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ORIGINAL ARTICLE

Survey of pelvic reconstructive surgeons on performance of opportunistic salpingectomy at the time of pelvic organ prolapse repair

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Abstract

Introduction and hypothesis Opportunistic salpingectomy (OS) at the time of benign hysterectomy has recently emerged as a potential primary preventive modality for ovarian cancer. Our objective was to determine whether the reported rate of OS at the time of prolapse surgery is similar to the rate of OS at the time of gynecologic surgery for non-prolapse indications.

Methods An anonymous online survey was sent to the Society of Gynecologic Surgery members. Responses were divided into surgeons who did and did not perform OS at the time of prolapse repair. Differences between surgeons who did and did not perform OS were evaluated using the chi-square test. Multivariable logistic regression was used to identify which responses related to increased odds of performing OS.

Results There were 117 (33.1%) completed responses; of these, 98 (83.8%) reported performing OS at the time of prolapse repair, which was similar to the reported rate of OS at the time of hysterectomy for non-prolapse indications, 82.1%. After multivariable logistic regression, performance of salpingectomy at the time of hysterectomy for a non-prolapse indication (aOR: 17.9, 95% CI: 3.11–42.01), use of a laparoscopic or robotic surgical approach (aOR 14.1, 95% CI: 1.81–32.21) and completion of an FPMRS fellowship (aOR: 3.47, 95% CI: 1.20–10.02) were associated with a higher likelihood of performing OS at the time of prolapse repair.

Conclusions OS at the time prolapse repair is performed more frequently with concomitant hysterectomy compared with OS at the time of post-hysterectomy prolapse repair and is similar to rates of OS performed at the time of hysterectomy for non-prolapse indications.

Keywords Opportunistic salpingectomy · Pelvic organ prolapse · Ovarian cancer

Introduction

Each year there are approximately 20,000 new diagnoses of ovarian cancer in the USA; despite accounting for fewer than 3% of all cancers in women, ovarian cancer is the leading cause of death from cancer of the female reproductive tract [1, 2]. Despite advances in chemotherapy and surgical techniques, the survival rate for ovarian cancer has not changed appreciably over the last 30 years [3]. One major reason for this is that ovarian cancer is typically diagnosed in advanced stages because of a lack of effective screening strategies [4, 5]. Over the past 2 decades, histologic evidence has suggested that the serous sub-type of epithelial ovarian cancer (EOC), accounting for roughly 70% of all EOCs, arises from precursor lesions within the fallopian tubes, termed serous tubal intra-epithelial carcinomas (STICs), rather than from the ovary itself [6–9]. The exact number of EOCs arising from the STIC lesions is not entirely clear, but is currently estimated at 50% [10]. Additionally, several studies have demonstrated that tubal ligation appears to be protective against subsequent development of ovarian cancer [11, 12].

Based on these findings, opportunistic salpingectomy (OS), the removal of fallopian tubes in women undergoing

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surgery for another indication, has been proposed as a possible ovarian cancer prevention strategy. The technique was first presented in 2010 in British Columbia and has since been rapidly adopted by many surgeons at the time of benign hysterectomy and for surgical sterilization. In the USA, the rate of bilateral salpingectomy at the time of hysterectomy increased by 24% annually between 2008–2011 [13].

Surveys of surgeons revealed similar patterns of widespread adoption of OS. A 2013 survey of obstetrics and gynecology residency faculty found that 54% of surgeons performed OS during hysterectomy, and of these physicians, 75% did this to reduce the cancer risk [14]. Jones et al. distributed a similar survey to members of the American Congress of Obstetricians and Gynecologists and found that 75% of respondents perform bilateral salpingectomy at the time of hysterectomy [15].

These surveys primarily reflect the practices of general obstetricians and gynecologists, and relatively little is known about the practice of opportunistic salpingectomy at the time of pelvic organ prolapse (POP) surgery. Approximately 200,000 procedures are performed annually for prolapse in the USA, and it is the most common indication for hysterectomy in postmenopausal women [16]. Therefore, gynecologists who perform surgery for POP are in the unique position of having significant opportunity to perform OS and thereby reduce the ovarian cancer risk.

The objective of this study was to determine whether the rate of OS at the time of pelvic organ prolapse-correcting surgery is similar to the rate OS during non-prolapse-related benign hysterectomy.

Materials and methods

A link to an anonymous online 33-question survey (SurveyMonkey Inc., Palo Alto, CA) regarding practice patterns of opportunistic salpingectomy at the time of pelvic organ prolapse surgery was sent to the 354 active and associate members of the Society of Gynecologic Surgeons (SGS). The survey was available online between 15 July and 1 September 2017. The questionnaire design was based on a review of the literature that previously addressed the performance of opportunistic salpingectomy at the time of hysterectomy [15, 17–19]. In this survey, opportunistic salpingectomy was defined as the removal of fallopian tubes with either ovarian conservation or in women who had previously undergone oophorectomy and did not have a greater than the general population risk of developing ovarian cancer. Additionally, survey respondents were reminded that all questions were only related to patients who have not undergone salpingectomy in the past, but may have undergone oophorectomy.

Descriptive analysis was performed on survey responses relating to demographic characteristics. Respondents were then categorized into those who did and did not perform salpingectomy at the time of prolapse repair. Differences between groups were evaluated using the chi-square test. Multivariable logistic regression was used to identify which responses related to increased odds that a surgeon would perform opportunistic salpingectomy at the time of prolapse repair. All statistical analysis was performed using STAT version 14.1 (Stata Corp, College Station, TX). This study was deemed exempt from review by the Institutional Review Board.

Results

A total of 125 members responded to the survey. Eight surveys were excluded because of incomplete responses, and the remaining 117 (33.1%) were included in the analysis. Table 1 demonstrates the demographic characteristics of the respondents. The majority, 80.0%, completed fellowship training, with female pelvic medicine and reconstructive surgery (FPMRS) being the most common. Most of the respondents, 95.7%, practiced in the USA or Canada, have been in practice for at least 10 years, 65.4%, and are involved in the training of residents, fellows or medical students, 88.0%. Vaginal prolapse repair was the most commonly reported technique for both POP repair with concomitant hysterectomy, 77.7%, and post-hysterectomy repair, 62.3%. Slightly over half of the respondents, 53.4%, favored extraperitoneal post-hysterectomy prolapse repair compared with intraperitoneal repair. All respondents were familiar with the theory that certain ovarian cancers arise in the distal fallopian tube and that OS is a potential method to minimize that risk.

Figure 1 shows the rates of OS performed at the time of prolapse repair stratified by patient age group. At the time of prolapse repair with concomitant hysterectomy, 74.4% reported performing bilateral salpingectomy with ovarian preservation in both pre- and postmenopausal women younger than 65 years, while just over half, 57.3%, reported perfoming OS in women older than 65 years. The overall reported rate of OS at the time of POP repair with hysterectomy was 83.8% and was similar to the reported rate of hysterectomy for non-prolpase indications, 82.1%. The reported rate of OS was lower in women undergoing post-hysterectomy prolapse repair, with 47.9% reporting performing OS in premenopausal women and 53.0% performing OS in postmenopausal women under age 65 and 43.6% in women over age 65. The overall rate of OS was 62.4% for post-hysterectomy prolapse repair.

More surgeons believed that OS conferred a health benefit in premenopausal women, 82.1%, and postmenopausal women under age 65, 82.9%, compared with women over age 65 years, 49.6%. Most, 78.6%, would offer OS in women with

Table 1 Characteristics of survey respondents

Demographic characteristics	*N* (%)
Completed fellowship	82 (70.0)
Currently in fellowship training	7 (6.0)
Type of fellowship	
Female pelvic medicine and reconstructive surgery (FPMRS)	80 (68.3)
Minimally invasive gynecologic surgery (MIGS)	7 (6.0)
Gynecologic oncology	4 (3.4)
Years in practice	
< 5 years	23 (19.7)
5 to 10 years	24 (20.5)
11 to 15 years	21 (17.9)
15 to 20 years	17 (14.5)
> 20 years	32 (27.3)
Practice setting	
Practice in the USA and Canada	112 (95.7)
Full time academic (primary medical school affiliation)	64 (54.7)
Other academic medical center (secondary medical school affiliation)	18 (15.3)
Private practice (with trainee involvement)	21 (17.9)
Private practice (without trainee involvement)	8 (6.8)
Other	6 (5.1)
Hospital affiliated with	
FPMRS fellowship	54 (46.2)
Gynecologic oncology fellowship	37 (31.6)
MIGS fellowship	30 (25.1)
Primary surgical approach to prolapse repair with concomitant hysterectomy	
Vaginal	91 (77.8)
Laparoscopic or robotic	24 (20.5)
Abdominal	2 (1.7)
Primary surgical approach to post-hysterectomy prolapse repair	
Vaginal	73 (62.4)
Intraperitoneal	34 (46.6)
Extraperitoneal	39 (53.4)
Laparoscopic or robotic	42 (35.8)
Abdominal	2 (1.7)

prior oophorectomy. For surgeons who have been in practice for over 10 years, 48.9% reported that they have been performing more salpingectomies at the time of prolapse repair since 2010. Only a small percentage, 12.0%, would alter their surgical approach to perform salpingectomy.

Table 2 demonstrates the differences in characteristics of respondents who do and do not routinely perform OS at the time of prolapse repair. Surgeons who routinely performed OS at the time of prolapse repair were more likely to have completed an FPMRS fellowship (80.8% vs. 36.8%, $p < 0.001$) and were also more likely to perform OS or bilateral salpingo-oophorectomy at the time of hysterectomy for a non-prolapse indication (90.9% vs. 31.6%, $p < 0.001$) and (76.7% vs. 31.6%, $p < 0.001$). Additionally, surgeons who performed OS were more likely to use a laparoscopic or robotic approach to POP repair with concomitant hysterectomy (23.4% vs. 5.2%, $p = 0.03$) and post-hysterectomy (40.8% vs. 10.5%, $p = 0.01$). All surgeons who performed OS at the time of prolapse repair reported that they believed that this procedure conferred benefit to patients in any age group compared with 63.2% of those who did not perform OS, $p < 0.001$; 88.9% felt that removal of one tube, if bilateral OS was not feasible, still conferred a health benefit.

More surgeons believed that OS conferred a health benefit in premenopausal women, 82.1%, and postmenopausal women under age 65, 82.9%, compared with women over age 65 years, 49.6%. Most, 78.6%, would offer OS in women with prior oophorectomy. For surgeons who have been in practice for over 10 years, 48.9% reported that they have been performing more salpingectomies at the time of prolapse repair since 2010. Only a small percentage, 14.1%, would alter their surgical approach to perform salpingectomy (Table 3).

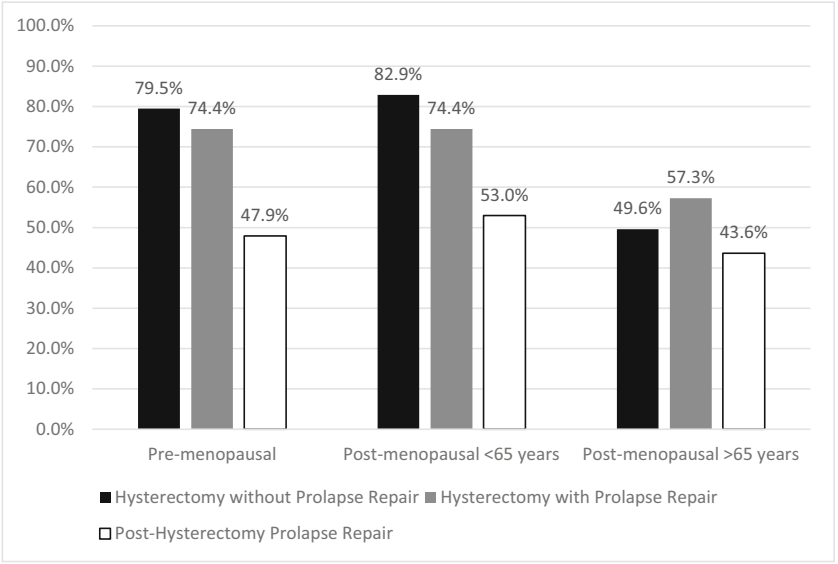

Fig. 1 Rate of opportunistic salpingectomy stratified by age group

Surgeons who did not routinely perform salpingectomy were more likely to work at a full-time academic practice (84.2% vs. 50.5%, $p = 0.006$), more likely not to offer BSO at the time of hysterectomy with prolapse repair in any age group (73.6% vs. 24.2%, $p < 0.001$) and believe that there was added risk associated with OS at the time of prolapse repair (63.2% vs. 51.5%, $p = 0.04$). There were no significant differences in practice patterns related to the number of annual prolapse procedures performed and number of POP procedures with concomitant hysterectomy.

Increased risk of intra- and postoperative bleeding was cited as the most common perceived risk of OS at the time of prolapse repair, 35.0%, followed by increased operating time, 29.9%, and compromised ovarian function in premenopausal women, 18.8%, with no significant differences in responses between those who did and did not perform OS. However,

Table 2 Comparison of survey responses between surgeons who routinely perform opportunistic salpingectomy and those who do not

Response	Perform salpingectomy with POP repair ($n = 98$)	Do not perform salpingectomy with POP repair ($n = 19$)	*p value*
Completed FPMRS fellowship	80 (80.8)	7 (36.8)	< 0.001
In practice longer than 10 years	50 (50.5)	10 (52.6)	0.87
Full-time academic practice	50 (50.5)	16 (84.2)	0.006
More than 100 POP repair surgeries per year	45 (45.4)	7 (36.8)	0.49
> 50% of POP repair surgeries include hysterectomy	42 (42.4)	7 (36.8)	0.65
Laparoscopic or robotic approach to POP repair with hysterectomy	23 (23.4)	1 (5.2)	0.03
Laparoscopic or robotic approach to post-hysterectomy POP repair	40 (40.8)	2 (10.5)	0.01
Vaginal approach to POP repair with hysterectomy	60 (60.6)	13 (68.4)	0.28
Vaginal approach to post-hysterectomy POP repair	27 (27.3)	9 (47.3)	0.10
Intraperitoneal vaginal colpopexy for post-hysterectomy POP repair	30 (30.6)	4 (21.1)	0.27
Extraperitoneal vaginal colpopexy for post-hysterectomy POP repair	31 (31.6)	8 (42.1)	0.11
Do not perform BSO in any age group during POP repair with hysterectomy	24 (24.2)	14 (73.6)	< 0.001
Do not perform BSO in any age group during post-hysterectomy POP repair	47 (47.4)	10 (52.6)	0.68
Will alter surgical approach to perform bilateral salpingectomy	14 (14.1)	–	–
Will perform salpingectomy if ovaries removed during prior surgery	86 (86.8)	–	–
Perform BSO at time of hysterectomy without POP repair	76 (76.7)	6 (31.6)	< 0.001
Salpingectomy at time of hysterectomy without POP repair	90 (90.9)	6 (31.6)	< 0.001
Believe salpingectomy provides health benefit in any age group	99 (100.0)	12 (63.2)	< 0.001
Believe there is a benefit to removing only one fallopian tube	88 (88.9)	7 (36.8)	< 0.001
Believe there is added risk with performing salpingectomy	51 (51.5)	12 (63.2)	0.04

Table 3 Surgeons' beliefs regarding risks and benefits of opportunistic salpingectomy

Responses	Perform salpingectomy (N = 98)	Do not perform salpingectomy (N = 19)	p
Risk of salpingectomy			
Believe salpingectomy increases operating time	29 (29.5)	6 (31.5)	0.86
Increases intra- and postoperative bleeding	32 (32.6)	9 (47.4)	0.21
May compromise ovarian function in premenopausal women	16 (16.3)	6 (31.5)	0.12
Do not think there is added risk	48 (48.9)	5 (26.3)	0.07
Benefit of salpingectomy			
May reduce the risk of tubal/peritoneal/ovarian cancer	94 (95.9)	8 (42.9)	< 0.001
May reduce the risk of postoperative pelvic pain	13 (13.1)	1 (5.2)	0.33
May reduce the risk of postoperative hydrosalpinx	28 (28.5)	2 (10.5)	0.1

those who performed salpingectomy were more likely to believe that this procedure would reduce the risk of tubal, peritoneal and high-grade serous ovarian cancer compared with those who did not perform OS (95.9% vs. 42.9%, <0.001). Other cited benefits of OS included decreased risk of postoperative pelvic pain (13.1% vs. 5.2%, $p = 0.33$) and postoperative hydrosalpinx (28.5% vs. 10.5%, $p = 0.1$). The most common cited reasons for not performing OS at the time of prolapse repair was lack of evidence that this procedure prevents malignancy, 31.5%, and that it is not harmful, 26.3%. Additional reasons for not performing OS included concerns about increased costs of surgery and that salpingectomy is more difficult with the vaginal approach.

After multivariable logistic regression, performance of salpingectomy at the time of hysterectomy for a non-prolapse indication (aOR: 17.1 95% CI: 3.09–43.11), use of a laparoscopic or robotic surgical approach (aOR 14.1, 95% CI: 1.81–32.21) and completion of an FPMRS fellowship (aOR: 3.21, 95% CI: 1.08–10.41) were most strongly associated with the likelihood that a surgeon would perform OS at the time of prolapse repair.

Discussion

Over the past 10 years, opportunistic salpingectomy has emerged as the most promising method of decreasing the mortality associated with ovarian cancer in the absence of effective early detection and prevention tools. Previous examinations of surgeon practices reported a relatively rapid adoption of OS, with reported salpingectomy rates of 75–96% at the time of benign hysterectomy [15, 18, 19]. However, most of these studies have focused on the practice patterns of general obstetrician-gynecologists. This study represents the first analysis of OS practice at the time of pelvic reconstructive surgery, which accounts for a significant portion of the number of benign gynecologic procedures and in many cases may be the first opportunity at which OS can be offered to patients.

The overall rate of OS at the time of prolapse repair was similar to the rate in non-prolapse-related benign hysterectomy, in both the literature and this cohort of surgeons. Additionally, almost half of the surveyed surgeons who were in practice more than 10 years ago, when OS was first proposed as a possible preventive strategy for ovarian cancer, have increased the number of salpingectomies they perform. No surgeon reported a decrease in the number of OS performed over this time.

Surgeons were more likely to perform salpingectomy with concomitant hysterectomy compared with post-hysterectomy prolapse. One reason for this could be the surgical technique. Hysterectomy necessitates entry into the peritoneal cavity and allows access to the fallopian tubes, whereas extraperitoneal repair would require an additional procedure, usually laparoscopy, to remove the fallopian tubes. The majority of post-hysterectomy prolapse repairs were performed vaginally, and of these slightly more than half were performed using extraperitoneal techniques. But even with intraperitoneal vaginal repair for post-hysterectomy prolapse, access to the fallopian tubes may be limited by pelvic adhesions [20]. While there was no significant difference between utilization of extraperitoneal repairs between groups, surgeons who performed OS were significantly more likely to utilize a laparoscopic or robotic approach to post-hysterectomy repair compared with those who did not. Interestingly, a minority of surgeons, 14.1%, reported that they would consider altering their surgical approach if a patient desires salpingectomy. This is contrary to current clinical opinion, which recommends against choosing a specific surgical modality or performing additional procedures for the sole purpose of performing opportunistic salpingectomy [21].

Formal FPMRS fellowship training and higher likelihood of performing BSO at the time prolapse repair or OS or BSO at the time of hysterectomy for non-prolapse indications were

also significantly associated with a higher rate of OS at the time of prolapse repair. This may be related to an increased comfort level with adnexal surgery in general, particularly at the time of vaginal surgery. Full-time academic status was associated with a lower rate of adopting OS; however, this did not persist in the multivariable analysis.

Surgeons who did not perform OS at the time of POP repair were more likely to believe that the procedure came with added risk; however, approximately half of those who did perform OS also felt the procedure could be associated with an increased complication rate. The most commonly cited cause for concern in both groups was an increase in surgical blood loss. Current literature evaluating estimated blood loss (EBL) at the time of salpingectomy has been limited to retrospective or small prospective studies but has consistently demonstrated minimal to no increase in blood loss compared with hysterectomy without salpingectomy. However, Koh et al. suggest that wider adoption of OS will lead to more complicated salpingectomies potentially increasing EBL [22–24].

Additional risks cited in this survey were increased time of surgery and possible compromise of ovarian function in premenopausal women. One study comparing post-partum tubal ligation with salpingectomy showed a 20-min increase in operating time. However, most studies evaluating operating times at the time of hysterectomy with and without OS showed minimal increases in total operating times [23, 25, 26]. To date, no study has shown any significant disruption of the ovarian reserve or earlier onset of menopause in women undergoing OS [27–29].

The main limitation of this study is the relatively low number of respondents, which introduces non-response bias and may prevent the study results from being generalizable to all surgeons who perform prolapse repair. However, the response rate in this survey is higher or similar to other online surveys regarding opportunistic salpingectomy and gynecologic surgery practice in general. Moreover, the rates of OS that we report for both prolapse procedures and non-prolapse related hysterectomy are consistent with what has previously been seen in the literature involving both surveys and national databases [14–18, 29–31].

In summary, opportunistic salpingectomy at the time of prolapse repair is performed more frequently with concomitant hysterectomy compared with OS at the time post-hysterectomy prolapse repair and is similar to reported rates of OS performed at the time of hysterectomy for non-prolapse indications. Additional studies are needed to determine whether the addition of OS at the time of prolapse repair has a significant impact on surgical outcomes such as blood loss, operative time and cost, particularly in post-hysterectomy prolapse procedures in which entry into the peritoneal cavity may not be routinely performed.

Compliance with ethical standards

Conflicts of interest None.

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