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INTERIM UPDATE: The content on hysteroscopic sterilization in this Practice Bulletin has been updated as highlighted (or removed as necessary) to reflect the withdrawal of the Essure® device from the market. The information on salpingectomy for sterilization also has been revised as highlighted to be consistent with current ACOG guidance on salpingectomy for ovarian cancer prevention.

Benefits and Risks of Sterilization

Female and male sterilization are both safe and effective methods of permanent contraception used by more than 220 million couples worldwide (1). Approximately 600,000 tubal occlusions and 200,000 vasectomies are performed in the United States annually (2–4). For women seeking permanent contraception, sterilization obviates the need for user-dependent contraception throughout their reproductive years and provides an excellent alternative for those with medical contraindications to reversible methods. The purpose of this document is to review the evidence for the safety and effectiveness of female sterilization in comparison with male sterilization and other forms of contraception.

Background

Prevalence of Sterilization Compared With Other Contraceptive Methods

According to data from the 2006–2010 National Survey of Family Growth, 38.4 million women aged 15–44 years used contraception. Sterilization remained the most common method, used by 47.3% of married couples (tubal occlusion, 30.2%; vasectomy, 17.1%) (5). In comparison, 18.6% of married couples used oral contraceptives, 15.3% used male condoms, 7.1% used intrauterine devices (IUDs), and 3.9% used injectable contraceptives (5). Rates of female sterilization increased dramatically in the 1970s, peaking at 702,000 procedures in 1977; remained stable in the 1980s and early 1990s; and decreased slightly to 643,000 procedures in 2006 (6).

Female Sterilization
Timing

Female sterilization can be performed at any time before or after pregnancy. The choice and timing of sterilization are affected by individual patient preference, medical

assessment of acute risk, access to services, and insurance coverage. The timing of the procedure influences both the surgical approach and the method of tubal occlusion. In the United States, more than one half of all tubal occlusions are performed in the early postpartum period, with sterilization procedures performed after 8–9% of all hospital deliveries (6).

Postpartum. Postpartum sterilization is performed at the time of cesarean delivery or after a vaginal delivery and should not extend the patient's hospital stay. Minilaparotomy after vaginal delivery is generally performed before the onset of significant uterine involution through a small infraumbilical incision. It typically is performed with regional or general anesthesia, but may be performed using local anesthesia with sedation. In most cases, epidural anesthesia placed during labor can be left in place for the procedure (7).

Postpartum sterilization requires counseling and informed consent before labor and delivery (8). Ideally, consent should be obtained during prenatal care, when the patient can make a considered decision, review the risks and benefits of the procedure, and consider alternative

contraceptive methods. Various obstacles, including young age and concern for patient regret, the consent process, lack of available operating rooms and anesthesia, and receiving care in a religiously affiliated hospital, prevent as many as 50% of women who request postpartum sterilization during their prenatal care from undergoing the procedure before discharge after delivery. Risk of repeat, unintended pregnancy within 1 year of delivery, which has been reported to be as high as 46.7% for women who requested but did not receive postpartum sterilization, emphasizes the importance of facilitating this requested procedure (9). In order to be an effective advocate for postpartum sterilization, the obstetrician–gynecologist needs to be proactive about identifying and overcoming barriers to accomplishing a postpartum procedure (10).

Health care providers also must be familiar with any laws and regulations that may constrain sterilization, such as limitations on the patient's age, and time and procedural requirements for the consent process. Some patients have insurance coverage restricted to pregnancy and the immediate postpartum period; such women may have limited access to contraceptive options after delivery. The health care provider should inform the patient that insurance coverage for sterilization is variable so that she can discuss this issue with her insurer. In cases of intrapartum or postpartum maternal or neonatal complications, the patient and the health care provider should consider postponing sterilization to a later date (11).

Postabortion. Postabortion sterilization can be performed immediately after an uncomplicated spontaneous or induced abortion with no increased risk compared with an interval procedure (12). After a first-trimester abortion or a second-trimester abortion, tubal occlusion by either laparoscopy or minilaparotomy is acceptable. With either approach, a single anesthetic may be used for the abortion and the tubal occlusion. As with postpartum sterilization, it is important to consider state regulations. Some states have enacted statutes that limit a woman's ability to consent for sterilization when seeking an abortion.

Interval. Tubal occlusion can be performed as an interval procedure separate from pregnancy. A urine pregnancy test should be done before the procedure; however, this does not rule out a luteal phase pregnancy. Although not a requirement, performing the procedure during the patient's follicular phase or using an effective method of contraception before the procedure reduces the likelihood of a concurrent pregnancy.

Sterilization Approaches and Techniques

Laparoscopy. The laparoscopic approach is used for interval and postabortal tubal occlusion procedures and is performed as an outpatient procedure. Laparoscopy provides an opportunity to inspect the abdominal and pelvic organs, requires small incisions, is immediately effective, and enables a rapid return to full activity. The disadvantage of laparoscopy is the risk of bowel, bladder, or major vessel injury. The procedure can be performed in appropriately selected patients with local anesthetic and intravenous sedation. However, the procedure is typically performed under general anesthesia in an operating room setting. Use of general anesthesia slightly increases the risk of complications, but increases the acceptability of the procedure to patients and health care providers. Tubal occlusion can be achieved using electrocoagulation, mechanical devices, or tubal excision.

Electrocoagulation. Bipolar electrocoagulation for tubal occlusion is used exclusively with laparoscopic approaches. At least 3 cm of the isthmic portion of the fallopian tube must be completely coagulated (13). Monopolar electrocoagulation has been associated with thermal injury to the bowel and is rarely used.

Mechanical Devices. Mechanical devices commonly used in the United States include the silicone rubber band, the spring-loaded clip, and the titanium clip lined with silicone rubber. Special applicators are necessary for each of these mechanical occlusion devices. The silicone band can be applied only to a fallopian tube that is sufficiently mobile to allow it to be drawn into the applicator. All of these devices are most likely to be effective when used to occlude a normal fallopian tube; tubal adhesions, thickened tubes, or dilated fallopian tubes may increase the risk of misapplication and subsequent failure. Spontaneous clip migration or expulsion is rare (14–16).

Tubal Excision. The risks and benefits of salpingectomy should be discussed with patients who desire permanent sterilization (17). No significant differences in length of hospital stay, readmissions, blood transfusions, or postoperative complications, infections, and fever have been identified in cases with and without salpingectomy (18, 19). Complete or partial salpingectomy may be preferable in the setting of abnormal fallopian tubes (such as hydrosalpinx), in which tubal occlusion devices may be less effective. Tubal division can be accomplished using either monopolar energy or bipolar energy and a cutting device. Advantages of salpingectomy include high contraceptive efficacy, prevention of future tubal disease, and possibly the opportunity to decrease the risk of ovarian cancer in patients who already are undergoing pelvic surgery for benign disease (17).

Minilaparotomy. In the United States, minilaparotomy generally is reserved for postpartum procedures and rarely considered for patients at high risk of complications

associated with laparoscopic procedures. Minilaparotomy is performed using a 2–3-cm incision placed in relation to the uterine fundus (generally infraumbilically for postpartum sterilization and suprapubically for interval procedures). Obese patients and those failing laparoscopic procedures may require a larger incision. In contrast with laparoscopy, minilaparotomy requires only basic surgical instruments and is appropriate for low-resource settings where specialized surgical equipment is not available. In randomized trials, there was no difference in major morbidity between women who underwent tubal occlusion procedures performed by laparoscopy compared with minilaparotomy (20). When sterilization is performed concurrent with cesarean delivery, any higher associated morbidity rate compared with sterilization after vaginal delivery has been attributed to the indications for which the cesarean delivery was performed (21).

The commonly used techniques for tubal ligation and excision at the time of minilaparotomy and cesarean delivery include the Pomeroy, modified Pomeroy, and the Parkland methods. The Uchida and Irving methods rarely are used in the United States (22). To ensure complete transection of the tubal lumen, care should be taken to excise a sufficient section of the fallopian tube, particularly in cases of a previous failed tubal ligation or preexisting tubal disease. When an excision method is used, tubal segments should be submitted to pathology to confirm complete transection.

Hysteroscopy. There currently are no hysteroscopic sterilization devices on the market. The Essure® device had been the only remaining hysteroscopic sterilization option, but on December 31, 2018, the manufacturer voluntarily discontinued the sales and distribution of the product, citing declining sales as the reason (23). The manufacturer's decision to withdraw Essure® from the market followed a series of actions by the U.S. Food and Drug Administration (FDA) to address an increase in patient reports of adverse effects (23). There is an ongoing postmarket surveillance study of Essure®, and the FDA is continuing to monitor the safety of the device (23). For more information, see "*How should women who had hysteroscopic sterilization with Essure® be counseled regarding continued use of the device*?" later in this document.

Male Sterilization

Vasectomy performed as an outpatient procedure with local anesthesia has been popular in the United States since 1965. Based on data from the National Survey of Family Growth, 6.2% of reproductive-aged women reported relying on vasectomy as a birth control method (5). Compared with abdominal approaches to female sterilization, vasectomy is safer, more effective, and less expensive (24). Vasectomy is not immediately effective; an alternative form of contraception must be used until

a semen analysis confirms azoospermia. Most men are azoospermic at 3 months after vasectomy, and 98–99% are azoospermic at 6 months after vasectomy (25).

Clinical Considerations and Recommendations

▶ *Who are good candidates for female sterilization?*

Women who have completed their childbearing are candidates for sterilization. Preoperative counseling should be comprehensive and include a discussion of surgical technique, efficacy, safety, potential complications, and the alternatives to female sterilization. These alternatives should include long-acting reversible methods and vasectomy.

Women should have ample opportunity to make a considered decision about sterilization, and they should be informed that factors, such as young age, unstable relationship, and low parity might increase the risk of regret. Women should understand the permanence of the procedure and that in the event of regret, reversal procedures are likely to be prohibitively expensive and not covered by insurance. Women should be counseled about the risk of failure, risk of regret, and alternatives (including LARC and vasectomy). In a well-informed woman, age and parity should not be a barrier to sterilization. Choice of sterilization type should involve consideration of the patient's medical health, the safety of abdominal surgery and general anesthesia, and any health insurance limitations. There are no medical conditions that are strictly incompatible with sterilization, but the safety of a sterilization surgery must be assessed in the context of the patient's medical conditions. The U.S. Medical Eligibility Criteria for Contraceptive Use, from the Centers for Disease Control and Prevention, provides guidance for many of these circumstances (26).

▶ *How safe is laparoscopic sterilization?*

Tubal occlusion by laparoscopy is a safe and effective method of permanent contraception. Overall complication rates are low, and procedure-related death is a rare event. Mortality rates in the United States have been estimated at one to two deaths per 100,000 procedures (24), with most deaths attributed to hypoventilation and cardiopulmonary arrest during administration of general anesthesia. Results from a U.S. study from 1977 to 1981 indicate that 11 of 29 sterilization-related deaths occurred in women with underlying medical conditions (27). A more recent study found no mortality among 9,475 women who underwent interval laparoscopic tubal ligation (28). A large Swiss study of 27,653 women

undergoing tubal occlusion by laparoscopy or minilaparotomy reported no intraoperative or postoperative deaths (29).

Major complications from laparoscopic tubal ligation are uncommon, vary by study definition, and occur in 0.1–3.5% of laparoscopic procedures (14, 15, 28, 29). Using a standard definition of intraoperative and postoperative events, overall complication rates for laparoscopic tubal occlusion are estimated to be 0.9–1.6 per 100 procedures; unintended conversion to laparotomy is estimated as 0.9 per 100 cases (28). This complication rate did not vary significantly according to the method of occlusion used. Intraoperative complications include unplanned major surgery needed because of a problem related to the tubal surgery, transfusion, or a life-threatening event. Postoperative complications include unintended major surgery, transfusion, febrile morbidity, a life-threatening event, or rehospitalization. Use of general anesthesia, previous abdominal or pelvic surgery, obesity, and diabetes were independent predictors of complication (28).

▶ **How effective is traditional sterilization compared with reversible contraceptive methods?**

Laparoscopic tubal occlusion is far more effective than short-term, user-dependent, reversible contraceptive methods, such as oral contraceptive pills, injections, and barrier methods. Data from the 2002 National Survey of Family Growth indicate that within 1 year of starting any reversible method, 12.4% of typical users experience a contraceptive failure (30). Based on recent analysis by method, contraceptive failure occurs in the first year of typical use for 9% of women using oral contraception, patch, or ring; 18% of women relying on the male condom; 3% of women using injectable methods; and 24% using fertility awareness-based methods (31).

Failure rates of sterilization are comparable with those of long-acting reversible contraception methods, such as IUDs and the etonogestrel implant. The annual failure rates for the IUD are 0.8% for the copper T380A and 0.2% for the levonorgestrel-releasing intrauterine system. The etonogestrel implant has a 0.05% reported failure rate, the lowest of any contraceptive method (31).

The U.S. Collaborative Review of Sterilization (CREST), a large, prospective, multicenter observational study of 10,685 women conducted in 1996 by the Centers for Disease Control and Prevention, concluded that although sterilization via laparoscopy or minilaparotomy is a highly effective method of contraception, the risk of failure is substantially higher than previously reported (32). Analysis of CREST data found a 5-year cumulative failure rate of 13 per 1,000 for aggregated sterilization methods (including laparoscopy and laparotomy) (32), compared with a 5-year cumulative failure rate of 14 per 1,000 procedures for the copper T380A IUD (33). The 5-year cumulative pregnancy rate for the levonorgestrel-releasing IUD ranged from 5–11 per 1,000 procedures (34–36). The risk of pregnancy persists for years after the sterilization procedure and varies by occlusion technique and age of the woman (Table 1).

▶ **How does the safety of female sterilization compare with intrauterine devices and the contraceptive implant?**

There are few medical contraindications to the use of either IUDs or the contraceptive implant (26). Long-acting methods of contraception, including IUDs and the contraceptive implant, are at least as effective as tubal occlusion and are associated with lower morbidity and mortality. Among women using IUDs for contraception, approximately 1% will experience pelvic infection within the first 20 days (37). Overall, complications with IUDs are uncommon and mainly include expulsion, method failure, and perforation. The expulsion rate is between 2% and 10% during the first year (38). Perforation occurs in 1 per 1,000 insertions or less (39). Complications associated with contraceptive implant use are rare, but include bruising and pain at the implant site (1–3%), implant migration, and deep implant insertion that leads to difficult removal (<1%) (40). Both of these devices are placed in the outpatient setting with no systemic anesthetic, and if placed at the appropriate time should be immediately effective.

Although pregnancy after a sterilization procedure is uncommon, there is substantial risk that any poststerilization pregnancy will be ectopic. Analysis of CREST data found that one third of poststerilization pregnancies (47 out of 143 pregnancies) were ectopic (41). Pregnancies that occur in the setting of hormonal contraceptive or IUD use are also more likely to be ectopic; 20% of all IUD failures result in an ectopic pregnancy (32, 36). There have been several case reports of ectopic pregnancies that occurred in patients with the contraceptive implant (42, 43). However, overall, patients who have undergone sterilization procedures have a lower ectopic risk than noncontraceptive users.

▶ **How should women who had hysteroscopic sterilization with Essure® be counseled regarding continued use of the device?**

Although the manufacturer of Essure® voluntarily stopped sales and distribution of the device on December 31, 2018, women who already have the Essure® device implanted can be counseled that the FDA continues to "believe that the benefits of the Essure® device outweigh its risks" (23). And, Essure® users who are not experiencing adverse effects can continue to use the device (44). Women who are experiencing complications that may be related to use of Essure® should be counseled

Table 1. Pregnancy Rates by Sterilization Method

Method	5-year (per 1,000 procedures)	10-year (per 1,000 procedures)	Ectopic (per 1,000 procedures)
Postpartum partial salpingectomy	6.3	7.5	1.5
Bipolar coagulation[*†]	16.5	24.8	17.1
Silicone band methods	10.0	17.7	7.3
Spring clip	31.7	36.5	8.5
Vasectomy	11.3		No association

*Secondary analysis of 5-year failure rates with bipolar coagulation performed in different decades found that failure was significantly lower in later periods, reflecting improved technique with the method: 19.5 per 1,000 procedures for 1978–1982 versus 6.3 per 1,000 procedures for 1985–1987.

†Peterson HB, Xia Z, Wilcox LS, Tylor LR, Trussell J. Pregnancy after tubal sterilization with bipolar electrocoagulation. U.S. Collaborative Review of Sterilization Working Group. Obstet Gynecol 1999;94:163–7.

Data from Jamieson DJ, Costello C, Trussell J, Hillis SD, Marchbanks PA, Peterson HB. The risk of pregnancy after vasectomy. US Collaborative Review of Sterilization Working Group [published erratum appears in Obstet Gynecol 2004;104:200]. Obstet Gynecol 2004;103:848–50; Peterson HB, Xia Z, Hughes JM, Wilcox LS, Tylor LR, Trussell J. The risk of pregnancy after tubal sterilization: findings from the U.S. Collaborative Review of Sterilization. Am J Obstet Gynecol 1996;174:1161–8; discussion 1168–70; Peterson HB, Xia Z, Hughes JM, Wilcox LS, Tylor LR, Trussell J. The risk of ectopic pregnancy after tubal sterilization. U.S. Collaborative Review of Sterilization Working Group. N Engl J Med 1997;336:762–7; *and* Peterson HB, Xia Z, Wilcox LS, Tylor LR, Trussell J. Pregnancy after tubal sterilization with bipolar electrocoagulation. U.S. Collaborative Review of Sterilization Working Group. Obstet Gynecol 1999;94:163–7.

about management options, including the benefits and risks of surgical removal of the device.

The risk of pregnancy among women who have had successful hysteroscopic sterilization procedures appears to be similar to the risk in women who have had other sterilization methods, with a 3-year pregnancy rate of 4.8 per 1,000 pregnancies (45–49). However, pregnancies are more common among women who do not undergo the recommended 3-month follow up with hysterosalpingography or transvaginal ultrasonography to confirm proper device placement and bilateral tubal sterilization or who do not use a backup method of contraception during this follow-up period (45, 47, 49).

Potential complications of hysteroscopic sterilization include tubal perforation, improper coil placement, and expulsion of the device. In the clinical trials of Essure®, tubal perforations occurred in 1–3% of women, intraperitoneal placement in 0.5–3%, and other improper placements in 0.5% of the cases. Coil expulsion occurred in 0.4–3% of women (50–52). Other adverse effects that can occur after hysteroscopic sterilization include allergies or hypersensitivity reactions to nickel or other components. Essure® inserts release a small amount of nickel each day. As with laparoscopic sterilization, women may report pelvic pain and menstrual changes after the procedure. A retrospective cohort study found that a greater proportion of women with Essure® were subsequently diagnosed with menstrual dysfunction and a smaller proportion were diagnosed with pelvic pain compared with women who had undergone laparoscopic sterilization, though the differences were small (47).

Essure® users who have symptoms that are potentially device related and for whom conservative treatment options have failed should be counseled about removal options. Multiple case series in the literature describe techniques for Essure® removal, including laparoscopic salpingectomy, hysteroscopic removal, and cornuectomy (53–55). However, the proportion of patients who will experience relief of their symptoms after Essure® removal is unclear. Based on evidence from case series, hysterectomy generally is not necessary for Essure® removal but may be performed along with salpingectomy if hysterectomy is otherwise clinically indicated (56–58).

▶ *Which method of tubal occlusion is most effective for postpartum sterilization?*

Data from the CREST study indicate that postpartum partial salpingectomy is associated with lower failure rates than interval tubal occlusions done by laparoscopy (32). This lower failure rate may be because a segment of tube is removed rather than mechanically occluded or cauterized, or because a pathologist is able to confirm complete tubal cross sections. A recent systematic review of studies of the titanium clip lined with silicone rubber and partial salpingectomy by the modified Pomeroy technique concluded that the titanium clip may have decreased efficacy when used in the immediate postpartum period (59). A randomized control trial that compared the titanium clip with partial salpingectomy for postpartum sterilization concluded that the titanium clip is significantly less effective (60).

► Does the technique used for female sterilization affect the risk of ectopic pregnancy?

The risk of ectopic pregnancy varies substantially with the method and timing of tubal occlusion. Based on CREST study data, the 10-year cumulative probability of ectopic pregnancy after tubal occlusion by any method was 7.3 per 1,000 procedures (41) (Table 1). Ectopic pregnancy was not reported in the clinical trials with hysteroscopic tubal sterilization, but has been described in a case report after tubal occlusion was confirmed by hysterosalpingography (61).

For all methods except postpartum partial salpingectomy, the probability of ectopic pregnancy was greater for women sterilized before age 30 years than for women sterilized at age 30 years or older. Postpartum partial salpingectomy was the only method reported by the CREST study that did not have a higher 10-year cumulative probability of ectopic pregnancy in younger women (41). For all methods of tubal occlusion, the risk of ectopic pregnancy did not diminish with the length of time since the procedure.

► How do the safety and efficacy of tubal occlusion compare with vasectomy?

Vasectomy is safer than tubal occlusion. It is a less invasive surgical procedure, is performed using local anesthesia, and is protective against ectopic pregnancy. Although specific data are lacking on major morbidity and mortality related to vasectomy, serious complications are thought to be rare (62–64).

Vasectomy has a failure rate of 0.15% in the first year, which is lower than the rate reported for most methods of female sterilization (30, 63). Neither female nor male sexual function appears to be affected after tubal occlusion or vasectomy (65, 66).

Vasectomy failure is not associated with an increased risk of ectopic pregnancy. When controlling for pregnancy rates, tubal occlusion has a higher rate of ectopic pregnancy than vasectomy. The incidence of ectopic pregnancy is 0.32 per 1,000 women-years in women who had tubal occlusion and 0.005 per 1,000 women-years in women whose partners had vasectomy (67). By comparison, the estimated absolute incidence of ectopic pregnancy in women using no contraception is 2.6 per 1,000 women-years (67).

Vasectomy-related major morbidity and mortality are extremely rare in the United States (62). Minor complications of vasectomy, such as infection at the site of incision, bleeding, hematoma formation, granuloma formation, and epididymitis, are reported to occur at rates of 0.4–10% (68, 69). In comparison with the incisional technique, the no-scalpel vasectomy technique has a lower incidence of hematoma formation, infection, and pain and has a shorter operative time (62, 68, 70, 71).

Multiple large epidemiologic studies have concluded there is no causal relationship between vasectomy and both atherosclerosis disease and immunologic disease (63, 65, 72, 73). In addition, there are robust data suggesting no association between vasectomy and testicular cancer or prostate cancer (66, 74–76). The nerves involved in male erectile function and ejaculation are not affected by vasectomy, and there is no increased risk of impotence. Chronic testicular pain after vasectomy may rarely result from obstructive epididymitis or sperm granuloma.

► Does tubal occlusion cause menstrual abnormalities?

Prospective studies that account for confounding factors, such as presterilization use of hormonal contraceptives, have found that tubal occlusion had little or no effect on menstrual patterns (77–84). An analysis of CREST data found that women who underwent sterilization were no more likely than controls to report persistent changes in their menstrual cycle length or intermenstrual bleeding (85). However, they were more likely to have beneficial changes in their menstrual cycle, including decreases in the amount of bleeding, in the number of days of bleeding, and in menstrual pain. The method of tubal occlusion did not have a significant effect on the findings. There are conflicting data describing the effect of hysteroscopic sterilization on menstrual patterns (86, 87).

► Are women who undergo tubal occlusion more likely to have a hysterectomy?

In an analysis of CREST data, women who had tubal occlusion were found to be four to five times more likely to undergo hysterectomy over a 14-year follow-up period than those whose partners underwent vasectomy (88). Increased risk was independent of patient age and the method of tubal occlusion used, but was associated with a presterilization history of menstrual disorders or other benign gynecologic disorders, including endometriosis and uterine leiomyomas. There is no known biologic mechanism to support a causal relationship between tubal occlusion and subsequent hysterectomy.

► Does tubal occlusion have noncontraceptive benefits?

Multiple observational trials have confirmed that laparoscopic tubal occlusion reduces the incidence of ovarian cancer (relative risk, 0.29–0.69) (89–92). This protective effect persists after adjusting for age, use of oral

contraceptives, and parity (89). Tubal occlusion maintains its protective effect in women at high risk of ovarian cancer due to *BRCA1* and *BRCA2* mutations (93). Evidence suggests that ovarian cancer may originate from the fimbriae of the fallopian tube (94–96), and complete salpingectomy for tubal sterilization is becoming increasingly common (17). Although tubal occlusion does not protect against sexually transmitted infections (including human immunodeficiency virus [HIV]), it has been shown to reduce the spread of organisms from the lower genital tract to the peritoneal cavity and, thus, protect against pelvic inflammatory disease (97). This protection is incomplete, however, as suggested by rare case reports of pelvic inflammatory disease and tubo-ovarian abscess in women who have undergone sterilization (98–100).

▶ *What is the risk that a patient will regret having had sterilization, and how can the risk be reduced?*

Most women who choose sterilization do not regret their decision; however, information and counseling about this method of contraception should be provided with the intent to minimize regret among individual women (101–103). Although there are certain key indicators for future regret—such as young age (less than age 30) at the time of sterilization—many indicators of regret are part of individual social circumstances, which should be explored with the patient before a decision is made.

Prospective analysis of CREST study data found that the cumulative probability of regret over 14 years of follow-up was 12.7% (101). However, the probability was 20.3% for women aged 30 years or younger at the time of sterilization, compared with 5.9% for women older than 30 years at the time of sterilization. A meta-analysis of studies of poststerilization regret concluded that women who underwent sterilization at age 30 years or younger were twice as likely to express regret as women older than 30 years at the time of sterilization (103). Women aged 30 years or younger at the time of their procedure were 3.5–18 times more likely to request information about sterilization-reversal and approximately eight times more likely to undergo reversal or evaluation for in vitro fertilization. In the CREST study, the 14-year cumulative probability of requesting reversal information was as high as 40.4% in women who underwent sterilization between ages 18 years and 24 years—almost four times higher than for women older than 30 years at the time of the procedure (101). Similarly, men who underwent vasectomy at young ages were more likely to have the procedure reversed than those who underwent vasectomy at older ages (26).

Analysis of CREST data also showed a relationship between regret and the timing of the procedure. The cumulative probability of regret diminished steadily with increased interval between delivery and sterilization (101). Postabortion sterilization was not associated with increased regret when compared with interval sterilization (101, 104–106).

Other risk factors for increased regret include having received less information about the procedure, having had less access to information or support for use of an alternative contraceptive method, and having made the decision under pressure from a spouse or because of medical indications (107–109). The number of living children is not associated with a request for reversal information.

It is important to attempt to reduce the likelihood of poststerilization regret with thorough and effective counseling that takes into account known risk factors. However, patients should not be denied sterilization because of presence of such risk factors, especially young age. Both the patient and her partner, when appropriate, should be counseled (see Box 1). The choice to undergo sterilization is an individual and personal decision. It is critical that health care providers refrain from inserting their own biases or judgments about the appropriateness of a patient's decision to proceed with sterilization. Full consideration should be given to all reversible contraceptive options, particularly the long-acting reversible methods. Patients must be informed that IUDs and the implant are at least as effective as sterilization.

Box 1. Components of Presterilization Counseling

- Permanent nature of the procedure, not intended to be reversible
- Alternative methods available, particularly long-acting reversible contraception and vasectomy
- Details of the procedure, including risks and benefits of anesthesia
- The possibility of failure, including ectopic pregnancy, with sterilization and other methods
- The need to use condoms for protection against sexually transmitted infections, including human immunodeficiency virus (HIV)
- Completion of informed consent process
- Local regulations regarding interval from time of consent to procedure

Data from Pollack AE, Soderstrom RM. Female tubal sterilization. In: Corson SL, Derman RJ, Tyrer LB, editors. Fertility control. 2nd ed. London (ON): Goldin Publishers; 1994. p. 293–317.

Summary of Recommendations and Conclusions

The following recommendations and conclusions are based on good and consistent scientific evidence (Level A):

▶ Tubal occlusion by laparoscopy is a safe and effective method of permanent contraception.

▶ Tubal occlusion does not protect against sexually transmitted infections (including HIV).

▶ Compared with abdominal approaches to female sterilization, vasectomy is safer, more effective, and less expensive.

▶ Laparoscopic tubal occlusion is far more effective than short-term, user-dependent, reversible contraceptive methods, such as oral contraceptive pills, injections, and barrier methods.

▶ Long-acting methods of contraception, including IUDs and the contraceptive implant, are at least as effective as tubal occlusion and are associated with lower morbidity and mortality.

▶ Although pregnancy after a sterilization procedure is uncommon, there is substantial risk that any post-sterilization pregnancy will be ectopic.

▶ Patients who have undergone sterilization procedures have a lower ectopic risk than non-contraceptive users.

The following recommendations are based on limited or inconsistent scientific evidence (Level B):

▶ Postpartum partial salpingectomy is associated with lower failure rates than interval tubal occlusions done by laparoscopy.

▶ Laparoscopic tubal occlusion reduces the incidence of ovarian cancer.

The following recommendation is based primarily on consensus and expert opinion (Level C):

▶ Women should be counseled about the risk of failure, risk of regret, and alternatives (including LARC and vasectomy). In a well-informed woman, age and parity should not be a barrier to sterilization.

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The MEDLINE database, the Cochrane Library, and the American College of Obstetricians and Gynecologists' own internal resources and documents were used to conduct a literature search to locate relevant articles published between January 1990–October 2012. The search was restricted to articles published in the English language. Priority was given to articles reporting results of original research, although review articles and commentaries also were consulted. Abstracts of research presented at symposia and scientific conferences were not considered adequate for inclusion in this document. Guidelines published by organizations or institutions such as the National Institutes of Health and the American College of Obstetricians and Gynecologists were reviewed, and additional studies were located by reviewing bibliographies of identified articles. When reliable research was not available, expert opinions from obstetrician–gynecologists were used.

Studies were reviewed and evaluated for quality according to the method outlined by the U.S. Preventive Services Task Force:

I Evidence obtained from at least one properly designed randomized controlled trial.

II-1 Evidence obtained from well-designed controlled trials without randomization.

II-2 Evidence obtained from well-designed cohort or case–control analytic studies, preferably from more than one center or research group.

II-3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence.

III Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Based on the highest level of evidence found in the data, recommendations are provided and graded according to the following categories:

Level A—Recommendations are based on good and consistent scientific evidence.

Level B—Recommendations are based on limited or inconsistent scientific evidence.

Level C—Recommendations are based primarily on consensus and expert opinion.