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Guideline No. 453: Endometrial Ablation in the Management of Abnormal Uterine Bleeding

(En français : Ablation de l'endomètre dans la prise en charge des saignements utérins anormaux)

The English document is the original version; translation may introduce small differences in the French version.

This clinical practice guideline was prepared by the authors and overseen by the SOGC Clinical Gynaecology Committee (2024). It was approved by the SOGC Guideline Management and Oversight Committee (2024).
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Informed consent: Patients have the right and responsibility to make informed decisions about their care, in partnership with their health care provider. To facilitate informed choice, patients should be provided with information and support that is evidence-based, culturally appropriate, and personalized. The values, beliefs, and individual needs of each patient in the context of their personal circumstances should be considered and the final decision about care and treatment options chosen by the patient should be respected.

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RECOMMENDED CHANGES IN PRACTICE

1. Regarding the use of distension media, when the fluid deficit reaches 1000 mL with hypotonic solutions, such as glycine, stop the procedure and reassess accuracy of fluid loss. If the deficit is confirmed or uncertain, discontinue the surgery immediately.

KEY MESSAGES

1. Endometrial ablation techniques are safe and effective minimally invasive alternatives to hysterectomy for benign abnormal uterine bleeding.
2. Medically complex patients (ASA $>$ 3), or patients requiring general anaesthesia should have endometrial ablation performed in a health care environment with appropriate anaesthesia and monitoring resources. Resectoscopic endometrial ablation has efficacy similar to that of non-resectoscopic techniques; therefore, the former technique should be performed in such environments because of its lower cost.
3. Endometrial ablation does not delay the diagnosis of subsequent endometrial cancer and may decrease the overall risk of endometrial cancer.
4. If significant intracavitary abnormalities are present, resectoscopic endometrial ablation combined with hysteroscopic metroplasty, myomectomy, or polypectomy should be considered. The sequential use of a hysteroscopic tissue removal system and non-resectoscopic endometrial ablation device is not recommended due to concerns regarding safety and significant additional costs.
5. Residency training programs across Canada will need to continue to teach hysteroscopic skills, as non-resectoscopic techniques cannot always be performed in cases with cavity pathologies and anomalies. They are also associated with significant additional case costs, and access to those technologies can be limited in some remote or rural areas of Canada.

ABSTRACT

Objective: To provide an update of the current evidence-based guideline on the techniques and technologies used in endometrial ablation, a minimally invasive technique for the management of abnormal uterine bleeding of benign origin.

Target Population: Women of reproductive age with abnormal uterine bleeding and benign pathology with or without structural abnormalities.

Benefits, Harms, and Costs: Implementation of the guideline recommendations will improve the provision of endometrial ablation as an effective treatment for abnormal uterine bleeding. Following these recommendations would allow the surgical procedure to be performed safely and maximize success for patients.

Evidence: The guideline was updated with published literature retrieved through searches of Medline and the Cochrane Library from January 2014 to April 2023, using appropriate controlled vocabulary and keywords (endometrial ablation, hysteroscopy, menorrhagia, heavy menstrual bleeding, abnormal uterine bleeding, hysterectomy). Results were restricted to systematic reviews, randomized control trials/controlled clinical trials, and observational studies written in English.

Grey (unpublished) literature was retrieved from the Association of Obstetricians and Gynecologists of Quebec (AOGQ) in 2023.

Validation Methods: The authors rated the quality of evidence and strength of recommendations using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. See Appendix A (Tables A1 for definitions and A2 for interpretations of strong and conditional [weak] recommendations).

Intended Audience: Obstetricians, gynaecologists, and primary care providers.

Social Media Abstract: This is an updated version of the 2015 SOGC Endometrial Ablation guideline. The authors discuss special considerations, update evidence, and make new fluid deficit recommendations.

SUMMARY STATEMENTS:

1. Endometrial ablation is a safe and effective minimally invasive surgical procedure that has become a well-established alternative to medical treatment or hysterectomy for abnormal uterine bleeding in select cases (*high).*
2. Medical preparation to thin the endometrium can be used to facilitate resectoscopic endometrial ablation and can be considered for some non-resectoscopic techniques. For resectoscopic endometrial ablation, preoperative endometrial thinning results in higher short-term rates of amenorrhea, decreased distension media fluid absorption, and shorter operative time when compared with no treatment (*high*).
3. Non-resectoscopic techniques are technically easier to perform than resectoscopic techniques, have shorter operative times, and can be done in procedure rooms rather than formal operating rooms. Both techniques have comparable results with respect to patient satisfaction and reduction of heavy menstrual bleeding (*high*).
4. Both resectoscopic and non-resectoscopic endometrial ablation have low complication rates. Uterine perforation, fluid overload, hematometra, and cervical lacerations are more common with resectoscopic endometrial ablation; perioperative nausea/vomiting, uterine cramping, and pain are more common with non-resectoscopic endometrial ablation (*high*).
5. All non-resectoscopic endometrial ablation devices available in Canada have demonstrated effectiveness in decreasing menstrual flow and result in high patient satisfaction. Device selection depends primarily on surgical judgement and the availability of resources. In general, non-resectoscopic endometrial ablation devices require the confirmation of a relatively normal endometrial cavity before device selection (*high*).
6. The use of local anaesthetic and blocks, oral analgesia, and conscious sedation allows for the provision of non-resectoscopic endometrial ablation in less resource-intensive environments, including regulated non-hospital settings (*moderate*).
7. Low-risk patients with satisfactory pain tolerance are good candidates to undergo endometrial ablation in settings outside the operating room or in free-standing surgical centres (*moderate).*
8. Endometrial ablation procedures do not increase the risk of cancer, do not cause delayed diagnosis of endometrial cancer, and may decrease the overall risk of endometrial cancer (*high).*

RECOMMENDATIONS:

1. Preoperative assessment should be comprehensive to rule out any contraindications to endometrial ablation or to plan for

concurrent management of fibroids, cavitary anomalies, or polyps (*good practice point*).
2. Patients should be counselled about the need for effective contraception following endometrial ablation (*good practice point*).
3. Recommended evaluations for abnormal uterine bleeding, including but not limited to endometrial sampling and an assessment of the uterine cavity, are necessary components of the preoperative assessment (*good practice point*).
4. Clinicians should be knowledgeable about complications specific to resectoscopic endometrial ablation, such as those related to fluid distension media and electrosurgical injury (*good practice point*).
5. For resectoscopic endometrial ablation, a strict protocol should be followed for fluid monitoring and management to minimize the risks associated with distension medium overload. The maximum threshold for hypotonic solution, such as glycine, is 1000 mL. The threshold for isotonic solutions, like sodium chloride, is up to 2500 mL in the absence of cardiopulmonary/renal disease (*strong, high*).
6. If uterine perforation is suspected to have occurred during cervical dilatation or with the resectoscope (without electrosurgery), the procedure should be discontinued immediately, and the patient should be closely monitored for signs of intraperitoneal hemorrhage or visceral injury. If the perforation occurs with electrosurgery or if the mechanism of perforation is uncertain, abdominal and pelvic exploration is warranted to obtain hemostasis and rule out potential visceral injuries (*strong, high*).
7. With resectoscopic endometrial ablation, if uterine perforation has been ruled out, acute hemorrhage may be managed by using one or more of these techniques: intrauterine Foley balloon tamponade, intracervical vasopressors injection, administration of rectal misoprostol, and systemic administration of tranexamic acid (*conditional, moderate*).
8. If repeat endometrial ablation is considered following non-resectoscopic or resectoscopic endometrial ablation, it should be performed by a skilled hysteroscopic surgeon with direct visualization of the cavity. Patients should be counselled about the increased risk of complications with repeat endometrial ablation (*strong, moderate*).
9. When considering endometrial ablation in patients with a history of cesarean delivery, resectoscopic techniques that allow direct visualization of the cavity and myometrial defect (isthmocele) should be used (*good practice point*).
10. Endometrial ablation may be considered in the setting of abnormal uterine bleeding related to adenomyosis. However, patients should be counselled that preoperative pain is an independent risk factor for endometrial ablation failure and subsequent hysterectomy, whether related to adenomyosis or other potentially comorbid conditions including endometriosis (*strong, moderate*).
11. Concomitant insertion of a levonorgestrel intrauterine system at the time of endometrial ablation may improve outcomes, but this practice is under investigation and has not been definitively established in any population (*conditional, low*).
12. If significant intracavitary abnormalities are present, resectoscopic endometrial ablation combined with hysteroscopic metroplasty, myomectomy, or polypectomy should be considered. The sequential use of a hysteroscopic tissue removal system and non-resectoscopic endometrial ablation device is not recommended owing to concerns regarding safety and significant additional cost (*good practice point*).
13. Residency training programs will need to continue to inculcate hysteroscopic skills as non-resectoscopic techniques cannot always be used for cases with cavity pathologies and anomalies. They are also associated with significant additional case costs (*good practice point*).
14. The presence of persistent abnormal uterine bleeding or uterine pain following endometrial ablation warrants a thorough investigation. If endometrial sampling cannot be performed, an ultrasound evaluation of endometrial thickness should be performed and hysterectomy considered (*good practice point*).

INTRODUCTION

Endometrial ablation refers to a number of minimally invasive surgical procedures designed to treat abnormal uterine bleeding (AUB), defined as changes in the frequency of menses, duration of flow, or amount of blood loss. Endometrial ablation consists of targeted destruction or removal of the endometrial surface of the uterine cavity in select women who have no desire for future pregnancy. The procedure was initially designed to treat heavy menstrual bleeding refractory to medical therapy and not caused by structural uterine pathology. It is a less invasive alternative to hysterectomy.

Although endometrial destruction through the endocervical canal dates back to 1937, this technique became more widely adopted in 1981 with the advent of laser endometrial ablation, followed by rollerball and loop resection in the late 1980s. Subsequent to these techniques, various non-resectoscopic ablation techniques have become available. They use different energy sources to achieve destruction of the endometrium, including heated liquid (either free circulating or confined within a balloon), radiofrequency electricity, and tissue freezing. Currently, a number of these systems are available in Canada.

According to the Association of Obstetricians and Gynecologists of Quebec (AOGQ), 6623 endometrial ablations were performed in Québec in 2020/21, compared with 3646 in 2012/13, an increase of more than 80%.[1] Endometrial ablation is now more frequently performed than vaginal hysterectomy in Québec. However, the impact of endometrial ablation on hysterectomy rates remains uncertain. American statistics from 6 states show endometrial ablation being used as an "additive medical technology rather than a substitute" for hysterectomy.[2] In the United Kingdom, there has been a significant reduction in hysterectomy rates over the past 20 years, due to both improved medical treatment options and increased use of endometrial ablation techniques.[3,4] Endometrial ablation improves treatment access for those women who have AUB and provides an alternative to major procedures, such as hysterectomy.

ABBREVIATIONS

AUB	Abnormal uterine bleeding
GnRH	Gonadotropin-releasing hormone
LNG-IUS	Levonorgestrel intrauterine system
NaCl	Sodium chloride
PASD	Placenta accreta spectrum disorder

In the past 20 years alone, there have been more than 1100 publications on endometrial ablation. This guideline reviews the indications and contraindications for performing endometrial ablation (Table 1) and compares resectoscopic and non-resectoscopic techniques. The document also includes discussions of operative set-up, anaesthesia, preoperative and postoperative care, and some special considerations in clinical practice.

COMPARISON OF ENDOMETRIAL ABLATION WITH OTHER THERAPIES

Endometrial Ablation Versus a Levonorgestrel Intrauterine System

A levonorgestrel intrauterine system (LNG-IUS) is a simple treatment option for women with AUB and is more cost-effective than any surgical technique, including endometrial ablation. In a recent meta-analysis, LNG-IUS and endometrial ablation had similar outcomes for up to 3 years after treatment in terms of subsequent hysterectomy, patient satisfaction, quality of life, amenorrhea, and treatment failure.[5] A Cochrane review concluded that endometrial ablation and LNG-IUS had similar patient satisfaction outcomes, though endometrial ablation was associated with a greater reduction in menstrual bleeding.[6] During the first 6 months of use, the LNG-IUS may be associated with a number of progestogenic side effects, including but not limited to irregular bleeding, breast tenderness, and headache.

Clinical Tip

LNG-IUS should be discussed prior to any surgical option for women with AUB and a relatively normal uterine cavity.

Endometrial Ablation Versus Hysterectomy

In a review of 9 prospective randomized clinical trials, hysterectomy was associated with improved pain control and reduced bleeding.[7] In another study, at 4-year follow-up

Table 1. Indications and contraindications for endometrial ablation (EA)

Indications for EA	Absolute contraindications for EA

• Abnormal uterine bleeding of benign origin
  • EA may be considered as a primary intervention in circumstances such as:
  - intolerance to or failure of medical therapy; or
  - patient preference
• EA may be considered for patients who refuse or are poor surgical candidates for hysterectomy.
	• Pregnancy
	• Desire to preserve fertility
	• Known or suspected endometrial hyperplasia or cancer
	• Cervical cancer
	• Active pelvic infection
	• Specific contraindications related to non-resectoscopic techniques

98% of women post hysterectomy versus 85% of women post endometrial ablation were satisfied with their results.[8] However, hysterectomy was associated with higher risks of adverse events, severe complications, and a longer hospital stay. In a large retrospective study with 11 years of follow-up data, risk of surgery for subsequent pelvic floor repair and stress urinary incontinence was lower with endometrial ablation than with hysterectomy.[9] Although the direct costs of endometrial ablation are about half those of hysterectomy, it appears that the costs of the 2 procedures become equivalent at 4 years, because some women with endometrial ablation will need additional treatment. Age <40 years, prior tubal ligation, and preoperative dysmenorrhea are independent predictors of endometrial ablation failure and subsequent re-intervention.[10,11]

Summary Statement 1

PREOPERATIVE AND POSTOPERATIVE CARE

Preoperative Care

The work-up of patients with AUB and the algorithm for decision-making have been previously described.[12] Patients must not have any contraindication to hysteroscopy and must not desire future pregnancy, as serious maternal–fetal complications have been reported in pregnancies following endometrial ablation (i.e., uterine rupture causing maternal death, limb defects, premature labour).[13] Therefore, women must be counselled that endometrial ablation is not considered a sterilization method. Women must also be appropriately counselled about realistic expectations of ablation outcomes. The goal of endometrial ablation is to sufficiently reduce bleeding symptoms from the patient's perspective; amenorrhea, although possible, cannot be guaranteed. Management of patient expectations is an important consideration.

Endometrial preparation can be considered preoperatively, as a thin endometrium can improve visualization for the resectoscopic techniques and improve patient outcomes. A thin endometrium may be achieved by scheduling the procedure in the immediate postmenstrual phase, performing curettage prior to the procedure, or administering preoperative hormonal therapy. A systematic review suggested that preoperative endometrial thinning with gonadotropin-releasing hormone (GnRH) agonists or danazol resulted in higher rates of amenorrhea at 12 and 24 months than placebo or no treatment.[14] Whether or not this difference is maintained beyond 24 months is uncertain. Both GnRH agonists and danazol also had a beneficial effect on the intrauterine operating environment with respect to shorter operative time, improved visualization, and reduced absorption of distension media. The disadvantages of these agents include the costs and side effect profiles. Randomized data assessing the value of progestins in preoperative endometrial thinning prior to endometrial ablation are not available. In a study of resectoscopic endometrial ablation, amenorrhea rates at 12-month follow-up were 39% for endometrial preparation with GnRH agonists compared with 34% for danazol, 26% for medroxyprogesterone acetate, and 18% for dilatation and curettage.[15]

The use of endometrial preparation prior to non-resectoscopic endometrial ablation will depend on the product monograph for each individual device. Meta-analysis of a few randomized trials on second-generation devices (radiofrequency ablation and balloon devices) suggest that preoperative endometrial thinning does not improve postoperative rates of amenorrhea.[14]

No randomized controlled trials with sufficient numbers and power have supported or refuted the role of antibiotic prophylaxis before endometrial ablation by any technique.[16]

Postoperative Care

Patients can usually be discharged within 1–3 hours of endometrial ablation depending on the type of anaesthesia used. They can resume their normal activities progressively but are advised to abstain from sexual intercourse for 1 week. Pain can be managed with non-steroidal anti-inflammatory drugs or analgesics and will usually resolve within 24 hours. Light vaginal bleeding or pinkish discharge is usual and can last up to several weeks following the procedure. Patients are counselled to seek medical care if they have fever, intense pain, or profuse vaginal bleeding.

Summary Statement 2 & Recommendations 1, 2, and 3

Clinical Tip

Required investigations prior to endometrial ablation include:

- Pregnancy test
- Up-to-date Pap test
- Cervical cultures, if clinically appropriate
- Endometrial sampling
- Assessment of uterine cavity for Müllerian anomalies or intracavitary pathology using transvaginal ultrasound, saline infusion sonography, or diagnostic hysteroscopy.

(See also SOGC Clinical Practice Guideline No. 292, Abnormal Uterine Bleeding in Pre-Menopausal Women.[12])

Because it is often difficult to interpret residual menstrual discharge post procedure, the efficacy of the endometrial ablation should be assessed no earlier than 12 weeks postoperatively.

COMPARISON OF RESECTOSCOPIC AND NON-RESECTOSCOPIC ENDOMETRIAL ABLATION TECHNIQUES

First-generation techniques introduced in the 1980s consisted of targeted endometrial destruction under direct hysteroscopic visualization. These techniques included laser ablation and electrosurgical endometrial resection or ablation. Despite their efficacy, the first-generation methods had certain disadvantages. They required a skilled hysteroscopic surgeon and an operating room environment. Their uncommon but serious complications of fluid overload and uterine perforation led to the advent of simpler, less user-dependent alternatives.

These second-generation techniques, also known as non-resectoscopic ablation, use a variety of energy sources to non-selectively destroy the endometrial lining. The advantage of these newer technologies is that they require shorter surgical time, less specialized training, and they can be performed in an outpatient setting. They also help to avert complications associated with the use of fluid distension media while achieving similar clinical outcomes.[17] For these reasons, non-resectoscopic procedures have become increasingly popular.[18] Their use does not obviate the need for skilled hysteroscopic surgeons for complex cases such as cavitary fibroids, Müllerian anomalies, repeat ablations or other endometrial pathology. Also, access to these technologies can be limited in some remote or rural areas of Canada.

Resectoscopic Endometrial Ablation

Resectoscopic endometrial resection/ablation is an attempt to destroy the basal endometrial layer to prevent further endometrial proliferation. Patients are placed in supported dorsal lithotomy position and the cervix dilatated to at least 10 mm. Most operative hysteroscopic systems employ a 9 mm (27 French) scope. Hysteroscopes are usually rigid, with operative hysteroscopy using 12°, 15°, or 30° of angulation. After uterine distension is achieved, the cavity is inspected, and endometrial lesions or abnormalities are mapped. Importantly, intrauterine landmarks (tubal ostia, internal cervical os, and/or the characteristic appearance of the endometrium) are identified to confirm that the cavity has been entered and ensure that the operator has not created a false passage. Focal lesions are biopsied, resected, and sent separately to the pathology laboratory.

The rollerball is used at the fundus and ostial regions with a touch technique applying no pressure. The treatment endpoint is a visual change in the endometrium to a yellow-brown honeycomb appearance indicating myometrial tissue has been reached. Tissue destruction to a depth of 4−6 mm will usually destroy the basal endometrial layer. The uterine walls can be ablated with the ball electrode or resected using the loop electrode, which also provides a specimen for histology. The electrode should always be visible, in contact with tissue, and moving toward the surgeon when activated. Prolonged activation of the electrode, excessive power settings, and dampened currents should be avoided to prevent capacitive coupling and other causes of electrosurgical injuries. The surgeon should avoid excessive ablating beyond the cervico-uterine junction (with the exception of reddish glandular areas) to avoid cervical stenosis.

Endometrial polyps and small submucosal fibroids can be resected using the resectoscope, larger myoma (>3 cm) require advanced operative hysteroscopy skills and consideration of GnRH agonist or antagonist suppression with add-back therapy for prolonged suppression. Endometrial resection and resection of fibroids may result in more fluid absorption and may be associated with longer operative times.[17]

Use of a fluid management system is recommended. Bipolar resectoscopic systems require the use of normal saline as a distension medium, thereby eliminating concerns about hyponatremia; however, large quantities of normal saline can still result in fluid overload complications. Therefore, fluid monitoring is required with the use of any distension medium.

Efficacy of Resectoscopic Endometrial Ablation

Early studies reported high rates of improvement in heavy menstrual bleeding and high rates of patient satisfaction. O'Connor and Magos reported a 20% repeat surgery rate, including a 9% hysterectomy rate, over a 5-year follow-up period in a group of 525 patients undergoing endometrial resection.[19] Martyn and Allan reported similar results with a repeat surgery rate of 9.2%, including an 11.6% hysterectomy rate, at 5 years of follow-up.[20] The presence of fibroids and dysmenorrhea did not increase the risk of failure.

A meta-analysis of 21 randomized trials comparing different resectoscopic techniques of endometrial destruction showed

no difference in rates of amenorrhea and subsequent hysterectomy.[17] First-generation techniques showed improvement in bleeding in 72.5%–79.5% of cases at 1-year follow-up and high patient satisfaction rates.[17]

Advantages and Disadvantages of Resectoscopic Endometrial Ablation

Compared with the non-resectoscopic techniques, resectoscopic endometrial ablation offers certain advantages. It allows for accurate assessment of uterine pathology with directed biopsies, documentation with photography, and concurrent treatment of intracavitary pathology. It can also be used in patients who have had previous endometrial ablation or trans-myometrial surgery. However, resectoscopic endometrial ablation is a skill-dependent procedure that generally requires a hospital operating room environment and has a higher complication rate than non-resectoscopic methods.

Fluid Management During Endometrial Resection

Resectoscopic endometrial ablation has potential complications specific to this surgical modality. Careful fluid management is critical to the safe use of hysteroscopic endometrial ablation. Fluid overload leading to pulmonary edema and cardiovascular compromise can occur with hypotonic solutions, such as glycine 1.5% (200 mOsm) or sorbitol 3% (165 mOsm), as well as with isotonic solutions, such as sodium chloride (NaCl) 0.9%. However, with hypotonic solutions, fluid overload is also associated with dilutional hyponatremia, which in turn can cause brain edema and symptoms of nausea, vomiting, confusion, agitation, headache, and even visual disturbances that could potentially lead to blindness. Severe hyponatremia can also lead to brainstem herniation and death.[21]

Normal sodium concentration in a healthy individual varies between 135 and 145 mmol/L. Intravascular absorption of glycine of 1000 mL is associated with a drop in natremia of 7–10 mmol/L and radiologic evidence of cerebral edema.[22,23] Therefore, serum sodium of a healthy woman could drop to 125 mmol/L, a level below which there can be neurological complications. Hence, various national societies have determined that, in general, the absorption of 1000 mL of hypotonic solution, such as glycine, is the upper limit that should prompt termination of the procedure.[24–28]

Isotonic solutions such as NaCl 0.9% are considered safer because there is no dilutional hyponatremia of clinical significance and the upper limit for absorption of NaCl 0.9% for a healthy individual has been determined to be 2500 mL by consensus from various specialty societies and national guidelines, such as those of the American Association of Gynecologic Laparoscopists (AAGL)[28] and British Society for Gynaecological Endoscopy (BSGE),[24] as there are no data to provide a specific threshold. In older women or those with cardiopulmonary compromise, the upper limit of absorption should be reduced as per Table 2. In one prospective study, 155 patients with myoma were randomly assigned to bipolar loop resection using 0.9% saline versus monopolar loop resection using 1.5% glycine. There was a significant decrease in serum osmolarity and serum sodium in the monopolar group versus none of these effects in the bipolar group,[29] and up to 30% hyponatremia in the monopolar group compared with none in the bipolar group. Litta et al. looked at surgical outcomes of 216 women and found that 12% of

Table 2. Management of hysteroscopic distension fluid losses

Measurement of intake and output (I & O) during hysteroscopy
a. I & O should be measured accurately, ideally by an electronic fluid management system, for all operative hysteroscopy procedures.
b. I & O values for all distension media should be monitored and fluid deficits reported to the surgeon and anesthesiologist.
c. The circulating nurse should seek assistance, and additional staff if required, to monitor fluid I & O.
d. Final I & O values or fluid deficit should be recorded on the operative record.
e. Final I & O values should be reported to the surgeon and anesthesiologist at the end of the procedure.
For hypotonic solutions
At a fluid deficit of 500 mL:
• Ensure the anesthesiologist and surgeon are aware of the deficit in return of uterine distension fluid.
At a fluid deficit of 1000 mL:
• Stop the procedure and reassess accuracy of fluid loss; if confirmed, discontinue surgery immediately.
• Serum electrolyte values should be obtained, and abnormalities managed appropriately.
• Observe the patient for signs of fluid overload and encephalopathy, changes in level of consciousness, seizure activity, pulmonary fluid management, and tachypnea.
• Consider admitting the patient for observation and management of complications.
For isotonic solutions
• When the fluid deficit reaches 2500 mL, stop the procedure and reassess accuracy of fluid loss; if confirmed, discontinue surgery.
For older women and/or those with cardiopulmonary compromise
• Use 750 mL as the upper limit of fluid deficit with hypotonic solutions.
• Use 1500 mL as the upper limit of fluid deficit for isotonic solutions.

patients undergoing type 1 and type 2 myoma resection using monopolar electrodes had an incomplete removal, which required a second surgery owing to excessive fluid absorption, whereas patients who were operated on using bipolar electrodes had a complete surgery on the first attempt.[30] Although calculation of fluid deficit has become more accurate using dedicated irrigation-pump systems, there is still an approximation of actual fluid intravasation because of spillage onto the floor, absorption by pads and drapes, intraperitoneal absorption through the fallopian tubes, bag overfill, and blood loss.[24,31]

Table 2 provides an approach to prudent management of hysteroscopic distension fluid issues.

Excessive fluid absorption may be prevented by pretreatment of the endometrium,[15] intracervical injection of pressor agents (vasopressin, epinephrine), and the use of a distension pressure that is less than that of the patient's mean arterial pressure. Electronic fluid monitoring systems, which allow regulation of the flow rate, infusion pressure, outflow suction, and fluid deficit are more accurate in calculating fluid deficits than traditional gravity infusion systems and manual estimation of fluid deficit.

Non-Resectoscopic Endometrial Ablation

Currently various energy sources are used in 6 non-resectoscopic endometrial ablation devices approved by Health Canada, including bipolar radiofrequency ablation (NovaSure), heated fluid freely circulated in the uterine cavity (Genesys HTA), and fluid contained in a balloon (Thermablate EAS, Cavaterm, LiNA Librata). Specifications of each of these devices are compared in Table 3. It is important to note that some of these devices are approved but not commercially sold in Canada at this time. Others are approved in the United States only (PlasmaSense, Cerene cryotherapy, Mara Water Vapor System). Future technologies like these have promising preliminary results.[32]

In the absence of large differences in effectiveness and with low complication rates for each of the devices, the choice of which to use depends primarily on the following practical issues and patient factors:

- Availability of scientific evidence
- Local availability and cost effectiveness
- Surgeon preference
- Ease of use in outpatient/clinic setting
- Requirement of endometrial preparation
- Uterine cavity characteristics (size, cavitary pathology)

Clinical Tip

For safety and appropriate intracavitary device placement, pre- and postprocedural diagnostic hysteroscopy or intraprocedural ultrasound guidance may be considered.

The balloon technologies involve coagulation of the endometrium that eventually leads to fibrosis. The maximum effect of this process is seen at 6 months post procedure rather than at 2–4 weeks, as seen with other technologies.

Comparing the Efficacy of Non-Resectoscopic Devices

Patient satisfaction and re-intervention rates may be more clinically meaningful than absolute amenorrhea rates in comparing outcomes of procedures using non-resectoscopic devices. All of these devices work well and are associated with high levels of patient satisfaction, as demonstrated by the pivotal trials conducted by the US Food and Drug Administration (FDA) that showed satisfaction rates of 86%–99% at 1 year.[33]

Direct comparisons of non-resectoscopic devices are scarce, and differences between trials with respect to outcome measures, preoperative endometrial preparation, practice settings, and follow-up times make it challenging to compare outcomes accurately. NovaSure radiofrequency ablation has been the most studied in randomized trials, which compare the device with the Hydro ThermAblator hot liquid balloon and Cavaterm.

NovaSure versus Hydro ThermAblator

At 12 months of follow-up, NovaSure had significantly higher rates of patient satisfaction (87% vs. 68%) and amenorrhea (47% vs. 24%) than the Hydro ThermAblator.[34] This benefit persisted at 5 years, with NovaSure having significantly higher satisfaction rates (81% vs. 48%), higher amenorrhea rates (55% vs. 37%), and fewer surgical re-interventions (15% vs. 35%).[35]

NovaSure versus Cavaterm

In a small, randomized trial of 57 patients, there was no difference in patient satisfaction (92% vs. 83%) or re-intervention rates between groups at 1-year follow-up. Amenorrhea rates, however, were significantly higher with NovaSure (42% vs. 12%).[36]

A network meta-analysis reported that bipolar radio frequency endometrial ablation resulted in higher rates of amenorrhea than thermal balloon at 12 months,[37] which was confirmed by another systematic review.[38] However, there was no difference between techniques in patient satisfaction or number of women still experiencing heavy bleeding.

Table 3. Comparison of non-resectoscopic endometrial ablation devices

Device	Mechanism of action	Device size, mm	Treatment time, min	Advantages	Disadvantages	Procedural points
Radiofrequency electricity, free-circulating fluid, and tissue freezing devices						
NovaSure	Bipolar radiofrequency	6.0	1–2	• Rapid treatment time • No endometrial preparation required • High rates of amenorrhea and satisfaction	• Cavity limitations (mostly suitable for normal cavities) • Cost of disposable equipment • Seating the devices requires practice	After cervical dilatation to Hegar 8 mm (25 Fr), device is inserted against the fundus then slightly retracted. Deployed after proper seating. Pending CO_2 perforation detection check, negative pressure is applied, and power is delivered until 50 ohm of tissue impedance is reached. Blood/steam from the cavity is removed during the procedure.
Her Option	Cryo-ablation at −90 °C	5.5	10–18	• Minimal anaesthesia • Minimal or no cervical dilatation • Able to treat larger cavities	• Long treatment time • Variability of outcome data[72] • Requires ultrasound guidance and hormonal endometrial preparation	After cervical dilatation to Hegar 5–5.5 mm (15 Fr), a disposable 4.5 mm cryoprobe is used to form an elliptical freezing zone starting at both cornua. Concurrent transabdominal ultrasound allows visualization of the process. Additional applications are necessary to treat the lower uterine body.
Hydro ThermAblator	Saline at 90 °C circulated freely	7.8	3 to heat fluid, 10 to treat	• Direct visualization of treatment effect • Can treat irregular cavities (fibroids) • Short learning curve	• Requires hormonal endometrial preparation • Safety concerns: fluid leaks may cause burns • Long treatment time	After cervical dilatation, a disposable sheath that adapts to a 2.7–3.0 mm hysteroscope is inserted. Fluid is heated to a target temperature and treatment is performed under direct visualization. Loss of more than 10 mL of fluid (through cervix or fallopian tubes) will shut the system off automatically.
Hot liquid–filled silicone balloon devices						
Thermachoice III	5% dextrose at 87 °C	5.5	8	• Short learning curve • Long-term safety and effectiveness data	• Cramping from balloon distension • Long treatment time	The cervix is dilatated, the cavity is measured, and the pear-shaped balloon catheter is inserted. Automated treatment maintains a pressure of 180–185 mm Hg. Safety features monitor and prevent excess temperature and pressure. Endometrial preparation (hormonal/mechanical) is optional.
Thermablate EAS	Glycerine at 173 °C	6	8 (heat fluid) 2.2 (treat)	• Short learning curve • Rapid treatment time	• RCT results not yet available	Fluid heats prior to catheter insertion. During treatment, the balloon undergoes a series of pressurizations (200 mm Hg) and depressurizations. Fluid pressure is monitored by transducers that react to contractions/relaxations of the uterus. Endometrial preparation (hormonal/mechanical) is optional.
Cavaterm	1.5% glycine at 75–80 °C	8	10	• Simple to use • Adjustable balloon length	• Cramping from balloon distension • Long treatment time	Fluid is maintained at approximately 200 mm Hg in treatment. A safety mechanism will stop the procedure if it exceeds 250 mm Hg. Endometrial preparation (hormonal/mechanical) is optional.

RCT: randomized controlled trial.

EFFECTIVENESS OF RESECTOSCOPIC VERSUS NON-RESECTOSCOPIC TECHNIQUES

Primary outcome measures when evaluating endometrial ablation procedures include rates of amenorrhea, patient satisfaction, and surgical re-intervention. A Cochrane Database review compared resectoscopic and non-resectoscopic techniques and reported similar amenorrhea rates at 1 year (37% vs. 28%) and 2−5 years (53% vs. 48%).[17] Because women who experience heavy menses are likely to be satisfied with either lighter or normal menses, satisfaction rates for both types of ablation are high.[39] In the Cochrane meta-analysis, satisfaction rates were also comparable at 1 year (91% vs. 88%) and 2−5 years (93% vs. 87%).[17] In an updated analysis of 25 randomized controlled trials with over 4000 patients, rates of amenorrhea and patient satisfaction were not significantly different, even up to 10 years after surgery.[40] The surgical re-intervention rate (repeat ablation and/or hysterectomy) for AUB has been reported to be similar between techniques (21% vs. 25% at 2−5 years).[17] However, analysis of studies with longer follow-up periods shows that non-resectoscopic endometrial ablation has a lower re-intervention rate (Relative risk ratio 0.6; 95% CI 0.38−0.96) than resectoscopic endometrial ablation.[40]

Although clinical outcomes between techniques were comparable, non-resectoscopic procedures required shorter surgical time, were more likely to be performed under local anaesthesia, and resulted in patients' quicker return to normal activity.[39,40] The overall perioperative complication rate was low with both techniques (<2.5% each), but the non-resectoscopic procedures had lower incidences of uterine perforation, fluid overload, hematometra, and cervical laceration.[39,40] These advantages were offset by increased nausea/vomiting and uterine cramping in the perioperative period.[40] A higher incidence of equipment failure of second-generation devices was reported in earlier trials, but this is becoming less of a concern with updated models.

Summary Statements 3, 4, and 5

ANAESTHESIA AND OPERATIVE SET-UP

Resectoscopic ablation is frequently performed under general or regional anaesthesia in the operating room. However, in the appropriate setting, it can also be safely and effectively performed using a local paracervical block with intravenous sedation. Local, regional, or general anaesthesia can be used for non-resectoscopic endometrial ablation. A main advantage of non-resectoscopic procedures is that they may be conducted under local anaesthesia in a less resource-intensive environment than the operating room. Performing such procedures in the operating room rather than in a procedure room adds significant additional costs.

In addition to local anaesthesia by paracervical block, oral or intravenous conscious sedation may be used depending on patient pain tolerance and surgeon preference. Non-steroidal anti-inflammatory drugs can be given preoperatively and are moderately effective in diminishing uterine contractions during and after the procedure.[41]

Procedure Room Versus Operating Room Setting

In the United States, non-resectoscopic endometrial ablation is frequently an office-based procedure, and provider payment processes promote use of these less resource-intensive environments.[42] In the Canadian setting, although there is less funding available for this practice, an estimated savings of CAD $562 per patient undergoing endometrial ablation has been attributed to the introduction of balloon devices in the outpatient setting.[38] Endometrial ablation performed in a hospital-based procedure room or a free-standing day surgery centre rather than an operating room offers the advantages of a patient-centred environment, easier scheduling, and lower case costs. Appropriate low-risk patient selection and a satisfactory pain management strategy are critical in this environment. Procedure rooms must have appropriate emergency equipment readily accessible, and all personnel must be trained in appropriate adverse event protocols. A systematic review comparing non-resectoscopic endometrial ablation performed in the outpatient setting with resectoscopic endometrial ablation in the operating room showed varying amounts of significant cost-savings.[38]

Summary Statements 6 and 7

COMPLICATIONS OF ENDOMETRIAL ABLATION

The most common adverse events following endometrial ablation are pelvic pain, cramping, and nausea/vomiting. These will generally resolve within 12−24 hours of the procedure. Other problems that can develop post procedure are hematometrium, pyometrium, and endometritis. More severe complications are rare with both techniques of endometrial ablation but may include injury to contiguous pelvic structures, such as pelvic blood vessels, bowel, and urinary tract anatomic components.

Procedural complications, such as severe pain, bleeding, uterine perforation, and infection may require emergent surgical management.[17]

The FDA has a reporting system for non-resectoscopic ablation complications, and bowel injury is the most common complication reported to its Manufacturer and User Facility Device (MAUDE) database.[43] Other major complications reported more infrequently are urinary tract injuries, immediate hysterectomy, gas embolism, necrotizing fasciitis, and death. The incidence of such complications is unavailable from databases, as the denominator (i.e., total number of cases) is not known. However, the majority of these adverse events were associated with failure to comply with manufacturers' instructions for use. To mitigate the risk of injury with non-resectoscopic procedures, surgeons may consider post-dilatation hysteroscopy or concurrent ultrasound surveillance during the procedure.

Long-term recurrent AUB after endometrial ablation may be caused by endometrial proliferation, adenomyosis, or (rarely) a pre-malignant or malignant condition of the uterus. Investigation should include an endometrial biopsy if more than 1 year has passed since the procedure. Because dense intrauterine synechiae sometimes result from endometrial ablation, endometrial biopsy and even dilatation and curettage, may often be impossible.[44] Transvaginal ultrasound can also be used to exclude abnormal proliferation of the endometrium. When adequate sampling of the endometrium cannot be obtained and AUB persists with ultrasonic evidence of a thickened endometrium, hysterectomy is generally indicated for both curative and diagnostic purposes.[44]

Serious Complications of Endometrial Ablation

Immediate complications

Uterine perforation has been reported in 0.3% of non-resectoscopic endometrial ablation procedures and 1.3% of resectoscopic ablations or resections.[17] If uterine perforation is suspected to have occurred during cervical dilatation or with the resectoscope (without electrosurgery), the procedure should be abandoned, and the patient should be closely monitored for signs of intraperitoneal hemorrhage or visceral injury. If the perforation occurs while using electrosurgery or if the mechanism of perforation is uncertain, abdominal exploration is warranted to obtain hemostasis and rule out visceral injury.

Perioperative hemorrhage has been reported in 1.2% of women undergoing non-resectoscopic ablation and 3.0% of those undergoing resectoscopic ablation.[17]

Pelvic infections and fever occur in the immediate postoperative period in approximately 1% of women who have undergone endometrial ablation.[17] In a meta-analysis, the incidence of infectious complications included endometritis (1.4%–2.0%), myometritis (0%–0.9%), pelvic inflammatory disease (1.1%), and pelvic abscess (0%–1.1%).[17]

Delayed complications

Hematometra has been reported in 0.9% of women undergoing non-resectoscopic ablation and in 2.4% of those undergoing resectoscopic ablation.[17] Although intrauterine scarring is an expected result of endometrial ablation, hematometra will occur when areas of the endometrium are adherent and there is endometrial bleeding behind the occlusion. Hematometra and cervical stenosis may be managed by cervical dilatation, hysteroscopic adhesiolysis and drainage, or hormonal endometrial suppression. For persistent pain despite minimally invasive treatment, hysterectomy may be indicated.

Post-ablation tubal sterilization syndrome has been reported to occur at a rate as high as 10%.[45] Some women who have undergone tubal ligation prior to endometrial ablation experience cyclic or intermittent pelvic pain. The proposed etiology is bleeding from active endometrium trapped in the uterine cornua. This can be prevented by appropriate treatment of this area at the primary procedure or can be managed laparoscopically by excision of the tubal stumps or by hysterectomy.

Clinical Tip

- For acute hemorrhage in resectoscopic endometrial ablation, if uterine perforation has been ruled out, bleeding may be managed with one or more of these techniques: intrauterine Foley balloon tamponade, intracervical injection of vasopressors, rectal misoprostol administration, and systemic tranexamic acid administration.
- Hematometra should be suspected in a patient with a history of an endometrial ablation who presents with amenorrhea and cyclic pain, even when remote from the procedure.[46] This condition can be diagnosed by transvaginal ultrasound and prevented by ensuring complete ablation of the uterine fundus, cornua, and tubal ostia, while avoiding ablation of the cervix or cervico-uterine junction.
- Tips for administering paracervical block[47]:
  - Infiltration of the cervix carries risks of intravascular injection and toxicity of the local anaesthetic. These

risks can be minimized by infiltrating slowly, using lower concentrations of local anaesthetic, frequently aspirating, and monitoring for symptoms of intravasation (tinnitus, blurring of vision, perioral/facial numbness). If the local anaesthetic contains epinephrine, patients may experience palpitations, tachycardia, or feelings of anxiety. Basic resuscitative equipment should be available.

- Allow the block to take effect by waiting 10—15 minutes prior to proceeding with cervical dilatation.

Complications Specific to Resectoscopic Endometrial Ablation

Resectoscopic endometrial ablation has potential complications specific to this surgical modality. Careful fluid management is critical to the safe use of hysteroscopic endometrial ablation. In addition, surgeons must possess a comprehensive understanding of potential electrosurgical injuries during hysteroscopic endometrial ablation.

Safe hysteroscopic surgery requires careful fluid management to avoid excessive intravasation of hysteroscopic distension media. Adherence to a strict protocol for fluid monitoring and management criteria will minimize the risk of complications of distension medium overload such as cardiovascular compromise and pulmonary edema, electrolyte abnormalities, and encephalopathy. Table 2 provides an approach to prudent management of hysteroscopic distension fluid issues.

Electrosurgical injuries with monopolar operative hysteroscopy can occur due to capacitive coupling and defective insulation and result in cervical, vaginal, or perineal burns. There is an increased risk of this occurring when the tip of the resectoscope is in the cervical canal, when the cervix is over-dilatated, or when there are electrode insulation defects. There is a greater degree of capacitive coupling injury with higher voltage outputs, which may occur with use of a dampened coagulation mode, long uninterrupted periods of electrode activation, and non-contact with tissue.[48] Risks of capacitive coupling can be reduced by preventing cervical over-dilatation, using the lower voltage "cut" current, avoiding prolonged and uninterrupted activation, checking for insulation defects, ensuring contact with tissue during activation, and using a metallic speculum (weighted or Sims speculums) during the procedure to disperse any stray currents.

Recommendations 4, 5, 6, and 7

SPECIAL CONSIDERATIONS

Repeat Ablation

Irrespective of technique, endometrial ablation has a success rate of 73%—85%. Therefore, failure raises the issue of repeat ablation or hysterectomy. The decision for repeat ablation versus another approach will depend on the surgeon's skill and the patient's consent once appropriately informed about possible complications. If the initial ablation was deemed a failure because it did not reduce menstrual flow and if the symptoms are highly suggestive of adenomyosis, definitive management should be considered.

If repeat endometrial ablation is considered, a hysteroscopic approach using the resectoscope is recommended. A non-resectoscopic blind procedure is *contraindicated* in this clinical scenario. Complication rates of repeat endometrial ablation are statistically higher than those of primary procedures, with risks of perforation, more fluid absorption, and bleeding occurring at rates of 9.3%—11% compared with 2.05% for primary ablation.[49] Repeat ablation should therefore be performed by skilled surgeons with experience in hysteroscopic surgery. When repeat procedures are performed in patients with the appropriate indications, success rates of avoiding hysterectomy are estimated to be 55%—60%.[50]

Recommendation 8

Previous Cesarean Delivery

The literature regarding endometrial ablation in patients with a history of cesarean delivery consists primarily of small retrospective cohort studies. For resectoscopic endometrial ablation, there are generally no restrictions following cesarean delivery. However, caution should be exercised over the cesarean delivery scar, as myometrial thinning may predispose it to perforation or thermal injury. For a patient with previous transmural myomectomy, obtaining adequate visualization of the cavity using a pressure pump should allow for safe treatment. Evaluation of the isthmocele and, in particular, the minimum residual myometrium associated with this defect is an important consideration to prevent potential electrosurgical bladder injury.

For the available non-resectoscopic technologies, no restriction on the minimum myometrial thickness has been mentioned. However, caution is recommended with patients who have had >2 cesarean deliveries.

Non-resectoscopic endometrial ablation is contraindicated in patients who have undergone classical cesarean delivery or transmural myomectomy. Five-year data on satisfaction, treatment failure, and operative complications of non-resectoscopic endometrial ablation in patients with a history of cesarean delivery are similar to those in patients who have not undergone cesarean delivery.[51]

Recommendation 9

Adenomyosis

Endometrial ablation may be a safe and effective strategy to reduce both AUB and dysmenorrhea associated with adenomyosis in appropriately selected patients when medical therapy has failed. However, there are no randomized controlled trials involving endometrial ablation that compare interventions for adenomyosis-related AUB or dysmenorrhea. In the most recently published Cochrane systematic review and meta-analysis of interventions for heavy menstrual bleeding,[52] randomized controlled trials of non-resectoscopic endometrial ablation versus minimally invasive surgical hysterectomy[53] and LNG-IUS versus resectoscopic endometrial ablation [54] both excluded women with adenomyosis.

The largest prospective study published to date evaluating endometrial ablation in the setting of adenomyosis was a single-site cohort study in France.[55] In this study of 43 patients with AUB (median age 47 y), 77% of patients reported comorbid dysmenorrhea. At 6-month follow-up after NovaSure endometrial ablation, 40 patients (93%) reported a significant reduction in AUB and 29 patients (67%) reported the same at 3 years. There was also a reduction in dysmenorrhea in 20 patients (61%) at 6 months and 17 patients (52%) at 3 years with a non-statistically significant recurrence rate of dysmenorrhea during this time. Hysterectomy for recurrent AUB or dysmenorrhea was recorded in 8 patients (19%) during the study, and 3 patients were lost to follow-up at 3 years. Although this is promising data, more research is needed to confidently counsel patients with adenomyosis contemplating endometrial ablation.

One concern during preoperative counselling is that adenomyosis-associated dysmenorrhea may worsen following endometrial ablation and lead to hysterectomy. A large retrospective cohort study of 5818 women in the United States who underwent non-resectoscopic endometrial ablation between 2003 and 2015 identified preoperative pelvic pain as an independent risk factor for failed endometrial ablation and subsequent hysterectomy.[56] Interestingly, among hysterectomy specimens following failed endometrial ablation, women in the preoperative pain group demonstrated lower prevalence of adenomyosis (38%) than women without pain (50%). In this study, endometriosis appeared to drive the association between preoperative pain and failed endometrial ablation, with 43% of hysterectomy operative reports describing endometriosis compared with 16% of reports in the non-pain hysterectomy group describing the same. Similar rates of adenomyosis between hysterectomies related to endometrial ablation failure (45%) and hysterectomy for similar non-malignant indications without previous endometrial ablation (43%) have been reported in a retrospective cohort of 213 patients who underwent NovaSure endometrial ablation.[57] However, in this study, there was a higher reported prevalence of *deep* adenomyosis (>2.5 mm endometrial penetration) in the endometrial ablation failure group. Further research is needed to clarify whether endometrial ablation induces deep adenomyosis or if deep adenomyosis is a predictor for endometrial ablation failure.

Especially in patients with adenomyosis and comorbid dysmenorrhea, concomitant insertion of an LNG-IUS at the time of endometrial ablation may be helpful in reducing postoperative failure due to recurrent bleeding or new or recurrent pain. This question is being investigated in a multicentre randomized controlled trial in 35 hospitals in the Netherlands, and patients with adenomyosis will be included.[58] For now, this practice is based on biologic plausibility, evidence supporting each individual practice, and limited published reports of concomitant endometrial ablation and LNG-IUS insertion that have suggested favourable outcomes relative to LNG-IUS alone.[59]

Recommendations 10 and 11

Intracavitary Pathology and Non-Resectoscopic Endometrial Ablation

Intracavitary fibroids and polyps were excluded from the original randomized controlled trials evaluating non-resectoscopic endometrial ablation techniques. These procedures were originally designed to treat normal uterine cavities. Subsequently, various attempts have been made to examine the utility of these technologies in distorted cavities with submucosal fibroids. The Genesys HTA, which relies on freely circulating heated fluid under direct visualization, may be suited to treat distorted cavities, as it does not rely on the fixed shape of a mesh

or balloon. Women with types 1 and 2 submucosal fibroids (<3 cm) who were followed prospectively following treatment with NovaSure had amenorrhea rates of 69% at 1 year post procedure.[60,61]

Similarly, there are limited data on sequential resection of intracavitary pathology followed by non-resectoscopic endometrial ablation. The NovaSure radiofrequency ablation device monograph lists as a contraindication "a patient with any anatomic condition […] or pathologic condition that could lead to weakening of the myometrium."[62] NovaSure is not approved for use for subsequent ablation in the setting of intracavitary fibroids requiring hysteroscopic resection. Although there are limited case series data (n = 24 with completed follow-up)[63] supporting efficacy and safety of sequential hysteroscopic lesion morcellation (MyoSure) and endometrial radiofrequency ablation (NovaSure), these data are for type 0 fibroids and polyps, not any fibroid involving the myometrium (≥type 1). Additionally, this practice represents marked incremental cost over electrosurgical resection followed by global resectoscopic endometrial ablation.

Despite encouraging results showing that non-resectoscopic endometrial ablation may be beneficial in treating AUB in women with small submucosal fibroids (<3 cm), further research is required to support this treatment. Similarly, where hysteroscopic tissue removal is required prior to global endometrial ablation, even if the tissue removal does not *weaken* the myometrium (as would be the case in polypectomy or myomectomy for type 0 fibroids), hysteroscopic myomectomy/polypectomy combined with resectoscopic endometrial ablation should be used to treat women with symptomatic intracavitary pathology. This recommendation is based on both a lack of safety data for sequential hysteroscopic tissue removal and non-resectoscopic endometrial ablation as well as the marked incremental cost of using a hysteroscopic tissue morcellator and non-resectoscopic endometrial ablation device for the same case. It is for these reasons that training programs will need to continue to educate residents in both methodologies.

Recommendation 12 and 13

Endometrial Ablation and Diagnosis of Subsequent Endometrial Cancer

Endometrial ablation or resection often leads to severe synechiae (i.e., partial or complete Asherman syndrome), which is a welcomed process clinically translating to lighter menses or amenorrhea. However, since endometrial cells may still proliferate after surgery, the question of delayed diagnosis of endometrial cancer is a legitimate one. In a recent systematic review of 11 selected studies, there was no increase in the rate of cancer in women who had previous endometrial ablation and no increase in more advanced stages at the time of diagnosis.[64] Moreover, endometrial ablation may even be protective of endometrial cancer, provided there is no risk factor at the time of the procedure, such as endometrial hyperplasia.[65] In one retrospective study over an 18-year period, 1521 women had endometrial ablative procedures for AUB.[66] During the study's long-term follow-up period, none of the women developed endometrial cancer later in life. This incidence is much lower than the lifetime risk of endometrial cancer in the general population.[66] The French national society recently recommended to consider endometrial ablation as a means to decrease endometrial cancer in premenopausal women undergoing hysteroscopic surgery.[67] Finally, one study compared medical treatment of AUB with endometrial ablation procedures in 234 721 women followed for 4 years and found no difference in the incidence of subsequent endometrial cancer and specifically no difference in the timing of the diagnosis of cancer (odds ratio 0.15−1.40).[68]

In summary, endometrial ablation procedures do not increase the risk of cancer, do not delay the diagnosis of endometrial cancer, and may decrease the overall risk of the disease. However, the presence of persistent AUB or uterine pain following this intervention warrants a thorough investigation; if endometrial sampling cannot be performed, ultrasound endometrial thickness evaluation should be performed, and hysterectomy considered.

Summary Statement 8 and Recommendation 14

Pregnancy After Endometrial Ablation

Scar tissue formation such as dense synechiae and altered vascularization after endometrial ablation reduce the probability of pregnancy significantly. However, endometrial ablation is not a sterilization procedure. Pregnancies that occur after endometrial ablation are often complicated and can even lead to maternal death.[13] Therefore, a preoperative discussion on the choice of method of contraception must be part of the overall discussion on the risks and benefits of endometrial ablation. Pregnancy rates after endometrial ablation range from 1.7% to 3.1%.[69,70] The average onset of a new pregnancy after endometrial

ablation is 1.5 years, and 80%–90% did not involve the use of a contraceptive method. In a systematic review, Kohn et al.[71] found that 85% of 274 pregnancies after endometrial ablation ended in termination, miscarriage or ectopic pregnancy; 15% continued and were associated with an elevated incidence of preterm birth, stillbirth, cesarean delivery, and placenta accreta spectrum disorder (PASD).[71] In one Australian study of 575 pregnancies post endometrial ablation, the incidence of cesarean delivery was 43% and the rates of preterm birth and stillbirth were both 13%.[70] The risk of PASD was 7% in the post–endometrial ablation pregnancies versus 0.1% in the general population.[69]

In summary, preoperative discussion on contraception method is paramount before planning surgery. In some cases, concomittant sterilization can be offered at the time of endometrial ablation, but the method of sterilization should attempt to minimize the risk of post-ablation tubal ligation syndrome. Women who do become pregnant after endometrial ablation should obtain information from their care provider regarding the risks and benefits of continuing the pregnancy. Pregnancy termination complications as well as third-trimester complications are not infrequent, and care should be provided in a safe environment by medical staff equipped with the skills and experience to manage obstetrical complications like unanticipated PASD.

CONCLUSION

Endometrial ablation is an established and effective procedure to manage AUB. In well-selected patients, success rates and rates of patient satisfaction are high, and the procedure provides a viable alternative to other more invasive and higher risk procedures, such as hysterectomy.

Cavity assessment and endometrial sampling prior to endometrial ablation is vital and imperative.

Choice of technique for endometrial ablation should be dictated by both patient and anatomical factors. Resectoscopic endometrial ablation techniques continue to be a valuable skill set and should remain a critical element to residency training programs. Use of fluid management systems and bipolar resectoscopes aid in reducing the risks associated with this technique.

Adenomyosis is not a contraindication to endometrial ablation, although failure rates may be higher in this patient group. Combined medical therapy and endometrial ablation may in fact improve success rates.

Concerns regarding endometrial ablation leading to delayed diagnosis of endometrial cancer are currently unfounded. Endometrial ablation may in fact reduce the risk of developing endometrial cancer. Endometrial ablation should therefore be considered a reasonable option for managing AUB after negative endometrial sampling. Combined medical therapy and endometrial ablation should continue to be studied to provide evidence for these questions.

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APPENDIX A

Table A1. Key to Grading of Recommendations, Assessment, Development and Evaluation Quality of Evidence

Grade	Definition
Strength of recommendation	
Strong	High level of confidence that the desirable effects outweigh the undesirable effects (strong recommendation for) or the undesirable effects outweigh the desirable effects (strong recommendation against)
Conditional (weak)[a]	Desirable effects probably outweigh the undesirable effects (weak recommendation for) or the undesirable effects probably outweigh the desirable effects (weak recommendation against)
Quality of evidence	
High	High level of confidence that the true effect lies close to that of the estimate of the effect
Moderate	Moderate confidence in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low	Limited confidence in the effect estimate: The true effect may be substantially different from the estimate of the effect
Very low	Very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

Adapted from GRADE Handbook (2013), Table 5.1.
[a]Do not interpret conditional (weak) recommendations to mean weak evidence or uncertainty of the recommendation.

Table A2. Implications of Strong and Conditional (Weak) recommendations, by guideline user

Perspective	Strong Recommendation • "We recommend that…" • "We recommend to not…"	Conditional (Weak) Recommendation • "We suggest…" • "We suggest to not…"
Authors	The net desirable effects of a course of action outweigh the effects of the alternative course of action.	It is less clear whether the net desirable consequences of a strategy outweigh the alternative strategy.
Patients	Most individuals in the situation would want the recommended course of action, while only a small proportion would not.	The majority of individuals in the situation would want the suggested course of action, but many would not.
Clinicians	Most individuals should receive the course of action. Adherence to this recommendation according to the guideline could be used as a quality criterion or performance indicator.	Recognize that patient choices will vary by individual and that clinicians must help patients arrive at a care decision consistent with the patient's values and preferences.
Policy makers	The recommendation can be adapted as policy in most settings.	The recommendation can serve as a starting point for debate with the involvement of many stakeholders.

Adapted from GRADE Handbook (2013), Table 6.1.