**Prevention and Management of Retained Products of Conception**

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**1. Introduction**

Retained products of conception (RPOCs) are defined as the presence of fetal or placental tissue in the uterine cavity after missed abortion, termination of pregnancy (TOP), or delivery, including cesarean section (1).

The overall reported prevalence of RPOCs in the literature is 4%–6.3% (2,3). RPOC incidence increases after miscarriage in the first and second trimester and after TOP and in individuals with a history of RPOCs (3)**.**

Most RPOCs are identified in asymptomatic women after delivery or miscarriage during routine ultrasound evaluation (4,5). The presenting symptoms among symptomatic patients include vaginal bleeding (6), which is occasionally accompanied by lower abdominal pain with or without fever. The presence of one of these symptoms should raise the possibility of RPOCs (7).

Ultrasound imaging is considered the first-line modality for the evaluation of patients with suspected RPOCs (8). The most sensitive findings on gray-scale ultrasound for the diagnosis of RPOCs are a thickened endometrial echo complex and the detection of an intrauterine mass (9). The sensitivity of ultrasound in the detection of RPOC ranges between 44% and 94%, with specificity and positive predictive values ranging from 10% to 98% and 57% to 84%, respectively (10–12). In addition, the application of color Doppler imaging has greatly helped to increase the detection rate in recent years (8,13,14).

As concluded by Ben-Ami et al. (11), detection rates are improved through the combination of clinical and ultrasound examination.

The phenomenon of RPOCs carries both short- and long-term complications. The short-term complications include increased risks of severe vaginal bleeding and infection while the long-term complications involve the formation of intrauterine adhesions (IUAs), Asherman's syndrome (15), and infertility (16). Both types of complications may be decreased by the early detection of RPOCs.

Besides the obvious burden of both the short- and long-complications for the affected women and health care system, RPOCs entail a significant economic cost. Despite the major impact of RPOCs, there are a lack of adequate preventive and management guidelines by the leading bodies in the field of obstetrics and gynecology. In the present study, we investigated methods for preventing and managing RPOCs in the available literature in order to develop evidence-based recommendations.

**2. Methods**

To consolidate established recommendations, an online search was performed in medical registers, including MEDLINE®, ClinicalKey®, and ClinicalTrials®, to obtain reference lists from the retrieved studies using the following related key words: “retained products of conception”, “intrauterine adhesions”, “Asherman's syndrome”, “conception” combined with the preface and/or “hysteroscopy”, “dilation and curettage”, “manual uterine exploration”, and “manual uterine revision” with “retained products of conception”. The search was limited to English-language publications. We included studies that described specific methods for managing RPOCs and their outcomes, if they involved at least 10 cases.

Finally, a list of recommendations was drafted. The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system was used to define the level of evidence for each recommendation using “high”, “moderate”, “low”, and “very low” (17).

**3. Secondary Prevention of Retained Products of Conception**

Following delivery, the placenta should be carefully examined for missing cotyledons or fetal membranes (15). RPOCs should be suspected in the case of an abnormal placental appearance or in the presence of postpartum hemorrhage, especially if there is uterine atony. These conditions should necessitate manual uterine revision (15,18).

Previous studies have demonstrated a higher risk of RPOCs in women after manual removal of the placenta. In a retrospective cohort by Tandberg et al., 3% of 165 women who underwent manual removal of the placenta required additional surgical intervention in the form of dilation and curettage (D&C) (19). In a prospective study of 293 women after manual removal of the placenta, 12.2% required intervention for RPOCs compared to none in the control group (20).

The use of immediate sonographic evaluation after manual removal of the placenta or uterine cavity revision fails to increase the detection rate of RPOCs or prevent other future complications. Furthermore, it has been found to increase the risk of unnecessary invasive interventions (18). In contrast, a postponed sonographic evaluation has been found to increase the RPOC detection rate. A retrospective study showed that ultrasound examination 6 weeks postpartum after manual removal of the placenta increased the detection of RPOCs by 3-fold as compared to clinical features alone (21). This limited body of evidence implies the usefulness of a routine sonographic evaluation toward the end of the puerperium period for women at increased risk of RPOCs.

**4. Management**

Management options for women with RPOCs include expectant management, medical treatment, and surgical interventions such as D&C and hysteroscopic resection (HR) (8).

*4.1 Expectant Management*

There are limited reports in the literature addressing the role of expectant management for RPOCs. A meta-analysis by Sotriadis et al. reported a 6-week success rate up to 90% with expectant management after incomplete abortion (22). In addition, the MisoREST prospective cohort study (23) evaluated 197 women with RPOCs after treatment with misoprostol for first-trimester miscarriage. The researchers showed a 76% success rate of uterine evacuation with expectant management, with a 0.5% risk of emergency D&C. In a follow-up study, a nonsignificant difference was noted regarding future fertility (24).

Two recent retrospective studies reported on outcomes after expectant management for RPOCs. The first study, by Takahashi et al., evaluated 59 women, of whom 36 (61%) required intervention due to vaginal bleeding. In a multivariate analysis, higher intervention rates were demonstrated in patients with the following features: age < 35 years (adjusted odds ratio: 4.2, 95% confidence interval: 1.1–18.5), RPOC length ≥ 4 cm (adjusted odds ratio: 8.6, 95% confidence interval: 2.4–39.2), and RPOC hypervascularity (adjusted odds ratio: 4.6, 95% confidence interval: 1.3–18.8) (25). The second study, by Wada et al. (26), analyzed 44 patients with RPOCs who were managed expectantly after spontaneous or artificial abortion prior to 22 weeks of gestation. Of these, 10 (23%) presented with vaginal bleeding that required intervention. Heavy bleeding during abortion (> 500 mL) and hypervascularity were more frequently observed in the intervention group (26).

Finally, a retrospective study from Japan reported on 19 cases of RPOCs after abortion, all successfully treated with conservative management. Serial measurements of serum human chorionic gonadotropin reaching the cutoff value along with ultrasound surveillance were used to monitor these patients (27).

Thus, we can conclude that expectant management may be offered to asymptomatic women with RPOCs presenting with favorable clinical and sonographic features, in conjunction with close surveillance.

***4.2 Medical Management***

Despite the advantages of the medical, as opposed to surgical, evacuation of RPOCs, the evidence in the literature is limited. One short report from Australia showed the benefit of the application of misoprostol to women with RPOCs after suction aspiration for TOP. A course of 200 μg misoprostol, given six times, was effective in 93% of cases, reducing the need for a surgical intervention by approximately 80% (28). In addition, a retrospective study from Canada examined the role of treatment with misoprostol in women with RPOCs after missed abortion. Of the 64 women who received misoprostol, 64.6% were successfully managed (resolution of RPOCs without the need for surgical intervention). In contrast, women receiving expectant management showed a 91.8% success rate. The authors also noted that higher success rates were achieved in women who initially received expectant management after a diagnosis of missed abortion (76%) versus women primarily treated by surgical (40%) or medical (46%) regimens (29).

***4.3 Surgical Management***

Both D&C and HR are acceptable management options for RPOCs. However, as presented below, hysteroscopy has become the method of choice in recent years (30).

**4.3.1 Dilation & Curettage**

This surgical technique, which uses dilation and blunt or suction curettage, has been the most common method for managing RPOCs for many years (31).

Most of the studies presented in Tables 1 and 2 performed ultrasound-guided D&C. A prospective randomized trial by Debby et al. (32) compared the rates of RPOCs in women who underwent immediate transvaginal ultrasound after first-trimester uterine evacuation with a control group who did not undergo postprocedural ultrasound. The researchers noted higher rates of RPOCs in the control group (0.7% vs 3.7%; *P* < 0.05). Therefore, we conclude that early postevacuation ultrasound allows physicians to diagnose RPOCs and enables an immediate repeated evacuation, thereby reducing the rates of future RPOCs.

Another method commonly used for reducing surgical complications during D&C involves the use of cervical preparations. These include osmotic dilators as well as medications for cervical ripening, such as misoprostol (33). Despite the reported advantages, this approach has not been evaluated in the treatment of RPOCs in conjunction with D&C.

**4.3.2 Hysteroscopic Technique**

Multiple surgical techniques are available for resectoscope surgeries (e.g., cold loop, monopolar and bipolar electrosurgery, morcellator). Minimization of tissue damage is a major determinant of IUAs (34,35).

Touboul et al. (35) demonstrated a low IUA rate with bipolar hysteroscopic myomectomy compared with monopolar cautery. The authors attributed this difference to the less destructive effect of bipolar cautery on the healthy tissue adjacent to the tissue being resected. Undermining these results are other reports of a low incidence of IUAs with monopolar cautery (36) and a high incidence of IUAs with bipolar cautery (37).

Similarly, Mazzon et al. (11) reported a low IUA rate after hysteroscopic myomectomy, attributed to the use of a cold loop for dissecting the intramural portion of the myoma, which consequently minimized healthy tissue injury.

The vast majority of studies presented in Tables 1 and 2 performed resection of RPOCs with a hysteroscopic loop while trying to avoid the use of an electric current during the resection. As recommended in a systematic review by Di Spiezio Sardo et al. (38), the use of this technique reduces injury to the endometrium and thereby prevents the formation of future complications. An additional method presented here involves the use of hysteroscopic morcellation. This method has been suggested to be a less traumatic technique for removing RPOCs while improving visualization of the uterine cavity. Additionally, it has been shown to have comparable efficacy in reducing IUAs (39), as well as future conception rates with the use of the hysteroscopic loop (40).

**4.3.3 Timing** **of the Procedure**

During the 4 to 6 weeks after delivery or miscarriage, the distended uterus and cervical dilation may interfere with the hysteroscopic procedure. This may be due to spillage of the liquid medium used during hysteroscopy, which prevents distention of the uterine walls and hampers optimal visualization. These factors increase the risk of intraprocedural complications such as uterine perforation and infection. However, when patients with RPOCs present with acute complications such as acute uterine bleeding or fever during this time interval, prompt intervention may be required (41). A retrospective study that examined the adequate timing of the intervention for RPOCs failed to demonstrate a significant difference between the patients in the early intervention group (before 3 weeks) and those in the late intervention group (after 3 weeks) in terms of conception rates and time to conception (42). In another study by Tarasov et al., women with asymptomatic RPOC were divided into three groups based on the timing of the intervention from delivery: before 3 months, between 3 and 6 months, and after 6 months. The authors found no significant effect on patients’ reproductive outcomes (43).

To conclude, despite the limited literature addressing the adequate timing of the intervention after the RPOC diagnosis, most studies (Tables 1 and 2) did not intervene prior to 30 days after delivery.

**4.3.4 Antibiotic Prophylaxis**

The application of a transcervical instrument, such as a hysteroscope, has been suggested to carry bacteria and to transfer the normal vaginal flora into the uterine cavity, which may lead to the development of pelvic infection (44), as well as long-term consequences such as IUAs (38). Therefore, the use of prophylactic antibiotics prior to this procedure is a reasonable consideration. A 2013 Cochrane review (45) was unable to draw a conclusion regarding the administration of prophylactic antibiotics due to a lack of randomized trials. Subsequently, two systematic reviews and meta-analyses based on four and five randomized controlled trials, respectively, found no clinical benefit of antibiotic prophylaxis in hysteroscopic procedures (44,46). Importantly, none of these studies evaluated the role of antibiotics in the setting of RPOCs. Despite the lack of evidence, the American College of Obstetricians and Gynecologists recommends consideration of the prophylactic administration of a single 200-mg dose of doxycycline 1 hour prior to the surgical intervention for early pregnancy (47). Due to the possible benefits and despite the lack of evidence, most of the studies in Tables 1 and 2 administered prophylactic antibiotics prior to surgical intervention.

**4.3.5 Intrauterine Adhesions**

Previous reports have detected high rates of IUAs after surgical evacuation with D&C in patients with RPOCs, with prevalences ranging from 8.9% to 30% (48–50). Hooker et al. (51) noted an increased risk of IUA development, which correlated with the number of repeated D&C procedures. As a result, in 1997, Goldenberg et al. (52) published a case series of 18 women presenting with symptomatic RPOCs who were successfully managed with the use of a selective hysteroscopic cutting loop, thereby avoiding damage to the endometrium, an event that is associated with IUA development (53). Table 1 summarizes 11 studies that analyzed the rates of IUAs after surgical intervention for the treatment of RPOCs. Most of these studies were retrospective. Two studies reported on the rates of IUAs with the use of D&C, which varied between 18% and 40% (4,50). In contrast, the rates of IUAs after HR interventions ranged between 0% and 19% (41,54–58). It should be noted that most cases of IUAs in these studies were mild and that the rate of severe IUA cases was very low, according to American Fertility Society classifications (59). These results are supported by a meta-analysis by Smorgick et al. (60) that reported a 5.7% risk of IUAs after HR of RPOCs. Rein et al. (61) found IUA rates of 4.2% and 30% for HR and D&C, respectively. An additional meta-analysis by Hooker et al. (51) showed significantly higher rates of IUAs with D&C versus HR (29.6% vs 12.8%, respectively).

**4.3.6 Conception Rates**

Table 2 comprises 10 studies that evaluated future conception rates in women who underwent surgical evacuation for RPOCs. Conception rates ranged between 49.5% and 92.8% with the use of HR. The wide range of prevalence rates may result from the varying time periods of follow-up and the methods used for obtaining information on future pregnancies. Three of the studies compared the rates of conception after HR and D&C and showed higher rates of conception with the use of HR (61–63). In addition, several studies have reported a significantly shorter time interval to conception after HR as compared to D&C (31,62–64).

**5. Specific Conditions**

***5.1 Septic Products***

Infection is a severe complication of RPOCs. This condition may be referred to as septic abortion (65). Management of septic abortion includes the administration of intravenous antibiotics and rapid uterine evacuation (66,67). Although no studies have compared the management of D&C with that of HR in the event of infected products of conception, we believe that the use of a hysteroscopic method for removing infected products may lead to a further spread of the infection resulting from the medium used during this technique. Therefore, rapid ultrasound-guided suction curettage should be the method of choice in this setting.

***5.2 Acute Vaginal Bleeding***

RPOCs are a common cause of secondary postpartum hemorrhage as well as postabortion bleeding. In the setting of severe uterine bleeding requiring rapid management, immediate surgical intervention is warranted (68). The use of HR may be difficult in terms of visibility during severe bleeding. Therefore, ultrasound-guided D&C may be logically considered the most appropriate method.

***5.3 Large Adherent Masses***

Women with large adherent masses of RPOCs are at risk of incomplete uterine emptying after HR, which will necessitate an additional intervention (69). The prevalence of incomplete emptying varies among different studies. A recent meta-analysis reported a 91% success rate for the complete removal of RPOCs after a single hysteroscopic procedure (70). In a single retrospective study, only increased age and RPOC size were associated with the risk of an additional intervention. The authors described the efficacy of the two-step approach, in which a second HR was performed 3–4 weeks after the first, which thereby enabled removal of large masses of RPOCs without the use of D&C. Nonetheless, these patients showed higher rates of postoperative complications such as fever and IUAs (69).

**5.4 RPOCs with Enhanced Vascularity**

In recent years, postpartum or postabortion ultrasound Doppler evaluation has become able to detect a specific entity of RPOCs, that which exhibits enhanced vascularity (71). This form of intense vascularity has been referred to as enhanced myometrial vascularity or acquired arteriovenous malformations and may lead to life-threatening intraoperative bleeding (72).

Several case series have described the management of RPOCs with enhanced vascularity. Studies evaluating conservative management have shown it to be a safe option for these women, with spontaneous resolution occurring in up to approximately 100 days (73,74).

An alternative option includes surgical removal with D&C. The largest case series by Groszmann et al. (72) evaluated 31 women with RPOCs and enhanced vascularity. Twenty-eight patients underwent either ultrasound-guided or standard D&C, whereas three patients underwent D&C followed by hysteroscopy. The authors reported only three cases of blood loss above 100 mL, with none of the cases requiring further intervention.

Finally, many authors advocate the use of uterine artery embolization (UAE) as the first-line method for managing these patients to reduce the risk of severe hemorrhage (73,75). A study by Bazeries et al. (76) reported an 87% success rate in 31 women treated with UAE.

Despite these findings, larger prospective studies are still required to establish an appropriate method for managing these cases. Therefore, we believe that, at this point, each case should be managed individually, taking into consideration the patient’s age and medical history, the size of the lesion, and the peak systolic velocity.

**6. Preventive Measures for Reducing IUAs**

IUAs are a major complication of resectoscopic surgery, with possible effects on future fertility, abnormal placental implantation, and intrauterine growth restriction. The prevention of IUAs is an endeavor that has been pursued for decades, involving different modalities, with different degrees of success.

***6.1 Hyaluronic Acid Formulations***

Hyaluronic acid (HA) is a glycosaminoglycan polysaccharide found abundantly throughout the extracellular matrix of the body. Its structural properties and key roles in wound repair, the inflammatory response, angiogenesis, cell migration, and biodegradability (77,78) make it a promising agent for preventing IUAs. The use of this agent in other fields of medicine, such as dermal filler in cosmetic surgery and as an intra-articular injection for osteoarthritis, has provided some degree of success and has proven its safety (79,80).

In a meta-analysis, Haufang et al. (81) identified four clinical trials of moderate-to-excellent quality that demonstrated that HA can prevent IUAs, especially those of moderate severity. This was further supported in a recent meta-analysis by Fei et al. (82), which found that, along with its ability to reduce the incidence of moderate and severe IUAs, the use of HA also improved pregnancy rates after miscarriage. A practice report of the American Association of Gynecologic Laparoscopists (AAGL) and [European Society for Gynecological Endoscopy](https://esge.org/) (ESGE) proposed that HA application may reduce the rate of IUAs (83). Although the evidence supports the ability of HA to prevent some degree of IUAs, its ability to improve fertility rates and subsequent pregnancy outcomes remains questionable.

***6.2 Polyethylene Oxide-Sodium Carboxymethylcellulose Gel***

The proposed mechanism of action of polyethylene oxide-sodium carboxymethylcellulose gel (POC) (Intercoat by Ethicon, Inc.) is that it provides a temporary barrier to adhesion, much like a mechanical barrier, that enables spontaneous endometrial reepithelization without the hazardous apposition of de-epithelized surfaces.

Two studies evaluating its effectiveness in RPOCs reported conflicting results. Di Spiezio Sardo et al. (84) reported a significant reduction in IUAs but did not report on pregnancy outcomes. Fuch et al. (85) found no difference in the rates of IUAs or pregnancy rates. The scarcity and inconsistency of the data do not support the preventive role of POC in the formation of IUAs.

***6.3 Other Antiadhesives***

Human amnion, alginate carboxymethylcellulose HA gel, and carboxymethylcellulose HA gel all lack insufficient data for making any recommendations.

***6.4 Second-Look Hysteroscopy***

Second-look hysteroscopy has a diagnostic and a therapeutic benefit by enabling the blunt lysis of small flimsy adhesions with the hysteroscope. Data heterogeneity and its combined use with other preventive methods make it hard to assess its performance.

A randomized controlled trial by Pubbucu et al. (86) compared two groups treated with an intrauterine device (IUD) and hormonal therapy, where one group had an early second-look hysteroscopy 1 week after the initial surgical intervention. The rate of IUAs at 2 months differed significantly between the two groups, favoring early repeat hysteroscopy (10.9% vs 82.9%, P < 0.05). However, there was no significant difference in pregnancy rates between the groups (47.2% vs 30%, P = 0.22), thus questioning the usefulness of the IUA rate as a measured outcome in other studies.

***6.5 Estrogen***

The proliferative endometrial effect of estrogen is believed to improve post-traumatic endometrial healing, thereby reducing the risk of IUAs and their subsequent obstetrical sequelae.

Two small prospective studies (86,87), one of which was randomized (87), examined the effect of estrogen on IUAs and obstetrical outcomes after hysteroscopic septum resection. Neither study found a significant difference in terms of obstetrical outcomes. In contrast to these results, in both studies, the estrogen group had no adhesions on second-look hysteroscopy while the control groups had a 5.3–6.9% IUA rate.

The AAGL practice guidelines, developed in collaboration with the ESGE, recommend that women be treated after operative hysteroscopy with 2.5 mg per day of conjugated equine estrogen for 2–3 cycles, while the addition of progestin may be considered (83). Higher estrogen formulations were found to have no benefit in the prevention of IUAs (87).

***6.6 Mechanical Factors***

To prevent IUAs, physically distancing the endometrial walls from each other has been suggested. The insertion of intrauterine mechanical factors, such as an intrauterine balloon, Foley catheter balloon, and IUD, has been evaluated for preventing IUAs. The placement of mechanical barriers was thought to separate the anterior surface of the uterus from the posterior, enabling endometrial regeneration (88). However, on the other hand, foreign objects placed inside the uterine cavity have the potential to induce an inflammatory response and further IUA formation.

Lin et al. (89) demonstrated some degree of efficacy with the use of a Foley balloon catheter and a non-hormonal IUD, used after resectoscopic surgery for Asherman’s syndrome. Other studies have demonstrated the ability of a balloon catheter (90) and IUD (91) to reduce the rate of IUA formation, while another has failed to prove these effects (92). In addition, a previous randomized controlled trial found no difference between the insertion of an intrauterine balloon and an IUD (93).

**7. Conclusion**

As presented throughout this review, RPOCs are a prevalent disorder that may arise after normal delivery, miscarriage, and TOP and may lead to immediate, short-, and long-term complications, including secondary infertility. Despite these detrimental risks and their clinical significance, guidelines addressing the adequate management and prevention of RPOCs by the leading committees in the field of obstetrics and gynecology are lacking. Based on the data presented throughout this review, we have developed a list of recommendations that may assist clinicians in the treatment of women with RPOCs to prevent these long-term complications (Box 1).

**Box 1. Recommendations for the prevention and management of retained products of conception**

**Box 1. Recommendations for the management of retained products**

* Careful inspection of the placenta for missing cotyledons or fetal membranes is required after its delivery (Moderate)
* Immediate manual uterine revision following placental delivery should be performed if retained products are suspected, either clinically or on inspection (Moderate)
* Ultrasound examination is recommended 4 to 6 weeks after delivery in women who undergo uterine revision or manual removal of the placenta (Low)
* Women with RPOCs following medical or surgical treatment for miscarriage or TOP may be considered for an additional course of misoprostol, in the absence of hemodynamic instability and severe uterine bleeding (Low)
* Women presenting with septic products of conception should receive immediate intravenous antibiotics with rapid ultrasound-guided suction curettage (Moderate)
* RPOCs presenting with severe vaginal bleeding should undergo immediate surgical intervention with HR or D&C, under ultrasound guidance, if hysteroscopy is not technically possible (High)
* Surgical interventions in women with RPOCs should be performed with a hysteroscopic loop or morcellator while trying to avoid the use of an electric current during the procedure (High)
* Prior to a surgical intervention, prophylactic antibiotics should be considered (Low)
* If large residual tissue that cannot be fully removed during a single procedure is encountered, a second hysteroscopic intervention should be scheduled 4 weeks later (Low)
* Following RPOC removal, preventive measures with estrogen-based regimens for 1–2 months and postoperative instillation of hyaluronic acid may be considered to prevent the formation of IUAs (Low)
* Second-look hysteroscopy 4–8 weeks after hysteroscopic intervention may be considered for treating and preventing the formation of IUAs (Low)

**Table 1. Studies reporting on the prevalence of IUAs in women treated for RPOCs**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | **Year** | **Intervention method** | **Number of patients** | **Study group** | **Design** | **Abx** | **Hormones** | **Delivery to intervention** | **IUA rate** | **Electricity used** |
| **Westendorp** (50) | 1998 | D&C | 50 | Abortion  TOP  Delivery | Pros | Yes | NA | NA | 20/50 **(40%)** | NR |
| **Dankert** (54) | 2008 | HL | 10 | Delivery | Retro | NA | NA | 11 days to 6 months | 0/9 **(0%)** | NA |
| **Faivre** (56) | 2009 | HL | 50 | Abortion  TOP  Delivery | Retro | Yes | NA | \*60 days (30–90 days) | 0/22 **(0%)** | Tried to avoid |
| **Golan** (41) | 2010 | HL | 159 | Abortion  Delivery | Retro | Yes | NA | \*45 (31–180) | 0/21 **(0%)** | Not used |
| **Rein** (61) | 2011 | D&C and HL | 42 (D&C) vs 53 (HL) | First- or second-trimester miscarriage  Delivery | Pros | NA | NA | 26 ± 8 days | 2/48 **(4.2%)** for HL vs 12/39 **(30.8%)** for D&C | Not used |
| **Hrazidrova** (4) | 2012 | D&C | 100 | Delivery | Pros | NA | NA | Within 24 hours | 18/100 **(18%)** | NR |
| **Barel** (57) | 2014 | HL | 167 | Abortion  Delivery | Retro | Yes | Yes | 50.1 ± 25.5 days | 16/84 **(19%)** | Tried to avoid |
| **Hamerlynck** (39) | 2016 | HM and HL | 46 (HM) vs 40 (HL) | Abortion  TOP  Delivery | RCT | NA | NA | NA | 1/35 **(3%)** for HM vs 1/30 **(3%)** for HL | Tried to avoid |
| **Smorgick** (77) | 2017 | HL | 50 | First-trimester MA or TOP | Retro | Yes | No | 1.7 ± 0.8 months | 0/50 (0%) | Tried to avoid |
| **Campas** (55) | 2019 | HL | 114 | Abortion  TOP  Delivery | Retro | NA | NA | \*109 days (70–149 days) | 4/53 **(7.5%)** | Tried to avoid |
| **Smorgick** (58) | 2020 | HL | 85 | Surgical termination in first and second trimester | Retro | Yes | Yes | 1.5 months ± 0.9 months | 2/49 **(4.1%)** | Tried to avoid |

\* Refers to the median duration of follow-up

Abbreviations: D&C, dilation and curettage; HL, hysteroscopic loop; HM, hysteroscopic morcellation; MA, missed abortion; Retro, retrospective; Pros, prospective; RCT, randomized controlled trial; NA, not available; TOP, termination of pregnancy; NR, not relevant

**Table 2. Studies reporting the conception rate in women treated for RPOCs**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | **Year** | **Intervention method** | **Number of patients** | **Study group** | **Design** | **Follow-up period** | **Abx** | **Hormone** | **Conception rate** | **Electricity used** |
| **Cohen** (62) | 2001 | D&C and HL | 24 (D&C) vs 46 (HL) | TOP  Delivery | Retro | \*6 (6–42) months | NA | NA | 14/17 **(82.4%)** for HL vs 10/16 **(62.5%)** for D&C | Tried to avoid |
| **Faivre** (56) | 2009 | HL | 50 | Abortion  TOP  Delivery | Retro | \*43 (23–69) months | Yes | NA | 23/30 **(76%)** | Tried to avoid |
| **Jimenez** (94) | 2009 | HL | 84 | Abortion  Delivery | Retro | NA | Yes | Yes | 24/30 **(78.6%)** | NA |
| **Golan** (41) | 2010 | HL | 159 | Abortion  Delivery | Retro | At least 3 years | Yes | NA | 23/28 **(82%)** | Not used |
| **Rein** (61) | 2011 | D&C and HL | 42 (D&C) vs 53 (HL) | First- or second-trimester miscarriage  Delivery | Pros | NA | NA | NA | 31/45 **(68.8%)** for HL vs 22/37 **(59.5%)** for D&C | Not used |
| **Ben-Ami** (63) | 2014 | D&C and HL | 94 (D&C) and 83 (HL) | Abortion  Delivery | Retro | NA | NA | NA | 77/83 **(92.8%)** for HL vs 87/94 **(92.6%)** for D&C | Not used |
| **Ikhena** (95) | 2016 | HL | 111 | Early abortion  Delivery | Retro | At least 18 months | Yes | Yes | 55/111 **(49.5%)** | Surgeon's decision |
| **Van Wessel** (40) | 2016 | HL and HM | 86 | Abortion  TOP  Delivery | Retro | 4–6 years | No | NA | 19/22 **(86.4%)** for HL vs 24/27 **(88.9%)** for HM | Tried to avoid |
| **Sonnier** (64) | 2017 | HL | 115 | Abortion  Delivery | Retro | 22 months | Y | NA | 44/53 **(83%)** | Tried to avoid |
| **Campas** (55) | 2019 | HL | 114 | Abortion  TOP  Delivery | Retro | Less than 1 year | NA | NA | 30/36 **(84%)** | Tried to avoid |

\* Median duration of follow-up

Abbreviations: D&C, dilation and curettage; HL, hysteroscopic loop; HM, hysteroscopic morcellation; Retro, retrospective; Pros, prospective; NA, not available; TOP, termination of pregnancy.

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