Surgical management of placenta accreta: a 10-year experience

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Abstract

Objective. To examine maternal morbidity in primary surgical management of placenta accreta. Design. Retrospective case series. Setting. Quaternary perinatal referral center in Melbourne, Australia. Population. Clinically suspected and histologically confirmed cases of placenta accreta, increta and percreta. Methods. Women were identified from our hospital database coded for placenta accreta, increta, percreta and peripartum hysterectomy. Relevant details were sought from medical records. Main outcome measures. Predefined maternal morbidities: blood loss, transfusion requirements, surgical complications, reoperation rate, duration in hospital. Predefined neonatal outcomes: gestational age at birth, birth-weight, admission to intensive (NICU) or special care nurseries (SCN), respiratory distress syndrome. Results. Between 1999 and 2009, 33 women were diagnosed with invasive placentation. A total of 27 were confirmed histologically after hysterectomy: 12 accreta, one increta, and 14 percreta. Median blood loss was 2 L. There was a 1.8-L reduction in mean blood loss with elective vs. emergency hysterectomy (p = 0.04). Nearly two-thirds of women required four or more units of packed red-blood-cells. Half of the women suffered from surgical complications, mostly from bladder injury. The risk of returning to theater for further surgery was 20%. Women with placenta percreta were more likely to require additional blood products (p = 0.03), sustain renal tract injury (p = 0.003) and require intensive care admission (p = 0.002). Conclusions. A primary surgical approach to management of placenta accreta is associated with significant maternal morbidity, even when managed in a dedicated quaternary perinatal referral center.

Abbreviations: NICU, neonatal intensive care unit; SCN, special care nursery.
regularly come together to each offer expertise in minimizing the risk of maternal hemorrhage and neonatal morbidity (2,3). The traditional approach to management has been entirely surgical, namely en bloc hysterectomy (4), with close physician support of circulatory indices, often in the intensive care unit. Maternal morbidity is known to be significant (5,6) and cases of maternal mortality are very occasionally reported (7). Without this assembly of experienced clinicians the maternal and neonatal risks would be utterly unacceptable.

Nevertheless, in recent years, more conservative management strategies are being examined to potentially minimize this surgical morbidity and to preserve women’s fertility (4,8,9). This approach is defined by leaving the placenta in situ at the time of cesarean delivery and allowing later reabsorption or expulsion to occur (4). Furthermore, methotrexate may be administered to enhance resolution and has been reported to reduce the size of retained placenta and to reduce serum beta-human chorionic gonadotropin to undetectable levels (10). At our institution, the only quaternary referral center in Melbourne, Australia, our approach has been a traditional surgical model. However, acknowledging the potential benefits from this different and less invasive medical approach, we felt it prudent to first reflect on our experience before entertaining a change towards these newer alternatives. Accordingly, we designed the current study to investigate the maternal morbidity and mortality risks for histologically proven cases of placenta accreta, increta and percreta in our center over a 10-year period.

**Material and methods**

Between 1999 and 2009, cases of confirmed placenta accreta, increta and percreta were identified retrospectively from our Birth Outcome Summary (BOS) at Monash Medical Centre, Southern Health. We defined placenta accreta as abnormal adherence to the myometrial surface due to deficient decidua basalis, placenta increta when the chorionic villi invade into myometrium and placenta percreta, when the chorionic villi invade to or through the uterine serosa (5). The Birth Outcome Summary database was coded for placenta accreta, placenta increta, placenta percreta and peripartum hysterectomy. Medical records were reviewed for obstetric, gynecological and medical history, diagnostic testing, surgical management, maternal complications, neonatal admissions and neonatal outcomes.

Our management protocol consisted of the following: all patients received regular ultrasound evaluation and auxiliary imaging with magnetic resonance. Magnetic resonance was available for cases requiring further evaluation of the depth of placental invasion into surrounding tissues. Patients remained as inpatients until the time of their surgery. Women at risk of preterm delivery received betamethasone prophylaxis to reduce neonatal morbidity. Surgery was usually scheduled for 38 weeks’ gestation in the absence of bleeding. A multidisciplinary team of perinatologists, gynecological oncologists, anesthetists, intensivists and neonatologists counseled the patient. Hematologists were in-house to manage our massive transfusion protocol as required. A maternal intensive care unit bed was kept available if required. The use preoperative internal iliac balloon catheters was individualized. A general anesthetic was administered with invasive monitoring. A midline laparotomy was performed. A fundal and vertical incision into the uterus was our preference away from the invasive placenta. The fetus was delivered into the care of the neonatologist. In some cases of small focuses of placenta accreta, a cautious attempt at removal of the placenta was entertained; however, in the event of significant bleeding or when significant invasion was encountered, this was abandoned in favor of hysterectomy with the placenta left in situ. Depth of placental invasion was recorded at the time of surgery. Cases resulting in hysterectomy had histological confirmation of the diagnosis. Surgical specimens were fixed in 10% buffered formalin prior to histological examination. In each specimen, eight to 12 tissue blocks were obtained from areas of the placenta adherent to the uterine wall. Each block contained a full section of fetal and maternal surfaces of the placenta, myometrium and uterine serosa, which were examined to distinguish between placenta accreta, increta or precreta.

This case series was exempted from Southern Health Human Research Ethics committee approval in accordance with the National Health and Medical Research Council (NHMRC) research guidelines (11). Results are expressed as raw numbers or median (range). Statistical analyses were performed using the Mann-Whitney U-test for continuous variables and the chi-square test or Fisher exact test for categorical variables. A p-value of <0.05 accorded statistical significance.

**Results**

Between 1999 and 2009 there were 69 664 births at our institution. We identified 33 cases of suspected placenta accreta, of which 27 cases (82%) were confirmed as placenta accreta on histology. This included 12 placenta accreta, one placenta increta and 14 placenta percreta.

Table 1 illustrates maternal demographics and clinical characteristics of our study population. All women had identifiable risk factors for placenta accreta: 74% of women having two or more previous cesarean sections. Table 2 describes the diagnosis of placenta accreta, increta
and percreta. Overall, most women (22/27) were diagnosed antenatally, either routinely or in the setting of antepartum hemorrhage. There were no statistically significant differences between these groups. There was 1/27 postnatal diagnosis of placenta accreta from a retained placenta following a normal vaginal delivery and an unsuccessful manual removal in theater.

Table 3 summarizes our surgical approach of cesarean hysterectomy and Table 4 describes maternal morbidity associated with placental histopathological diagnosis. When we examined all cases collectively, the median estimated blood loss was 2 L (range 0.6–9 L). We found a 1.8-L reduction of mean blood loss with elective hysterec-
tomy compared with emergency hysterectomy ($p = 0.04$); however, this was not improved by antenatal diagnosis ($p = 0.2$). Nearly two-thirds of women required at least four units of packed red blood cell transfusion. This did not differ significantly between elective vs. emergency hysterectomy (6.3 vs. 8.8 units; $p = 0.1$) or whether internal iliac artery ligation was performed (8.0 vs. 6.5 units; $p = 0.6$). Three women required oophorectomy; two from placental invasion deep into the broad ligament and one from persistent bleeding from the ovarian vein. There were two cases of placenta percreta that required reoperation within 48 h of delivery for intraabdominal hemorrhage. Late reoperation consisted of 3/27 cases. The indications were small bowel obstruction requiring a laparotomy and adhesiolysis, vesicovaginal fistula repair and nephrectomy for complications following ureteric injury, at five, six and 36 months post-hysterectomy, respectively.

Regarding neonatal outcomes, the median gestational age at birth was 36 weeks with a birthweight of 2775 g. All were singleton pregnancies. Nineteen babies were born preterm at less than 37 weeks of gestation. Eleven neonates had a low birthweight of less than 2500 g. Six neonates required admission for intensive care (NICU) and 12 neonates required support in our lower level special care nursery (SCN). Four neonates were diagnosed with respiratory distress syndrome. The median length of stay was 23 days for the NICU and 14 days for SCN admissions. There was one fetal death in utero at 21 weeks from antepartum hemorrhage and chorioamnionitis.

**Discussion**

This study shows clearly the significant maternal morbidity associated with placenta accreta. Overall median estimated blood loss was 2 L and median packed red blood cell transfusion was four units. Half of the women suffered from surgical complications, mostly from injury to the bladder. The chance of returning to theater was one in five, which included both early and late reoperation. Women with placenta percreta were more likely to require additional blood products, sustain renal tract injury and require intensive care admission than were women with placenta accreta or increta. Nevertheless, these results are consistent with previously published reports of surgical management of placenta accreta (5,6) and thus highlight the seriousness of this modern obstetric reality.

*Table 1. Patient demographics of study population diagnosed with placenta accreta, increta and percreta.*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Median (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age at delivery</td>
<td>34 (26–42)</td>
</tr>
<tr>
<td>Gravidity</td>
<td>5 (2–9)</td>
</tr>
<tr>
<td>Parity (before delivery)</td>
<td>2 (1–7)</td>
</tr>
<tr>
<td>Gestational age at delivery, weeks</td>
<td>36 (21–38)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous cesarean section</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1 (4)</td>
</tr>
<tr>
<td>1</td>
<td>6 (22)</td>
</tr>
<tr>
<td>2</td>
<td>13 (48)</td>
</tr>
<tr>
<td>3 or more</td>
<td>7 (26)</td>
</tr>
<tr>
<td>Previous uterine manipulationa</td>
<td>12 (44)</td>
</tr>
<tr>
<td>Antepartum hemorrhage</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>9 (33)</td>
</tr>
<tr>
<td>1 episode</td>
<td>10 (37)</td>
</tr>
<tr>
<td>2 episodes</td>
<td>5 (19)</td>
</tr>
<tr>
<td>3 or more episodes</td>
<td>3 (11)</td>
</tr>
<tr>
<td>Transferred from another hospital</td>
<td>14 (52)</td>
</tr>
</tbody>
</table>

*aIncludes uterine curettage, surgical termination of pregnancy, surgery for ectopic pregnancy.*

*Table 2. Diagnosis of placenta accreta, increta and percreta in this study. Data are raw numbers or median (range).*

<table>
<thead>
<tr>
<th></th>
<th>Diagnosed antenatally</th>
<th>GA when diagnosed</th>
<th>Diagnosed on routine USS</th>
<th>Diagnosed on USS for APH</th>
<th>Diagnosed on USS for other indication</th>
<th>Use of MRI</th>
<th>Diagnosed at birth</th>
<th>Diagnosed postpartum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accreta/increta, n = 13</td>
<td>10</td>
<td>30 (19–38)</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Percreta, n = 14</td>
<td>12</td>
<td>31 (19–36)</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>5*</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

*aIncludes one case diagnosed antenatally only from MRI.*

APH, antepartum hemorrhage; GA, gestational age; MRI, magnetic resonance imaging; USS, ultrasound scan.
Pelvic hemorrhage remains a considerable challenge, with blood loss expected to be at least double that of routine cesarean section. The median blood loss from peripartum hysterectomy in our series is 2 L, with a reported range of blood loss in the literature of 2–5 L and requiring replacement of up to five units considered the norm (2.5). Various methods to reduce blood loss have been described, including internal iliac artery ligation. However, in our series we found no particular advantage in blood loss when this was used. This technique appears effective in controlling hemorrhage in only 50% of cases (12) due to the significant collateral blood supply to the gravid uterus. Of note, in our series preoperative internal iliac balloon catheterization was only performed in one woman. This procedure has only become recognized more recently and there is now a literature describing its use in this setting; however, results are mixed (13,14). Tan et al. (15) documented a 40% reduction in blood loss with balloon catheterization (from 3.3 to 2 L) and a 50% reduction in blood transfusion requirements; however, other studies have not consistently demonstrated any significant differences in blood loss, coagulopathy or length of stay (16,17). It remains unclear whether this procedure should be performed routinely for all elective procedures. Other advances such as cell saver technology may also reduce transfusion requirements (18).

Astute antenatal diagnosis probably affords the best chances of reducing blood loss and morbidity overall. This allows for transfer to a tertiary unit and permits thorough planning, imaging and mobilization of the dedicated multidiscipline team in an elective, rather than in an emergency setting. Antenatal diagnosis has been associated with reduced peripartum blood loss and the need for blood transfusion (19,20). Interestingly, in 6/33 (18%) cases identified antenatally, the diagnosis of placenta accreta was not confirmed by subsequent histopathology. This is consistent with a series by Eller et al. (3), who reported 28% of antenatally suspected cases did not satisfy histological criteria of absence of the intervening layer of decidua, Nitabuch’s layer, between placenta and myometrium. All women in our series received antenatal ultrasound; however, an additional concern was that the diagnosis of placenta accreta was not demonstrated in approximately one in five cases on antenatal scan. Tikkanen et al. (20) reported a reduction of 3 L in estimated blood loss and a reduction of nearly seven units in packed red blood cell transfused with appropriate antenatal diagnosis, presumably due to the advanced notice and meticulous elective surgical planning this allows. Accordingly, in our series, there was just under a 2-L reduction of mean blood loss with elective hysterectomy compared with emergency hysterectomy.

In light of the maternal morbidity described in our series, conservative management of placenta accreta has more recently been suggested as an alternative option, whereby the placenta is left undisturbed after delivery of the fetus and the abdomen is closed (4). This has been
advocated to be an effective method in reducing surgical morbidity without the increased need for blood transfusion and with the additional benefit of preserving fertility (4,8,9,21). A large retrospective multicenter study reported 167 women with attempted conservative management for placenta accreta, in whom 131 (78%) retained their uterus (21). Of these, 18 (14%) women returned for hysterectomy within 24 h and 18 (14%) underwent later hysterectomy (28% hysterectomy overall). Complications of sepsis, vesicouterine fistula and uterine necrosis were documented in 10 women (6%) in the series. There was also a requirement for prolonged follow-up, as placental resorption may take many months. In all, 25% of the women eventually needed curettage to remove the retained placental tissue. Subsequent return to fertility and pregnancy outcomes were not found to be compromised following successful treatment; however, recurrence of placenta accreta has been reported to be between 7 and 29% (22,23). Furthermore, in a case series of 15 women who did manage to have their uterus successfully retained, five out of the nine women with preserved men- sses did not have a desire for future pregnancies due to the fear of recurrence (24). Case reports have described successful treatment with methotrexate (10,25); however, its benefit is uncertain, as currently there is insufficient evidence on its efficacy and safety, and there are no clear guidelines available on dose regimes (9).

A modified surgical approach in the form of staged or two-step hysterectomy has also been described (26,27). One group reported the preoperative insertion of balloon catheterization followed by cesarean delivery, leaving the pla- centa in situ. The woman is then transferred to the angiography unit under anesthesia for embolization to the uterus and placental bed, followed by immediate hysterectomy (27). Transfusion requirements were reduced by seven units of packed red blood cells; however, only one- third of women were successfully treated with the staged hysterectomy protocol. Recently, delayed hysterectomy has been reported using an entirely laparoscopic approach several weeks or months after the initial cesarean delivery (28,29). This minimally invasive approach may improve visualization of tissue planes and thereby improve hemosta- sis, but long operating times and risk of hemorrhagic complications limit this approach to highly experienced centers.

These new approaches should be considered investiga- tional until larger prospective series become available. Until then, surgical management as presented in this study should remain the mainstay of care. There are some limitations to our study that deserve comment. First, the retrospective nature of this study design is open to inclu- sion bias and errors in the Birth Outcome Summary data collection. Secondly, being a quaternary referral center there may be a bias for inclusion of more significant cases of placenta accreta and percreta requiring a higher degree of medical care. Our results may overestimate the expected morbidity for cases with a small focus of pla- centa accreta. Thirdly, it is difficult to directly compare surgical with medical management of placenta accreta with various retrospective series without evidence from a prospective randomized trial.

**Funding**

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11. NHMRC. When does quality assurance in health care require independent ethical review? Advice to institutions.


