

Trends of Opportunistic Salpingectomy

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ABSTRACT

Background and Objectives: This study analyzed the trends of opportunistic salpingectomy (OS) accompanied by hysterectomy in a 9-year follow-up period at a single institute.

Methods: This retrospective cohort study included 1184 women at Hualien Tzu Chi Hospital from 2007 to 2015 who underwent hysterectomy performed with or without OS. Parameters including patient age, operating time, surgical approach, length of hospital stay, and perioperative complications were evaluated.

Results: There was an increase in the number of hysterectomies with OS (from 8% to 80%; $P < .001$) over the study period. Minimal additional operating time was necessary for hysterectomy with OS (3.7 and 3.6 minutes in open and laparoscopic surgery, respectively). No significant differences were observed in the risks of hospital readmission or blood transfusions between women who underwent hysterectomy with OS performed with the open approach and those who underwent the procedure using the laparoscopic approach. From 2007 to 2015, the proportion of open hysterectomies decreased from 56% to 6%.

Conclusion: The results of this 9-year follow-up study revealed that, as a cancer prevention method, OS seems

to be feasible and safe, requires minimal extra time, and does not increase the morbidity or long-term sequelae.

Key Words: Hysterectomy, Laparoscopy, Open surgery, Opportunistic salpingectomy, Ovarian cancer.

INTRODUCTION

Epithelial ovarian cancer (EOC) is the second most common gynecologic cancer and the most common cause of gynecologic cancer mortality in developed countries.¹ The most common histology of EOC is high-grade serous carcinoma (HGSC), usually arising from the fallopian tube fimbria.² Large-scale epidemiological studies and meta-analyses have revealed that tubal ligation decreases the risk of endometrioid and clear cell tumors by >50% and that of serous tumors of the ovary by >25%.³⁻⁵ Because of the lack of a screening test for ovarian cancer, opportunistic salpingectomy (OS) could be a solution for reducing the incidence of ovarian cancer.⁶ The Society of Gynecologic Oncology of Canada (2011), Society of Gynecologic Oncology (2013),⁷ and American College of Obstetricians and Gynecologists (2015)⁸ have published statements in favor of OS for ovarian cancer prevention. In recent years, salpingectomy has been increasingly performed for tubal sterilization.⁹

Although there is controversy regarding the short- and long-term outcomes of OS,^{10,11} the procedure maintains ovarian function and has relatively few surgical complications.^{12,13} Moreover, several studies have shown a significant reduction in the risk of EOC among women who underwent bilateral salpingectomy, compared with those who underwent tubal preservation^{14,15} or unilateral salpingectomy.¹⁵

In this study, we analyzed the trends of OS performed during hysterectomy since 2007, as well as the long-term outcomes of the procedure.

MATERIALS AND METHODS

Ethics

This retrospective cohort study was conducted from 2007 to 2015 in accordance with the ethical standards of the respon-

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Conflicts of Interest: All authors declare no conflict of interest regarding the publication of this article.

This research was conducted in accordance with the ethical standards of the responsible committee on human experimentation (Hualien Tzu Chi Hospital) and with the Helsinki Declaration. This research was approved by the Research Ethics Committee of Hualien Tzu Chi Hospital.

Informed consent: Dr. Ding, declares that written informed consent was obtained from the patient/s for publication of this study/report and any accompanying images.

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Inclusion and Exclusion Criteria

We used data from the electronic medical records database of Hualien Tzu Chi Hospital, which captures demographic, administrative, and clinical information for all hospital discharges (inpatient and day surgeries). All women who underwent a combination of salpingectomy and hysterectomy at our hospital from January 1, 2007, to December 31, 2015, were included in this study. Patients who had a previous history of bilateral salpingo-oophorectomy (BSO) or who underwent oophorectomy were not included. The volume of the surgeon performing the operations was ~40–50 hysterectomies per year. The discharge summary provided information on operating time (time from first skin incision until completed skin closure, time of OS [it is customary to record specific operating times for OS at our institution]), surgical approach (vaginal, laparoscopic, combined vaginal and laparoscopic, and open), surgical indication, and length of hospital stay (LOS). Data were also gathered on patients who required blood transfusion or readmission to the hospital, which reflected possible surgical complications. All statistical analyses were performed with SPSS software (version 20; IBM, New York, NY, USA).

Procedural Uptake

The rates of salpingectomy between 2007 and 2015, which include the number of hysterectomies that were performed with and without OS, were examined. Student's *t* test was used to assess significant differences in the rate of procedures across the 9-year period.

Operative and Perioperative Measures

To investigate whether OS is associated with a higher risk of complications, data on women who underwent hysterectomy were divided into 2 categories based on surgical procedure: (1) hysterectomy alone (the reference group, because these women were expected to be at the lowest risk of complications) and (2) hysterectomy with OS. Because the continuous variables were distributed normally, data were presented as means with standard deviations. Differences in the age of patients, operating time, LOS, hospital readmission, and the rate of blood transfusion were analyzed by using χ^2 tests for categorical variables and independent-samples *t* tests for continuous variables.

OS Procedure

The procedure for laparoscopic salpingectomy involved coagulation and resection of the tissue from the distal fimbrial end to the uterine cornu, with the tube being left on the uterus. The mesosalpinx was carefully spared so that ovarian function was not compromised (**Figure 1**). OS accompanied with total abdominal hysterectomy (TAH) was performed similarly. Conventional laparoscopic hysterectomy was defined as surgery performed with 3 or 4 ports, whereas laparoendoscopic single-site surgery (LESS) was that performed through a single port.

RESULTS

Procedural Uptake

From January 2007 to December 2015, 1184 patients who underwent hysterectomy were included. Of those, 712 had OS. The mean time of OS was 3.7 ± 1.1 minutes. Patients' mean age was 47.3 years.

From 2010, the OS rate increased markedly, being 32% in 2009, 76% in 2010, and approximately 80% in 2011 onward (**Figure 2**).

The total number of each surgical method is presented in **Figure 3**. The number of TAHs began declining in 2010, and only 7 patients underwent TAH in 2015. By contrast, conventional laparoscopy and LESS began increasing in

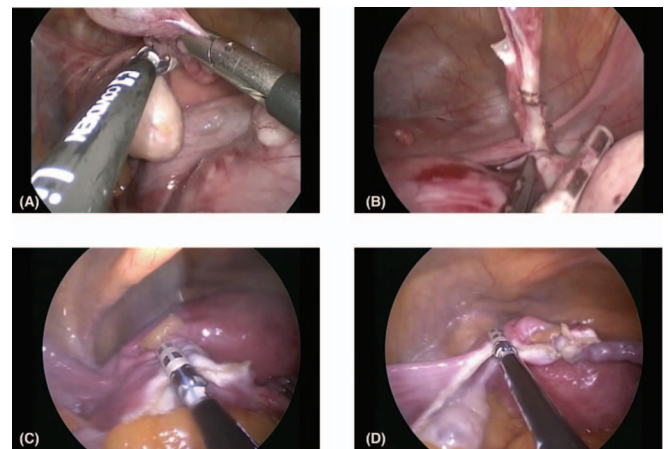


Figure 1. Salpingectomy procedure. **A, C**, The tubes are removed through coagulation and resection from the distal fimbrial end to the uterine cornu. **B, D**, The mesosalpinx is spared. The tube can be left on the uterine body or resected before hysterectomy. The salpingectomies in the photographs were performed through single-port laparoscopy.

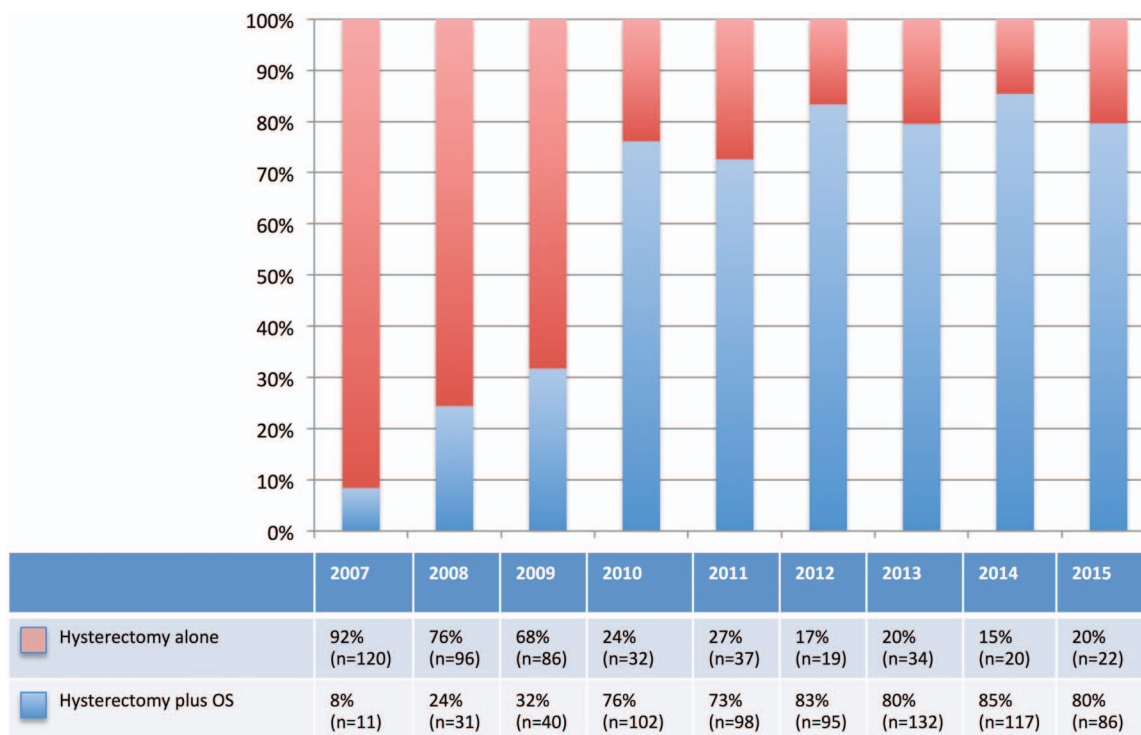


Figure 2. Number and percentage of hysterectomies and salpingectomies performed from 2007 to 2015.

2011; in 2015, the percentage of LESS was approximately half that of conventional laparoscopy (31% vs 63%).

Operative and Perioperative Measures

Table 1 shows the differences in age, operating time, LOS, readmission, and blood transfusion rates in patients who underwent hysterectomy with OS. The mean operating time was longer with the laparoscopic approach than with the open procedure (111 minutes vs 93.2 minutes; $P > .05$). Rates of readmission for hysterectomy with OS were the same in both the open and laparoscopy groups (0.7% vs 0.6%; $P > .05$). LOS was significantly shorter in the laparoscopy group than in the open group (4.4 vs 5.8 d; $P < .001$). The blood transfusion rate was significantly higher in the open group than in the laparoscopy group (3.3 vs 1.1%; $P = .005$).

Five women who underwent OS were readmitted (**Table 2**) for ovarian tumor.

DISCUSSION

Because of increasing evidence showing that the fallopian tube epithelium (FTE) is where ovarian cancer originates,^{16,17} gynecologic oncologists in our department began performing OS during hysterectomy in 2007. At that time, OS was

performed in only 8% of hysterectomies, and the rate kept increasing until 2011, from which time it remained stable at approximately 80%. The same trend was noted in Canada: the OS rate increased from 5% in 2008 to 35% in 2011.¹⁸ We also observed that the percentage of OS performed during hysterectomy increased from 2007 to 2015, with the highest percentage being 85.4% in 2014. Moreover, an increased percentage of LESS (30.5%) was noted in our hospital.

BSO has been suggested for preventing ovarian cancer in women carrying a *BRCA1/2* mutation after the childbearing period. However, preservation of ovarian function is a concern in premenopausal women: oophorectomy reduces hormone production and increases the long-term risks of psychosexual, cognitive, and coronary heart diseases.¹⁹ Thus, the decision to perform oophorectomy at the time of hysterectomy should be made carefully.¹⁹

Recently, Swedish¹⁵ and Danish²⁰ researchers have published population-based data providing initial evidence of benefits from salpingectomy, including a 35%–42% reduction in OC risk. In the Swedish study, salpingectomy significantly reduced ovarian cancer risk (hazard ratio [HR]: 0.65), and a dose response effect was evident (bilateral salpingectomy twice as effective as unilateral salpingectomy; HR 0.35 vs 0.71). The Danish study found significant variation in the



Figure 3. Number and percentage of each surgical method TAH, conventional laparoscopy, and LESS performed from 2007 to 2015.

risk according to histology ($P = .003$), with the strongest risk reductions associated with endometrioid cancer (odds ratio [OR], 0.66) and EOC of other histology (OR, 0.60). The researchers concluded that bilateral salpingectomy reduces EOC risk by 42% (OR, 0.58).

In 2009, a Canadian study found considerable evidence for the fallopian tube being the primary site of pelvic HGSC and suggested salpingectomy as a preventive measure.²¹ Since then, ovarian cancer researchers at Vancouver General Hospital began to urge their colleagues to routinely remove the fallopian tubes during hysterectomy and tubal ligation, to prevent ovarian cancer. In a 2013 survey involving gynecologists, only 37% of respondents were unaware of the evidence that HGSC originates in the fallopian tube.¹³ However, 38% of respondents were unsure whether there would be

any population benefit from performing OS during other gynecologic operations. Multiple barriers to implementation of OS in practice were identified.¹³ Recently, an Australian group described their practice of performing OS to prevent HGSC: 70% of respondents offered OS to women undergoing gynecologic surgery for benign indications.²² At our hospital, the practice of offering OS began in 2007.

No increased risks of LOS, hospital readmissions, or blood transfusions were associated with hysterectomy and OS in our study. Morelli et al¹² performed prophylactic salpingectomy in premenopausal women at a low risk of ovarian cancer and found no negative effects on ovarian function and no perioperative complication related to salpingectomy in short-term (3-month) follow-up. The cost of OS is very low,²³ and the risk of OS and its

Table 1.
Operative and Perioperative Parameters of Opportunistic Salpingectomy by Surgical Approach

Variable	Open Procedures	Laparoscopic	P
Hysterectomy with OS, n	267	445	
Age, years	47.3 ± 1.4	47.4 ± 1.5	NS
Operative time, min	93.2 ± 23.2	111 ± 20.7	NS
Length of hospital stay, d	5.8 ± 0.7	4.4 ± 0.5	<.001
OS time	3.7 ± 1.1	3.6 ± 0.8	NS
Readmission, n (%)	2 (0.7%)	3 (0.6%)	NS
Blood transfusion, n (%)	9 (3.3%)	5 (1.1%)	.005

Unless stated otherwise, data are means ± SD.

Table 2.
Characteristics of Patients Readmitted After Receiving Opportunistic Salpingectomy

Case	Age	Year	Initial Diagnosis	Initial Surgery	Readmission Diagnosis	Surgery	Time Interval (months)
1	40	2011	Adenomyosis	LAVH+BS	Serous cystadenoma	Laparoscopic oophorectomy	10
2	42	2010	Adenomyosis	TAH+BS	Corpus luteum cyst	Laparoscopic oophorectomy	11
3	44	2013	Adenomyosis	LAVH+LS	Torsion of ovary	LESS oophorectomy	23
4	44	2008	Adenomyosis	TAH+BS	Mucinous cystadenoma	Oophorectomy	61
5	41	2013	Leiomyoma	LAVH+BSO	Endometrioma	LESS LAOC	13

BS, bilateral salpingectomy; LAVH, laparoscopically assisted vaginal hysterectomy; LAOC, laparoscopic ovarian cystectomy; LS, left salpingectomy.

influence on ovarian function are small.²⁴ The operating time is prolonged by only 3–5 minutes.²⁴ There has been an increasing trend toward the use of minimally invasive surgery at our hospital (**Figure 3**). In recent years, LESS has become more popular than the conventional multiport laparoscopy.²⁵ Single-port surgery has several advantages over multiport surgery, such as a reduction in morbidity and an improvement in cosmetic outcomes. In our series, the percentage of LESS became closer to that of multiport laparoscopy. Angioni et al²⁶ also reported that single-port laparoscopic OS is feasible and safe, with favorable surgical and cosmetic outcomes compared with multiport laparoscopy.

CONCLUSION

There is increasing evidence that OS can prevent HGSC in women with a low risk of ovarian cancer. OS performed during hysterectomy is feasible and safe.

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