Opportunistic Salpingectomy as a Strategy for Epithelial Ovarian Cancer Prevention

ABSTRACT: Opportunistic salpingectomy may offer obstetrician–gynecologists and other health care providers the opportunity to decrease the risk of ovarian cancer in their patients who are already undergoing pelvic surgery for benign disease. By performing salpingectomy when patients undergo an operation during which the fallopian tubes could be removed in addition to the primary surgical procedure (eg, hysterectomy), the risk of ovarian cancer is reduced. Although opportunistic salpingectomy offers the opportunity to significantly decrease the risk of ovarian cancer, it does not eliminate the risk of ovarian cancer entirely. Counseling women who are undergoing routine pelvic surgery about the risks and benefits of salpingectomy should include an informed consent discussion about the role of oophorectomy and bilateral salpingo-oophorectomy. Bilateral salpingo-oophorectomy that causes surgical menopause reduces the risk of ovarian cancer but may increase the risk of cardiovascular disease, cancer other than ovarian cancer, osteoporosis, cognitive impairment, and all-cause mortality. Salpingectomy at the time of hysterectomy or as a means of tubal sterilization appears to be safe and does not increase the risk of complications such as blood transfusions, readmissions, postoperative complications, infections, or fever compared with hysterectomy alone or tubal ligation. The risks and benefits of salpingectomy should be discussed with patients who desire permanent sterilization. Additionally, ovarian function does not appear to be affected by salpingectomy at the time of hysterectomy based on surrogate serum markers or response to in vitro fertilization. Plans to perform an opportunistic salpingectomy should not alter the intended route of hysterectomy. Obstetrician–gynecologists should continue to observe and practice minimally invasive techniques. This Committee Opinion has been updated to include new information on the benefit of salpingectomy for cancer reduction, the feasibility of salpingectomy during vaginal hysterectomy, and long-term follow-up of women after salpingectomy.

Recommendations and Conclusions

Opportunistic salpingectomy is the removal of the fallopian tubes for the primary prevention of ovarian cancer in a woman already undergoing pelvic surgery for another indication. Based on the current understanding of ovarian carcinogenesis and the safety of salpingectomy, the American College of Obstetricians and Gynecologists supports the following recommendations and conclusions:

- Salpingectomy at the time of hysterectomy or as a means of tubal sterilization appears to be safe and does not increase the risk of complications such as blood transfusions, readmissions, and postoperative complications, infections, or fever compared with hysterectomy alone or tubal ligation.
- Ovarian function does not appear to be affected by salpingectomy at the time of hysterectomy based on surrogate serum markers or response to in vitro fertilization.
- The surgeon and patient should discuss the potential benefits of the removal of the fallopian tubes during a hysterectomy in women at population risk of ovarian cancer who are not having an oophorectomy.
• Counseling women who are undergoing routine pelvic surgery about the risks and benefits of salpingectomy should include an informed consent discussion about the role of oophorectomy and bilateral salpingo-oophorectomy.
• Although data are limited, postpartum salpingectomy and salpingectomy at time of cesarean delivery appear feasible and safe.
• The risks and benefits of salpingectomy should be discussed with patients who desire permanent sterilization.
• Plans to perform an opportunistic salpingectomy should not alter the intended route of hysterectomy.

Background
Ovarian cancer has the highest mortality rate of all types of gynecologic cancer and is the fifth leading cause of cancer deaths among women (1). The overall survival rate for women with epithelial ovarian cancer has improved marginally in the past 50 years. The more aggressive epithelial ovarian carcinomas represent at least 90% of all cases of ovarian cancer and are responsible for 90% of deaths due to ovarian cancer (2, 3). Current attempts at screening for ovarian cancer have been unsuccessful and are associated with false-positive test results that lead to unnecessary surgery and surgical complications (4–7). A theory has been developed that opportunistic salpingectomy may offer obstetrician–gynecologists and other health care providers the opportunity to decrease the risk of ovarian cancer in their patients who are already undergoing pelvic surgery for benign disease. This Committee Opinion addresses women at population risk undergoing routine pelvic surgery for benign disease; for women at increased risk of ovarian cancer, see Practice Bulletin No. 182, Hereditary Breast and Ovarian Cancer Syndrome (8). In 2013, the Society of Gynecologic Oncology released a practice statement that noted for women at population risk of ovarian cancer, salpingectomy should be considered (after completion of childbearing) at the time of hysterectomy, in lieu of tubal ligation, and also at the time of other pelvic surgery (9). This Committee Opinion has been updated to include new information on the benefit of salpingectomy for cancer reduction, the feasibility of salpingectomy during vaginal hysterectomy, and long-term follow-up of women after salpingectomy.

Theory of Epithelial Ovarian Carcinogenesis
There are strong molecular data that provide insight into the origin and pathogenesis of ovarian cancer. The most compelling theory of epithelial ovarian carcinogenesis suggests that many serous, endometrioid, and clear cell carcinomas are derived from the fallopian tube and the endometrium and not directly from the ovary (10–14). This contrasts with the traditional view of ovarian carcinogenesis in which ovarian surface epithelium (mesothelium) undergoes metaplastic changes that lead to the different histologic types of epithelial ovarian cancer. In women with a genetic predisposition for ovarian cancer, lesions have been found in the fallopian tubes that closely resemble ovarian high-grade serous carcinomas or serous tubal intraepithelial carcinomas. These lesions are thought to be an important source of ovarian carcinoma that secondarily involves the ovary. Molecular studies show that these tubal lesions express a common TP53 mutation, as do high-grade serous carcinomas (14, 15). In addition, gene expression of high-grade serous carcinomas is more closely related to the fallopian tube morphology than to the ovarian surface epithelium. High-grade serous carcinomas express a müllerian marker (PAX8) but not a mesothelial marker (calretinin).

Although many types of epithelial ovarian cancers may derive from the fallopian tube, it is important to remember that some types of epithelial ovarian cancer still primarily arise from the ovary. In addition, non-epithelial ovarian cancer, such as germ cell tumors and sex-cord stromal tumors, also arise from the ovary rather than the fallopian tube. Thus, although opportunistic salpingectomy offers the opportunity to significantly decrease the risk of ovarian cancer, it does not eliminate the risk of ovarian cancer entirely. Obstetrician–gynecologists should counsel women who have undergone salpingectomy of potentially relevant signs and symptoms of ovarian cancer (7).

Pelvic Surgery and the Risk of Ovarian Cancer
Research into epithelial ovarian carcinogenesis primarily affects two groups of women: 1) those at high risk of hereditary ovarian cancer; and 2) those at population risk (no genetic predisposition for ovarian cancer) who are undergoing routine pelvic surgery. Studies of risk-reducing surgery for patients with BRCA mutations demonstrated that 1–5% of those women had early tubal malignancy; in most of these cases of malignancy, an early intraepithelial component was located in the fimbriated end of the fallopian tube (16, 17). Tubal ligation has a protective effect specifically against endometrioid and clear cell carcinomas of the ovary, which support the theory that these tumors may be related to retrograde menses of endometrial cells (18). Results from the Nurses’ Health Studies show that women who had undergone a tubal ligation (n = 29,340) had a 24% lower risk of ovarian cancer compared with women who did not have the procedure (n = 194,278) (19). A population-based cohort study in Sweden showed a similar decreased risk of ovarian cancer in women undergoing sterilization (20). By performing salpingectomy when patients undergo an operation during which the fallopian tubes could be removed in addition to the primary surgical procedure (e.g., hysterectomy), the risk of ovarian cancer is reduced. In the Swedish study, women who underwent bilateral salpingectomy had a 65%
reduction in the risk of ovarian cancer and women who underwent sterilization had a 28% reduction in risk compared with women who did not undergo sterilization, salpingectomy, hysterectomy, or bilateral salpingo-oophorectomy (20). A meta-analysis of three studies of women undergoing hysterectomy for benign indications showed women who underwent bilateral salpingectomy at the time of hysterectomy had a lower risk of developing ovarian cancer when compared with women who did not undergo salpingectomy. These patients were monitored for a minimum of 30 years after salpingectomy (21).

Salpingectomy at the time of hysterectomy or as a means of tubal sterilization appears to be safe and does not increase the risk of complications such as blood transfusions, readmissions, postoperative complications, infections, or fever compared with hysterectomy alone or tubal ligation (22, 23). Additionally, ovarian function does not appear to be affected by salpingectomy at the time of hysterectomy based on surrogate markers or response to in vitro fertilization (24–27). In one observational study, 71 women who underwent laparoscopic hysterectomy with opportunistic bilateral salpingectomy were monitored for 3–5 years after surgery to assess their ovarian function. In these women, follicle-stimulating hormone, antimüllerian hormone, antral follicle count, vascular index, flow index, and vascular flow index were used to determine ovarian function and then compared with a control group that included 652 healthy women with intact uterus and adnexa. Results showed no difference between the two groups, which reaffirms that ovarian function can be safely preserved with opportunistic bilateral salpingectomy (28).

**Counseling**

The surgeon and patient should discuss the potential benefits of the removal of the fallopian tubes during a hysterectomy in women at population risk of ovarian cancer who are not having an oophorectomy. Counseling women who are undergoing routine pelvic surgery about the risks and benefits of salpingectomy should include an informed consent discussion about the role of oophorectomy and bilateral salpingo-oophorectomy. Bilateral salpingo-oophorectomy that causes surgical menopause reduces the risk of ovarian cancer but may increase the risk of cardiovascular disease, cancer other than ovarian cancer, osteoporosis, cognitive impairment, and all-cause mortality (29). In the Nurses’ Health Study, all-cause mortality and cancer mortality increased in women who received a bilateral salpingo-oophorectomy (30). The risk of ovarian cancer after hysterectomy with ovarian conservation is 0.1–0.75% (31). Death from ovarian cancer after tubo-ovarian conservation in the Nurses’ Health Study was 0.03% (30). The benefits of ovarian conservation decrease with age, and there is little benefit after age 65 years (32). Given current theories of ovarian carcinogenesis, ovarian conservation and salpingectomy may represent a better option than bilateral salpingo-oophorectomy for ovarian cancer risk reduction for most women undergoing other pelvic surgeries for benign disease. When counseling women about laparoscopic sterilization methods, obstetrician–gynecologists can communicate that bilateral salpingectomy can be considered a method that provides effective contraception. Obstetrician–gynecologists should counsel patients that salpingectomy eliminates tubal reversal as an option for those women who experience regret and seek fertility options later (33).

**Surgical Technique and Timing of Salpingectomy**

Salpingectomy should remove the tube completely from its fimbriated end and up to the uterotubal junction; the interstitial portions of the tubes do not need to be removed. Any fimbrial attachments on the ovary should be cauterized or removed. Complete salpingectomy is preferred over fimbriectomy because precursors to fallopian tube cancer (or ovarian cancer) can be found throughout the fallopian tube (34); however, if complete salpingectomy cannot be performed, then removing as much of the fallopian tubes as possible, excluding the interstitial portion, still may have value (16). Earlier benign lesions (serous tubal intraepithelial lesions and tubal intraepithelial lesions in transition) and the more recently described concept of a surrogate precursor (secretory cell outgrowths) have been implicated in the development of tubal dysplasia and tubal carcinomas (34). Serous tubal intraepithelial lesions and tubal intraepithelial lesions in transition are most frequently located in the fimbriated end of the uterine tube, whereas secretory cell outgrowths are distributed throughout the tube.

Although data are limited, postpartum salpingectomy and salpingectomy at time of cesarean delivery appear feasible and safe. Although there is no information about the effectiveness of complete salpingectomy as a method of sterilization, possible surrogates may include postpartum partial salpingectomy and interval partial salpingectomy, which were found to have a 7.5 and 20.1 cumulative probability of pregnancy per 1,000 procedures, respectively, in the United States (35). Two studies that compared bilateral salpingectomy to tubal ligation at time of cesarean delivery found an increased surgical time of 9–13 minutes for the salpingectomy group when suture ligation or cautery was done; otherwise, there were no differences in blood loss or complications in the studies of 46 women (36) and 6,185 women (37). Another retrospective study of almost 150 women who underwent sterilization at the time of cesarean delivery showed no difference in surgical time for either group, as well as no difference in blood loss or complications (infection, reoperation, and readmission). An electrothermal bipolar vessel sealing system was used for the 50 patients who underwent salpingectomy and modified Pomeroy technique was used for the 99 patients who had...
a tubal ligation (38). In 2018, two small randomized controlled trials were published that compared salpingectomy with standard postpartum tubal ligation at time of cesarean delivery. In the larger one (80 patients), the modified Pomeroy technique was used for the women randomized to tubal ligation, and salpingectomy was accomplished using clamps and suture (39). The study reported an increase in operative time of 15 minutes in the salpingectomy group ($P=0.004$); and bilateral salpingectomy was completed in 68% of women randomized to salpingectomy compared with a 95% completion rate in the bilateral tubal ligation group ($P=0.002$). There were no adverse events related to the sterilization procedure reported in either group (39). The second trial of 44 women found no difference in operative time or blood loss (40). Both the Pomeroy and Parkland methods were performed for tubal ligation and the salpingectomies were performed using the small jaw vessel sealing system. Bilateral salpingectomy was completed in 86% of the randomized women and tubal ligation in 91% (40). Current data on salpingectomy during postpartum sterilization procedures are limited to studies of fewer than 20 patients undergoing salpingectomy. These small studies reported longer durations of surgery (12–17 minutes) and a small increase in blood loss (50 mL) for postpartum salpingectomy when compared with postpartum bilateral tubal ligation or postpartum tubal occlusion (37, 41). A 2018 article detailing the technique of salpingectomy at time of vaginal hysterectomy reported success in all attempts (more than 60 cases) (42).

**Conclusion**

Opportunistic salpingectomy at the time of benign gynecologic surgery is increasing (22). Based on a physician survey of members of the American College of Obstetricians and Gynecologists, 77% perform bilateral salpingectomy at the time of hysterectomy for benign indications. The respondents also performed bilateral salpingectomy at the time of sterilization at the following rates: 53% during interval sterilization, 26% during postpartum sterilization; and 37% during cesarean deliveries (43). Other than a significant increase in operative time for salpingectomy with hysterectomy (16 minutes) and with sterilization (10 minutes), 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 (22, 23). Larger studies that are powered to detect possible differences in complications are necessary. The risks and benefits of salpingectomy should be discussed with patients who desire permanent sterilization. Plans to perform an opportunistic salpingectomy should not alter the intended route of hysterectomy (44).

Obstetrician–gynecologists should continue to observe and practice minimally invasive techniques. Because the benefits of opportunistic salpingectomy are not completely elucidated, vaginal hysterectomy should not be changed to a laparoscopic hysterectomy just to perform a salpingectomy. Studies that reviewed the feasibility of salpingectomy at the time of vaginal hysterectomy demonstrate that opportunistic salpingectomy can be successfully performed 75–88% of the time. Reasons that salpingectomy could not be done included pelvic or adnexal adhesions and fallopian tubes that could not be accessed vaginally (45, 46). Plans to perform an opportunistic salpingectomy should not alter the intended route of hysterectomy (44).

**References**


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