Differences in perioperative outcomes after laparoscopic management of benign and malignant adnexal masses

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Objective: To compare the feasibility and safety of the laparoscopic management of adnexal masses appearing preoperatively benign with those suspicious for malignancy.

Methods: Retrospective study of 694 women that underwent laparoscopic management of an adnexal mass.

Results: Laparoscopic management of an adnexal mass was completed in 678 patients. Six hundred and thirty five patients had benign pathology (91.5%) and 53 (7.6%) had primary ovarian cancers. Sixteen patients (2.3%) were converted to laparotomy; there were 13 intraoperative (1.9%) and 16 postoperative complications (2.3%). Patients divided in 2 groups: benign and borderline/malignant tumors. Patients in the benign group had a higher incidence of ovarian cyst rupture (26% vs. 8.7%, p<0.05). Patients in the borderline/malignant group had a statistically significant higher conversion rate to laparotomy (0.9% vs. 16.9%, p<0.001), postoperative complications (1.9% vs. 12.2%, p<0.05), blood loss, operative time, and duration of hospital stay. The incidence of intraoperative complications was similar between the 2 groups.

Conclusion: Laparoscopic management of masses that are suspicious for malignancy or borderline pathology is associated with an increased risk in specific intra-operative and post-operative morbidities in comparison to benign masses. Surgeons should tailor the operative risks with their patients according to the preoperative likelihood of the mass being carcinoma or borderline malignancy.

Keywords: Laparoscopy, Benign, Malignant, Borderline, Adnexal mass

INTRODUCTION

The evolving field of laparoscopy in gynecologic surgery has enabled endoscopic management of most adnexal masses [1].

While laparoscopy has been widely accepted as a standard diagnostic and therapeutic method for adnexal masses that have a low risk of malignancy, several authors have questioned the use of this approach for malignant adnexal masses. Potential issues raised with the use of laparoscopy for adnexal masses include misdiagnosis, tumor spillage, and inability to perform a complete staging and/or debulking procedure [2].

Laparoscopy offers multiple advantages over the traditional laparotomy approach including smaller size of incisions, improved visualization, decreased blood loss, and faster recovery. An additional controversial advantage for patients with an ova-

rian malignancy that require adjuvant chemotherapy, is a shorter interval to the initiation of treatment [3].

The feasibility of laparoscopic management of benign adnexal masses has been previously described in many reports [4,5]. However, there are only a few studies in the literature that describe the combined outcomes of a large number of patients with adnexal masses that are not specifically thought to be at a low risk for malignancy. In 1999 Dottino et al. [6], specifically reported an early 4 year experience of laparoscopic management of adnexal masses in patients that had both a low and high risk of malignancy at the Mount Sinai Hospital in New York. In our current study, we update the laparoscopic experience at Mount Sinai (10 years later), and report on the feasibility and complication rates in the laparoscopic management of 694 women with benign and malignant adnexal masses in this institution.

MATERIALS AND METHODS

This is a retrospective review of all women who underwent laparoscopic management of an adnexal mass at the Mount Sinai School of Medicine (New York, NY, USA) during the period of July 2004 to June 2008. This evaluation included all laparoscopic cases performed for adnexal pathology (unilateral or bilateral), regardless of indication for surgery and preoperative level of suspicion for malignancy. Institutional Review Board approval was obtained. All patients in our study were managed surgically either by a gynecologic oncologist or general gynecologist attending physician from the Mount Sinai School of Medicine. Routine preoperative evaluation of the patients included history and physical examination, serum CA-125 and at least one imaging modality of the pelvic/abdominal cavity. Modalities included ultrasonography, computed tomography (CT) and/or magnetic resonance imaging (MRI). The radiology report for all imaging studies was carefully read and masses were considered to be suspicious for malignancy when there was presence of either multi-loculation, papillary projections, ascites and/or when an overall suspicion for malignancy was clearly stated by the radiologist.

After the appropriate preoperative evaluation was completed, each patient included in the study underwent laparoscopic management of the adnexal abnormality with the indicated procedures. The operations performed were included in the following categories: 1) ovarian cystectomy, 2) adnexectomy (salpingoophorectomy, oophorectomy, salpingectomy and/or resection of broad ligament myoma), 3) laparoscopic total hysterectomy±

unilateral or bilateral salpingo-oophorectomy (LH±SO), 4) laparoscopic supracervical hysterectomy±unilateral or bilateral salpingo-oophorectomy (LSH±SO), 5) laparoscopic staging for malignancy (hysterectomy with bilateral salpingo-oophorectomy±appendectomy, peritoneal washings peritoneal biopsies, omentectomy with pelvic and paraaortic lymph node dissection), and 6) other laparoscopic procedures. The laparoscopic management of an adnexal mass that was suspicious for malignancy included an attempt to remove the mass intact from the abdomen in a laparoscopic endobag with care to avoid rupture and/or spillage. Intraoperative specimen evaluation by the surgeon and/or pathology department (frozen section) was used to further guide the attending surgeon. Robotic surgeries were not included in the study.

A computerized database was created recording the patient characteristics, preoperative workup, preoperative and postoperative diagnosis, intraoperative findings and impression, surgery performed, intraoperative and postoperative complications, estimated blood loss, operative time, duration of hospital stay, frozen section and final pathological diagnosis. The preoperative assessment was considered benign if the CA-125 determination was <35 U/mL (WNL) and the imaging study (ies) suggested the mass to be benign. For stratification purposes, if either the CA-125 was ≥ 35 U/mL or any of the imaging studies suggested malignancy, the preoperative assessment was considered suspicious for malignancy.

In order to evaluate laparoscopic outcome variables including cyst rupture, conversion rate, and complication rates, the patients were stratified into 3 groups based on a comparison of the preoperative assessment and final postoperative pathologic diagnosis.
- Group I (concordant benign): preoperative assessment benign and final pathology benign.
- Group II (discordant): preoperative assessment benign and final pathology malignant or vice versa.
- Group III (concordant malignant): preoperative assessment suspicious/malignant and final pathology malignant.

The statistical analysis was performed using the SPSS ver. 17 (SPSS Inc., Chicago, IL, USA). Qualitative data was described by using unit number and percent; mean and standard deviation were used to describe the quantitative data. Student t-test and analysis of variance tests (ANOVA) were used to compare quantitative variables among two or more groups respectively. χ^2 test was used to compare qualitative variables among groups.

RESULTS

There were 694 women that underwent laparoscopic surgical management of an adnexal mass. Gynecologic oncologist (10/88 surgeons, 11.4%) attendings performed 58.1% of the operations, and general gynecologists (78/88 surgeons, 88.6%) performed 41.9% of the operations in the study. Descriptive characteristics are shown in Table 1.

Complete laparoscopic management was successful in 678 (97.7%) of cases and included 197 ovarian cystectomies (28.4%), 402 adnexectomies (58.1%), 37 LH±SO (5.3%), 10 LSH±SO (1.4%), and 27 laparoscopic complete staging procedures for malignancy (3.8%). Six of these 27 patients had optimal cytoreduction for advanced stage carcinoma (0.8%). Five patients had other laparoscopic procedures such as adhesiolysis (0.7%). The average operative time was 1.6 hours (range, 0.3 to 7 hours), the average blood loss was 65 mL (range, 5 to 1,100 mL) and the average duration of hospital stay was 1.5 days (range, 1 to 12 days).

There were a total of 13 intraoperative complications (1.9%) including 6 urinary tract injuries, 4 cases of bowel injury and 3 cases of vascular injury. The intraoperative complications were managed laparoscopically in all but two cases. In one case, a small bowel injury was repaired through a laparotomy incision; a case of a bladder injury required a laparotomy to allow a partial cystectomy with ureteral reimplantation and tumor debulking for advanced malignant disease.

Sixteen patients had postoperative complications (2.3%). One patient had a sigmoid colon enterotomy that was diagnosed postoperatively and was repaired by laparotomy; one patient had transient abdominal distention in which intestinal perforation was ruled out by a diagnostic laparoscopy; three patients with unspecified postoperative febrile morbidity (treated with broad spectrum antibiotics); three patients required a blood transfusion; three incisional hernias (one case of incarcerated hernia at the trocar site that was repaired laparoscopically and two cases that underwent a hernia repair by laparotomy in the year following surgery); one wound infection/abscess (treated with incision and drainage and broad spectrum antibiotics); one case of a rectovaginal fistula managed by laparoscopic loop ileostomy and vaginal fistula repair; and three cases of intestinal ileus, which resolved spontaneously.

Conversion to laparotomy was performed in 16 patients (2.3%), 8 cases due to extensive adhesions (prior laparotomies or endometriosis), 6 patients were converted secondary to advanced stage malignancy for tumor debulking, one case secondary to poor visualization due to megacolon and one due to small bowel injury. The average body mass index (BMI) of all patients included in the study was 28.2 and the BMI of the patients that were converted to laparotomy was 28.7 (p=NS) and none of the patients converted had a BMI greater than 35. Of the 16 patients converted to laparotomy, 9 had no prior abdominal surgery, five had 1 prior operation, one patient had 2 prior operations and one had 4 prior abdominal surgical procedures.

Benign pathology was encountered in 635 (91.5%) patients. Ovarian cystadenoma (24.8%) and endometrioma (22%) were the most common pathologic diagnosis. Ovarian borderline tumors were diagnosed in 21 patients (2.9%) including 16 with serous and 5 with mucinous histology. The International Federation of Gynecology and Obstetrics (FIGO) staging for the patients with borderline tumors was as follows: 18 stage I, 1 stage II and 2 stage III patients. Thirteen of the 21 borderline tumors had unremarkable (unsuspicious for carcinoma) preoperative imaging (11 cases of unilateral simple cysts and 2 cases of bilateral simple cysts) and all 13 were found to be stage I on final pathology. Eight patients had suspicious preoperative imaging (solid nodules -3-, calcification of wall -1-, thickened nodular cyst wall -2- or septae -2-). Only 4 had preoperative CA-125 sent and all were elevated (>35 U/mL). Five of the 8 suspicious borderline tumors were found to be stage I on final pathology while 3 borderline cases were more advanced (one stage II and two stage III). Of the 21 borderline tumors, 6 underwent initial cystectomy followed by additional operation at a later date. Five women underwent adnexectomy, and 10 had laparoscopic staging. No patient with a borderline ovarian tumor recurred during the follow-up period (range, 3 to 56 months).

Malignant tumors were diagnosed in 38 women (5.6%).

Table 1. Demographic characteristics (n=694)

Characteristics	Mean±SD or no. (%)
Age (yr)	49.9±4.7
Nulliparous	266 (43.8)
Postmenopausal	276 (39.8)
No. of previous abdominal surgeries:	
None	476 (68)
One	156 (22)
Two	24 (3.4)
Three or more	27 (3.7)
Positive family history of ovarian and/or breast cancer (1st degree relative)	107 (15.4)
Body mass index	28.2±4.8
<20	38 (5.5)
20-30	341 (49.1)
30-40	185 (26.7)
>40	12 (1.7)

These included 35 ovarian malignancies, 1 fallopian tube carcinoma, and 2 non gynecologic malignancies which were found to not involve the ovaries at exploration (one peritoneal adenosarcoma and one leiomyosarcoma of the large intestine). Of the 35 patients who had an ovarian malignancy, 32 were primary ovarian carcinoma and 3 were metastatic to the ovary (1 breast and 2 colon). The primary ovarian malignancies included 28 epithelial, 3 sex cord – stromal tumors and 1 ovarian sarcoma.

Of the 32 primary ovarian carcinomas 11 were stage I (7 IA, 4 IB, and 0 IC); seven of which were suspicious preoperatively by imaging. Stage II ovarian carcinoma was diagnosed in 7 patients (1 IIA, 2 IIB, and 4 IIC); four of which were suspicious preoperatively by imaging. The remainder of cases of ovarian carcinoma were stage III or IV.

The women were stratified into 3 groups based on the concordance of the preoperative assessment and final postoperative pathologic diagnosis, Group I (concordant benign, 584 pts), Group II (discordant, 76 pts) and Group III (concordant malignant, 34 pts). Laparoscopic outcome variables in the three groups are presented in (Table 2). The difference in the incidence of ovarian cyst rupture in Group I and II vs. Group III was statistically significant (I, 26%; II, 22.1%; III, 3%; p<0.05). The difference in the percentage of

conversion to laparotomy in Group III vs. Group I and II was statistically significant (I, 0.9%; II, 3.4%; III, 24.2%; p<0.001). Other differences that were statistically significant were blood loss, operative time and duration of hospital stay. There were no statistically significant differences in intraoperative and postoperative complications between the three groups.

An additional stratification of adnexal masses was made based on the final pathologic diagnosis: benign vs. borderline/malignant (Table 3). The difference in incidence of ovarian cyst rupture in benign adnexal masses and borderline/malignant tumors was statistically significant (26% vs. 8.7%, p-value<0.05). Patients with borderline/malignant adnexal masses had a statistically significant increase in the percentage of conversion to laparotomy in comparison to patients with benign pathology (0.9% vs. 16.9%, p-value<0.001). Other variables that were statistically different in both groups were blood loss, operative time and duration of hospital stay. Although the difference in the intraoperative complications between the 2 groups was not statistically significant, the patients with borderline/malignant tumors had statistically more postoperative complications than patients with benign pathology (1.9% vs. 12.2%, p-value <0.05).

Table 2. Comparison of laparoscopic outcome variables in the three groups

Variables	Group I (n=584)	Group II (n=76)	Group III (n=34)	Total (n=694)	χ^2	p-value
Ovarian cyst rupture	152 (26)	17 (22.4)	1 (3)	170 (24.5)	9.7	<0.05
Conversion to laparotomy	5 (0.9)	3 (3.9)	8 (23.5)	16 (2.3)	75.5	<0.001
Intraopertive complications	13 (2.2)	0 (0.0)	2 (5.9)	15 (2.2)	3.8	>0.05
Postoperative complications	12 (2)	1 (1.3)	3 (8.8)	16 (2.3)	3.8	>0.05
Blood loss* (mL)	57.2±92.1	81.4±85.3	173.8±142.5	65.6±97.8	48.9	<0.001
Operative time* (hr)	1.0±0.9	1.9±1.3	3.4±1.6	1.6±1.1	56.5	<0.001
Hospital stay* (day)	1.4±1.2	2.0±2.0	3.0±2.0	1.5±1.3	69.5	<0.001

Values are presented as number (%) or mean±SD. *By Kruskal Wallis test.

Table 3. Comparison of laparoscopic outcome variables between benign adnexal masses and borderline/malignant adnexal masses

	Benign adnexal masses (n=635)	Malignant and borderline adnexal masses (n=59)	χ^2	p-value
Ovarian cyst rupture	165 (26)	5 (8.6)	9.3	<0.05
Conversion to laparotomy	6 (0.9)	10 (16.9)	54.3	<0.001
Intraoperative complications	13 (2)	2 (3.3)	0.02	>0.05
Postoperative complications	12 (1.9)	4 (12.2)	5.8	<0.05
Blood loss* (mL)	58.5±91.2	139.7±129.8	6.3	<0.001
Operative time* (hr)	1.5±0.9	2.9±1.8	6.3	<0.001
Hospital stay* (day)	1.4±1.2	2.6±2.1	7.7	<0.001

Values are presented as number (%) or mean±SD. *By Mann-Whitney test.

DISCUSSION

Historically, laparoscopy was predominantly used in gynecology for the management of benign appearing adnexal masses. Because of the larger cohort of experienced laparoscopic surgeons especially gynecologic oncologists, and the rapid and major technologic advancements including instrumentation and robotics, laparoscopy has been increasingly utilized for the management of malignant adnexal masses in the last decade [7]. Until recently, if the preoperative assessment of an adnexal mass was suspicious for malignancy, a surgical exploration via midline vertical abdominal incision was commonly mandated to allow comprehensive surgical staging and debulking. The contemporary algorithm for the diagnosis and treatment of benign and suspicious adnexal masses has transitioned to a laparoscopic approach in an effort to improve patient recovery and reduce the incidence of an unnecessary laparotomy [8,9].

Published opinion regarding the role of laparoscopic surgery in the management of an adnexal mass with moderate to high suspicion of malignancy is divided between those advocating its use [3,6,10] and those still mandating initial laparotomy [4,5]. Other surgeons offer a compromise, such as avoiding the use of laparoscopic management in all postmenopausal patients [11] or initiating laparoscopic assessment and then proceeding to laparotomy if the mass appears suspicious intraoperatively [12]. In a survey of the members of the American Association of Gynecologic Laparoscopists comprised mainly of general laparoscopists, 12% of respondents stated that they would perform a laparoscopy on a woman with an adnexal mass that is suspicious for malignancy as their initial approach [13].

In our series, 10 of the surgeons were highly experienced gynecologic oncologists (10/88 surgeons included) and they performed 58.1% of the adnexal laparoscopic surgeries included in the study. Many previous studies included only a limited number of highly experienced oncologic surgeons [3,6]. The inclusion of all adnexal masses managed by both generalists and specialists offer a unique perspective to the analysis of this data. In our study, 91.5% of all adnexal masses were benign on final pathology. In other studies the incidence of unexpected cancers discovered at the time of laparoscopy for non suspicious adnexal masses has shown to be exceptionally low (0.6%) [4]. The higher incidence of borderline and malignant tumors reported when compared to previous studies is likely due to the fact that we included suspicious masses as well as the fact that 60% of the cases were managed by gynecologic oncologists with referral practices.

There are many advantages of laparoscopic surgery reported in other studies including avoiding a laparotomy, shorter operative time, decreased blood loss, shorter hospital stay, and fewer complications. These findings were confirmed in our study. Our average blood loss was 65 mL and the average duration of hospital stay was 1.5 days. These findings suggest that laparoscopy has a low morbidity and can be safely used for the management of benign and malignant adnexal masses as previously described [3,10].

In our study, the conversion to laparotomy in patients with carcinoma or borderline tumors was comparable to a Gynecologic Oncology Group (GOG) study from 2005 [14]. In a study by Chi et al. [15] 2005, there were no conversions to laparotomy; this report however only included 20 stage I patients that were managed laparoscopically. It appears that patient selection, diagnosis, extent of disease, and skill of the operating surgeon play an important role in the reported conversion rates. We found that conversion to laparotomy was highest in patients with either advanced stage ovarian cancer, or metastatic non gynecological malignancy.

The available data for incidence of cyst rupture while performing laparoscopy or laparotomy for adnexal masses vary widely. Laparoscopic tumor rupture rates have been reported from 10.5% to 41.8% [16,17]. These rates may vary based on the planned procedure such as cystectomy versus adnexectomy [18]. Some studies imply a difference in rupture rates with laparoscopy compared with laparotomy, but other studies refute this difference. In our study, the incidence of cyst rupture in benign masses was consistent with the findings in previous reports [5] and in order to prevent spillage and up-staging of carcinomas, the preferred technique used in our Institution is to place an unruptured cyst/adnexa in an endoscopic bag and to aspirate its contents. This is followed by removal of the specimen through an adequate trocar site.

The clinical significance of cyst rupture is also uncertain. Currently, the largest study addressing cyst rupture consists of a retrospective, multicenter study of more than 1,500 patients. A cyst or mass rupture was found to be an independent predictor of decreased disease-free survival [19]. In contrast, no survival difference existed among a retrospective review of 394 patients [20]. Other studies show that intraoperative rupture would up-stage malignant cysts and therefore necessitate the use of adjuvant chemotherapy for patients who may not otherwise have required it [21]. In our series, tumor spillage occurred in 1 case of ovarian sarcoma and in the case of peritoneal adenosarcoma not involving the ovary. In both these cases, tumor spillage did not affect staging or prognosis of the patients.

The risk of port site metastasis in laparoscopic cancer surgery

was highlighted by some early case series that reported a range of 0% to 2.3% with an even higher incidence in patients with recurrent ovarian cancer or in the presence of ascites [22,23]. In our study, no cases of port site metastasis were reported after a mean follow up of 22.1 months.

Contrarily to postoperative complications, the incidence of intraoperative complications was similar in benign and malignant masses. Previous studies have reported various types of complications and morbidities associated with laparoscopy with a variable rate of 4-11% [15,24]. Opposite to some prior reports, we observed no major vascular injuries [19,25].

Laparoscopic management of suspicious adnexal masses is technically feasible with a low morbidity rate. In addition to sparing patients from unnecessary laparotomy, operative laparoscopy can be employed for complete surgical staging as previously shown [6,10]. In our series, the majority of patients with borderline tumors or ovarian cancer were successfully managed by laparoscopic optimal tumor cytoreduction and staging.

It is now accepted that laparoscopy offers many advantages over laparotomy for the management of benign adnexal masses at a low complication rate. Our study supports that the laparoscopic technique offers these same benefits to patients with suspicious and malignant adnexal masses. With appropriate patient selection and proper intra-operative technique, our study suggests that laparoscopy may be employed in the initial management of many adnexal masses. Laparoscopy can be also utilized for surgical staging of early ovarian malignancies and in selected patients with advanced disease.

Patients that undergo laparoscopic management of masses that are suspicious for malignancy or borderline pathology are in increased risk of conversion to laparotomy, blood loss, operative time, duration of hospital stay, and postoperative complications in comparison to patients with benign masses. The preoperative counseling of patients with an adnexal mass undergoing laparoscopic resection, should include a tailored risk assessment for intraoperative and postoperative complications according to the preoperative likelihood of the mass being carcinoma or borderline malignancy.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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