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Survey article

Practice patterns using minimally invasive surgery for the treatment of ovarian cancer: A survey of physician members of the Society of Gynecologic Oncologists

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ABSTRACT

Retrospective studies suggest that minimally-invasive surgery may be safe and effective for the treatment of early-stage ovarian cancer as well as interval cytoreduction after neoadjuvant chemotherapy. Adoption rates and attitudes towards its use remain largely unknown. We aimed to determine the current use of minimally-invasive surgery for the treatment of ovarian cancer and identify perceived barriers towards further adoption of this method. Electronic survey was administered to physician members of the Society of Gynecologic Oncology. Chi-square analysis was used to determine if any correlation existed between variables and the current use of minimally invasive surgery in general practice and, specifically, for the treatment of ovarian cancer. There was a survey response rate of 15.1%. Sixty-five percent of respondents practiced in an academic setting, and 32.1% of respondents had completed fellowship training within the past 5 years. Ninety percent of respondents were performing > 50% of their current procedures using minimally invasive surgery. Over seventy percent of respondents said that they performed minimally invasive surgery for primary staging and interval cytoreductive surgery for the treatment of ovarian cancer. Concern for residual disease and lack of scientific validation were the most frequently cited barriers to the implementation of minimally invasive surgery for the treatment of ovarian cancer. A majority of respondents have adopted the use of MIS for the management of early stage ovarian cancer. Advances in imaging to detect occult tumor deposits and a randomized trial to study and promote the use of minimally invasive surgery in ovarian cancer is warranted.

1. Introduction

Ovarian cancer accounts for 2.5% of all female malignancies but accounts for a disproportionate 5% of female cancer deaths with the average lifetime risk of developing ovarian cancer in the general female population of 1 in 78 women. Due to its aggressive nature and lack of a specific marker for early disease, most ovarian cancer is diagnosed in advanced stage, which is accompanied by worse prognosis (Torre et al., 2018).

The current mainstays of treatment for ovarian cancer (OC) include surgery and adjuvant chemotherapy with outcomes improving with surgical cytoreduction to no gross residual disease (Fagotti et al., 2016). Recent randomized controlled trials have shown similar survival outcomes in individuals who receive neoadjuvant chemotherapy (NACT) with interval cytoreduction followed by adjuvant chemotherapy for Stage IIIC and IV epithelial ovarian cancer (Vergote et al., 2018).

With the advent of minimally invasive surgery (MIS), new techniques have been utilized to improve postoperative outcomes for gynecologic cancer as MIS has been shown to decrease morbidity, blood loss, and length of stay in hospital for multiple gynecologic surgeries (Fagotti et al., 2016). With regards to endometrial cancer, minimally invasive surgery has been shown to be a safe and effective treatment without compromising long-term oncologic outcomes (Walker et al., 2012). Conversely, although MIS is feasible and procedurally safe for the surgical management of cervical cancer, its oncologic safety has been challenged (Ramirez et al., 2018).

A number of recent retrospective studies suggest that laparoscopic surgery is feasible and safe for the treatment of early-stage epithelial OC (Ditto et al., 2017; Bogani et al., 2017; Melamed et al., 2017; Koo et al., 2014); as well as advanced-stage EOC, particularly after patients have

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received NACT (Melamed et al., 2017; Gueli Alletti et al., 2016; Fagotti et al., 2019). Although these studies are retrospective in nature and are limited by small sample sizes, they provide data that lends support to the use of MIS for the treatment of OC; however, there is no current consensus on its widespread use. The goal of this study was to determine the current practice patterns regarding the use of MIS for the surgical treatment of OC and to try to identify what barriers exist preventing its widespread adoption. For the purposes of this study, all ovarian, fallopian tube and primary peritoneal cancers will be referred to as ovarian cancer (OC).

2. Materials and methods

This study was approved by the Institutional Review Board of the University of Texas Southwestern Medical Center. An electronic survey assessing the current practice patterns of gynecologic oncologists regarding the use of MIS in the treatment of OC was developed by the authors of this study (Supplementary data 1). The names and email addresses of current Full, Trainee, and Senior members was obtained from the Society of Gynecologic Oncology (SGO). The survey was emailed to each member of SGO with two reminder emails sent per SGO guidelines. The data collection period was set for four weeks to allow ample time for respondents to fill out the survey.

Data concerning demographic information of respondents was collected including type of practice, role in training of fellows/residents, practice location, years since the completion of fellowship training, and gender. To determine baseline usage of MIS for each respondent we asked what percentage of surgeries are performed using minimally invasive surgical techniques. We also asked which surgeries each respondent was currently performing, would like to perform, or had no interest in performing via MIS using the following procedures: hysterectomy with or without adnexal surgery, pelvic and para-aortic lymphadenectomy, omentectomy, cytoreductive surgery, splenectomy, diaphragmatic stripping, bowel resection and reanastomosis, low anterior resection, appendectomy, and radical hysterectomy. We then asked if respondents performed MIS for the treatment of OC. Because a significant amount of the current available data pertains to the use of MIS after NACT, we asked whether respondents gave NACT in their practice and whether or not they performed interval cytoreductive surgery (ICS). In those who did not currently use MIS after NACT, we asked whether or not they would consider it after complete clinical response to NACT or with disease only left in the pelvis. Finally, we asked what the perceived benefits and barriers are to using MIS for the treatment of OC.

Study data were collected and managed using REDCap electronic data capture tools hosted at The University of Texas Southwestern (Harris et al., 2009). REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources. All data collected through the survey was completely anonymous and any identifying information was removed prior to data analysis. Data was analyzed by determining proportions of responses for each question and using cross-tabulation to determine if any themes could be drawn from the survey data. Categorical variables were analyzed using Chi-square tests in Microsoft Excel for Mac (Version 16.36) to determine if any correlation between variables was present.

3. Results

There were a total of 234 respondents out of 1551 emailed surveys for a survey response rate of 15.1%. Approximately two-thirds (64.7%) of the respondents practiced in an academic setting with 94% involved with resident training and 53.3% involved with fellow training. Approximately one-third (35.3%) of respondents were in private practice. Of those in private practice, 35.4% performed cases as co-surgeons. The respondent's practice location was equally distributed throughout the United States with less than 1% practicing outside of the United States. Most respondents had finished training within the past five years and male and female respondents were equally distributed (Table 1).

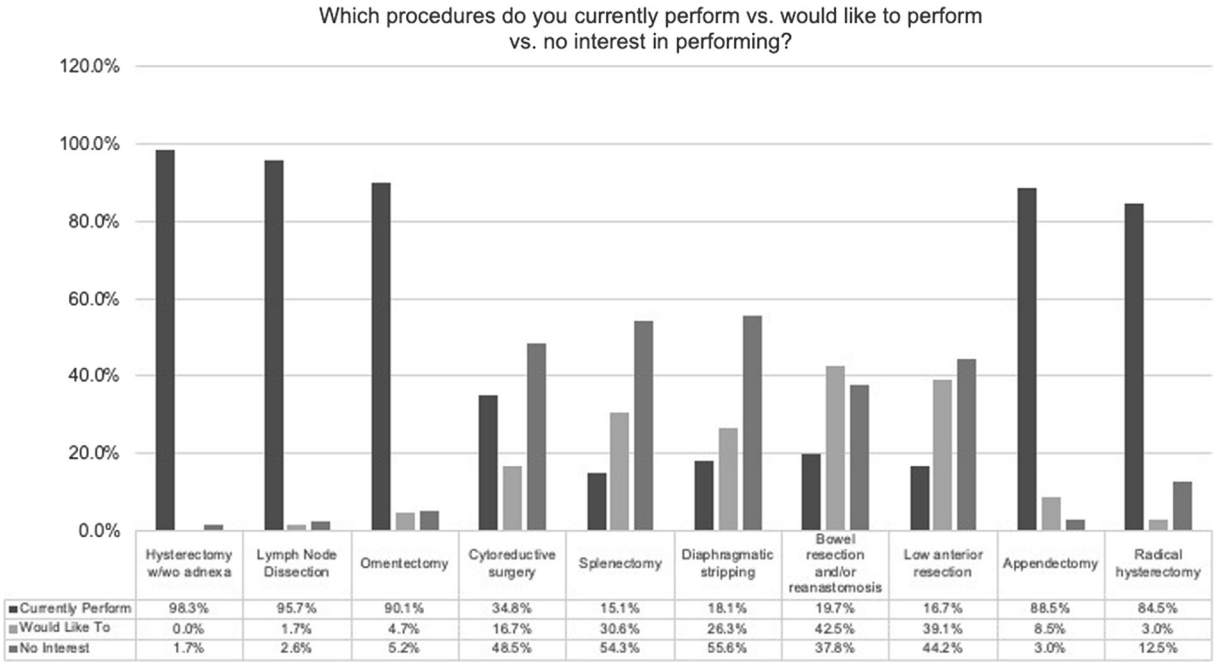
Table 1
Respondent demographics.

Number of responses	234
Total surveys emailed	1551
Response rate	15.1%
Practice Type (n = 232)	
Academic (n = 150)	64.7%
Train fellows	53.3%
Train residents	94.0%
Private (n = 82)	35.3%
Co-operate with partners	35.4%
Practice Location (n = 233)	
Eastern USA	25.8%
Western USA	17.6%
Midwest USA	25.3%
Southern USA	12.4%
Southeast USA	18.5%
Outside USA	0.4%
Years in Practice (n = 234)	
< 5	32.1%
5–9	15.8%
10–14	11.5%
15–19	14.1%
20+	26.5%
Gender (n = 231)	
Male	50.2%
Female	49.8%

In total, 90% of respondents used MIS to perform more than half of the procedures in their practice. For all types of gynecologic cancer, the most frequently performed procedures using minimally invasive techniques included hysterectomy with/without adnexal surgery (98.3%), lymphadenectomy (95.7%), omentectomy (90.1%), appendectomy (88.5%), and radical hysterectomy (84.5%) (Fig. 1). Many respondents reported that they would like to perform more advanced procedures laparoscopically including cytoreductive surgery (16.7%), splenectomy (30.6%), diaphragmatic stripping (26.3%), bowel resection and reanastomosis (42.5%) and low anterior resection (39.1%) (Fig. 1). When trying to determine if practice type, location, gender, or years since completion of training had any impact on the current use of MIS, only female gender ($p = 0.0001$) and having completed training less than 15 years previously ($p = 0.0018$) were significantly associated with use of MIS in current practice. Of note, this significance was seen on univariate analysis and, as such, these variables could be related to one another.

In regards to ovarian cancer specifically, the most frequently performed procedures using minimally invasive techniques included diagnostic laparoscopy to determine feasibility of primary debulking (90.1%), primary staging for early stage ovarian cancer (76.7%), and interval cytoreductive surgery for patients with advanced ovarian cancer (72.7%). Only 20.3% of respondents used MIS to perform primary debulking (Fig. 2). Practice type, location, gender, or years since completion of training was not significantly associated with use of MIS for the treatment of OC. 78.7% of respondents stated that they would consider MIS for ICS with a complete clinical response and 57.4% of respondents stated they would consider MIS for ICS with disease limited to the pelvis.

The most commonly cited benefits of MIS included decreased intraoperative blood loss (65.1%), decreased length of stay in hospital (81.2%), and decreased patient morbidity. The risk of morbidity with



	Hysterectomy w/wo adnexa	Lymph Node Dissection	Omentectomy	Cytoreductive surgery	Splenectomy	Diaphragmatic stripping	Bowel resection and/or reanastomosis	Low anterior resection	Appendectomy	Radical hysterectomy
Currently Perform	98.3%	95.7%	90.1%	34.8%	15.1%	18.1%	19.7%	16.7%	88.5%	84.5%
Would Like To	0.0%	1.7%	4.7%	16.7%	30.6%	26.3%	42.5%	39.1%	8.5%	3.0%
No Interest	1.7%	2.6%	5.2%	48.5%	54.3%	55.6%	37.8%	44.2%	3.0%	12.5%

Fig. 1. Procedures in which respondents already perform or would like to perform using minimally invasive surgery.

the use of MIS as it relates to BMI was not specifically ascertained by our survey. There was not any perceived benefit to the use of MIS for the treatment of ovarian cancer in 13.1% of respondents. When asked about the perceived barriers, leaving disease behind or residual occult tumor (84.1%) and lack of scientific validation for MIS compared to laparotomy (58.0%) were most commonly cited (Table 2).

4. Discussion

The current survey shows that 76.7% of respondents incorporated minimally invasive surgery for primary staging of early stage ovarian cancer. Approximately 50% of gynecologic oncologists who responded to this survey would either like to perform or are already performing complex upper abdominal surgical procedures in the context of ovarian cancer surgical management (Fig. 1). Furthermore, 72% of respondents are using MIS for interval cytoreductive surgery (Fig. 2). Interestingly, 79% of respondents would use MIS only if there was a clinical complete response to neoadjuvant chemotherapy.

Our survey provides support that a segment of the gynecologic oncology community has definite interest in the use of MIS highlighting several perceived benefits of MIS, including reduced patient morbidity and length of hospital stay. Prior studies have documented the safety and efficacy of MIS for staging in presumed early-stage EOC and interval cytoreductive surgery (Ditto et al., 2017; Bogani et al., 2017; Koo et al., 2014; Gueli Alletti et al., 2016). A National Cancer Database case-control study showed no difference in time to death between

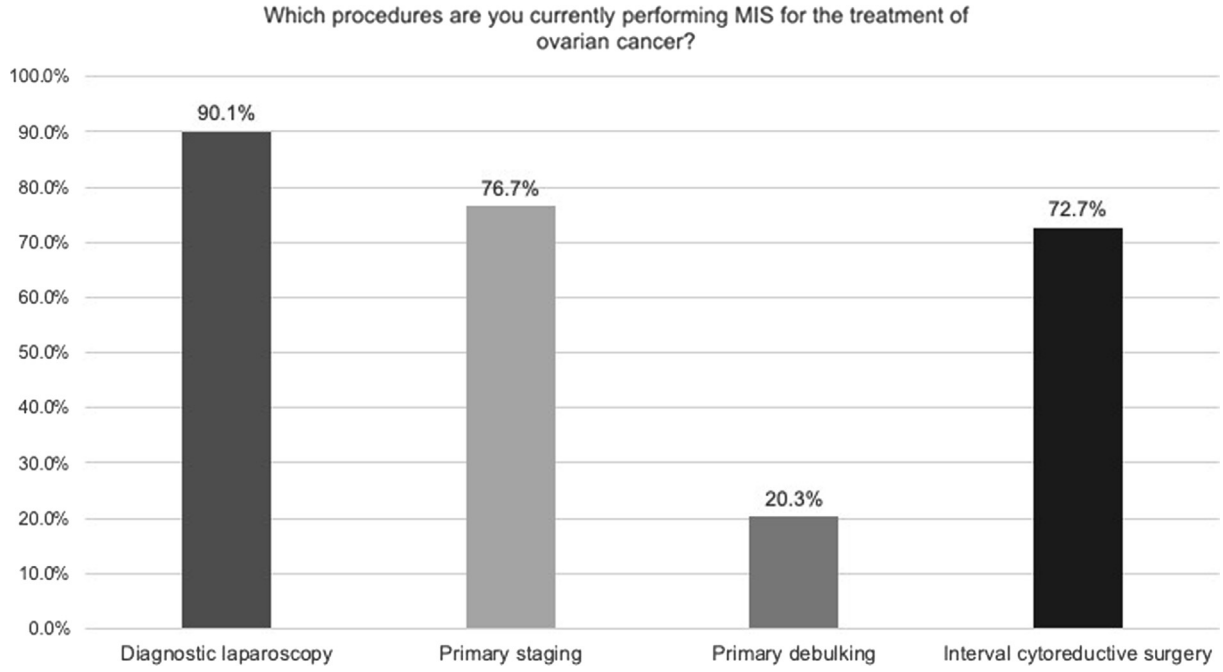


Fig. 2. Procedures in which respondents perform minimally invasive surgery for the treatment of ovarian cancer.

Table 2
Perceived benefits and barriers of using MIS for the treatment of ovarian cancer.

Benefits	
Decreased intraoperative blood loss	65.1%
Decreased length of stay post-operatively	81.2%
Decreased patient morbidity	76.9%
I do not perceive any benefits	13.1%
Other (earlier resumption of chemotherapy, faster healing, better visualization)	7.4%
Barriers	
Leaving disease behind/residual occult tumor	84.1%
Lack of laparoscopy training	8.0%
Lack of robotics training	9.3%
Lack of OR time/increased operating time	15.0%
Lack of hospital support	3.5%
Poor remuneration	10.6%
Lack of scientific validation for MIS compared to laparotomy	58.0%
Concern for medicolegal climate	13.3%
Other (lack of ability to debulk large volume disease, cost, coding issues, lack of ability to assess extent of disease, potential cancer spread due to insufflation, fear of occult injury)	7.1%

laparoscopy and laparotomy staging in presumed Stage I EOC (Melamed et al., 2017).

Interval cytoreductive surgery performed via MIS did not have inferior survival outcomes to laparotomy according to a case-control National Cancer Database study (Melamed et al., 2017). A multi-center, international study which examined 127 consecutive patients with Stage III/IV EOC treated with MIS after NACT reported that 96% of patients were debulked to no gross residual disease with a conversion rate to laparotomy of 4%. Median PFS was noted to be 23 months with 5-year OS of 52.6% (Fagotti et al., 2019). There is currently an ongoing randomized, controlled, noninferiority clinical trial (LANCE – Laparoscopic cytoreduction After Neoadjuvant Chemotherapy) to further investigate the oncologic outcomes of laparoscopic vs. laparotomic interval cytoreductive surgery.

The above studies and increasing comfort in utilizing MIS techniques for more complex pelvic and upper abdominal procedures, have resulted in MIS becoming an alternative platform for the management of early and advanced stage ovarian cancer. There are issues that need to be addressed in order to gain widespread acceptance of MIS for the surgical management of ovarian cancer. Concern for residual occult tumor was indicated by 85% of respondents in this study as a barrier for implementation of MIS. Lack of randomized studies to compare survival between traditional laparotomy vs MIS is another significant concern cited by 58% of respondents in this survey. Hyperthermic intraperitoneal chemotherapy (HIPEC) at the time of interval cytoreductive surgery has shown improvement in RFS and OS without additional morbidity in patients with complete cytoreduction or optimal cytoreduction (van Driel et al., 2018). The use of HIPEC with or after minimally invasive interval cytoreductive surgery is in need of further study. There is a need for imaging modalities to improve accurate detection and staging, such as, sentinel lymph node detection and intraoperative guided imaging to improve detection of occult metastases (Shirakawa et al., 2019). Future research should be aimed at the use of high quality studies to compare the oncologic efficacy and safety of MIS compared to laparotomy and improvement in detection of occult malignancy.

This survey study has several limitations, including those which are inherent to surveys namely, lack of personalization, differences in interpretation of asked questions, and unconscientious responses. The survey was not specific for any particular histologic subtype of ovarian cancer. A response rate of only 15.0% with 2/3 of the respondents working in an academic setting presents selection bias in our data (Table 1).

5. Conclusions

The current survey data and prior studies on this subject, show that the interest and use of MIS in the management of ovarian cancer is increasing with continued interest in performing more radical procedures using MIS. There are several perceived benefits that support the adaptation of MIS in patients with clinically limited or low volume disease. Higher quality clinical trials to study oncologic efficacy and technologic modalities to detect occult disease intraoperatively are needed to promote extensive use of MIS in the treatment of ovarian cancer.

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CRediT authorship contribution statement

Kevin M. Kremer: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing - original draft. **Jessica Lee:** Visualization, Writing - review & editing. **Matthew J. Carlson:** Visualization, Writing - review & editing. **Salvatore J. Lococo:** Methodology, Writing - review & editing. **David S. Miller:** Supervision, Writing - review & editing. **Jayanthi S. Lea:** Conceptualization, Formal analysis, Methodology, Supervision, Writing - original draft.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gore.2020.100617.

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