cavity. Retained placenta is a common cause of postpartum hemorrhage and complete removal decreases the risk of bleeding [5-6]. Therefore, the procedure consists of manually removing the placenta to obtain an "empty" uterus. Unfortunately, in cases of placenta accreta spectrum (PAS), this procedure often results in massive hemorrhage. Kayem et al. performed a retrospective study comparing two consecutive epochs. In the first one, the extirpative approach was routinely applied for PAS whereas in the second one, the placenta was left *in situ*. Mean number of red blood cells (RBC) transfused (3,230 ± 2,170 mL versus 1,560 ± 1,646 mL; $p < .01$), disseminated intravascular coagulation (5 [38.5%] versus 1 [5.0%]; p=02), and hysterectomy rates (11 [84.6%] versus 3 [15%]; $p < .001$), were reduced using the placenta *in situ* approach [1]. Moreover, when a cesarean-hysterectomy for

suspicion of PAS has been planned, Eller et al. showed that early maternal morbidity was increased when placental removal was attempted compared with the placenta left undisturbed *in situ* (67% versus 36%; p = 0.04) [7]. Consequently, several authorities recommend that manual placental removal should be avoided in cases of planned cesarean-hysterectomy [8-11]. The downside of this approach is the potential for unnecessary hysterectomy if the patient does not really have PAS. In conclusion, extirpative approach with a forcible manual removal of the placenta should be abandoned unless there is a low probability of PAS [12]. Unfortunately, manual removal of the placenta usually happens in most cases with undiagnosed placenta accreta. In our opinion, women with strongly suspected PAS should never have attempted manual removal of the placenta. For women with risk factors for PAS or mild suspicion of PAS, caregivers should stop attempts to manually remove the placenta in cases of unusual and unexplained difficulties before the occurrence of massive hemorrhage.

Leaving placenta *in situ* without hysterectomy or expectant management

Short-and mid-term maternal outcome

This approach consists of leaving the placenta *in situ* and waiting for complete resorption. It was first described mainly in France [2] and initially was termed 'conservative treatment of placenta accreta'. As other conservative approaches have been since described, it is more accurate to use the term 'leaving the placenta *in situ without hysterectomy*' or 'expectant management' [13].

The goals of this approach are to avoid the morbidity associated with hysterectomy, preserve fertility and still avoid hemorrhage. Planned cesarean-hysterectomy while leaving the placenta *in situ* is considered the "gold standard" treatment for PAS [6-12] but is associated with high rates of severe maternal morbidity (40% to 50% [12]) and loss of fertility. Cesarean hysterectomy with placenta percreta is even more morbid, with reported mortality rates up to

7% [14]. By leaving the adherent placenta *in situ* after the delivery of the child, one can expect a significant decrease of blood flow within the uterus and even the parametrium. This also will occur within the placenta, and the placenta will progressively and spontaneously detach from the uterus and even adjacent organs by necrosis. It is analogous to cutting the foot of ivy that is incrusted into a stone wall, and waiting for its death before removing it in order to avoid weakening the wall. This approach is particularly attractive for severe PAS with adjacent organ invasion in order to avoid operative complications and injuries.

On the other hand, expectant management has important risks. These include intrauterine infection, placental abscess and even sepsis, as well as unpredictable massive hemorrhage. Moreover, it requires long-term monitoring until complete resorption of the placenta.

In practice, the exact position of the placenta is determined by a preoperative ultrasound. Before initiating cesarean delivery, all materials required for an immediate conversion to hysterectomy are readily available. Laparotomy is made by a midline vertical cutaneous incision, often enlarged above the umbilicus. The uterine approach uses a midline or "classical" incision at a distance from the placental bed. After delivery of the child, and only in cases wherein PAS is unlikely, the obstetrician carefully attempts to remove the placenta by controlled cord traction (see below); If the placenta does not easily separate form the uterus, it confirms the diagnosis of MAP. In this case, the cord is tied with suture, cut at the site of insertion and the uterine cavity is closed. Postoperative antibiotic therapy (amoxicillin and clavulanic acid) is usually administered prophylactically for 5 days to minimize the risk of infection, although efficacy is uncertain. Adjunctive procedures (embolization or vessel ligation, temporal internal iliac occlusion balloon, methotrexate, hysteroscopic resection of retained tissues) may be used to attempt to decrease morbidity or to hasten placental resorption. As with antibiotic treatment, none of these interventions is proven to improve outcomes.

In France, the first conservative treatment took place in 1993; the number of procedures increased steadily, particularly during the 2000's [4]. First, only very limited data about maternal outcome after conservative management were available. Moreover, they were from small case reports and case series from individual tertiary-care institutions [1, 12].
In 2007, Timmermans et al. reviewed available case series of placenta accreta managed by leaving the placenta *in situ* [15]. They found 48 case reports describing the outcome of 60 women as well as two French case series including 31 women, yielding available data on 91 cases. Of the 26 women managed conservatively while leaving the placenta *in situ* without the use of additional therapies, 22 (85%) had a favorable outcome. Expectant management failed in 4 (15%) of patients who required hysterectomy due to severe hemorrhage or infection [15].

In order to increase statistical power and satisfactory external validity, a French multicenter retrospective study was conducted to determine maternal outcome after conservative treatment [2]. Of 45 university hospitals in France, 40 (88.9%) agreed to participate in the study, and 25 used conservative treatment for placenta accreta at least once. Placenta accreta was diagnosed according to the following clinical and histologic criteria: 1) It was partially or totally impossible to manually remove the placenta with no discernable cleavage plane between all or part of the placenta and uterus, 2) prenatal diagnosis of placenta accreta on sonogram, confirmed by the failure of gentle attempts to remove it during the third stage of labor or at cesarean delivery, 3) evidence of placental invasion at the time of surgery; 4) histologic confirmation of accreta on hysterectomy specimen. Women treated with an extirpative approach or a planned cesarean-hysterectomy were excluded from this study. Conservative management in case of placenta accreta was defined by the decision of the obstetrician to leave the placenta partially or totally *in situ*, with no attempt to remove it forcibly. When placenta accreta was not suspected before delivery, it was diagnosed when it

was impossible to detach the placenta by gentle manipulation, and conservative treatment was defined as leaving part or all of it in the uterus. The study included 167 cases of placenta accreta with 59% of placentas left partially *in situ* and 41% left totally *in situ*. Outcomes are summarized in Table 1 [2]. Success rates were similar to prior reports [1, 12] with successful uterine preservation (no hysterectomy) in 78.4% of cases. Importantly, severe maternal morbidity occurred in only 6% (10/167) (defined as any of the following: sepsis, septic shock, peritonitis, uterine necrosis, postpartum uterine rupture, fistula, injury to adjacent organs, acute pulmonary edema, acute renal failure, deep vein thrombophlebitis or pulmonary embolism, or maternal death) [2]. One maternal death related to multi-organ failure occurred in a patient with marrow aplasia, nephrotoxicity with acute renal failure, followed by peritonitis with septic shock, after injection of methotrexate in the umbilical cord. Other rare morbidities included vesico-vaginal fistula and arteriovenus fistula formation. These complications also have been reported by others [12-13] and are similar to those reported after planned cesarean hysterectomy [7, 8, 10].

The placenta spontaneously and completely resorbed in 75% of cases after a median of 13.5 weeks (min: 4 weeks, max: 60 weeks). Hysteroscopic resection and / or curettage were performed to remove any remaining placenta in 25% at a median of 20 weeks after delivery (min: 2 weeks, max: 45 weeks) [2]. Strengths of this retrospective study included a large number of cases and participating centers, which increases the study's external validity. Thus, it is reasonable to anticipate similar results in other University teaching hospitals that may have limited experience in conservative treatment of placenta accreta, but where blood banks, pelvic arterial embolizations, obstetric subspecialties, obstetric anesthesia, interventional radiology, urology, and gynecological oncology are readily available.

Limitations include its retrospective design and the absence of histologic confirmation of PAS in cases without hysterectomy [16]. Accordingly, some of these cases may not truly

have been PAS, resulting in possible bias and underestimation of maternal morbidity associated with conservative management. Indeed, only about half of women had a placenta previa and prenatal suspicion of PAS, and the rate of previous cesarean was lower than in other series [2, 16]. It is noteworthy that conservative management was typically proposed to women who desired further pregnancies [2, 12]. This may account for the characteristics of the population, wherein only 53% of women had a previous cesarean but 96% had at least one risk factor. Moreover, we used stringent and uniformly applied criteria to define PAS (see above) in order to minimize this limitation. Finally, histopathological examination confirmed the diagnosis of placenta accreta in all immediate (18/18) and all but one delayed hysterectomies (17/18) [2]. Despite these reassuring elements regarding possible selection bias, we acknowledge that such bias may exist, and that some women may not have had PAS. Indeed, the problem of being certain of PAS concerns all studies related to placenta accreta/increta/percreta when no hysterectomy specimen for histopathologic confirmation is available. Consequently, assessment of conservative management of PAS is difficult. In a review detailing correlations between ultrasound and pathological findings, only 72/1078 cases had histopathological descriptions [17].

Data are even more scarce regarding conservative management of placenta percreta. Pather et al. reported three cases of placenta percreta treated with conservative management and also performed a review of available data. They found 57 cases of suspected placenta percreta that were managed conservatively with the placenta left *in situ*. Hysterectomy was avoided in 60% of cases and 42% experienced major morbidity (including sepsis, coagulopathy, hemorrhage, pulmonary embolism, fistula and arteriovenous malformation) [18]. In a similar review, Clausen et al retrieved 36 cases of placenta percreta managed by leaving the placenta *in-situ* [19]. Delayed hysterectomy was required in 58% of cases. In the French national study that reported the largest series of consecutive cases of placenta percreta

with attempt to leave the placenta *in situ* (n=18), prenatal diagnosis by ultrasonography or MRI was performed in 14 cases and during labor (at the time of the cesarean) in four cases [2]. Conservative treatment was successful for 10 of 18 cases (55.6%) of placenta percreta, and severe maternal morbidity occurred in 3 of the 18 (16.7%). Of the eight cases of placenta percreta with bladder involvement, conservative treatment was successful in six cases (75%) and severe maternal morbidity occurred in two (25%) [2]. Although morbidity was considerable, it was favorable in comparison with planned cesarean-hysterectomy in women with percretas [14].

These results show that leaving placenta *in situ* is a reasonable option for women with PAS who are properly counseled and motivated, in particular if they desire future pregnancies. It also is critical that they agree to close follow-up monitoring in centers with adequate equipment and resources [2, 6, 8-11]. However, many questions remain unanswered because only scare data are available regarding the various adjunctive treatments and procedures used in a conservative approach with the placenta left in situ:

Gentle attempted removal of the placenta

There are few data available to answer this question. The main drawback of attempted removal of the placenta is that this procedure can cause severe bleeding with a risk of maternal hemorrhagic complications and hysterectomy. Its main advantage is to potentially avoid leaving an *in situ* placenta, if there is not really PAS, as well as to remove the non-adherent portion of the placenta when the placenta adheres partially to the myometrium. This can reduce the volume of placenta left in the uterus, potentially reducing the risk of bleeding and infection. It is important to emphasize imprecision in the antenatal diagnosis of PAS using Doppler ultrasound and/or MRI. These two imaging modalities are good but imperfect for the diagnosis of PAS [12, 20]. The consequences of a false-negative result are obvious, i.e.

increased maternal morbidity [12]. Similarly, caregivers should be aware that false-positive results, which may occur in up to 28% of cases [7], also increase maternal morbidity. They may lead caregivers to perform unnecessary surgical procedures with their inherent complications. It makes sense to consider the context. Thus, our current practice is to attempt to gently remove the placenta by cord traction only in cases when the diagnosis of placenta accreta is uncertain. An example would be a nulliparous woman with a history of curettage in whom ultrasound revealed intraplacental lacunae in a low-lying anterior placenta and no visible evidence of placenta accreta during the cesarean [12].

Methotrexate (MTX) adjuvant treatment

Some authors have proposed the use of methotrexate to hasten placental resolution [21]. Its efficacy for this indication has never been demonstrated and only case reports and small case series with no control groups have been reported [15]. Accordingly, the Royal College of Obstetricians and Gynaecologists (RCOG) as well as the International Federation of Gynecology and Obstetrics (FIGO) do not recommend its routine use [10-11]. The low rate of placental cell division in the third trimester compared to early pregnancy raises the question of whether methotrexate has any effect on placental resorption. In addition, methotrexate can rarely cause serious harm such as neutropenia or medullary aplasia, even with a single dose in a young patient [12]. These complications are particularly morbid in the setting of infection, which is one of the more common complications of conservative management [2]. Finally, the only case, to our knowledge of maternal death after conservative treatment was secondary to a cascade of complications (bone marrow suppression, sepsis, renal failure) attributed to an intra-umbilical cord administration of methotrexate [2]. For these reasons, we do not advocate the use of methotrexate in cases of conservative treatment.

Prophylactic surgical or radiological uterine devascularization

There are also very limited data on the use of these adjuvant techniques. Prophylactic devascularization can be achieved by techniques used to treat postpartum hemorrhage (embolization, bilateral uterine artery ligation, stepwise uterine devascularization, bilateral ligation of hypogastric arteries), although these uterine-sparing procedures may be relatively less effective in cases of placenta accreta [22-23]. Angstmann et al. demonstrated that prophylactic embolization before performing cesarean hysterectomy may reduce the risk of blood loss with accreta [24]. Thus, it is possible that prophylactic devascularization could reduce the risk of secondary hemorrhage in the setting of conservative treatment [25]. It could also theoretically accelerate placental resolution. In fact, in a retrospective comparative study, the median delay for complete placental resorption was significantly shorter when women underwent an embolization (median=17 weeks; $q_1$011.5; $q_3$023; range: 1-38 weeks) compared to women who did not undergo embolization (median=32 weeks; $q_1$018; $q_3$048.8; range: 12-111 weeks) (P=0.036). Unfortunately, the reason for embolization was not clearly reported by the authors [25]. In contrast, devascularization may cause harm [2, 23]. In the French multicenter series of 167 cases of placenta accreta treated conservatively, the only two cases of uterine necrosis occurred in patients (62 total) who underwent arterial embolization [2]. Other adverse effects of uterine artery embolization also have been reported [12]. The risk:benefit ratio of routine devascularization procedures in conservative management of placenta accreta remains to be determined.

Monitoring of conservative management

Unfortunately, there are no data regarding this important issue. In our practice, we typically observe the patient in the hospital for up to 8 days and administer prophylactic antibiotics for 5 days. This epoch is the time of highest risk for bleeding and infection. Prior to discharge,

the woman and her partner should be advised about the need for close, long-term monitoring. There is still a risk for bleeding and infection and the size and vascularization of the retained placenta often does not meaningfully change for several weeks. The following symptoms require emergency medical attention: hyperthermia, severe pelvic pain, foul smelling vaginal discharge, and bleeding. She also should be advised about the possibility of abnormal and persistent vaginal discharge. There should be a multidisciplinary team available with the skills to manage complications twenty-four hours a day, seven days a week [12, 26]. Patients are seen for outpatient clinic visits weekly for the first two months. If she is asymptomatic, monthly visits are conducted until complete resorption of the placenta. The visits include a clinical examination (bleeding, temperature, pelvic pain), pelvic ultrasound (size of retained tissue) and laboratory screen for infection (hemoglobin and leukocytes, C reactive protein, vaginal sample for bacteriological analysis.) [2]. Of course, the efficacy of most of these measures is uncertain, but in theory they may reduce the risk of serious complications.

We do not routinely use magnetic resonance (MRI) imaging and serial beta human chorionic gondadotropin (HCG) levels for monitoring. Soyer et al. used MRI to follow 23 women with placenta left *in situ* for PAS [27]. The median delay for complete placental resorption was 21.1 weeks (1-111). They found a significant correlation between the degree of vascularity on early phase of dynamic MRI and delay of complete placental resorption ($r=0.69$; $P<.001$). They speculate that MRI may help predict delay for complete placental resorption [27]. It is not clear whether decreasing levels of βhCG correlate with the rate of involution of placental tissue. Khan et al and Torrenga and colleagues described several cases of placenta left *in situ* followed with serial beta HCG levels [28-29]. Serum beta HCG levels decreased to minimal levels in five months in the Khan study and in in 5 to 10 weeks in the Torrenga study. In both studies, beta HCG levels did not correlate with the volume of remaining tissue [28-29], raising questions about its usefulness for the monitoring of these

patients. Thus, measuring serum beta hCG on a weekly basis can reassure to some extent, but low levels do not guarantee complete placental resolution (11). Consequently, placental resorption should be documented by ultrasound imaging [11].

Systematic hysteroscopic resection of placental tissue that does not resorb.

Again, data regarding this issue are scarce. As mentioned previously in the French retrospective study, hysteroscopic resection or curettage or both were used to remove retained placenta in 29 (25.0%) cases, at a median of 20 weeks (range 2– 45 weeks) after delivery [2]. These results highlight the fact that this procedure is performed frequently. Nevertheless, no information regarding the reason for performing this procedure (due to pain, bleeding and or infection, to hasten placental resorption, on maternal request or systematically) was available. In a small cohort of 23 women with placenta left *in situ* for placenta accreta, 12 underwent hysteroscopy under ultrasound guidance due to pain and/or bleeding with retained placental tissue [30]. The use of bipolar energy was limited as much as possible to minimize risk of uterine perforation. The median size of the retained placenta was 54mm (13-110). No complications occurred due to hysteroscopic resection. Complete removal (11/12) was achieved after one, two and three hysteroscopic procedures in 5 (41.7%), 2 (16.7%) and 4 (33.3%) cases, respectively. One delayed hysterectomy was performed after "failure" of the hysteroscopic procedure [30]. It seems that hysteroscopic resection may shorten recovery time without harmful effects in symptomatic women. The role of prophylactic hysteroscopy or the timing of it in asymptomatic women is unknown. The safety and feasibility of high-intensity focused ultrasound (HIFU) in the treatment of placenta accreta after vaginal delivery was recently tested in 12 women with placenta accreta [31]. The average period of residual placental involution was 36.9 days. HIFU treatment did not apparently increase the risk of infection or hemorrhage and no patient required hysterectomy.

Delayed interval hysterectomy

Another possible advantage of leaving the placenta *in situ* is to plan a delayed interval hysterectomy, after partial involution of the placenta and decreased uterine vascularity. This may decrease hemorrhagic morbidity and risk of injury to adjacent organs. This strategy seems most attractive in women with placenta percreta, who are at highest risk for blood loss and urinary tract injury. Excellent outcomes have been reported using this approach in percreta cases [32]. On the other hand, this approach requires two surgeries instead of one and both may be quite morbid. Also, there is a risk of hemorrhage or infection prompting the need for emergency hysterectomy during the planned interval. Finally, the optimal timing of planned delayed hysterectomy is uncertain [13]. It may only be possible to truly ascertain whether delayed interval hysterectomy is effective through appropriate randomized clinical trials.

Long-term maternal outcome and subsequent fertility and obstetrical outcome

Few data are available regarding subsequent pregnancies in women with conservative management of PAS using the placenta *in situ* approach, but successful pregnancies have been reported [12]. However, these reports are biased towards successful outcomes. Therefore, an attempt was made to contact all women included in the French national retrospective study who did not undergo a hysterectomy, to estimate fertility and pregnancy outcomes after successful expectant management [33]. Follow-up data were available for 96 (73.3%) of the 131 women included in the study. There were eight women who had severe intrauterine synechiae and were amenorrheic. Of the 27 women who reported wanting more children, 3 women were attempting to become pregnant (mean duration: 11.7 months, range: 7–14 months), and 24 (88.9%) women had had 34 pregnancies (21 third-trimester deliveries,

1 ectopic pregnancy, 2 elective abortions and 10 early pregnancy losses) with a mean time to conception of 17.3 months (range, 2–48 months). All 21 deliveries resulted in healthy babies born after 34 weeks of gestation. Placenta accreta recurred in 6 of 21 cases (28.6%) and was associated with placenta previa in 4 cases. Postpartum hemorrhage occurred in four (19%) cases; this was associated with PAS in three and to uterine atony in one. These results show that successful expectant management for placenta accreta can be associated with successful subsequent fertility and pregnancy, although there is an increased risk of recurrent PAS [33].

Planned cesarean-hysterectomy versus conservative treatment

This is one of the most important unresolved questions regarding the management of PAS. However, there is only one small retrospective study directly comparing maternal outcomes following planned cesarean-hysterectomy (n=16) versus conservative management while leaving the placenta *in situ* (expectant management) (n=10) [34]. No differences were observed between groups except for estimated blood loss, which was lower in the conservative treatment group (3625mL $\pm$ 2154 versus 900mL $\pm$ 754; $p < .05$) [34]. Of course this study was too small and prone to bias to truly compare strategies. In fact, it is possible that severe maternal morbidity is increased in cases of conservative treatment because unpredictable infectious complications, uterine necrosis and secondary hemorrhage associated with conservative treatment can be dramatic. As with delayed interval hysterectomy, the relative merits of planned cesarean hysterectomy and conservative management will only be elucidated through properly designed clinical trials.

Until such trials are completed, it seems reasonable to counsel women about planned cesarean hysterectomy and conservative management. A major consideration is whether or not future childbearing is desired. A planned cesarean-hysterectomy may be the best option if the patient has no desire for more children, is older and / or multiparous. Nevertheless, we believe

that conservative management is a reasonable option for patients who are properly counseled and motivated. For example, women who want the option of future pregnancies, who agree to close follow-up monitoring, and who are in centers with adequate equipment and resources [1-2, 6, 11-12].

Moreover, leaving the placenta *in situ* may prove to be the most appropriate choice in the most severe cases of PAS, in particular in cases of organ adjacent invasion [12], where radical surgery is often associated with severe maternal morbidity [14]. Others also favor this approach, even in the U.S. where conservative management is less common than in France. An U.S. survey noted that 14.9% of providers would attempt to leave the placenta *in situ* in a hemodynamically stable patient [34] and 32% had attempted conservative management for PAS [35].

One step-conservative surgery

This is an alternative conservative procedure that has been described by one author [3]. It consists of resecting the invaded area of the uterus together with the placenta and reconstructing the uterus. It is performed at the time of cesarean delivery as a "one-step procedure" [3]. This strategy aims to combine the advantages of the leaving the placenta *in situ* approach (i.e. preserving fertility) and of cesarean-hysterectomy (no persistent high risk of bleeding or infection after the procedure). The main steps of this uterine-sparing technique achieved through a median or Pfannenstiel incision are (1) vascular disconnection of newly-formed vessels and the separation of invaded uterine from invaded vesical tissues; (2) performance of an upper-segmental hysterotomy; (3) resection of all invaded tissue and the entire placenta in one piece; (4) use of surgical procedures for hemostasis; (5) myometrial reconstruction in two planes; (6) bladder repair if necessary [3].

Palacios Jaraquemada et al. described outcomes of this one-step conservative surgery in 68 women presenting with placental invasion of adjacent organs (invasion of the posterior upper bladder (n=46; group 1), and of the posterior lower vesical area (n=22; group 2)) [3]. Uterine preservation was achieved in 95.7% (44/46) and 27.3% (6/22) of cases, respectively. The indications for the 18 hysterectomies were segmental circumferential rupture greater than 50% (n=13), coagulopathy (n=2) infection (n=1) and uncontrolled hemodynamic instability (n=2). The following complications were reported (mostly in group 2): lower ureteral injuries (n=2), vesical fistula (n=1), hematoma in the vaginal cuff (n=1) and uterine infection (n=1). Among the 50 women with uterine preservation, follow-up was available in 42. Menses were recovered between 3 and 16 months. Ten women had another uneventful pregnancy and delivery with no recurrence of PAS [3]. In another publication, Palacios Jaraquemada reported 45 pregnancies following a one step-procedure for placenta accreta [36]. Among these 45 pregnancies, 44 were uneventful and only one was complicated by a recurrence of PAS [36].

As we have limited experience with the one-step conservative surgery, we find it difficult to make strong recommendations regarding the technique. It is important to note that the one step procedure may be less reproducible and generalizable than conservative treatment because it requires a novel and specific surgical procedure. Successful use of the procedure by other groups and prospective trials will ultimately clarify the merits of one step conservative therapy.

The triple-P procedure

The team of Chandraharan proposed a novel uterine-sparing procedure for PAS termed “the triple-P procedure” [4]. The main steps of this procedure include (i) preoperative placental localization using transabdominal ultrasound to identify the superior border of the placenta in

order to deliver the fetus by an incision above the upper border of the placenta, (ii) pelvic devascularization involving preoperative placement of intra-arterial balloon catheters with inflation after delivery, and (iii) no attempt to remove the placenta with *en bloc* myometrial excision and uterine repair. It seems important to ensure that a 2-cm margin of myometrium is retained in the lower lip of the uterine incision to facilitate closure of the myometrial defect [4]. Bleeding from the separated and adherent part of the placenta is controlled by over sewing the defect. If the posterior wall of the bladder is involved, placental tissue invading the bladder is left *in situ* to avoid cystotomy.

The authors reported a small series, comparing outcomes after (n=19) and prior to implementation of the Triple-P procedure (n=11). In the past, PAS was treated with an elective cesarean delivery, using an incision into the uterine fundus, leaving the placenta in part or entirely in the uterus unless PPH occurred and peripartum hysterectomy was required (control group) [4]. Demographic characteristics were comparable between groups, with a percreta rate of 54.5% and 68.4% (p=.35), respectively. There was no statistical difference for the estimated mean blood loss (2,170 mL vs 1,700 mL; p=0.44) and the rate of transfusion (45.5% vs 47.4%; p=0.61). However, the rates of postpartum hemorrhage (54.5% vs 15.8%; p=0.035) and hysterectomy (27.3% vs 0.0%; p=0.045) were lower in the triple P group. One major complication (5%) occurred in a woman treated with triple P (right common iliac and external iliac artery thrombosis) [4]. This is a known complication of temporal internal iliac occlusion balloon catheters [12]. As with the one step procedure, these data should be considered preliminary and further studies are needed to assess relative efficacy. It is noteworthy that the RCOG and FIGO do not recommend balloons for cesarean-hysterectomy or conservative treatment [10-11] due to untoward effects, although the issue remains controversial.

Conclusion

Except for extirpative treatment (best reserved for cases unlikely to be PAS), conservative management for PAS may be a reasonable alternative option to planned cesarean-hysterectomy in well-selected cases. It is important that women treated with expectant management have appropriate counseling and close surveillance after delivery. The best-studied conservative approach is expectant care after leaving placenta *in situ*. Although comparable outcomes to planned cesarean hysterectomy have been reported, the approach is of uncertain efficacy due to bias in case selection and uncertainty regarding the diagnosis of PAS. Prospective trials are desperately needed to assess the true risks and benefits of conservative management overall, as well as for each approach. The prospective PACCRETA study has been initiated in order to answer some of the questions raised in this chapter [20].

Contribution to authorship

Loïc Sentilhes wrote the first draft of the report. All authors contributed to the writing of the final version and to its revision for important intellectual content, and all have seen and approved the final version.

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Tables

Table 1. Maternal morbidity after conservative treatment for placenta accreta, modified from Sentilhes et al. [2].

Characteristics	Placenta accreta, including percreta (n=167)
Placenta left in situ	167 (100)
Partially	99 (59.3)
Entirely	68 (40.7)
Primary postpartum hemorrhage	86 (51.5)
No additional uterine devascularization procedure	58 (34.7)
Additional uterine devascularization procedure	109 (65.3)
Pelvic arterial embolization*	62 (37.1)
Vessel ligation*	45 (26.9)
Stepwise uterine devascularization	15 (9.0)
Hypogastric artery ligation	23 (13.8)
Stepwise uterine devascularization and hypogastric artery ligation	7 (4.2)
Uterine compression suture*	16 (9.6)
Balloon catheter occlusion	0
Methotrexate administration	21 (12.6)
Primary hysterectomy	18 (10.8)
Cause of primary hysterectomy	
Primary postpartum hemorrhage	18/18 (100)
Postpartum prophylactic antibiotic therapy > 5 days	54 (32.3)
Transfusion patients	70 (41.9)
Units of packed red blood cells transfused > 5	25 (15.0)
Transfer to intensive care unit	43 (25.7)
Infection	47 (28.1)
Septic shock	1 (0.6)
Sepsis	7 (4.2)
Vesicouterine fistula	1 (0.6)
Uterine necrosis	2 (1.2)
Deep vein thrombophlebitis or pulmonary embolism	4 (2.4)
Secondary postpartum hemorrhage	18 (10.8)
Delayed hysterectomy	18 (10.8)
Median interval from delivery to delayed hysterectomy (d)	22 (9-45)
Cause of delayed hysterectomy	
Secondary postpartum hemorrhage	8/18 (44.4)
Sepsis	2/18 (11.1)
Secondary postpartum hemorrhage and sepsis	3/18 (16.7)
Vesicouterine fistula	1/18 (5.6)
Uterine necrosis and sepsis †	2/18 (11.1)
Arteriovenous malformation	1/18 (5.6)
Maternal request	1/18 (5.6)

Death	1 (0.6)
Success of conservative treatment	131 (78.4)
Severe maternal morbidity	10 (6.0)

Data presented as mean ± standard deviation, or as median with interquartile range in parentheses, or as number of patients with percentages in parentheses.

* The total number of additional uterine devascularization procedures exceeds the number of patients because some patients had more than one such procedure.

Some patients had more than one type of morbidity.

† These two patients had bilateral supra-selective embolization of the uterine arteries due to primary postpartum hemorrhage on the day of delivery.

Success of conservative treatment was defined as uterine preservation.

A primary hysterectomy took place within the first 24 hours, whereas a delayed hysterectomy took place more than 24 hours after delivery.