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GENERAL GYNECOLOGY

Two-step hysteroscopy for management of morbidly adherent retained products of conception

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Abstract

Purpose Retained products of conception (RPOC) may occur as the result of a morbidly adherent placenta. In these cases, the hysteroscopic removal of RPOC may be technically challenging, and may require more than one hysteroscopic procedure. We sought to compare the clinical, surgical, and postoperative characteristics of cases managed by either a one-step hysteroscopy procedure or a two-step hysteroscopy approach.

Methods A retrospective review of all RPOC cases managed by hysteroscopy from 1/2013 to 3/2018. We included cases of RPOC occurring following delivery and medical or surgical pregnancy terminations. The rates of postoperative intrauterine adhesions were assessed by office hysteroscopy.

Results A two-step procedure was required in 11 (3.9%) of the 358 women who underwent hysteroscopy for removal of RPOC during the study period. Comparison between the two-step and the one-step procedure groups revealed that the women in the two-step group were significantly older and the mean RPOC size was significantly larger (35.5 ± 4.1 years versus 30.7 ± 5.9 years, respectively, $p = 0.01$, and 38.6 ± 9.8 mm versus 22.3 ± 7.5 mm, $p < 0.001$, respectively). While the rates of intraoperative complications were similar between groups, readmission for postoperative fever was more common in the two-step group (18.2% versus 2.0%, respectively, $p = 0.03$). Postoperative intrauterine adhesions were diagnosed in 20.0% and 5.2%, respectively ($p = 0.05$).

Conclusions The two-step hysteroscopic approach enabled the complete removal of larger RPOC masses without the use of uterine curettage. The women who underwent the two-step procedure, however, were at increased risk for postoperative fever and postoperative intrauterine adhesions.

Keywords Retained products of conception · Residual trophoblastic tissue · Placental remnants · Hysteroscopy

Introduction

Retained products of conception (RPOC) may occur following vaginal delivery, cesarean section, or medical or surgical pregnancy terminations [1]. The surgical management of RPOC has evolved in recent years from "blind" suction curettage to operative hysteroscopy, allowing for focused and targeted removal of the RPOC and complete visualization of the uterine cavity during the procedure [2]. The advantage of the hysteroscopic procedure appears to be lower rates of postoperative intrauterine adhesions, possibly accounting for the relatively favorable fertility outcomes of these women [3, 4].

Some cases of RPOC are hypothesized to occur due to a morbidly adherent placenta, i.e., placenta accreta [5]. In those cases, the mean size of the RPOC mass is typically large, and the mass is often adherent to the uterine wall and highly vascular. Thus, the hysteroscopic removal of residual placenta accreta may be technically challenging. Legendre et al. reported 12 cases of conservative surgical management of retained placenta accreta by hysteroscopy. The mean size of the retained placenta was 54 mm. Seven women (58.3%) required two or more hysteroscopic procedures for complete removal [6]. Their study demonstrated the feasibility

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of complete removal of complex RPOC cases by several successive hysteroscopic procedures.

The two-step hysteroscopic procedure was originally described for treatment of large submucosal fibroids [7]. Based on a similar rationale, a two-step hysteroscopic procedure may be used for women with large RPOC mass and/or residual placenta accreta. The rates of the two-step hysteroscopy for removal of RPOC varied significantly in previous studies. While almost 60% of the women required more than one hysteroscopic procedure in the study by Legendre et al. [6], only ~ 6% required a second hysteroscopic resection in the study reported by Hrazdirová et al. [8]. None of those studies compared the characteristics and outcomes of women who underwent the one-step versus the two-step procedures.

In the current study, we sought to investigate the two-step surgical approach for the hysteroscopic management of complex RPOC cases and to assess surgical outcomes in terms of complications and postoperative intrauterine adhesions.

Materials and methods

We retrospectively identified all cases of RPOC surgically managed by operative hysteroscopy in our department from January 2013 to March 2018 by a computerized search for the ICD-9 code 667.1 ("Retained products of conception") and operative hysteroscopy. We subsequently reviewed the patients' medical records for their obstetrical and gynecological history, clinical presentation at the time of RPOC diagnosis, preoperative ultrasound findings, surgical findings and procedures, intraoperative and postoperative complications, and pathology results. The estimated blood loss and the fluid deficit had not been consistently recorded for all cases and they were, therefore, not analyzed in this study. The study included all women who underwent hysteroscopy for removal of RPOC (following either delivery or termination of pregnancy) during the study period. We excluded the cases of women who were managed with the "see and treat" hysteroscopy technique, i.e., hysteroscopy without anesthesia using a small diameter hysteroscope.

All the women had been referred for hysteroscopy because of ultrasound findings suspicious for RPOC. The ultrasound scans were mostly performed by outside providers, with or without the use of color Doppler flow studies. The ultrasound reports available in the medical records were retrospectively reviewed.

In the current study, we included cases of women who were operated under general anesthesia by means of the Versapoint bipolar system fitted with a 2.5 mm or a 4 mm electrosurgical loop (Gynecare, Ethicon Endo surgery, Somerville, NJ, USA) and NaCl 0.9% solution as a distension media. As previously described, the resectoscope loop electrode was used for blunt separation of the RPOC mass from the uterine wall, while minimizing the use of bipolar electro-surgery to avoid causing thermal damage to the endometrium [9]. When necessary, excessive bleeding was controlled with the administration of intravenous oxytocin (10 units in 1000 mL NaCl 0.9%), per-rectal misoprostol (1 mg), and/or intracervical vasopressin [10 mL of diluted vasopressin prepared by dilution of 1 vial (20 units) of vasopressin in 100 mL NaCl 0.9%]. Peri-operative antibiotic treatment was also prescribed. When the RPOC removal could not be completed by hysteroscopy in a single procedure, a second procedure was scheduled for 3–4 weeks later.

In accordance with our departmental protocol for RPOC management, an office hysteroscopy follow-up aimed to diagnose postoperative intrauterine adhesions was scheduled 6–8 weeks after the final operative hysteroscopy. Postoperative intrauterine adhesions were classified according to the American Fertility Society classification [10].

The SPSS software was used for the statistical analyses (Version 26, IBM Corp.). The normal versus non-normal distribution of the variables was tested with the SPSS normality test function. The Student *t* test, Fisher exact test, Chi square test and the Mann–Whitney rank test were employed as appropriate. The odd's ratio (OR) and their 95% confidence intervals (CI) were calculated using a logistic regression model. A p value below 0.05 was considered statistically significant.

The study was approved by the Institutional Review Board which waived the patient's informed consent for this retrospective study that involved secondary analysis of existing data with minimal risk to the participants.

Results

During the study period, a total of 358 women underwent hysteroscopy for removal of RPOC. Their baseline demographic, obstetrical, clinical, and surgical characteristics are shown in Table 1. Eleven of those women (3.9%) required a two-step hysteroscopy procedure. The characteristics of the women who underwent the one-step hysteroscopic procedure and those who underwent the two-step procedure are compared in Table 2. Those who required a two-step procedure were significantly older than those who underwent a one-step procedure and more likely to develop RPOC following vaginal or cesarean delivery rather than a medical or surgical pregnancy termination. In addition, the RPOC size was significantly larger in the two-step procedure group, and those women were more likely to present with vaginal bleeding or fever rather than with asymptomatic ultrasound findings (Table 2).

Preoperative ultrasound reports were available in the medical records of 291 (81.3%) women, but Doppler studies

Table 1 The baseline demographic, obstetrical, clinical and surgical characteristics of the study cohort

Parameter	Result
Age (years)	30.9 ± 5.9
Parity	1 (0–9)
Pregnancy leading to RPOC diagnosis	
Vaginal delivery	189 (52.8)
Cesarean delivery	27 (7.5)
Medical pregnancy termination	61 (17.0)
Surgical pregnancy termination	81 (22.6)
Time period from pregnancy termination to hysteroscopy (months)	1.8 ± 0.8
Clinical presentation at time of RPOC diagnosis	
Asymptomatic ultrasound findings	117 (32.7)
Vaginal bleeding	221 (61.7)
Fever and suspected endometritis	20 (5.6)
RPOC size on hysteroscopy (mm)	22.8 ± 8.1

Data are presented as mean ± standard deviation, median (range) or number (%)

RPOC retained products of conception

were performed in only 245 (68.4%) cases. The mean size of the RPOC mass on ultrasound was 20.8 ± 9.3 mm, and it was significantly larger in the two-step procedure group compared with the one-step procedure group (30.1 ± 11.3 mm versus 20.4 ± 9.0 mm, respectively, $p = 0.02$). On Doppler flow studies, color Doppler was demonstrated in the RPOC mass in 188/245 (76.7%) cases. The rates of a positive color Doppler flow were not different between the two-step and the one-step groups (77.0% versus 70.0%, respectively, $p = 0.7$). The ultrasound images of a woman who underwent the two-step procedure are shown in Figs. 1 and 2, and her hysteroscopy image is shown in Fig. 3.

Intraoperative complications occurred in six (1.7%) women who underwent hysteroscopy for removal of RPOC (either by a one-step or a two-step procedure), and they included uterine perforation by cervical dilators that was managed conservatively in two (0.5%) cases, fluid overload in one case (0.3%), and cervical lacerations in three (0.8%) cases (Table 3). The rates of intraoperative complications were similar for the two-step and the one-step procedure groups. Postoperative complications included nine (2.5%) cases of readmission for postoperative fever, and the rates of postoperative fever were significantly higher for the two-step group compared with the one-step procedure group (Table 3).

For the management of uterine atony and/or uterine bleeding, intraoperative uterotonics (either intravenous oxytocin and/or per-rectal misoprostol) and intracervical vasopressin were administered in 16 (4.5%) and 10 (2.8%) women, respectively. Comparison of the one-step and the two-step procedure groups revealed that the rates of intraoperative administration of uterotonics and vasopressin were significantly higher in the latter group (27.3% versus 3.6%, $p = 0.01$, and 27.3% versus 3.6%, $p < 0.001$, respectively) (Table 3). There were no cases of blood transfusions.

Postoperative intrauterine adhesions were assessed by office diagnostic hysteroscopy in 242 women (67.6% of the study cohort). Intrauterine adhesions were diagnosed in 14 (5.8%) of those women, while 228 (94.2%) women had a normal-appearing uterine cavity. Comparison of the two-step versus the one-step procedure groups revealed that intrauterine adhesions were diagnosed in 2/10 (20%) versus 12/232 (5.2%) women, respectively, $p = 0.05$ (Table 3).

We attempted to determine the risk factors for RPOC cases requiring a two-step procedure by performing a multivariate logistic regression analysis. Only women's age and

Table 2 Comparison of demographic, obstetrical, clinical and surgical characteristics between women who underwent a one-step hysteroscopic procedure for RPOC removal and those who underwent a two-step procedure

Parameter	One-step procedure ($N = 347$)	Two-step procedure ($N = 11$)	*P* value
Age (years)	30.7 ± 5.9	35.5 ± 4.1	0.01
Parity	1 (0–9)	2 (0–4)	0.1
Pregnancy leading to RPOC diagnosis			
Vaginal/cesarean delivery	206 (59.4)	10 (90.9)	0.03
Medical/surgical pregnancy termination	141 (40.6)	1 (9.1)	
Time period from pregnancy termination to hysteroscopy (months)	1.8 ± 0.8	1.0 ± 0.5	0.001
Clinical presentation at time of RPOC diagnosis			
Asymptomatic ultrasound findings	114 (32.9)	3 (27.3)	0.006
Vaginal bleeding	216 (62.2)	5 (45.5)	
Fever and suspected endometritis	17 (4.9)	3 (27.3)	
RPOC size (mm)	22.3 ± 7.5	38.6 ± 9.8	< 0.001

Data are presented as mean ± standard deviation, median (range) or number (%)

RPOC retained products of conception

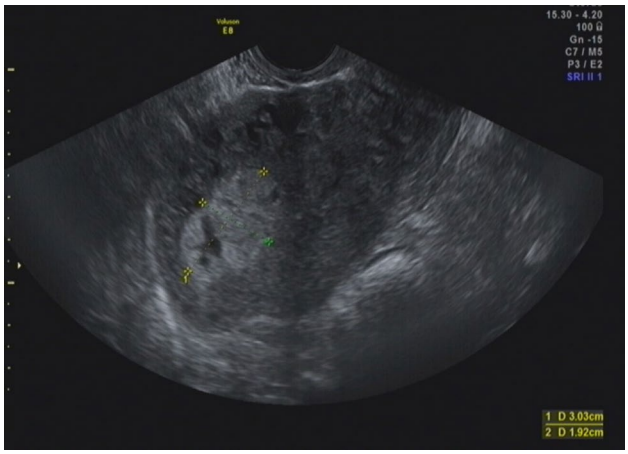

Fig. 1 The gray-scale ultrasound image of a 35-year-old woman gravida-3 para-3 who underwent a two-step hysteroscopy for removal of RPOC following a vaginal delivery complicated by manual removal of the placenta. She presented with vaginal bleeding 5 weeks after delivery. An echogenic mass measuring 30 × 19 mm can be observed on her ultrasound exam

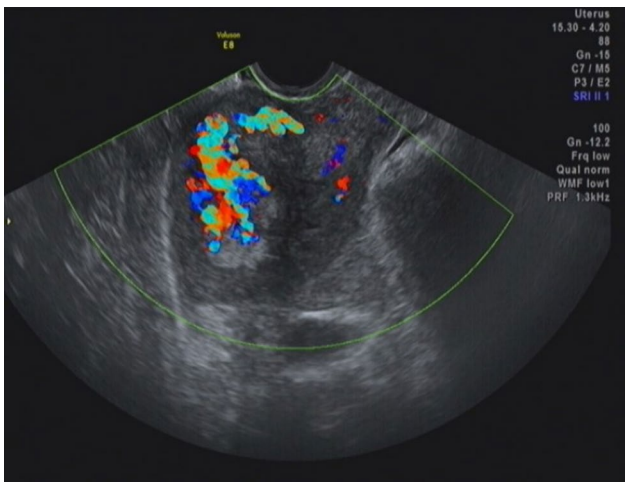

Fig. 2 The color Doppler flow ultrasound image of the same woman

the size of the RPOC were associated with the two-step procedure (OR = 1.2, 95% CI 1.1–1.4, $p = 0.02$, and OR = 1.3, 95% CI 1.1–1.4, $p < 0.01$, respectively).

Discussion

Hysteroscopy for removal of RPOC has been reported as a safe and feasible procedure with low rates of postoperative intrauterine adhesions [2, 9]. However, this procedure may be technically challenging in cases with a large and/or vascular RPOC mass, which is typically associated with a residual morbidly adherent placenta. Legendre et al. [6] reported the overall successful hysteroscopic management

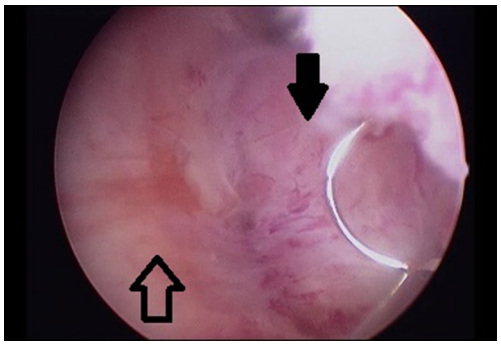

Fig. 3 The intraoperative hysteroscopic image of the same woman. The RPOC mass (black arrow) is adherent to the uterine wall (white arrow). During the first hysteroscopic surgery, impaired visualization due to bleeding in the uterine cavity prohibited the complete removal of the RPOC mass. The remaining RPOC mass could be more easily removed on the second hysteroscopy performed 3 weeks later. On her follow-up, office hysteroscopy, a normal cavity free of intrauterine adhesions was observed

of retained morbidly adherent placentas in 12 women, 7 of whom required more than one hysteroscopic procedure. In the current study, we compared the characteristics of women undergoing a one-step versus a two-step hysteroscopic procedure for the removal of RPOC. The two-step procedure enabled complete removal of the RPOC mass in all cases and was not associated with increased intraoperative complications, but it was associated with significantly higher rates of postoperative fever and postoperative intrauterine adhesions.

A vascular RPOC is often more difficult to extract by hysteroscopy due to the impaired intrauterine visibility. From our own experience, the use of diluted vasopressin administered by intracervical injection may help in overcoming this limitation. A similar approach has been described for the management of large submucosal fibroids, significantly reducing the fluid intravasation and the intraoperative blood loss [11]. We could not evaluate the effect of vasopressin use on the intraoperative blood loss and fluid deficit in our cases since those parameters were not consistently recorded in the operative reports of the study participants.

Preoperative Doppler flow measurements may be helpful in identifying women with highly vascular RPOC at risk for the two-step procedure. However, our study included only qualitative (yes/no) rather than quantitative Doppler flow studies which were not accurate enough for this purpose. Kamaya et al. described a color Doppler quantitative scale for diagnosis of RPOC cases [12]. In their study, the color Doppler flow studies were classified as avascular, minimally vascularity, moderately vascularity, and markedly vascularity. This classification may be useful to diagnose highly vascular RPOC cases to optimize their surgical treatment.

Table 3 Comparison of the intraoperative and postoperative complications between women who underwent a single hysteroscopic procedure for RPOC removal and those who underwent a two-step procedure

Parameter	One-step procedure ($N=347$)	Two-step procedure ($N=11$)	P value
All intraoperative complications	5 (1.4)	1 (9.1)	0.1
Uterine perforation by cervical dilator	2 (0.6)	0	0.1
Fluid overload	1 (0.3)	0	0.8
Cervical laceration	2 (0.6)	1 (9.1)	0.8
Postoperative complications (readmission for fever)	7 (2.0)	2 (18.2)	0.03
Intraoperative administration of uterotonics	13 (3.6)	3 (27.3)	0.01
Intraoperative administration of intracervical vasopressin	6 (1.7)	4 (36.3)	<0.001
Postoperative intrauterine adhesions[a]	12/232 (5.2)	2/10 (20)	0.05

Data are presented shown as mean ± standard deviation, median (range) or number (%)

RPOC retained products of conception

[a]Calculated among 242 women who presented for follow-up office hysteroscopy

Hysteroscopy for removal of RPOC using the cold loop of the hysteroscope for blunt separation of the RPOC mass has been described in several studies [2, 9]. This surgical approach appears to be superior to uterine curettage in terms of postoperative adhesions and adverse fertility sequela. However, it does require some degree of hysteroscopic surgical expertise which may limit its applicability. Alternatively, the intrauterine morcellator may be selected for RPOC removal. Hamerlynck et al. compared the hysteroscopic morcellation and the hysteroscopic loop resection for the removal of RPOC in a randomized controlled study. While the hysteroscopic morcellation procedures took significantly less time, the rates of complications and postoperative adhesions were similar between the groups [13].

Our study is limited by its retrospective design, missing information, and small sample size. We did not have the information on fluid deficit and intraoperative blood loss. Another limitation of our study is the variability of preoperative ultrasound exams, which did not consistently report the diagnosis of morbidly adherent RPOC in suspected cases. Finally, it lacks a long-term follow-up in terms of future fertility and the occurrence of Asherman's syndrome.

In conclusion, the two-step hysteroscopic approach enabled the complete removal of larger RPOC masses without the use of uterine curettage. However, women who underwent the two-step approach were at increased risk for intraoperative administration of uterotonics and vasopressin, postoperative fever, and postoperative intrauterine adhesions.

Author contributions We confirm that each author has fulfilled the conditions of having made substantial contributions to the concept and design, analysis, and interpretation of data and drafting and/or revisions of the manuscript. None of the authors have any disclosures.

Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to disclose.

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