

# Laparoscopic Management of Adnexal Masses

Eli Serur, MD, Pamela L. Emeney, RN, CCRN, MD, Daniel W. Byrne, MS

## ABSTRACT

**Background and Objective:** Although laparoscopic surgery for removal of adnexal masses is common, controversy exists about the safety and efficacy of this procedure for patients with malignancies. The aim of this study was to evaluate the effectiveness and safety of laparoscopic surgical treatment for patients with adnexal masses.

**Methods:** This was a retrospective chart review of one surgeon's experience in managing patients diagnosed with adnexal masses at 2 urban referral teaching hospitals in New York City. We reviewed the charts for 100 consecutive patients who underwent operative laparoscopy for management of adnexal masses between March 4, 1996 and November 9, 1998. Conversion to laparotomy, malignancy rate, complications, length of stay, and blood loss were recorded for each patient.

**Results:** Laparoscopic management was successfully completed for 81 of the 100 patients in this study; however, 19 required conversion to laparotomy. All 81 patients managed laparoscopically had a benign diagnosis, whereas 7 of the 19 patients who underwent laparotomy were diagnosed with malignancy. The median length of stay, estimated blood loss, and operating room time were significantly lower for those treated by laparoscopy alone compared with those converted to laparotomy (2 vs. 7 days; 100 vs. 500 ccs; 130 vs. 235 minutes, respectively;  $P < 0.05$ ). Though few patients were in the laparotomy group, that data are presented for completeness. A total of 10 complications occurred, 4 in

the group of patients managed laparoscopically (2 enterotomies, 1 pneumothorax, and 1 vaginal cuff cellulitis). Six complications occurred in those managed with laparotomy (2 enterotomies, 2 wound infections, 1 pneumonia, and 1 postoperative fever). The indications for conversion to laparotomy were: 7 malignancies (5 ovarian cancers and 2 uterine cancers), 7 dense adhesions, 2 small bowel enterotomies, 1 intraoperative bleeding, 1 secondary to a large uterus (880 grams), and 1 secondary to a large myoma (13 cm x 14.5 cm x 6 cm).

**Conclusions:** The laparoscopic approach is effective and safe for managing patients with adnexal masses of unknown pathology. Malignancies can be diagnosed accurately, converted to laparotomy, and staged appropriately. Adequate surgical skills along with timely use of frozen sections are required for successful operative management.

**Key Words:** Adnexal diseases-diagnosis-surgery, Laparoscopy, Adnexal mass, Ovarian carcinoma.

## INTRODUCTION

Laparoscopic management of adnexal masses is common in the United States, yet remains controversial due to conflicting research reports and rapid advances in technology and skill.<sup>1-4</sup> Although treating benign adnexal masses laparoscopically has become the standard of care,<sup>5-14</sup> managing suspected or known malignancies laparoscopically is an area with many unanswered questions and concerns.<sup>1-3,11,15-21</sup> Potential problems previously cited in the literature include lack of appropriate use of frozen sections intraoperatively,<sup>22</sup> trocar site abdominal wall tumor implantation,<sup>23,24</sup> and inappropriate or inadequate staging of malignancies at the time of laparoscopy.<sup>22</sup>

The aim of this study was to assess the effectiveness of laparoscopic management of adnexal masses with unknown pathology in a recent series of consecutive patients. The focus was on pathology findings, length of stay, operating room time, complications, and laparotomy conversion rate.

Chief, Section of Gynecological Oncology (Dr Serur).  
First year resident, Department of OB/GYN (Dr Emeney).  
The Brooklyn Hospital Center, Brooklyn, New York, USA.

Director of Biostatistics and Study Design, General Clinical Research Center,  
Vanderbilt University, Nashville Tennessee, USA (Mr Byrne).

Address reprint request to: Eli Serur, MD, FACOG, FACS, Chief, Section of  
Gynecological Oncology, The Brooklyn Hospital Center, 121 DeKalb Avenue,  
Brooklyn, NY 11201, USA. Telephone: (718) 250-8106, (718) 797-5495, E-mail: esur-  
er@aol.com

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## MATERIAL AND METHODS

This was an observational, retrospective chart-review study of patients clinically diagnosed with an adnexal mass. The inclusion criteria were: women who underwent laparoscopic surgery performed by, or under direct supervision of, the primary author (ES) for management of suspected adnexal masses during the 32-month study period, March 4, 1996 to November 9, 1998. Suspected adnexal or pelvic masses were, in general, defined as those with abnormal appearance on radiographic examination (ultrasound or CT scan) with the following characteristics: persistent cystic masses larger than 3 cm, with or without septations, papillations, or solid components. No patients were excluded preoperatively for elevated serum CA-125 concentrations or abnormal radiographic characteristics of the mass alone. Patients with complex masses, ascites, and elevated serum CA-125 levels were excluded from the laparoscopic approach due to the high probability of a malignant condition. No patients during this study period who were eligible for laparoscopic surgery requested laparotomy as the initial treatment. All procedures were performed at either The Brooklyn Hospital Center in Brooklyn, New York or Saint Vincent's Hospital Medical Center located in Staten Island, New York. The second author (PLE, a fourth-year medical student at the time) performed the chart review between November 9, 1998 and December 10, 1998. The third author (DWB) performed the statistical analysis. All patients provided a history and underwent a physical examination prior to surgery. The following variables were abstracted from the medical records: age, weight, height, length of stay, estimated blood loss, pathology findings, complications, and reasons for conversion to laparotomy.

Ascites was defined as an abnormal accumulation of serous fluid in the peritoneal cavity, identified on physical examination as a positive fluid wave, and confirmed preoperatively by CT scan or ultrasound. Complications were defined as pneumothorax, confirmed by chest x-ray; wound infection, occurring within 14 days postoperatively, and confirmed by positive wound cultures; postoperative fever, a documented temperature of 38.3° C occurring postoperatively within 48 hours; enterotomy, defined as incision of the small intestines; vaginal cuff cellulitis, defined clinically by elevated temperature (greater than 38.3° C), pelvic tenderness, vaginal cuff discharge and induration; and pneumonia, confirmed by chest x-ray.

All patients were placed on a clear-liquid diet 24 hours prior to surgery. A mechanical bowel preparation, including 2 to 4 liters of polyethylene glycol-electrolyte solution (Golytely, Braintree Laboratories, Braintree, MA) by mouth, or 8 oz of magnesium citrate, and a prepackaged monobasic and dibasic sodium phosphate enema (Fleet, C.B. Fleet Co. Inc.) were administered the evening before surgery. Cefazolin (Schein Pharmaceuticals, Florham Park, NJ) 1 to 2 g was administered preoperatively via intravenous piggyback. In patients with sensitivity to cephalosporins, Cleocin phosphate (Pharmacia and Upjohn, Kalamazoo, MI) 600 mg intravenous piggyback was administered preoperatively.

The initial laparoscopic procedure was consistent for all patients. Once on the operating table, patients were placed in a supine position with legs in Allen laparoscopic stirrups (Allen Medical Systems, Cleveland, OH), and with arms at their side. Bilateral thigh-high antiembolic compression stockings (TED stockings) and pneumatic compression stockings (Kendall sequential compression sleeves, The Kendall Co., Mansfield, MA) were applied. A urinary catheter was inserted. All procedures were performed in the inpatient operating suite. All patients received nonnitrous general anesthesia and underwent endotracheal intubation. A standard 4-trocar technique was used. A 12-mm Ethicon Endopath Optiview (Ethicon Endo-Surgery, Inc. Cincinnati, Ohio) was used to gain direct access into the peritoneal cavity via an infraumbilical or supraumbilical incision (this technique was used for 78 patients). This was followed by two 5-mm ports placed under direct laparoscopic visualization at the right and left lower quadrant and a 12-mm port placed 2 cm above the symphysis pubis. Hasson open laparoscopic technique was generally used in patients with multiple previous surgeries (this technique was used for 22 patients).<sup>25-27</sup> Carbon dioxide insufflation pressures of 15 mm Hg were maintained during the procedure. The patients were placed and maintained in a 30-degree Trendelenburg position. Diagnostic laparoscopic inspection of all peritoneal surfaces was performed, followed by adhesiolysis using sharp dissection. In patients with suspicious-appearing masses (ie, tumor excrescences on the surface of the ovary, uterus, or peritoneal implants) frozen section biopsy specimens were obtained. If a malignancy was confirmed, immediate laparotomy, and surgical staging was performed by the primary author (ES). In patients with benign-appearing masses (ie, cystic lesions with smooth surfaces) an attempt was made to resect the mass intact and place it

in an Endopouch Pro specimen-retrieval bag (Ethicon Endo-Surgery, Inc. Cincinnati, OH). Aspiration of the mass was then performed prior to its removal from the abdominal cavity. Benign-appearing masses that were too large to be removed intact via the Endopouch were aspirated, placed in the Endopouch and removed. All specimens were then sent to the pathology department for diagnostic evaluation.

Informed consent was obtained from each patient for the procedure, which included a statement describing the possibility and consequences of conversion to laparotomy. Because this was a retrospective chart-review study, additional study consent and Institutional Review Board approval were not required.

All patients were seen and examined postoperatively at 2 and 6 weeks. The 93 patients with benign disease were then referred back to their primary physicians for further follow-up care. Of the 7 patients with malignant pathology, 6 were followed by the primary author, and examined every 3 to 6 months, with 1 patient lost to follow-up.

Serum CA-125 analyses were performed at Smith-Kline-Beecham laboratories in Syosset, New York. Values were established by a classical solid-phase immunoradiometric assay. Levels below 35 U/mL were considered normal.

### Statistical Analysis

Categorical variables were assessed with the chi-square or Fisher's exact test. For comparisons across the 3 years of the study, the Mantel-Haenszel test for a linear association was used. Continuous variables that were normally distributed, such as age, height, and weight, are presented as means and standard deviations. These variables were assessed with a Student's *t*-test. If variables were not normally distributed (such as length of stay), the median was presented and comparisons were made with the Mann-Whitney U test. The statistical software SPSS version 9.0 (SPSS Inc., Chicago, IL) was used for all analyses. All tests are two-tailed and *P* values less than 0.05 were considered statistically significant.

## RESULTS

### Conversion to Laparotomy

Of the 100 patients who met the inclusion criteria for this study, 19 required conversion to laparotomy. As expected, the outcome variables, such as estimated blood loss, operating room time, and length of stay, were significantly different in those patients converted to laparotomy (**Table 1**).

Of the 19 patients converted to laparotomy, 7 conversions were due to malignancies, 7 to dense adhesions, 2

**Table 1.**

Comparison of patients with laparoscopic management of adnexal masses with those requiring conversion to laparotomy.

	Laparoscopic (n=81)	Laparotomy (n=19)	<i>P</i> Value
Age (yrs) mean ± SD range	48.2 ± 14.0 17 - 80	49.4 ± 15.1 22 - 79	0.743
Height (cm) mean ± SD Range	159 ± 7 142 - 175	157 ± 6.5 148 - 170	0.218
Weight (kg) mean ± SD range	73.5 ± 21.5 32.3 - 141	73.3 ± 15.6 43 - 105	0.983
Menopausal status			0.504
Premenopausal	40 (49.4%)	11 (57.9%)	
Postmenopausal	41 (50.6%)	8 (42.1%)	
Brooklyn Hospital Ctr St Vincent's Med Ctr	47 (58.0%) 34 (42.0%)	17 (89.5%) 2 (10.5%)	0.010
Year of the procedure			0.008
1996	9 (11.1%)	8 (42.1%)	
1997	26 (32.1%)	4 (21.1%)	
1998	46 (56.8%)	7 (36.8%)	
Estimated blood loss (cc) median range	100 5 - 500	500 100 - 1500	<0.001
Operating room time (min) median median hours/minutes range	130 2 hrs/10 min 55 - 285	235 3 hrs/55 min 75 - 325	<0.001
Length of stay (days) median range	2.0 0.5 - 6.0	7.0 3 - 12	<0.001
Ascites	2 (2.5%)	0 (0.0%)	1.000
Complications	4 (4.9%)	6 (31.6%)	0.003

to small bowel enterotomies (associated with trocar placement), 1 secondary to extensive bleeding, 1 secondary to a large uterus (880 grams), and 1 secondary to a large myoma (13 cm x 14.5 cm x 6 cm). To assess the learning curve of the laparoscopic technique, we compared the data from the surgeries performed in the first half of the study (the first 50 patients by date of surgery) with the second half (the second 50 patients). Estimated blood loss was slightly lower in the second half, 12% vs. 26%,  $P = 0.074$ . The percentage with malignancies was also lower in the second half, 4% vs. 10%,  $P = 0.240$ . The complication rate was lower in the first half, 8% vs. 12%,  $P = 0.505$ . Length of stay and operating room time did not change over the course of the study.

### Outcome

A total of 10 complications occurred in this series of patients. Four complications occurred in the 81 patients managed laparoscopically. Two patients incurred enterotomies as a result of trocar placement. Both patients had extensive adhesions secondary to previous abdominal surgeries and required conversion to laparotomy for enterotomy repair. One pneumothorax that occurred during surgery presented as decreased oxygen saturation along with elevated ventilation pressures. A chest x-ray in the recovery room later confirmed pneumothorax. The patient was treated with a chest tube for 24 hours and was discharged home on postoperative day 6 with no further sequelae. The etiology of the pneumothorax is unknown. The patient was a frail female with kyphosis and scoliosis. No difficulty occurred with intubation and no known history of lung disease existed. One patient developed vaginal cuff cellulitis. She presented to the emergency department 21 days postoperatively with vaginal bleeding, fever, and abdominal pain for 2 days. She was admitted to the hospital for 5 days and treated with ampicillin sodium (Apothecon Co., Bristol-Meyers Squibb Co, Princeton, NJ), gentamicin sulfate (SoloPak Laboratories, Inc., Boca Raton, FL) and metronidazole (SCS Pharmaceuticals, Chicago, IL).

Six complications occurred among the 19 patients who required conversion to laparotomy. One patient developed right lower lobe pneumonia, required intravenous antibiotics, and was discharged on postoperative day 6 on oral antibiotics. One patient developed fever (39° C) 36 hours postoperatively. She was started on gentamicin and clindamycin; all diagnostic tests for sepsis (including

chest x-ray, complete blood count, and blood, urine, and sputum cultures) were negative. No further investigations were done, and the patient was discharged home on postoperative day 5. Two patients experienced incidental enterotomies after conversion to laparotomy. Both patients had extensive endometriosis associated with multiple adhesions. Two patients developed wound infections and were managed at home with oral antibiotics and dressing changes by visiting nurses. Pathology data include benign conditions in 12 of 19 (63%) and malignancies in 7 of 19 patients (37%) (**Table 2**). Four patients had endometriosis, 5 had ovarian cancer, 2 had uterine cancer, 3 had tubo-ovarian abscesses (TOA), 1 had a serous cyst, and 1 had tubo-ovarian complex (TOC).

Of the 7 patients with malignancies, 1 was lost to follow-up 9 months after treatment (stage IV postradiation uterine sarcoma). Four of the 5 patients with ovarian cancer were treated with 6 cycles of paclitaxel (Taxol, Mead-

Histologic diagnosis	Laparoscopic (N=81)	Laparotomy (N=19)	Total (N=100)
Serous cyst	21	1	22
Endometriosis	11	4	15
Dermoid cyst	11	3	14
TOA	6	3	9
TOC	6	1	7
Hemorrhagic corpus luteum cyst	7		7
Ovarian cancer		5	5
Uterine cancer		2	2
Hydrosalpinx	3		3
Follicular cyst	3		3
Paratubal cyst	3		3
Fibroids	3		3
Hematosalpinx	1		1
Torsion	1		1
Lymphocyst	1		1
Thecoma	1		1
Morgagni cyst	1		1
TOA/TOC	1		1
Brenner tumor	1		1

**Table 3.**  
Pathology of Malignant Tumors.

Type	Histologic Diagnosis	Total N
Ovarian 5/7 71%	Granulosa cell tumor, stage Ic	1
	Papillary serous cystadenocarcinoma, stage IIIa, grade 2	1
	Papillary serous cystadenocarcinoma, stage IIIc	1
	Well differentiated endometrioid adenocarcinoma, stage Ic	1
	Mixed serous adenocarcinoma granulosa cell tumor, stage IIa grade 3	1
Uterine 2/7 29%	Post radiation sarcoma, stage IV	1
	Low grade sarcoma, stage IIIa	1

Johnson Oncology Products) and Paraplatin (carboplatin, VHA Plus Inc.) chemotherapy. One patient with stage Ic granulosa cell tumor did not receive chemotherapy. One patient (stage IIIc papillary serous cystadenocarcinoma) subsequently relapsed at 18 months after her initial diagnosis and received additional chemotherapy. The remaining 5 patients are alive with no evidence of disease at 14, 28, 36, 37, and 40 months after surgical treatment.

### Pathology

All 81 patients treated laparoscopically had benign disease (**Table 2**). The more common pathology findings include 21 serous cysts, 7 hemorrhagic corpus luteum cysts, 6 tubo-ovarian complexes, and 6 tubo-ovarian abscesses. For the 7 patients with malignancies, a more detailed description of the pathology is provided in **Table 3**. The 7 patients with malignancies were different from the 93 without malignancies in several ways. They were treated earlier in the 3-year study period, and they were older (57.0 vs. 47.8 years). The proportion with malignancies was 17.6% in 1996, 6.7% in 1997, and 3.8% in 1998,  $P = 0.069$ . Among the postmenopausal women, 10.4% had malignancies vs. 3.9% in premenopausal women. A malignancy rate of 9.4% existed at The Brooklyn Hospital Center compared with 2.8% at Saint Vincent's Hospital,  $P = 0.215$ .

### Preexisting Conditions and Previous Surgery

Of the 100 patients in this study, 12 had undergone previous hysterectomy. During the study, 39 patients under-

went hysterectomy (11 total abdominal hysterectomies and 28 laparoscopic-assisted vaginal hysterectomies). The mean uterine weight associated with total abdominal hysterectomy was 298 g (range 25 to 880 g), and the mean uterine weight associated with laparoscopic-assisted vaginal hysterectomy was 202 g (range 59 to 450 g,  $P = 0.107$ ).

Two patients had ascites preoperatively, both associated with cirrhosis. The first patient, a 58-year-old female, was admitted with a diagnosis of pelvic mass and a serum CA-125 level of 700 U/mL. A CT scan of the abdomen and pelvis revealed a left plural effusion, ascites, and a simple 4.5-cm adnexal cystic mass. She had a past medical history of Hodgkin's lymphoma and hepatitis 30 years previously. Review of serial CT scans revealed a stable cystic pelvic mass present for 3 years, with new onset of ascites. Diagnostic laparoscopy was performed and confirmed a serous cyst adenoma with ascites secondary to cirrhosis. The patient was managed with diuretics and discharged home uneventfully. The second patient, a 47-year-old female, was admitted with a diagnosis of menorrhagia, chronic pelvic pain, and a pelvic mass with a serum CA-125 level of 11 U/mL. A CT scan of the abdomen and pelvis revealed a left cystic structure 4 cm x 5 cm and ascites. She had a past medical history of insulin-dependent diabetes mellitus for 11 years, hypertension, angina, arthritis, and ethanol abuse. Diagnostic laparoscopy confirmed alcoholic cirrhosis and a left adnexa with a hemorrhagic corpus luteum cyst.

A total of 32 of the 100 patients had serum CA-125 values obtained within 1 month prior to surgery. Of the 51

premenopausal patients, 11 had a documented serum CA-125 level, 6 of which were elevated. Only 1 of the 6 elevated levels was associated with ovarian cancer, whereas 21 of the 49 postmenopausal patients had a documented serum CA-125 level, 8 of which were elevated. Only 4 of the 8 elevated levels were associated with malignancies, all of which were ovarian in origin. All 5 patients with ovarian cancer had elevated serum CA-125 levels preoperatively with the following values, 37, 185, 469, 488, and 1022 U/mL.

Of the 100 patients in this study, 70 had had previous abdominal surgery. The proportion with previous surgery was not statistically different between those managed with laparoscopy versus laparotomy ( $P = 0.579$ ). Among the 19 patients converted to laparotomy, 2 of 7 patients (29%) with malignancies had had previous abdominal surgery, whereas 10 of 12 patients (83%) with benign pathology had had previous abdominal surgeries. Of those managed with laparotomy, the proportion with previous surgery was higher in patients with benign pathology compared with those with a malignant pathology ( $P = 0.045$ ).

## DISCUSSION

Operative laparoscopy was first performed in 1901 by Georg Kelling<sup>28</sup> with an endoscope on a live dog. Since then, laparoscopists have continually redefined the boundaries for safe and effective use of this tool. Laparoscopic management of malignant ovarian lesions needs further exploration and research with a possible role for this modality in both early-stage disease and second-look operations.<sup>1,3,23,24,29</sup> The accepted standard of care at this time, which we support, is that known ovarian malignancies should be managed with laparotomy.<sup>30,31</sup> Whether adnexal lesions that are not clearly benign or malignant can be managed safely with laparoscopic techniques is a timely and important question to answer.

Our study supports the use of operative laparoscopy for the management of adnexal masses with unknown pathology. We observed that all 7 patients with malignancies were accurately diagnosed at the time of laparoscopy, converted to laparotomy, and appropriately staged.

To evaluate technical improvement in laparoscopy skills, data from the first half of the study was compared with data from the second half. The length of stay and opera-

tive time did not change during the study. The estimated blood loss was slightly less in the second half of the study. However, a decreasing trend was established for both conversion to laparotomy (26% vs. 12%) and malignancy rate (10% vs. 4%) during the second half of the study (statistical significance was not reached most likely because of the result of the small number of patients in this group). We attribute this progressive decrease in malignancy to improved patient selection.

Although analysis of the full learning curve would be ideal to assess technical improvement, for statistical power we opted to compare data from the first half of the study to data from the second half. The length of stay and operative time did not change during the study. The complication rate was slightly lower in the first half of the study, but did not reach statistical significance. We attribute this trend to laparoscopic management of more complex patients. The conversion-to-laparotomy rate was lower in the second half of the study, 12% vs. 26%,  $P = 0.074$ . We attribute this change to increased technical skills. The malignancy rate was lower in the second half, 4% vs. 10%,  $P = 0.240$ . We attribute this change to an improved patient selection process. Our data reflect a learning curve associated with managing more complicated patients and more appropriate patient selection.

Parker<sup>2</sup> has reported on the importance of careful patient selection, proper intra-operative assessment and liberal use of rapid frozen sections for appropriate management of adnexal masses via operative laparoscopy. Nezhat<sup>32</sup> states that experienced surgeons using intraoperative histologic sampling may safely evaluate adnexal masses laparoscopically. Canis et al<sup>33</sup> reported results of a study of 757 patients with 819 masses that were managed laparoscopically. Seven ovarian cancers and 12 tumors of low malignant potential (12.5%) existed. This resulted in a sensitivity of 100% in the laparoscopic diagnosis of malignancy, a specificity of 96.6%, and a negative predictive value of 100%. Using cautious management and strict guidelines, laparoscopic diagnosis of adnexal masses appears reliable and safe, allowing for immediate and adequate surgical treatment of malignancies. Careful preoperative assessment will reduce the possibility of inadvertently encountering malignancy, but will not entirely eliminate the risk.<sup>22</sup> With careful patient selection, proper technique, an experienced operator, and informed consent to proceed to laparotomy if required, laparoscopic treatment of adnexal masses is advisable.<sup>9</sup>

We found that patients undergoing successful laparoscopic management enjoyed a decreased length of stay, operative time, and estimated blood loss. Pittaway et al<sup>8</sup> compared laparoscopic adnexal excision with conventional laparotomy and concluded that the laparoscopic approach offers significant advantages to laparotomy in selected patients when performed by a laparoscopist experienced in advanced techniques. Statistically significant differences were reported for operative time, estimated blood loss, length of stay, total cost, and recovery time.

Our overall conversion-to-laparotomy rate was 19% (26% for the first half of the study and 12% for the second half). We believe this high rate of conversion is due to a combination of factors. First, a learning curve must be established and traversed to acquire the technical skills necessary to perform these procedures laparoscopically. For example, a small enterotomy during the first half of the study would have required conversion to laparotomy, whereas in the later half of the study this could be managed laparoscopically. Similarly, the laparoscopic management of intraabdominal adhesions, intraabdominal bleeding, and large pelvic masses was improved as technical skills were acquired. Second, improved patient selection during the second half of the study led to a decreased conversion rate secondary to malignancies. The use of CA-125 values, especially in the postmenopausal patient, in conjunction with a suspicious radiographic study was often initially managed with laparotomy in the second half of the study. Finally, the patient populations in the 2 hospitals were quite different. The Brooklyn Hospital Center, with a laparotomy conversion rate of 26.5%, serves an inner-city population with limited health care access and a high rate of ovarian neoplasm with infectious etiology, such as tubo-ovarian complex and pelvic inflammatory disease. These masses are technically difficult to manage laparoscopically, whereas Saint Vincent's Hospital, with a conversion rate of 5.5%, serves a middle-class suburban population with much less ominous pathology that is easier to resect laparoscopically. This diversity in patient population also plays a major role in the discrepancy in conversion to laparotomy for malignancy rate between The Brooklyn

Hospital Center, which was 9.4%, and Saint Vincent's Hospital, which was 2.8%.

The increased operative time in our study not only reflects the degree of technical difficulty but also the varying pathology encountered in our patient population including tubo-ovarian complex and tubo-ovarian abscess. In addition, many of our patients underwent a hysterectomy at the time of laparoscopy, whereas in other studies only the adnexal lesions were managed laparoscopically.

The 10% complication rate in our study was comparable to that of others. Infection was the most common complication, followed by small bowel enterotomy. This translates to a mild increase in length of stay. A higher complication rate was associated with laparotomy vs. laparoscopic management. Furthermore, 2 patients treated with laparotomy were at high risk for developing severe complications secondary to previous pelvic radiation. Both patients developed complications, 1 wound infection and 1 small bowel enterotomy. We believe that incorporating the following methods will decrease the complication rate in the future: use of the Hasson open laparoscopic technique for all patients with any previous abdominal surgery,<sup>26,27,34</sup> careful attention to good surgical technique, and efficient completion of procedures in a timely fashion.

We found that laparoscopic management of adnexal masses with unknown pathology was effective in removing benign lesions and in identifying patients with malignancies who required conversion to laparotomy. Long-term follow-up studies are now needed to assess the survival of these patients.

## **CONCLUSION**

In conclusion, the laparoscopic approach is effective and safe for managing patients with adnexal masses of unknown pathology. Malignancies can be diagnosed accurately, converted to laparotomy, and staged appropriately. Adequate surgical skills along with timely use of frozen sections are required for successful operative management.

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