

GENERAL GYNECOLOGY

Endometrial ablation: postoperative complications

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Endometrial ablation as a treatment for abnormal uterine bleeding has evolved considerably over the past several decades. Postoperative complications include the following: (1) pregnancy after endometrial ablation; (2) pain-related obstructed menses (hematometra, postablation tubal sterilization syndrome); (3) failure to control menses (repeat ablation, hysterectomy); (4) risk from preexisting conditions (endometrial neoplasia, cesarean section); and (5) infection. Physicians performing endometrial ablation should be aware of postoperative complications and be able to diagnose and provide treatment for these conditions.

Key words: complications, endometrial ablation, hysteroscopy, infection

Endometrial ablation as a treatment for abnormal uterine bleeding has evolved considerably over the past several decades. In the early era of manual resectoscopic endometrial ablation (REA), the energy source options were laser fiber or rollerball/rollerbarrel electrodes to desiccate the endometrium or a loop electrode to resect the endometrium. Inherent in the evolutionary process are unintended consequences. Unfortunately, the use of energy sources and intrauterine distending media resulted in intraoperative complications that were in some cases life threatening and, in rare cases, life ending.¹

As technology advanced, automated systems were designed and termed nonresectoscopic endometrial ablation (NREA) devices, global endometrial ablation devices, or second-generation endometrial ablation devices. Although these systems obviated the need for manual resecto-

scopic skills and fluid management systems, intraoperative complications still occurred but of differing types. These newer technologies include 5 ablative methods including a thermal balloon, circulated hot fluid, cryotherapy, radiofrequency electrosurgery, and microwave energy. All 5 methods have been compared with rollerball endometrial ablation by way of randomized clinical trials and are in general associated with similarly high patient satisfaction rates (86–99%), regardless of the method, but with wide ranges of amenorrhea rates (13.9–55.3%).²

Although these 2 categories of ablation methods (REA and NREA) may have different types of intraoperative complications, they have fairly similar postoperative complications. As is common with all forms of endometrial ablation, the entirety of the endometrium is rarely destroyed. As a result, complications can occur because the residual endometrium may allow implantation of an embryo, cause continued bleeding that may become obstructed, unobstructed but enough to be considered a failure, or may develop neoplasia. Therefore, the goal of this review was to focus on 5 categories of postsurgical complications including the following: (1) pregnancy after endometrial ablation, (2) pain-related obstructed menses (hematometra, postablation tubal sterilization syndrome), (3) failure to control menses (repeat ablation, hysterectomy), (4) risk from preexisting conditions (endometrial neoplasia, cesarean section), and (5) infection. Intraoper-

ative complications such as fluid overload, uterine perforation, and hemorrhage will not be addressed in this article.

Pregnancy-related complications

The issue of contraception is one of the most significant issues that should be addressed in patients considering endometrial ablation. Endometrial ablation is not considered a form of contraception. Unfortunately, although pregnancy after endometrial ablation is associated with significant maternal and fetal morbidity and mortality, the performance tubal sterilization also carries a risk for complications such as postablation tubal sterilization syndrome (see section in the following text).

Pregnancy has been reported to occur in 0.7% of women who have undergone endometrial ablation.³ Pregnancy has been reported as early as 5 weeks after ablation⁴ and as late as 12 years postoperatively (with subsequent tubal reanastomosis in a planned pregnancy).⁵ The chance of pregnancy occurring after endometrial ablation and tubal sterilization is estimated to be 0.002%, or 1 in 50,000.⁶ Pregnancy has also been reported in an amenorrheic woman.⁷ Successful pregnancies have been reported; however, there appears to be a greater risk of complications in pregnancies that follow endometrial ablation including preterm birth, intrauterine scarring/uterine chambering (creating separate uterine compartments), and postpartum hemorrhage.^{8,9} The authors have hypothesized that the preterm labor is in part because of narrowing or sometimes chambering of the endometrial cavity resulting in a smaller area for gestation.

There are several reviews of pregnancy occurring after endometrial ablation, evaluating many of the same cases from the available literature and also adding information from their own case series while updating the cumulative number of pregnancies after endometrial ablation ($n = 134$).^{10–12} This type of data

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(level III evidence) offers only limited confidence in making recommendations but does provide a reasonable platform for counseling patients and for anticipating potential complications.

For patients presenting in the first trimester, these series report at least a 28% miscarriage rate and an ectopic pregnancy rate of up to 6.5%. This may not be a significant increase over the baseline miscarriage rate, considering unrecognized or subclinical pregnancies; however, with a risk for ectopic pregnancy that is approximately 3 times baseline (approximately 2%), this would warrant a recommendation that ectopic pregnancy precautions be followed. The miscarriage rate may be higher because nearly half of the women in these series terminated their pregnancy, some of which would likely have aborted spontaneously.

In patients continuing a pregnancy past the viability range of 24 weeks, the larger series¹² reported a 31% risk of prematurity, a 16% risk of preterm premature rupture of membranes, a 25% risk of abnormal placentation (accreta spectrum), and a cesarean delivery rate of 44%. All of these complications occur more frequently than the general US population statistics in pregnancy. Approximately 60% of patients with abnormal placentation underwent hysterectomy at the time of delivery.¹² Amniotic band syndrome and spontaneous uterine rupture have also been reported with severe fetal arthrogryposis and scoliosis reported in some cases.^{13,14} Ultrasonography might identify uterine synechiae, which are common after endometrial ablation. Cornual uterine rupture has been reported in a 27-week gestation with the use of radiofrequency ablation.¹⁴ In this case, the patient experienced at prior midline fundal uterine perforation that would not explain the cornual location for rupture.

Firm pregnancy management recommendations are difficult to establish based on limited data. However, the currently available data would suggest that patients should be managed as though they are a higher risk for preterm birth. Some authors have suggested that treatment with 17-hydroxyprogesterone is justified⁸ and have followed up with patients with serial

ultrasonography because of the potential risk of intrauterine growth restriction. Because of the relatively high risk of abnormal placentation and cesarean delivery, having personnel experienced in cesarean hysterectomy and having access to a hospital with adequate blood banking services should be considered.

Pain-related obstructed menses

When energy is applied to the endometrium, tissue necrosis and inflammation can result in uterine contracture and intrauterine scarring. This has been demonstrated with both resectoscopic endometrial ablation as well as newer devices.¹⁵⁻¹⁷

Persistent endometrium after endometrial ablation is common as evidenced by clinical, imaging, and histologic studies. As mentioned previously, randomized clinical trials have shown amenorrhea rates to be generally less than 50%, suggesting persistent endometrial glands after endometrial ablation. Magnetic resonance imaging (MRI) studies have shown endometrial tissue to be present in up to 95% of patients undergoing rollerball ablation including patients with amenorrhea.¹⁸ In a comparative study of long-term histologic findings (more than 30 months) after rollerball ablation ($n = 21$) and endometrial resection ($n = 24$), hysteroscopy showed similar areas of persistent endometrium at the uterine fundus and cornual regions.¹⁹ Contracture and scarring in the presence of persistent endometrium can result in obstructed egress of menses. This can manifest as hematometra within the body of the uterine cavity (central hematometra) or at the cornual region.

Postablation tubal sterilization syndrome (PATSS) was initially reported in 1993 as a series of 6 patients presenting with unilateral or bilateral pelvic pain and vaginal spotting who had previously undergone tubal sterilization and endometrial ablation.²⁰ The patients were noted to have endometrial cavity scarring with one or both swollen proximal fallopian tubes. Symptom relief was reported in 5 of 6 patients with removal of the fallopian tubes. The incidence of PATSS is approximately 6-8% and usually develops 2-3 years after endometrial ablation.²¹⁻²³ The mechanism of

pain in PATSS is thought to be retrograde menstruation of cornual hematometra against an obstructed fallopian tube, causing visceral distention. It has also been associated with newer ablation devices.²⁴

The definitive treatment of PATSS is hysterectomy.²⁵ Hysteroscopic lysis of adhesions is possible but difficult to perform in the vulnerable cornual regions and will not reliably alleviate potential future bleeding against the proximal fallopian tube. As mentioned, in the original description of this syndrome, the authors performed salpingectomies²⁰; however, currently some of those authors are suggesting hysterectomy as a better and more definitive treatment for this condition.²²

The diagnosis of PATSS is initially suspected clinically in patients with cyclic cramping with or without menses with a history of endometrial ablation and tubal sterilization. Usually the confirmatory diagnosis is made surgically; however, MRI imaging during times of symptomatic cramping may be useful using T2-weighted images looking for blood trapped in the cornu. Ultrasound has not been reliably sensitive at diagnosing PATSS.

Preventing PATSS is challenging. When performing resectoscopic endometrial ablation, the cornu is particularly challenging because of the thin muscular density in that region that poses increased risk for perforation. Laparoscopic devices such as bands and clips are not designed for the first centimeter of the fallopian tube, and fulguration should be performed in the midportion of the fallopian tube rather than the proximal portion because of the risk of fistula formation.

Transcervical sterilization devices (Essure; Conceptus Inc, San Carlos, CA. Adiana; Hologic Inc, Marlborough, MA) have now been approved by the Food and Drug Administration. Whether these devices will prevent PATSS is unknown; however, neither of these devices should be used concomitant with endometrial ablation because of the potential for intrauterine synechiae, which can compromise the 3 month confirmation test (hysterosalpingogram).²⁶ If endometrial ablation is to be used after a tran-

TABLE 1

Preoperative predictors of treatment failure after endometrial ablation

Predictors	Hazard ratio	95% CI	P value
Thermal balloon vs radiofrequency ^a	1.5	0.7–2.9	.27
Age <45 y ^a	2.6	5.1	.008
Parity ≥5 ^a	1.3–6.0	2.5–14.8	< .001
Tubal sterilization ^a	2.2	1.2–4.0	.01
Preoperative dysmenorrhea ^a	3.7	1.6–8.5	.003
Hemoglobin ≥12 g/dL	1.8	0.9–3.6	.08
Ultrasonogram suggestive of adenomyosis	1.5	0.5–4.9	.003

CI, confidence interval.

^a Multivariable hazard ratio used in adjusted final analysis.Adapted, with permission, from El-Nashar.³⁴Sharp. Endometrial ablation. *Am J Obstet Gynecol* 2012.

scervical sterilization, it is recommended that it be performed following the 3-month hysterosalpingogram has been performed.

Upon the hysterosalpingogram confirmation of tubal occlusion, data are limited on whether endometrial ablation is safe and effective in women who have undergone hysteroscopic sterilization. Two hysteroscopic sterilization studies have reported success, one with Essure and thermal balloon ablation²⁷ and a second with Adiana and bipolar radiofrequency ablation.²⁸ The pathologic analysis of the extirpated uteri in both of these studies found no thermal injury to the fallopian tubes. Laparoscopic tubal occlusion can be performed concurrent with the ablation procedure.

Central hematometra is most likely to occur when the cervical canal is damaged at the time of endometrial ablation and has an incidence of 1–3%.^{29,30} Menses are obstructed at the level of the cervix, and therefore, the patient typically presents with cyclic pelvic pain. Central hematometra can be seen on imaging (ultrasound or MRI) at the time of cyclic pain. Central hematometra can usually be successfully treated with cervical dilatation²⁹; however, in some cases, hysteroscopic adhesiolysis may be necessary.

To avoid this complication, it has been suggested that the endometrial ablation should be terminated at the lower uterine segment to avoid thermal damage to the cervical canal. Partial rollerball ablation, wherein only the anterior or poste-

rior endometrium is treated, avoiding the cornua, has also been suggested as a method to avoid postablation hematometra, including PATSS.³¹ The rationale for this technique is that when total endometrial ablation or resection is performed, the endometrium is destroyed and the opposing myometrial walls are exposed and can grow together as part of the generated inflammatory response. In their series of 50 patients, with an average follow-up of 42 months, no hematometra were formed and their reported satisfaction rate was 76%, with 5 patients undergoing a hysterectomy (all with deep adenomyosis).

Failure to control menses

When does the failure to control menses become a problem? This question is difficult to answer for 2 reasons. First, failure is subjective and will vary among patients. Second, as more is published about failure, it is becoming clearer that there are individual risk factors that will affect the clinical response. Therefore, a discussion about result expectations is an important aspect in preoperative counseling.

As mentioned, most women who undergo endometrial ablation will not experience amenorrhea, yet approximately 85% will be satisfied with the procedure at the 1 year mark.¹ The evidence for long-term failure of endometrial ablation may be examined by a 4–5 year reoperation rate of 18–38%.^{32,33} In a study of 816 women undergoing endometrial ablation, risk factors for treatment fail-

ure included age younger than 45 years, parity of 5 or greater, prior tubal sterilization, and a history of dysmenorrhea (Table 1).³⁴ Women with a preoperative ultrasound suggestive of adenomyosis had a hazard ratio of 1.5 (95% confidence interval, .05–4.9). In a study of hysterectomy specimens after failed endometrial ablation in 67 women, bleeding was the most common complaint (51%), followed by pain (28%), and lastly both bleeding and pain (21%).³⁵ Surgical pathology findings included hematometra in 26% of the women who had pain complaints and intramural fibroids in 44% of women who listed bleeding as a primary reason for requesting hysterectomy.

For patients who are not satisfied with endometrial ablation, most case series report hysterectomy as the next step. This assumes that either therapy has failed in these patients or the patients declined other conservative options. Should a repeat endometrial ablation be offered? Repeat endometrial ablation was not evaluated as part of the Food and Drug Administration approval process and would be considered off-label use with the newer devices; however, there are few studies examining this question.

A repeat endometrial ablation in the presence of intrauterine synechiae can be challenging and place the patient at increased risk for complications. In a prospective cohort comparing primary (n = 800) and repeat endometrial ablation (n = 75), serious complications, defined as uterine perforation, hemorrhage, excess fluid absorption, and genital tract burns, were significantly more likely to be associated with repeat ablation (9.3% vs 2%). A small series (n = 21) of repeat endometrial ablation successfully used ultrasound guidance to assist with resectoscopic ablation without complications. At a mean of 23 months' follow-up, they reported an 88% success rate in avoiding hysterectomy.³⁶

Preexisting risks (cesarean section, hyperplasia)

Endometrial ablation is not a treatment for endometrial hyperplasia or cancer and may interfere with subsequent evaluation of the endometrium because of

synechiae that may make endometrial sampling difficult. The safety of endometrial ablation has not been well studied in women who are at an increased risk of developing endometrial cancer. These risks include nulliparity, chronic anovulation, obesity, diabetes mellitus, tamoxifen therapy, and hereditary non-polyposis colorectal cancer. Therefore, weighing options and risks is an important part of the informed consent process. Ablation itself does not appear to increase the risk of subsequent endometrial cancer.³⁷ Endometrial hyperplasia has been linked to endometrial adenocarcinoma and should be considered a contraindication to endometrial ablation.³⁸ Although there are few data regarding endometrial ablation in women taking tamoxifen, such women are at an increased risk of endometrial cancer, and ablation may interfere with the later diagnosis of this disorder. Therefore, tamoxifen therapy should also be considered a relative contraindication to endometrial ablation.

Women with hereditary nonpolyposis colorectal cancer have a 27–71% lifetime risk of developing endometrial cancer³⁹ and are advised to undergo hysterectomy after they have completed childbearing and are therefore not good candidates for endometrial ablation.

Previous low transverse cesarean section is not considered a contraindication to endometrial ablation. However, there have been cases of urinary tract injuries in such patients. Vesicouterine fistula formation was reported in a patient with three prior cesarean sections,⁴⁰ and ureteral injury resulting in an ureterocutaneous ostomy was reported through the MAUDE database without details of the number of prior cesarean sections.⁴¹ It is hypothesized that cases of asymptomatic lower-segment myometrial dehiscence covered only by a thin serosal layer may be a predisposing risk factor for urinary tract injury. However, in a series of 162 patients with more than 1 prior cesarean delivery, there were no urinary injuries.⁴² Further study is warranted to assess the risk of multiple cesarean sections and endometrial ablation.

TABLE 2

Characteristics of postoperative infections

Author	Infection type	Onset, d	Organism(s)	Therapies
Schlumbrecht et al ⁴⁹	Pyometra	20	<i>E coli</i>	Antibiotics
			<i>Enterococcus</i>	Hysterectomy
Salmeen and Morgan ⁴⁴	Endometritis	1	<i>E coli</i>	Antibiotics
				Hysterectomy
Das et al ⁴⁶	Pelvic abscess	3	<i>Coliforms</i>	Antibiotics
			Anaerobes	Laparotomy
				Abscess
				Drainage
Amin-Hanjani and Good ⁴⁵	Pyometra	3	<i>E coli</i>	Antibiotics
				Abscess
				Drainage
Roth and Rivlin ⁵⁰	Tuboovarian Abscess	50	<i>E coli</i>	Antibiotics
			<i>B fragilis</i>	Hysterectomy
Jansen ⁵⁶	Cornual abscess	>14		
			<i>H influenzae</i>	Antibiotics
				Cornual
				Resection
Halawa et al ⁴⁷	Endometritis	1	<i>C perfringens</i>	Antibiotics
				Hysterectomy
Haj et al ⁴⁸	Endometritis	1	<i>S aureus</i>	Antibiotics

B fragilis, *Bacteroides fragilis*; *C perfringens*, *Clostridium perfringens*; *E coli*, *Escherichia coli*; *H influenzae*, *Haemophilus influenzae*; *S aureus*, *Staphylococcus aureus*.

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Endometrial ablation and infection

In a metaanalysis comparing endometrial ablation procedures, the incidence of infectious complications included the following: endometritis (1.4–2.0%); myometritis (0–0.9%); pelvic inflammatory disease (1.1%); and pelvic abscess (0–1.1%).⁴³

Infection after endometrial ablation typically presents with fever and uterine or adnexal tenderness and/or cervical or vaginal discharge, occurring within the first 3 days after surgery^{44–48}; however, infection may present as late as 20–50 days postoperatively.^{49,50} An elevated white blood count is common among patients with serious pelvic infections. Imaging with pelvic sonography or computed tomography has been reported as helpful in identifying pelvic pathology such as gas within the uterus in a case of *Clostridium perfringens*,⁴⁷ tuboovarian

abscess,⁵⁰ pyometra,^{45,49} pelvic abscess,⁴⁶ and cornual abscess.⁵¹

Among 8 case reports of significant infection after endometrial ablation, surgery was performed in all cases including drainage of pyometra, abscess drainage, and hysterectomy. Most patients recovered rapidly with the exception of a woman with acute renal failure, fascial dehiscence, and vesicovaginal fistula who was hospitalized for several weeks⁴⁹ and a woman with sepsis followed by adult respiratory distress syndrome, acute renal failure, and toxic shock syndrome, who subsequently died⁴⁸ (Table 2). In most of the reported cases of significant infection, prophylactic antibiotics were not given, with the exception of a woman with diabetes and a mechanical heart valve requiring mitral valve prophylaxis.⁴⁹ Of the 8 subjects in Table 2,

the most commonly cultured organism was *Escherichia coli* (5 of 8), and the most common definitive therapy was hysterectomy (5 of 8). All patients were treated with broad-spectrum antibiotics.

Antibiotic prophylaxis is recommended for major obstetric and gynecologic procedures such as hysterectomy and cesarean section.^{52,53} Most minor gynecologic procedures do not require routine prophylaxis.⁵² Endometrial ablation may be different from other transcervical procedures such as dilatation and curettage, diagnostic hysteroscopy, and hysterosalpingography. Although it is likewise a minimally invasive and relatively quick procedure, it results in endometrial destruction and necrosis, raising further questions about antibiotic prophylaxis.

A randomized controlled trial to assess the effect of prophylactic antibiotics on the incidence of bacteremia following endometrial ablation or resection found the incidence of bacteremia to be 16% in 61 women in the nonantibiotic group and 2% of the 55 women in the antibiotic group.⁵⁴ Although there was a difference in the incidence of bacteremia, none of the women became ill, regardless of their blood culture status. The authors concluded that the role of prophylactic antibiotics in patients undergoing endometrial ablation remains unclear.

A Cochrane review of prophylactic antibiotics for transcervical intrauterine procedures deemed there was no evidence to either support or discourage the use of antibiotics to prevent infection for transcervical intrauterine procedures. The authors concluded that prophylactic antibiotics might be considered in populations and areas in which the incidence of infection after transcervical intrauterine procedures is high.⁵⁵ One population to consider at risk are patients with an implantable transcervical sterilization device.⁵¹ Currently the American College of Obstetricians and Gynecologists recommends against the use of prophylactic antibiotics in patients undergoing endometrial ablation.⁵²

Serious infection should be suspected in all patients who present with fever after endometrial ablation. A thorough examination including a pelvic examination should be performed to assess for

uterine or adnexal tenderness or mass. Broad-spectrum antibiotics should be administered promptly, and the patient should be evaluated for signs of sepsis. It is not clear which patients will have a milder form of infection and perhaps respond to broad-spectrum antibiotics only because reported cases have focused on serious infections. Imaging studies including pelvic sonography or computed tomography may be useful to diagnose serious conditions that require surgery.

Conclusions

Pregnancy occurring after endometrial ablation has been reported to be associated with risks throughout each trimester with a significant risk of ectopic pregnancy, preterm birth, and abnormalities of placenta (accreta spectrum). Practitioners who care for such women should be aware of and prepare for these risks.

Before performing endometrial ablation, preoperative risk factors for failure and risks for developing endometrial adenocarcinoma should be considered and weighed against other surgical and nonsurgical options.

Physicians performing endometrial ablation should be aware of complications such as PATSS and hematometra and should be able to diagnose and provide treatment for these conditions.

Serious infection should be suspected in all patients who present with fever after endometrial ablation. Broad-spectrum antibiotics should be administered promptly and the patient should be evaluated for signs of sepsis. Imaging studies including pelvic sonography or computed tomography may be useful to diagnose serious conditions that require surgery. ■

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