ORIGINAL ARTICLE

Laparoscopy-assisted cystectomy for large adnexal cysts

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Abstract

Objective To evaluate the feasibility and surgical outcome of laparoscopy-assisted surgery for large adnexal cysts.

Methods From January 1998 to October 2007, 46 women underwent laparoscopy-assisted surgery for large adnexal cysts whose maximum diameter were between 10 and 20 cm, radiologic and laboratory features suggestive of benign disease. All the patients had a pre-operative ultrasound with or without computed tomography and CA-125 assessment. Patients' demographics, clinical and ultrasound features, CA-125 values, surgical procedures, operative and post-operative complications, estimated amount of blood loss (EBL), operative time, conversion to laparotomy and the pathological findings were recorded.

Results Forty-six consecutive patients underwent laparoscopy-assisted surgery over 9 years. The mean and range of the patients' age and body mass index were 34.1 ± 6.3 and (21–45) years and 27.4 ± 5.9 and (22–40), respectively. In all the patients, except one with borderline ovarian tumor, laparoscopy-assisted surgery was successful. There were no operative or post-operative complications. The mean and range of the operative time, EBL and hospital stay were 48.4 ± 7.3 and (35–65) min, 55.0 ± 28.9 and (25–150) mL, 1.49 ± 0.50 and (1–3) days, respectively. The mean and range of the extracorporeal cystectomy time were 10.2 ± 2.7 and (8–14) min. The surgical procedures performed were: ovarian and paraovarian cystectomy ($n = 45$), unilateral salpingo-oophorectomy, pelvic-paraaortic lymphadenectomy and omentectomy ($n = 1$). Pathologic findings included serous cystadenoma ($n = 26$), mucinous cystadenoma ($n = 7$), dermoid ($n = 6$), endometriosis ($n = 6$), and borderline ovarian tumor ($n = 1$).

Conclusion Laparoscopy-assisted surgery is feasible and safe for women with large benign adnexal cysts and result s in a short surgery time.

Keywords Large adnexal cysts · Laparoscopy-assisted surgery

Introduction

Initially, gynecological laparoscopy was performed only for diagnostic purposes and sterilization. Nowadays, laparoscopy has been developed into an important component of the operative gynecological palette, since it has been accepted as an alternative to conventional gynecological surgery for many indications.

Adnexal masses constitute a common indication for gynecological surgery. Laparoscopy has been applied to different incidents in the field of gynecology including the removal of adnexial masses. The advantages of laparoscopic surgery include, but not limited to, small incisions, less post-operative pain, short hospital stay, earlier recovery and improved quality of life during the post-operative period.

Several studies [1–3] have attested to the safety of laparoscopic surgery in women with ovarian cysts. However, most of the patients included in these studies had smaller cysts. Several case reports and retrospective studies [4–8] reviewed the feasibility and surgical outcome of laparoscopy applied to large ovarian cysts. However, most patients with large adnexial cysts are still being treated by conventional laparotomy. Presumed limitations of laparoscopic

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surgery in the management of large adnexial cysts include technical difficulty in trocar insertion; visualization as well as removal of the cyst; concern regarding cyst rupture, which might upstage women found to have malignant ovarian neoplasms or cause peritonitis among women with dermoid ovarian cysts; and concern about incomplete surgical staging of women ultimately found to have ovarian cancer.

Starting in 1998, we have performed laparoscopy-assisted surgery for women presenting with large adnexial cysts, which are predicted to be benign. The aim of the current study is to report the feasibility and the surgical outcome of laparoscopy-assisted cystectomy for large adnexial cysts with benign features.

Materials and methods

The current study included 46 patients operated for benign adnexial cystic masses by using laparoscopy-assisted technique between January 1998 and October 2007. All the patients had a pre-operative ultrasound with or without computed tomography and CA-125 assessment. Each patient's body mass index (BMI) was calculated according to the following equation: BMI = weight in kilograms/height in m^2.

Inclusion criteria were age between 18 and 45 years; diameter of the adnexial cysts between 10 and 20 cm; the sonographic and computed tomographic features of the adnexial cysts consistent with benign disease (single unilocular cysts, cysts containing thin septa, normal or elevated CA-125 values cysts if they had features consistent with endometriotic cyst, cysts containing a solid area if they had features consistent with dermoid cyst). Patients were evaluated for their candidacy of laparoscopic surgery; and tolerance to general anesthesia and the Trendelenburg position.

All the surgeries were performed by the first author applying similar techniques. Patients were given informed consent about the laparoscopy-assisted surgery and when mandated, could be converted to laparotomy.

The following patient information was abstracted: age, BMI, pre-operative imaging studies, cyst dimensions, pre-operative CA-125, date of surgery, surgical procedures, estimated amount of blood loss (EBL), conversion to laparotomy and its causes, operative time, operative and post-operative complications, length of hospital stay and long-term follow up.

All the patients had mechanical bowel preparation and received pre-operative antibiotics. Patients without allergy received 1 or 2 g of cefazolin and those allergic to penicillin or cefazolin received 600 or 900 mg of clindamycin depending on their body weight.

The procedure was performed under general anesthesia. Pneumoperitoneum was established using carbon dioxide at pressure settings of 15 mm Hg for patients.

After induction of pneumoperitoneum, a 12-mm trocar was inserted subumblically and laparoscope was connected to a video camera. An uterine manipulator was used for the patients having an experience of sexual intercourse.

On occasions, when mandated by the cyst size, incision for the initial trocar insertion was made in the left subcostal mid-clavicular region. Two trocars were systematically inserted suprapubically: one 10-mm trocar in the midline, which is approximately 3 cm above the symphysis pubis, and the other 5-mm, which is a few centimeters over left lower quadrant, were applied to avoid the epigastric vessels. Each patient underwent insertion of an indwelling Foley catheter. The initial phase of laparoscopy was purely diagnostic. First, the abdominal cavity was inspected thoroughly and the adnexial mass was examined carefully.

Suprapubic trocar was inserted into the cyst and the cyst contents were aspirated by the aspiration canula sent through suprapubic trocar and the content of the cyst was examined (Fig. 1). A grasping forceps, inserted through the 5-mm port site, was used to close the cyst puncture site and minimalize the spillage of cyst contents (Fig. 2).

As the cyst was grossly decompressed, suprapubic trocar incision was enlarged about 2 cm and a ring forceps was introduced through this suprapubic incision. The cyst wall was held by ring forceps and adnex was extracted out of the abdomen (Figs. 3, 4). The inner wall covering the cyst was examined and extracorporeal cystectomy was performed. When there were the intracystic vegetations and the endometriotic cysts with elevated CA-125 values, cysts capsules were sent for frozen section analysis following cystectomy.

Fig. 1 A large ovarian cyst was aspirated by suprapubic port side
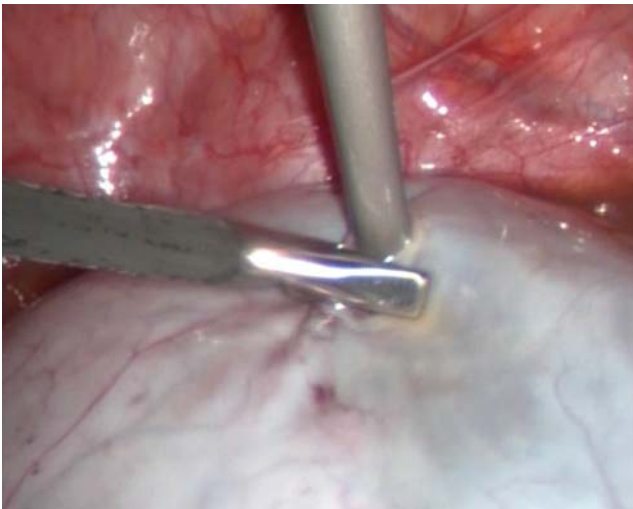
Fig. 2 To minimize the spillage of cyst contents, a grasping forceps inserted through the 5-mm port site have been used to close the cyst puncture site

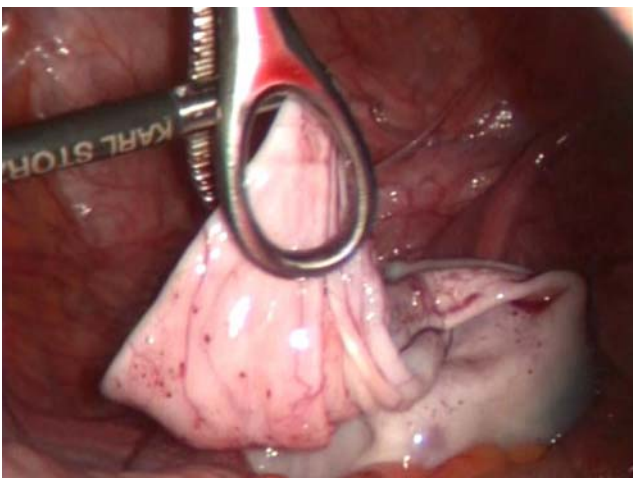**Fig. 4** The adnex was extracted out of abdominal cavity

Fig. 3 A large ovarian cyst following its laparoscopic aspiration was held with a ring forceps inserted through suprapubic incision

After cystectomy was completed, the ovarian cortex or paraovarian peritoneal defect was closed using 4/0 or 5/0 polydioxanone suture material and adnex was relocated into abdominal cavity. Then, cystectomy region was checked for any bleeding.

Results

During the study period, 46 consecutive patients with large adnexial cysts, presumed to be benign, underwent laparoscopy-assisted surgery. Thirteen patients were virgin, 33 were married or had an intercourse before. The mean and range of patients' age were 34.1 ± 6.3, and (21–45) years and the mean and range of patients' BMI were 27.4 ± 5.9 and (22–40) (Table 1).

Table 1 Demographic, clinic and pathologic findings of the patients

Age (years)	
Mean and range	34.1 ± 6.3 and (21–45)
BMI (kg/m^2)	
Mean and range	27.4 ± 5.9 and (22–40)
Diameter of the adnexial cysts (cm)	
Mean and range	12.1 ± 2.8 and (11–20)
Symptoms	
Abdominal or pelvic pain	(54.4%)
Abdominal swelling or bloatedness	(28.2%)
Abnormal vaginal bleeding	(10.9%)
Asymptomatic	(6.5%)
Operative time(min)	
Mean and range	48.4 ± 7.3 and (35–65)
Extracorporeal cystectomy (min)	
Mean and range	10.2 ± 2.7 and (8–14)
EBL (ml)	
Mean and range	55 ± 28.9 and (25–150)
Pathologic findings	
Serous cystadenoma	56.52% (n = 26)
Musinous cystadenoma	15.21% (n = 7)
Dermoid cyst	13.04% (n = 6)
Endometriosis	13.04% (n = 6)
Musinous borderline ovarian tumor	2.17% (n = 1)

The most common presenting symptoms were abdominal or pelvic pain (54.4%), abdominal swelling or bloating (28.2%) and abnormal vaginal bleeding (10.9%). Three patients (6.5%) were asymptomatic and among them the cysts were discovered on imaging studies performed for some other indications (Table 1). All the patients had

transvaginal or transabdominal ultrasounds, and 15 patients had computed tomography of the abdomen and pelvis.

The mean and range of maximum diameter of the adnexial cysts were 12.1 ± 2.8(10–20 cm). Seventeen cysts (47.8%) were unilocular and 9 (15.2%) were septated. Six cysts (13.04%) had an echogenic area thought to be consistent with dermoid cyst. None of the patients had ascites, omental cake or lymphadenopathy in pre-operative imaging studies. Forty-one (89.13%) patients had pre-operative CA-125 values within the normal range (<35 IU/mL). Five (10.87%) patients had elevated CA-125 values (48, 88,107, 185 and 5674 IU/mL, respectively). The latter case was 24 years old and we observed a ruptured endometrioma at laparoscopy, which we presented in 2003 [9].

None of the patients had intraoperative or postoperative complications. Laparoscopic surgery was converted to laparotomy in one patient with musinous borderline tumor. Since frozen section was reported borderline ovarian tumor, we performed unilateral salpingo-oopherectomy, pelvic and paraaortic lymphadenectomy, and omentectomy for surgical staging.

The mean and range of the operative time were 48.4 ± 7.3 and (35–65) min, the mean and range of extracorporeal cystectomy time were 10.2 ± 2.7 and (8–14) min, and the mean and range of the EBL were 55 ± 28.9 and (25–150) mL (Table 1).

The surgical procedures performed included unilateral salpingo-oophorectomy, pelvic and paraaortic lymph node dissection and omentectomy (1), and adnexal cystectomy (45). Additional surgical procedures included lysis of adhesions ($n = 9$) and bipolar cauterization of pelvic endometriosis ($n = 5$).

Among women whom the cyst contents were aspirated and measured, the mean and range volumes of the contents were 1250.5 ± 790.8 and (200–2,900) mL.

The mean and range of the length of hospital stay were 1.5 ± 0.5 and (1–3) days. Twenty-seven patients went home the following day, 17 patients stayed 2 days, 1 patient stayed 3 days. The patient with borderline tumor was discharged in the sixth postoperative day.

The postoperative pathologic findings were presented in Table 1. They were included serous cystadenoma ($n = 26$), mucinous cystadenoma ($n = 7$), dermoid cyst ($n = 6$), endometriotic cyst ($n = 6$), mucinous borderline ovarian tumor ($n = 1$). Long-term follow-up revealed no complications related to the laparoscopic-assisted surgery among any of the patients.

Discussion

The use of laparoscopy in the management of benign adnexal masses has become acceptable by most gynecologists, and the last several decades have witnessed an increasing trend in employing laparoscopic surgery among women with benign adnexal masses. A randomized prospective study [3] comparing laparoscopy and laparotomy in the management of patients with benign ovarian masses less than 10 cm in diameter reported a significant reduction in operative morbidity, postoperative pain and analgesic requirement, hospital stay, and recovery period among women undergoing laparoscopy. However, the experience with laparoscopic surgery as a primary treatment modality for large adnexal masses is still limited. Several authors [4–8] reported their experience with laparoscopic surgery among women with large ovarian cysts; however, the number of patients included in these reports was small. Eltabbakh et al. [10] reported 33 patients with large ovarian cysts underwent laparoscopic treatment. However, they reported that they had performed laparoscopic cystectomy in 2 of 33 cases and mean operation time was about 80 min. Our current study consists of 46 cases and we performed laparoscopy-assisted cystectomy in 45 of these cases and unilateral salpingo-ooferectomy, pelvic paraaortic lymphadenectomy and omentectomy in 1 case.

Laparoscopic ovarian cystectomy is usually performed intracorporeally, this method, in general, requires more longer operative time and can cause more blood loss for large adnexal cysts. Cystectomy and homeostasis comprise a major part of total operative time in the laparoscopic intracorporeal cystectomy. This time is shortened by laparoscopy-assisted extracorporeal cystectomy. In our cases, the mean cystectomy and mean operative time were 10 and 48 min, respectively.

Large adnexal cysts were defined as those with the largest diameter exceeding 10 cm on pre-operative imaging studies similar to the definition of some authors [4, 10].

The major advantage of the laparoscopic treatment of ovarian cysts for women under the age of 35 years is the lower risk of malignancy which is only 4.5 per 100,000 cases [11]. The risk increases to a higher extent for the postmenopausal women. A suspicious malignant tumor following laparoscopic treatment is often diagnosed by means of ultrasound, CA-125, CT or MRI.

We used an infra-umbilical, which is 2 cm below the left costal margin at the level of the midclavicular line for the initial trocar insertion. We did not use open technique. Major concerns regarding laparoscopic surgery among women with larger adnexal masses include, but not limited to rupture of such cysts on introduction of the Veress needle, laparoscopic trocars with spillage of the cyst contents, limited visualization of ureters, extraction of the mass, and malignant potential of such masses.

Spillage of material in cases of benign cystic teratomas or endometriomas can theoretically produce chemical peritonitis. Intraoperative spillage of a musinous cystadenoma may theoretically initiate pseudomyxoma peritonei.

Mage and co-workers [12] have observed no cases of pseudomyxoma peritonei after laparoscopic treatment of musinous cystadenoma. The treatment of the cyst must include careful and copious peritoneal lavage performed immediately, using several liters of normal saline or Ringer's Lactate, with the patient in a reverse Trandelenburg position.

Although it was uncertain whether intraoperative rupture had the same prognostic significance as ovarian surface involvement and/or positive pelvic washings [13], more studies have suggested that intraoperative rupture has not been found to be a predictor of outcome in stage I ovarian cancer [14–16]. In contrast, the prognostic effects of rupture of the capsules with spillage and upstaging of mature cystic teratoma with malignant transformation that are possibly IA to more advanced stages, including IIC or III, remain controversial [17]. Mayer et al. [18] reported that careless intraoperative rupture of the capsule with spillage of the teratoma content would result in upstaging and additional morbidity, and they strongly recommend that aggressive adjuvant therapy be considered.

It is still uncertain and controversial as to whether or not intraoperative rupture of stage-I ovarian cancer truly causes a worse outcome, and whether all these patients should receive adjuvant therapy. If tumor rupture has occurred during ovarian cancer surgery at the laparatomy in our cases we consider as FIGO IC and give adjuvant chemotherapy but we did not encounter any malign case during this study.

In all our cases, cyst rupture and spillage of cyst contents occurred during the cyst aspiration and we inserted a grasping forceps through the 5-mm port site to close the cyst puncture site and tried to minimalize the spillage of the cyst contents. We used a reusable laparoscopic suction–irrigation canula for aspiration of the cyst contents. Especially for women with dermoid or endometriotic cysts, we performed copious irrigation and aspiration with 1–3 L of normal saline. We did not encounter any chemical peritonitis.

Theoretically, removing the cyst through a puncture site could lead to a surviving ovarian remnant in the abdominal wall. Nezhat and co-workers [19] have not observed this phenomenon in their 1–3 years follow-up in the patients who underwent this technique of the cyst wall removal. A metastatic tumor has been reported in three cases on the anterior abdominal wall at the trocar side, following biopsy of ovarian cancer [20]. We had one case with borderline tumor and did not encounter any ovarian remnant on the abdominal wall during the follow-up period of 2 years.

Selection of patients for laparoscopic treatment can be accomplished successfully by excluding those with elevated CA-125 levels, suspect ultrasound appearances of cyst containing >3-mm thick septations, solid components within a cyst, matted loops of bowel, or ascites. In the current study, we did not include the patients with elevated CA-125 values except endometriomas. Large series demonstrated a reassuringly low incidence of inadvertently encountered malignancy at laparoscopy (0.4–1.2%) [12, 21], but intraoperative surveillance and numerous biopsies are necessary if unsuspected cancer is to be correctly diagnosed.

It is generally agreed that ovarian cancer should not be managed laparoscopically. A French retrospective multicenter study did not suggest any difference in outcome after laparoscopic management of ovarian cancers, although staging was suboptimal in a significant number of laparoscopically-managed cases [22]. In addition, one recent paper has mentioned the use of hand-assisted laparoscopy in the surgical management of ovarian cancer [23].

The hospital stay is considerably shorter for the laparoscopic surgery. In the beginning of this study, we had generally discharged the patients on the second day following the treatment; later we discharged them on the first postoperative day.

In the current study, we did not set any upper limit of BMI for laparoscopic surgery. It is possible that, for experienced laparoscopic surgeons and for some women with high BMI and certain body habitus, laparoscopic surgery could be safe and feasible. For the morbidly obese patients, laparoscopic surgery has the potential advantages of early ambulation and recovery, decreased chance of wound infection and incisional hernias.

In general, borderline ovarian tumors are treated surgically. The indication of laparoscopic surgery, including management of the primary tumor, conservative or radical management of the uterus and contralateral adnexia, and peritoneal staging, has been gaining gradual acceptance. Provided that the standards of surgical oncology are met, and that no large mass is present, long-term results are similar after laparoscopic surgery compared to laparotomy [24, 25].

We switched to laparatomy for only one patient, who is 27-year-old and had three children, according to frozen tissue result which was reported as borderline ovarian tumor. We performed unilateral salpingo-oopherectomy, pelvic and paraaortic lymph node dissection, and omentectomy for surgical staging. We have not performed pelvic and paraaortic lymph node dissection for borderline ovarian tumor since 2003. In this case, the cyst was uniocular and pre-operative CA-125 values were normal range.

In our study, nine cases were sent for frozen section analysis. Of nine patients, five had endometriotic cyst with elevated CA-125 levels. In the remaining four cases, there were intracystic vegetations. Borderline tumor was reported in one patient and rest of them was reported as benign.

Ultrasound might be limited in visualizing the entire cyst contents in some obese and virgin patients with

adnexal cysts. Computed tomography especially might be of value in diagnosing dermoid ovarian cysts in these individuals. In our cases, 15 patients had computed tomography of the abdomen and pelvis.

In 2002, the Society of Gynecologic Oncologists and the American College of Obstetricians and Gynecologists have published referral guidelines to gynecologic oncologists among women with pelvic masses [26]. Imaging studies especially transvaginal ultrasound are more reliable for selecting patients for laparoscopic surgery. The ultrasound morphology of adnexal masses is more dependable than pre-operative CA-125 values, especially in the young patients. The patient with the highest CA-125 value (5,674 U/mL) had an ultrasonographic appearance of endometriotic cyst and we detected a ruptured ovarian endometrioma during the laparoscopy [9].

According to the present study, laparoscopy-assisted cystectomy for the benign large adnexal cysts is a safe and effective technique, taking very short time. Our results suggest that this technique can be used for patients with large adnexal cysts, with relatively lower risk of complications and side effects.

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