Instruments and Techniques

Laparoscopic Adnexectomy of Suspect Ovarian Masses: Surgical Technique Used To Avert Spillage

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ABSTRACT

Herein is described and evaluated a safe laparoscopic adnexectomy technique for retroperitoneal dissection of suspect ovarian masses including the underlying peritoneum fixed to the ovary. Adopting this technique in cases of suspect adnexal masses enables the reduction of spilling and ensures an intact specimen. Twenty-two consecutive patients with suspect adnexal masses 10 cm or smaller underwent laparoscopic adnexectomy. Patients with bilateral suspect ovarian masses that required bilateral adnexectomy were enrolled only if they were no longer of childbearing age. Laparoscopy was feasible in all patients. No tumor spillage occurred. In 5 patients (23.6%), minilaparotomy was required to extract the specimen. Mean (SD) operating time was 80 (35–160) minutes, and estimated blood loss was 50 (10–100) mL. No major intraoperative complications occurred. Median (range) postoperative stay was 1 (1–3) day. Definitive pathologic analysis revealed benign pathologic conditions in 18 patients (81.8%), an ovarian tumor with low malignant potential in 3 patients (13.7%), and ovarian cancer in 1 patient (4.5%) in whom findings at frozen-section analysis were inconclusive. Median (range) follow-up of malignant ovarian tumors and of tumors with low malignant potential was 27 (21–29) months. No recurrence or port-site metastasis developed during follow-up. The data are encouraging for adoption of this technique to avert spillage during laparoscopic management of suspect adnexal masses, especially those firmly adherent to the peritoneum. However, the procedure must be validated in a larger series of patients to standardize the technique. Journal of Minimally Invasive Gynecology (2011) 18, 372–377 © 2011 AAGL. All rights reserved.

Keywords: Adnexectomy; Laparoscopy; Spillage; Suspect ovarian mass

Laparoscopy has been used to treat benign adnexal diseases for the last 30 years. In 1980, Semm and Mettler [1] reported 37 laparoscopic oophorectomy procedures with suturing, and a few years later, Reich et al [2–4] introduced use of bipolar instruments. Since then, laparoscopy has been progressively used for management of benign adnexal masses [5] because of its advantages of reduced perioperative morbidity, hospital stay, postoperative pain and analgesic requirements [6–8].

More recently, the indications for laparoscopy have been expanded to include evaluation and treatment of suspect adnexal masses, alone or in combination with minilaparotomy [9,10]; treatment of ovarian tumors with low malignant potential [11–14]; and comprehensive surgical staging of early-stage epithelial ovarian cancer [15–25].

The primary concerns about application of laparoscopy include risk of spillage, tumor cell peritoneal dissemination with carbon dioxide pneumoperitoneum, port-site metastases, and incomplete staging. The possibility of encountering unexpected ovarian malignancy during operative laparoscopy is the major concern about laparoscopic treatment of ovarian cysts. Intraoperative cyst rupture, which occurs more frequently during laparoscopy than with laparotomy, upstages an unexpected ovarian cancer from stage IA to stage IC, with all the consequences of possible delayed staging, necessity of adjuvant chemotherapy, and probably, even if not proved in perspective studies, a worse prognosis.

To our knowledge, neither studies of a proper laparoscopic surgical procedure for safe resection of suspect adnexal cysts, especially when fixed to the peritoneum, nor a technique for extraction of an intact sample for thorough gross and histopathologic examination have yet been...
Materials and Methods

From October 2008 to April 2010, 22 consecutive patients who had been referred to our gynecologic department with a diagnosis of adnexal cysts that satisfied the inclusion criteria and required laparoscopic adnexectomy rather than cystectomy were enrolled in the study. All ovarian cysts with ultrasonographic features of benign disease (endometriosis, dermoid cysts, functional ovarian cysts, and para-ovarian cysts) in women of childbearing age were excluded from the study because they were candidates for conservative treatment.

Inclusion criteria were unilateral or bilateral (only in patients no longer of childbearing age) ovarian cysts 10 cm or smaller in greatest diameter, with volume less than the capacity of the retrieval bag (Endo Catch II 15-mm specimen bag; Covidien PLC, Dublin, Ireland), ultrasonographic findings including thick papillary projections, solid areas, central flow, and velocimetric features of high velocity and low resistance; any cysts 10 cm or smaller that were fixed to the peritoneum; and American Society of Anesthesiologists physical status classification classes I to III. All patients gave signed informed consent to the surgical procedure and to comprehensive surgical staging of any unexpected malignant lesion discovered during elective procedures.

Exclusion criteria were ovarian masses larger than 10 cm and suspect bilateral ovarian masses in women of childbearing age. CA 125 value, age, and previous laparotomy were not considered exclusion criteria.

Patients were admitted to the hospital 1 day before surgery, and underwent transvaginal or transabdominal ultrasonography to confirm the features of the adnexal mass. Bowel preparation was performed using sodium phosphate solution. Antibiotic prophylaxis was with cefalotin 2g intravenously 60 minutes before skin incision, and antithrombotic prophylaxis, when required, was with low-molecular-weight heparin subcutaneously 12 hours before surgery and for 15 days after surgery. In all women who had previously undergone longitudinal laparotomy, open laparoscopy was performed. Postoperative fluid administration 2000 mL intravenously for the first 24 postoperative hours was standard. Patients were allowed clear fluids whenever they desired in the immediate postoperative period. Metoclopramide 20 mg and gastric protecting agents were administered to reduce postoperative nausea and gastric pain. Procedures were performed with the patient under general anesthesia.

Before pneumoperitoneum was performed, an orogastric tube was placed. In all patients who still had a uterus, a 16F Foley catheter and a uterine manipulator were placed before the beginning of the procedure. All procedures were performed by the same gynecologist (A.P.), who specialized in endoscopic surgery.

Surgical Technique

Pneumoperitoneum is attained using a Veress needle or with an open technique in the presence of a midline longitudinal scar. A 1.2-cm vertical incision is made at the level of umbilical area, a 10- to 12-mm trocar is inserted through the umbilicus, and a 10-mm 0-degree operative laparoscope is introduced. Three additional 5-mm trocars are inserted under direct vision at the level of the lower abdominal quadrants, lateral to the rectus muscles, and another one in the supraventricular area via a midline vertical skin incision. The patient is then placed in the Trendelenberg position.

The pelvis and abdomen are carefully explored to exclude signs of malignancy. The peritoneum is washed before the operative procedure is begun. Adhesiolysis is performed, when indicated, to reestablish the physiologic abdominal and pelvic anatomy.

The peritoneum of the posterior leaf of the broad ligament is opened parallel and lateral to the infundibulopelvic ligament. The Latzko pararectal space is then observed, and the ureter visualized and isolated as far as its junction with the uterine artery to free it from the layer of the broad ligament. The infundibulopelvic ligament is then coagulated and sectioned.

The vascular pedicle close to the ovary is used to exert safe traction on the posterior leaf of the broad ligament, which is coagulated and cut along its free portion, underneath the mass as far as the level of the proper ligament of the ovary. Thus, the freed peritoneum becomes a sheet around the mass to exert the necessary traction to expose the right planes to safely perform adnexectomy, averting any cyst manipulations to reduce the risk of spillage. When all of the posterior layer of the broad ligament containing the mass is completely detached from the surrounding tissues, the proper ligaments of the ovary and the salpinx are coagulated and sectioned and the specimen is freed (Fig. 1).

All efforts are made to avert rupture of the cyst during adnexectomy including limited manipulation of the mass, use of nontraumatic graspers, and preventive coagulation to prevent bleeding, which may obscure identification of the cleavage planes.

If the mass is primarily composed of fluid or if it is solid but smaller than 4 cm in diameter, the retrieval bag is inserted in the umbilical port. An ancillary lateral port is used to introduce a 5-mm scope. The fluid component of the cyst is aspirated through a single puncture after the mass is inside of the endobag, to enable easier extraction, which is always performed under vision. If the cyst is still bigger than the umbilical port incision, so as to not leave
a visible scar, the umbilical incision is extended along the umbilical length to gain up to 3 cm (umbilical minilaparotomy). In the presence of a midline longitudinal scar or in the case of solid masses larger than 4 cm, the retrieval bag is inserted in the ancillary suprapubic port. The specimen is extracted through a midline longitudinal minilaparotomy incision as long as is required depending on the size of the mass. When hysterectomy is performed in combination with adnexectomy, the specimen inside the endobag can be extracted through the vagina depending on the size of the mass. Thus, all masses can be removed unbroken from the abdomen without morcellation, which can hinder detailed histopathologic analysis of capsule infiltration. After the specimen has been extracted, the integrity of the endobag is checked.

Frozen-section analysis is performed. If the tumor is benign, the surgical procedure is stopped; if a borderline ovarian tumor is identified, laparoscopic staging is performed, with infracolic omentectomy and peritoneal biopsy; and if the tumor is malignant, the procedure is converted to laparotomy, enlarging the vertical incision to a xifopubic incision, and comprehensive surgical staging is performed.

All procedures used to prevent port-site metastasis are performed according to the recommendations of Ramirez et al [26], that is, minimize tissue trauma and the number of instrument transfers, rinse the trocars in 5% povidone-iodine before insertion, perform trocar fixation, rinse the tip of instruments in 5% povidone-iodine when interchanging them, resect the tumor with adequate margins, use protective bags to retrieve the tumor, remove all intraabdominal fluid before trocar removal, deflate the abdomen with the trocars in place, irrigate the sites of trocars with 5% povidone-iodine, and close the peritoneal trocar sites (10- to 12-mm trocars).

Hemostasis is achieved via bipolar coagulation. The peritoneal cavity is copiously rinsed with Ringer lactate solution. The fascia and peritoneum are closed at the 10-mm ports. Minilaparotomy when necessary is performed through a vertical skin and fascia incision in the midline or the
supraventricular or paraumbilical region, at the surgeon’s discretion according to the size of the specimen.

The fascia is closed with continuous suture using a delayed absorbable plurifilament suture. A rapidly absorbable subcutaneous suture is used. The skin is closed with simple stitches using nonabsorbable monofilament suture.

Results

The median (range) patient age was 48.5 years (15–81 years), and body mass index, 23.4 (17–35). Eleven patients (50%) were postmenopausal women. Seventeen patients (77%) had undergone previous abdominal surgery. Patient data are given in Table 1.

Median size of adnexal masses was 6 (4–10) cm. Three patients had bilateral suspect ovarian cysts; however, these patients were no longer of childbearing age. Operative data and the distribution of pathologic findings are given in Table 2.

At definitive pathologic analysis, a benign tumor was identified in 18 patients (81.8%). Three patients (13.7%) had ovarian tumors with low malignant potential. Two of these tumors were staged directly because findings at frozen-section analysis were positive, and the third tumor was staged a second time at laparoscopy. In 1 patient (4.5%) with inconclusive findings at frozen-section analysis, epithelial ovarian cancer was identified at definitive pathologic analysis, and laparoscopic comprehensive surgical staging was performed within 17 days after laparoscopy [27]. In this patient, there were no sign of progression of disease compared with previous laparoscopic findings.

Laparoscopic management was successful in all patients. There were no complications related to use of the Veress needle or placement of trocars, and no tumor spillage. In 5 patients (23.6%), minilaparotomy was required for specimen extraction.

Median (range) follow-up of malignant tumors and ovarian tumors with low malignant potential was 27 (21–29) months. No tumor recurrence or port-site metastasis occurred during follow-up. There were no major intraoperative complications. In an 81-year-old patient, a myocardial infarction occurred on day 5 after surgery, 2 days after discharge from the hospital. There were no minor postoperative complications. Operating time was 80 (35–160) minutes, and estimated blood loss was 50 (10–100) mL. Length of postoperative stay was 1 (1–3) day.

Discussion

Since laparoscopy has been proposed for management of suspect adnexal masses [9,10] and for comprehensive surgical staging of early epithelial ovarian cancer [15–25], there have been concerns about the risk of spillage and port-site metastasis, the effects on patient outcome, and the possibility of incomplete tumor staging. The effects of intraoperative capsular rupture on outcome in stage 1 epithelial ovarian cancer have been difficult to elucidate because reports in the published literature conflict and the heterogeneous populations included in these reports lead to flawed conclusions [28–34].

The prognostic value of malignant mass rupture was emphasized by Vergote et al [28] in a review of 6 international databases including 1545 women who underwent laparotomy to treat early ovarian cancer. Even with the inherent potential limitations of a retrospective study, surgical rupture of the tumor was observed to be an independent predictor of disease-free survival.

No prospective comparative data support the existence of increased tumor spillage in women with ovarian cancer managed via laparoscopic techniques, and unequivocal evidence that cyst rupture in early ovarian cancer worsens the prognosis is lacking. In a retrospective 2-institution study, Bakkum-Gamze et al [29] analyzed the importance of intraoperative tumor rupture on prognosis in a uniform cohort with early-stage epithelial ovarian cancer. Those authors concluded that intraoperative capsule rupture would worsen the prognosis of all stage 1 epithelial ovarian malignant tumors and

### Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yr</td>
<td>48.5 (15–81)</td>
</tr>
<tr>
<td>Body mass index</td>
<td>23.4 (17–35)</td>
</tr>
<tr>
<td>Previous abdominal surgery, %</td>
<td>17 of 22 (77)</td>
</tr>
<tr>
<td>Serum CA 125 &gt;35 IU/mL, %</td>
<td>2 of 22 (9)</td>
</tr>
<tr>
<td>Cyst diameter, cm</td>
<td>6 (4–10)</td>
</tr>
<tr>
<td>Menopausal women, %</td>
<td>11 of 22 (50)</td>
</tr>
<tr>
<td>Follow-up, mo</td>
<td>27 (21–29)</td>
</tr>
</tbody>
</table>

* Unless otherwise indicated, data are given as median (range).
that careful removal of an intact cystic mass should be the goal in surgical management of such lesions.

Thus, the possibility of encountering an ovarian malignant tumor during operative laparoscopy is the major concern about the laparoscopic approach to management of ovarian cysts. The literature reports a wide range of spillage rates during laparoscopic management of adnexal masses, from 12% to 25% [30,31]. However, while spillage during laparotomy can be minimized by surrounding the mass with gauze during the procedure, this is not possible with laparoscopy. Moreover, the effects of carbon dioxide pneumoperitoneum in neoplastic cell proliferation [35–38] and its continuous flux in the abdomen could enable spread of neoplastic cells freed by spillage. Canis et al [39] reported pelvic dissemination after a laparoscopic adnexectomy performed using minimal tumor manipulation and a specimen retrieval bag. Two other studies [40,41] reported peritoneal carcinomatosis in patients treated for cervical cancer who underwent laparoscopic lymphadenectomy with positive lymph nodes at microscopy. Mayer et al [42] reported peritoneal implantation of squamous cell carcinoma after rupture during laparoscopic removal of a dermoid cyst subsequently found to contain a squamous cell carcinoma.

Another important issue is management of suspect ovarian masses in childbearing age. In this condition, because of the likelihood of borderline ovarian tumor, a laparoscopic cystectomy could be performed for unilateral cysts smaller than 5 cm with an acceptable risk of spillage [14] while, for ovarian cysts bigger than 5 cm, a laparoscopic adnexectomy should be indicated [14]. If suspect ovarian masses are bilateral, a conservative approach should be deemed and it should be in laparotomic way in order to minimize the spread of tumor and recurrence of the disease [13,14].

To our knowledge, to date, no studies have described a laparoscopic technique to safely perform adnexectomy of suspect ovarian masses that minimizes the risk of spillage or a method to remove from the abdomen an intact specimen to enable accurate evaluation of eventual capsule infiltration. The same retroperitoneal approach that Hudson [43] proposed for laparotomic surgical treatment of fixed ovarian tumors is applied in laparoscopic treatment of adnexal masses. Thus, it is possible to remove the ovaries without manipulating the mass, making safe traction on the peritoneum of the posterior broad ligament, which becomes a sheet under the mass, especially if a firm ovarian cyst or adhesions are present.

It is mandatory that a gynecologic oncologist skilled in laparoscopy perform laparoscopic staging of borderline tumors and that accurate frozen-section analysis is possible. Because postsurgical management of early-stage ovarian cancer depends on its stage, adjuvant chemotherapy is required in patients with FIGO stage IC (all grades), whereas observation is necessary in patients with stage IA, IB, G1, or G2 FIGO stage, and it is crucial that an intact specimen be removed to evaluate capsule infiltration [44].

Herein is described a technique for removing the specimen from the abdomen while preserving the integrity of the specimen. When hysterectomy was not combined with the procedure, the specimen was removed from the abdominal cavity through a minilaparotomy incision. In patients who have previously undergone longitudinal laparotomy or with solid masses larger than 4 cm, the retrieval bag is removed from the abdominal cavity via longitudinal minilaparotomy using the previous incision, aspirating when possible the liquid portion with only a single puncture. In patients with no longitudinal scars, a mass containing fluid or that is solid but smaller than 4 cm in diameter, the umbilical incision can be enlarged longitudinally from the cranial to the caudal border apex to gain about 3 or 4 cm in length. It must be emphasized that laparoscopy in combination with minilaparotomy enables intact extraction of the specimen without morcellation, allowing detailed macroscopic examination without increased morbidity.

In management of a suspect ovarian mass, its size is of primary importance in selecting candidates for a laparoscopic approach because cysts larger than 10 cm have greater malignant potential [45,46] and the risk of spillage increases [47,48]. The last consideration about the correct approach to a large mass is that a cyst that exceeds the capacity of the largest endobag must be punctured before being extracted, with the risk of seeding tumor cells from malignant lesions. Thus, in our opinion, any ovarian cyst larger than 10 cm that requires adnexectomy, especially in postmenopausal women, should be managed using a laparotomic approach.

Inasmuch as the global incidence of unexpected ovarian malignant tumors identified during operative laparoscopy to treat an adnexal mass is approximately 1%, and increases to 3% in postmenopausal women [49], we think laparoscopic adnexectomy is the safest approach, reducing tumor manipulation and leaving the specimen intact until it is extracted from the abdominal cavity.

To guarantee the best prognosis, the correct surgical approach is mandatory. In choosing between laparoscopy or an open procedure, variables that should be considered include operating team experience, availability of accurate frozen-section analysis, and opportunity to perform adequate surgery to treat a cancer if indicated. Careful selection of patients (eg, clinical conditions, age, desire for childbearing, mass size, and patient preference) is of paramount importance to ensure the best outcome.

Adoption of laparoscopic adnexectomy to avert spillage during management of suspect adnexal masses, especially those firmly adherent to the peritoneum, must be validated in a larger series of patients to standardize the technique.

References


