

Peripartum hysterectomy

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Abstract

Aims

To study the indications and incidence of peripartum hysterectomy as well as the associated morbidity in a tertiary maternity department over a 10-year period.

Methods

A retrospective chart analysis was undertaken in a tertiary referral centre in Ireland. All women who delivered between 2011 and 2021 and identified as having had a peripartum hysterectomy were included for analysis.

Results

In total, 23 peripartum hysterectomies were performed within the unit, giving an incidence of 0.8 peripartum hysterectomies per 1000 deliveries. Suspected placenta accreta spectrum accounted for 18 (78.3%) of the hysterectomies performed, 17 (94.4%) of whom had at least one previous caesarean section. The mean gestation at delivery was 35.9 ± 1.9 weeks. Overall, the mean estimated blood loss was $3053 \text{ ml} \pm 2840 \text{ ml}$, with 65.2% ($n=15$) requiring red cell concentrate. No visceral injuries were reported.

Conclusion

Peripartum hysterectomy is a complex procedure with a high rate of operative morbidity. Factors that may help reduce this morbidity include the early recognition of cases that are likely to result in hysterectomy at the time of delivery, allowing an experienced gynaecologist to be present at the time of delivery.

Introduction

Peripartum hysterectomy refers to the removal of the uterus at the time of delivery or within the immediate postpartum period¹. Typically it is performed in the setting of life threatening haemorrhage following both caesarean and vaginal deliveries, when medical and conservative surgical methods have failed to control blood loss². Other obstetric

complications that may necessitate hysterectomy include placenta accreta spectrum (PAS), uterine rupture and sepsis³.

In Ireland, major obstetric haemorrhage accounts for over half of reported severe maternal morbidity cases and is increasing. Similarly, the rate of peripartum hysterectomy has also increased to 0.50 per 1000 maternities as reported by the National Perinatal Epidemiology Centre in 2019⁴. A strong association between peripartum hysterectomy and placenta accreta spectrum was also reported⁴.

PAS is the result of abnormal implantation into the uterine wall and the spectrum includes placenta accreta, increta and percreta. The condition is a cause of severe haemorrhage, and is a leading cause of caesarean hysterectomy⁵. The rise in caesarean section rate is associated with an increasing incidence of both placenta praevia and PAS⁶. With a higher number of caesarean sections, the likelihood of PAS in the setting of placenta praevia is increased up to 67% in those who have had four or more caesarean sections⁷. This, in turn, increases the likelihood of hysterectomy.

Peripartum hysterectomy is a complex procedure owing to both the anatomical and physiological changes that occur in pregnancy, in particular the massive increase in blood flow to the uterus. Furthermore, with the increasing availability of hormonal and other conservative measures for treatment of benign conditions such as menorrhagia for example, obstetricians and gynaecologists are performing fewer hysterectomies^{8,9}.

With this loss of surgical experience, emphasis should be placed regarding the early recognition of PAS, allowing the involvement of an experienced gynaecologist at an early stage⁸. Given the complexity of the procedure, morbidity is high, and complications include disseminated intravascular coagulation, injuries to the urinary tract and maternal mortality¹⁰.

Given this background, this objective of this study was to examine the incidence, indication and morbidity of peripartum hysterectomy in an Irish tertiary referral centre.

Methods

A retrospective chart review of all patients who underwent peripartum hysterectomy between 01/01/2011 and 31/01/2021 in a tertiary obstetric and gynaecological centre was performed. All women who delivered, and subsequently required a hysterectomy were included. Ethical approval was granted by the Clinical Research Ethics Committee, Galway University Hospital Ireland (Ref: [C.A 2778](#)).

Demographic data was obtained including age, parity, previous caesarean sections, previous uterine surgery and if patients had experienced a prior pregnancy complicated by placenta praevia or PAS.

Information related to the procedure itself was also recorded including the duration of procedure, indication for hysterectomy, the type of hysterectomy performed, estimated blood loss and any complications encountered.

Statistical analysis was performed using JASP (Jaspers Amazing Statistical Programme, University of Amsterdam) statistical software¹¹. Categorical variables were described using frequencies and percentages. Students t-test was used for parametric data, and Mann-Whitney U test was used for non-parametric data.

Results

In total, 28,918 women delivered in this tertiary unit in the time frame studied, and 23 underwent peripartum hysterectomy giving an incidence of 0.8 peripartum hysterectomies per 1,000 deliveries. Of these 23 women, 11 (47.8%) were primarily booked to the tertiary centre for delivery, and 12 (52.2%) had been referred from affiliated obstetric units. All deliveries included in this review were singleton gestations and all resulted in a live birth (n=23). The average age of the women in this review was 35 ± 3.7 years (range 28-43) and the average body mass index (BMI) was 28.3 ± 6.5 kg/m².

There were 21 patients (95.6%) who had delivered at least once before. Of these, 19 (82.6%) had at least one previous caesarean section. There were 18 patients who had suspected PAS in this study. Of these, 17 (94.4%) had a previous caesarean section, one of whom had a placenta praevia in a previous pregnancy. One of the suspected PAS cases had required a manual removal of placenta at the time of previous delivery as well as a procedure to evacuate retained products of conception following a vaginal delivery. Regarding pregnancy loss, 39.1% (n=9) and 8.7% (n=2) had a previous miscarriage or ectopic pregnancy respectively. A further breakdown of patient demographics and obstetric history can be found in Table 1.

Table 1: Patient Characteristics and Obstetric History

	Mean \pm Standard Deviation	Breakdown n (%)
Age (years)	35 ± 3.7	25-29: 2 (8.7%) 30-34: 8 (34.8%) 35-39: 12 (52.2%)

		>40: 1 (4.3%)
Body Mass Index (Kg/M²)	28.3 ± 6.47	< 18.5: 0 (0%) 18.5-24.9: 8 (34.8%) 25.0-29.9: 5 (21.7%) >30: 9 (39.1%) Missing: 1 case
Parity	1.9 ± 1.13	0: 2 (8.7%) 1: 7 (30.4%) 2: 7 (30.4%) 3: 5 (21.7%) 4: 2 (8.7%)
Previous Caesarean Sections		0: 4 (17.4%) 1: 8 (34.8%) 2: 8 (34.8%) 3: 1 (4.3%) 4: 2 (8.7%)
History of PAS	0 ± 0	No cases with prior history of PAS
History of Placenta Praevia	0.04 ± 0.21	No: 22 (95.6%) Yes: 1 (4.4%)
Previous Uterine Surgery* * Evacuation of retained products of conception (ERPC), Manual removal of placenta (MROP), Surgical termination of pregnancy (STOP)	0.32 ± 0.48	No: 16 (69.6%) Yes: 7 (30.4%) <ul style="list-style-type: none"> ● ERPC: 4 (57.1%) ● ERPC and MROP: 1 (14.3%) ● STOP: 1 (14.3%) ● Myomectomy: 1 (14.3%)

Overall, the average gestational age on admission was 32.1 ± 5.0 weeks and the average gestation at delivery was 35.9 ± 1.9 weeks. The mean length of antenatal stay within the hospital prior to delivery was 3.7 ± 4.1 weeks, ranging from only 1 day to 124 days. Most women had vaginal bleeding during their antenatal course (56.5%, n=13).

Regarding the cases of suspected PAS, the average gestational age at detection was 29.4 ± 4.1 weeks with ultrasound being used as an imaging modality in all instances (100%, n=18) and MRI used in 12 (66.6%) cases of suspected PAS.

The most frequent indication for peripartum hysterectomy was suspected PAS in 18 cases (78.3%), followed by postpartum haemorrhage secondary to uterine atony in 2 cases (8.7%) and cervical cancer in 2 cases (8.7%). In the remaining case, a patient returned to theatre 8 days following her caesarean section with severe sepsis, secondary to a ruptured, necrotic fibroid that ultimately required a hysterectomy in order to stabilise her condition. Regarding the suspected PAS cases, this can be further broken down into suspected accreta or percreta, accounting for 2 (11.1%) and 16 (88.9%) cases of PAS cases respectively. Histologically, 16 of these cases were confirmed as PAS following hysterectomy.

The mean length of operating time was 172 ± 48.8 minutes (n=21, missing =2). The most frequently performed procedure was a total abdominal hysterectomy (TAH) and bilateral salpingectomy (BS) in 16 (69.6%) cases, followed by TAH in 3 (13%), and radical hysterectomy in 2 (8.7%) cases respectively. Of the remaining cases, there was 1 (4.3%) subtotal hysterectomy and 1 (4.3%) TAH and unilateral salpingectomy (4.3%, n=1) was performed. In most cases (n=22, 95.7%) a gynaecological oncologist led or was part of the surgical team at the time of hysterectomy. A further breakdown of the surgical characteristics is given in Table 2.

Table 2: Surgical Characteristics

	Frequency n (%)
Operating Time	172 ± 48.8 minutes (n=21, missing =2)
Indication for peripartum hysterectomy	<p><u>Placenta accreta spectrum:</u> 18 (78.3%)</p> <p style="padding-left: 40px;">Suspected accreta: 16 (88.9%)</p> <p style="padding-left: 40px;">Suspected percreta: 2 (11.1%)</p> <p><u>Non placenta accreta spectrum:</u> 5 (21.7%)</p> <p style="padding-left: 40px;">Postpartum haemorrhage secondary to uterine atony: 2 (40%)</p> <p style="padding-left: 40px;">Cervical cancer: 2 (40%)</p> <p style="padding-left: 40px;">Severe sepsis: 1 (20%)</p>

Hysterectomy performed	Total abdominal hysterectomy and bilateral salpingectomy: 16 (69.9%) Total abdominal hysterectomy: 3 (13%) Radical hysterectomy: 2 (8.7%) Subtotal hysterectomy: 1 (4.3%) Total abdominal hysterectomy and unilateral salpingectomy: 1 (4.3%)
Level of Anaesthesia	General anaesthetic: 6 (26.1%) Combined (general and regional): 17 (73.9%)
Abdominal incision	Low transverse: 5 (21.7%) Vertical midline: 18 (78.3%)
Hysterotomy	Transverse lower segment: 8 (34.8%) Classical: 10 (43.5%) Fundal: 5 (21.7%)
Removal of placenta* *Removed from uterus at time of delivery or left attached prior to performing hysterectomy	Removed: 10 (43.5%) Left in situ: 13 (56.5%)
Internal Iliac artery balloon occlusion* *All cases in which balloon tamponade was used related to suspected PAS	Used: 13 (56.5%) Not used: 10 (43.5%)
Perioperative tranexamic acid	Used: 18 (78.3%) Not used: 5 (21.7%)

The overall average or estimated blood loss was 3053 ml \pm 2840 ml (range 400 ml-13000 ml). The average EBL in the PAS group was 2779 ml \pm 1832 ml, and in the non-PAS group the average EBL was 4040 ml \pm 5343 ml, however this difference was not statistically significant

($p=0.39$). The decrease in haemoglobin from preoperative to postoperative sampling ranged between 0.6 g/dL up to a 3.9 g/dL drop.

The use of Internal Iliac artery (IIA) balloons and leaving the placenta in situ, rather than removing it at the time of hysterectomy, were associated with less blood loss, however this difference was not statistically significant. A further breakdown of blood loss can be found Table 3.

Table 3: Blood loss and red cell concentrate use

Outcome	Overall n (%)
Estimated blood loss	<p>3053 ml \pm 2840 ml (minimum EBL 400ml. Maximum EBL 13000ml)</p> <p>Blood loss >1000ml: 82.6% (n=19)</p> <ul style="list-style-type: none"> ● PAS: 2779 ml \pm 1832 ml ● Non-PAS: 4040 ml \pm 5343 ml <ul style="list-style-type: none"> ○ $p= 0.39$ ● IIA balloons used: 2471 ml \pm 1641 ml* ● IIA balloons not used: 3810ml \pm 3873ml* <ul style="list-style-type: none"> ○ $p=0.27$ ● Placenta removed: 4340 ml \pm 3855 ml ● Placenta left in situ: 2063 ml \pm 1097 ml <ul style="list-style-type: none"> ○ $P=0.054$ <p>*IIA balloons only used in suspected PAS cases as this was an elective (planned) procedure carried out by the interventional radiology department and therefore not anticipated in the other, non PAS hysterectomies</p>
Use of red cell concentrates	<p>n= 15 (65.2%)</p> <ul style="list-style-type: none"> ● PAS: 13 (72.2%) ● Non-Pas: 2 (40%) <ul style="list-style-type: none"> ○ $P=0.181$ ● When IIA balloons used: 9 (69.2%)* ● When IIA balloons not used: 6 (60%)* <ul style="list-style-type: none"> ○ $p=0.65$ ● When placenta removed: 7 (70%) ● When placenta left in situ: 8 (61.5%) <ul style="list-style-type: none"> ○ $P=0.67$

	*IIA balloons only used in suspected PAS cases
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Other complications occurred in 8 (34.7%) cases excluding haemorrhage. The most serious of these included a patient who required haemodialysis in the setting of acute renal tubular necrosis. This occurred in the setting of significant haemorrhage (13000ml) secondary to uterine atony, which was refractory to all available uterotonic medications and intrauterine balloon tamponade. In this case, the patient required 25 units of red cells to replace the blood loss. Another case was complicated by a vault dehiscence on day 8 following a radical hysterectomy and was returned to theatre for re-suturing. No cases of urological or other visceral injury were recorded. Further surgical morbidity and the final histological results are listed in Table 4.

Table 4: Postoperative morbidity and final histological diagnosis

Outcome	Overall n (%)
Antibiotic Usage	n=20 (87%) <ul style="list-style-type: none"> ● PAS: 15 (53.3%) ● Non-Pas: 5 (100%) <ul style="list-style-type: none"> ○ P=0.328
Drain usage	n=20 (87%) <ul style="list-style-type: none"> ● PAS: 16 (88.9%) ● Non-PAS: 4 (80%) <ul style="list-style-type: none"> ○ P =0.602
Admission to ICU/HDU	n= 17 (73.9%) <ul style="list-style-type: none"> ● PAS: 12 (66.6%) ● Non-PAS: 5 (100%) <ul style="list-style-type: none"> ○ P=0.133
Duration of postnatal stay	7.7±2.6 days <ul style="list-style-type: none"> ● PAS: 7.05 days ± 2.13 days ● Non-PAS: 10 days ± 3.74 days

	○ P =0.03
Complications	n=8 (34.7%) <ul style="list-style-type: none"> ● Vault dehiscence on day 8 post op requiring re-suturing. ● Vault haematoma managed conservatively. ● Postoperative ileus in 2 cases ● Severe acute kidney injury requiring haemodialysis. ● Femoral nerve neuropraxia secondary to intraoperative retraction. ● Severe anxiety requiring referral to local psychiatric services.
Readmission	n=2 (9.1%) <p>PAS: 1 (5.5%) Non-PAS: 1 (20%)</p> ○ P=0.311
Histology	<ul style="list-style-type: none"> ● Normal: 4 (17.4%) ● Placenta Accreta: 5 (21.7%) ● Placenta Increta: 5 (21.7%) ● Placenta Percreta: 6 (26.1%) ● Necrotic fibroids: 1 (4.4%) ● Cervical cancer: 2 (17.4%)

Discussion

The incidence of peripartum hysterectomy within the studied time frame was 0.8 per 1000 deliveries. This is slightly higher than the incidences reported in other retrospective reviews which recorded incidences of 0.48 and 0.39 per 1000 deliveries although not statistically significant^{12,13}.

Studies have shown that risk factors for peripartum hysterectomy include increased maternal age and having had a previous caesarean section^{14,15}. This is in keeping with our findings, as most women within our cohort were aged over 35 years (n=13) and had at least one previous caesarean section (n=19).

The main risk factor in the development of PAS is prior caesarean section, with the likelihood of developing PAS increasing with the number of caesarean sections a patient has undergone¹⁶. In our study, most PAS cases had at least one prior caesarean section. Given

that the majority of those who had peripartum hysterectomy had 2 or less prior caesarean sections, it is a pertinent reminder that PAS may occur in the setting of any prior caesarean section, regardless of the number had.

In relation to complications, the most frequently encountered in this review was obstetric haemorrhage. Given that the main indication for peripartum hysterectomy is severe haemorrhage that cannot otherwise be controlled by conservative measures, and the significant risk of haemorrhage that PAS confers, this is not surprising^{5,15,17}. Other major complications known to affect those undergoing peripartum hysterectomy such as bowel or urinary tract injury did not occur in this cohort in contrast to other reviews^{18,19}. In some centres, ligation techniques, such as internal iliac artery ligation were surgical techniques used to control blood loss^{19,20}. Ligation techniques may predispose urological injury given the close proximity of these vessels to major urological structures including the ureters²¹. These techniques were not used within this cohort and may partly explain the avoidance of such injuries.

Prophylactic internal iliac artery balloon occlusion was used for most cases within the study. A reduction in mean blood volume was noted compared to those who had not had balloons placed, however this was not of statistical significance. In other studies, the outcomes of prophylactic internal iliac balloon occlusion have been conflicting, with some studies demonstrating a significant reduction in blood loss when used and others failing to do so^{22,23}. In our centre interventional radiology is readily accessible and the cost of placing balloons is not prohibitive, however this may not be the case in smaller or lower resourced facilities.

In most cases, recognition of PAS occurred early (29.4 ± 4.1 weeks), which allowed the involvement of an experienced gynaecological oncologist in all but one case, and the involvement of interventional radiology preoperatively when necessary. In this cohort, 52.2% (n=12) had been referred from smaller peripheral units who did not have access to interventional radiology or an experienced gynaecological oncologist on site. This further highlights the importance of early recognition, to allow timely referrals to be made to specialist centres. Given the complexity and challenges that such cases present, having an experienced team involved is paramount²⁴.

Despite this being a study that spans 10 years, the cohort is small. Further appraisal is warranted, and other areas related to this topic, including focus on histological diagnosis is worth exploring. The recognition of subclinical/microscopic PAS and how this may impact future pregnancies is an area that is currently being studied at our centre.

Peripartum hysterectomy is a complex procedure with a high rate of operative morbidity. Factors that may help reduce this morbidity include the early recognition of cases that are likely to result in hysterectomy at the time of delivery, allowing an experienced gynaecologist

to be present at the time of delivery. With rates of caesarean hysterectomy continuing to increase worldwide, the rate of peripartum hysterectomy will also increase. Obstetricians and gynaecologists, both consultants and trainees need adequate exposure to such cases in order to develop the surgical skills for dealing with a complex area of the speciality. In the clinical setting where obstetricians and gynaecologists do not have the skillset for dealing with such cases with appropriate manpower and resources such as interventional radiology, referral to a tertiary centre should be made without delay. Further work is required to reduce the increasing number of caesarean sections performed, as this study highlights, the risk of PAS that ultimately results in hysterectomy can occur even after only one prior caesarean section.

Declarations of Conflicts of Interests:

None declared.

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