Research Article

Laparoscopy Versus Laparotomy for The Staging of Early Stage Ovarian Cancer: Surgical Outcomes

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Abstract

Background: There is no evidence-based data evaluating the profits and harms of laparoscopy for the surgical treatment of early stage ovarian cancer. Objective: To compare the surgical and oncological outcomes between laparoscopy and laparotomy staging for early-stage ovarian cancer. Methods: This case-control study consisted of 15 women undergoing comprehensive laparoscopic surgical staging (LPS group) for apparently EOC. The control group included 15 women who underwent surgical staging by traditional open laparotomy (LPT group). Demographic data, detailed surgical procedures data, and all intra and postoperative details were documented and compared in between both groups. Results: Our results showed no difference in the basic patients characteristics and preoperative variables in between both groups. Operative time was significantly longer (P=0.005), and the amount of blood loss was higher in the LPT group (P=0.025). Intraoperative rupture of the ovarian mass happened in 3 (20%) cases in the LPS group and in 2 (13.3%) cases in the LPT group (P=0.531). Conversion to laparotomy has been done in 2 cases (13.3%). There was no other reported intraoperative complication in the LPS group. Following the procedure, the time needed for initiation of diet was nearly equal (P=0.457). While, the time needed for drain removal and the mean hospital stay were longer in the LPT group compared with the LPS group (P=0.048 and <0.001 respectively). Limitation: small sample size and lack of follow-up period. Conclusion: In early stage ovarian cancer, laparoscopic staging achieved by a well-trained, skilled surgeon has comparable surgical outcomes to laparotomy.

Keywords: Laparoscopy; Laparotomy; Ovarian cancer; Staging

1. Introduction

Ovarian cancer is responsible for about half the deaths from gynecological cancer, mostly due to its late presentation. Few patients are identified with early stage disease [1]. About 30% of patients with apparently early

stage ovarian cancer in fact port microscopic metastatic disease [2]. Disease upstaging has a major role in the indications for adjuvant therapy that may improve disease-free and overall survival [3].

Surgical comprehensive staging is the traditional approach for ovarian cancer including total abdominal hysterectomy, bilateral salpingo-oophorectomy, peritoneal washing, multiple biopsies of the peritoneal surface, omentectomy, and pelvic and paraaortic lymphadenectomy. Surgical staging of early ovarian cancer via laparoscopic approach was first described in the mid-1990s [4]. Since that time, only few case series or retrospective studies addressing the feasibility and safety of this approach in the staging of apparently early ovarian cancer have been published [5–9].

Even though 2 Cochrane databases were published to evaluate the profits and harms of laparoscopy for the surgical treatment of early stage ovarian cancer, they have not given high-quality evidence, and the subject remains unclear [10, 11]. In this study, we aimed to compare the surgical and oncological outcomes between laparoscopy and laparotomy staging for early-stage ovarian cancer.

2. Patients and Methods

This case-control study included 30 female patients consecutively diagnosed (laboratory and radiologically) with apparently early onset (stage I) ovarian cancer. Fifteen cases have been subjected to comprehensive surgical staging via laparoscopy (LPS Group) and then compared to the remaining fifteen cases who have been staged via classical open laparotomy (LPT Group).

Early stage ovarian cancer was identified radiologically as ovarian mass limited to one or both ovaries without evidence of intraperitoneal spread (stage I FIGO classification) with or without elevated CA-125. All histologic types of ovarian cancers were included. Any evidence for disease spreads beyond the ovaries was considered as exclusion criterion. All patients signed a written informed consent describing therapeutic options, procedure risks, possibility for bowel resection and likelihood of laparotomy conversion in LPS group. All cases were managed by the same surgeon. Demographic data, detailed surgical procedures data, and all intra and postoperative details were documented and compared in between both groups. All subjects received a single dose of prophylactic antibiotic 1 h before the intervention and prophylactic subcutaneous low-molecular-weight heparin as an anti-thrombotic agent for 3 weeks before procedure.

3. Surgical Techniques

Laparotomy was achieved in all patients via midline longitudinal incision. In laparoscopic staging, a 10- mm 0^{o} laparoscope was introduced at the umbilical site after pneumoperitoneum. Under direct vision, 3 ancillary trocars were placed: one 12-mm suprapubic trocar for removal of the retrieved lymph nodes and two 5-mm trocars at the lower abdomen lateral to the epigastric arteries. After employing this 4-trocar system, sterile saline solution was introduced for peritoneal washing and the aspirated liquid was sent for cytologic examination. Parietal and visceral peritoneal surfaces including the diaphragm, liver, gallbladder, small bowel and mesentery, rectosigmoid colon,

pouch of Douglas, paracolic gutters, and abdominal wall were cautiously examined then pelvic procedures including hysterectomy, bilateral salpingo-oophorectomy, and pelvic lymphadenectomy were completed. The surgical specimens were removed in all subjects via the umbilicus, as previously designated [12]. Bilateral pelvic lymphadenectomy was done as previously defined [13] in which external iliac, internal iliac and obturator lymph nodes were removed in all cases. To perform para-aortic lymphadenectomy and omentectomy, the laparoscope was moved and placed on the 12-mm suprapubic trocar, and an added pair of 5-mm trocars was introduced 2 cm inferior to the costal margin and directly medial to the left and right midclavicular line.

In laparotomy, after careful inspection of organs, the peritoneum and organs in the abdomen and pelvis were palpated as well. In laparoscopic surgery, apart from the usage of LigaSure (Covidien, Boulder, CO, USA) for para-aortic lymphadenectomy, other procedures were achieved with conventional instruments such as a suction and irrigation device, monopolar scissors, straight forceps, and a bipolar electrocoagulator. The removed lymph nodes were extracted using an Endo-pouch. To minimize the risk of port site metastasis, the incision sites were irrigated with large quantities of saline after trocars removal. Studied surgical outcomes included surgical findings, operative time, assessed blood loss, and perioperative complications.

Intraoperative mass rupture was considered in case of intentional or unintentional mass rupture with spill of cyst contents into the peritoneal cavity. On the contrary, if a mass has been intentionally drained with its collection bag to facilitate its removal without a peritoneal spill, this mass was not reported as ruptured. Active bleeding with hemoglobin <8 g/dL was considered as a measure for blood transfusion. Postoperative complications included any side effects occurring within 30 days of procedure as a result of the technique. Hospital stay was calculated from the first postoperative day.

In both groups, postoperative management was similar as regards diet resumption and antibiotic use. Cases were permitted to drink water after they passed gas from the bowel, then a liquid, soft, and normal regular diet was specified daily until the patients had no gastrointestinal symptoms complaints. Early ambulation was encouraged.

4. Statistical Analysis

Statistical analyses were performed by using the SPSS version 18.0 (SPSS Inc., Chicago, IL, USA) statistical software package. Comparison between both groups was done using Student t-test for continuous variables and 2-tailed chi-square test for categorical variables. P-value <0.05 was considered statistically significant.

5. Results

This case-control study consisted of 15 women undergoing comprehensive laparoscopic surgical staging for apparently EOC. The control group included 15 women who underwent surgical staging by traditional open laparotomy. Our results showed no difference in the basic patients characteristics and preoperative variables between the two groups. There was no significant difference in the mean age, BMI, nulliparity, and preoperative CA-125 levels (Table 1). Reported histological types, tumor site, size, grading and staging were shown in Table 2.

All cases underwent a complete comprehensive staging. Stage II disease was identified in 3 cases in the LPS group (20%) and 4 cases in the LPT group (26.6%).

	LPS group (n=15)	**LPT group (n=15)**	**P value**
Age/years (range, mean±SD)	43.47±14.559	44.2±13.305	0.887
BMI (kg/m^2) (range, mean±SD)	26.12±2.275	25.96±2.023	0.840
Nulliparous (n,%)	5/15 (33.3%)	4/15 (26.7%)	0.690
Preoperative CA125 (IU/ml) (median, range)	76 (5-7760)	58 (6-5890)	0.078

LPS: laparoscopic; LPT: laparotomy; n: number; SD: standard deviation; CA125: cancer antigen125

Table 1: Patients characteristics.

	LPS group (n=15)	**LPT group (n=15)**	**P value**
Histological type (n,%)			
Serous	9/15 (60)	10/15 (66.7)	0.723
Endometroid	2/15 (13.3)	2/15 (13.3)	
Mucinous	2/15 (13.3)	2/15 (13.3)	
Germ cell	2/15 (13.3)	1/15 (6.7)	
Tumor site (n,%)			
Right ovary	7/15 (46.7)	6/15 (40)	0.871
Left ovary	6/15 (40)	6/15 (40)	
Both ovaries	2/15 (13.3)	3/15 (20)	
Tumor size /cm	5.31±1.672	5.73±1.391	0.468
Tumor grade (n,%)			
G1	5/15 (33.3)	5/15 (33.3)	
G2	5/15 (33.3)	3/15 (20)	
G3	5/15 (33.3)	7/15 (46.7)	
Tumor stage (n,%)			
IA	8/15 (53.3)	6/15 (40)	0.723
IB	1/15 (6.7)	1/15 (6.7)	
IC	3/15 (20)	4/15 (26.7)	
II	3/15 (20)	4/15 (26.7)	

LPS: laparoscopic; LPT: laparotomy; n: number

Table 2: Histological types, tumor site, size, grading and stage after comprehensive surgical staging.

Intra- and postoperative details were shown in Table 3. The mean number of retrieved lymph nodes was nearly equal in both groups (P=1). In this study, operative time was significantly longer (P=0.005), and the amount of blood loss

was higher in the LPT group (P=0.025). Intraoperative rupture of the ovarian mass happened in 3 (20%) cases in the LPS group and in 2 (13.3%) cases in the LPT group (P=0.531). Conversion to laparotomy has been done in 2 cases (13.3%). There was no other reported intraoperative complication in the LPS group. While, in the LPT group 3 (20%) cases required intraoperative blood transfusion. Our data revealed no major postoperative complications in the LPT group. Our results revealed minor postoperative complications in 3 (20%) case in the LPS group (mild lymphedema of the left leg), and in 8 (53.3%) cases in the LPT group (P=0.058). Minor postoperative complications in the LPT group included: urinary tract infection (20%, N=3), ileus (13.3%, N=2), and wound infection (13.3%, N=3).

	LPS group (n=15)	**LPT group (n=15)**	**P value**
Operative time /hour (mean±SD)	2.8±1.775	3.13±1.356	0.005
Blood loss /ml (range, mean±SD)	326.67±282.759	563.33±263.538	0.025
Blood transfusion (n,%)	0/15 (0)	3/15 (20)	0.283
Removed lymph nodes (n,%)	20.87±15.514	20.87±15.066	1
Intraoperative mass rupture (n,%)	3 (20)	2 (13.3)	0.531
Postoperative complications (n,%)	3/15 (20)	8/15 (53.3)	0.058
Time needed for diet resumption /days (mean±SD)	4±1.5	3.8±1.2	0.457
Time needed for drain removal /days (mean±SD)	5.1±1.886	7.1±1.586	0.048
Hospital stay /days (mean±SD)	5.13±2.386	9.4±3.418	<0.001

LPS: laparoscopic; LPT: laparotomy; n: number; SD: standard deviation

Table 3: Intra- and postoperative details.

Following the procedure, the time needed for initiation of diet was nearly equal (P=0.457). While, the time needed for drain removal and the mean hospital stay were longer in the LPT group compared with the LPS group (P=0.048 and <0.001 respectively).

6. Discussion

Our results exposed the feasibility and safety of laparoscopic surgery for the management of early ovarian cancer with quite similar surgical outcomes compared to the classic laparotomy procedures. Our results revealed no significant difference as regards histological types of the tumours detected, the tumor site, size, grading and staging after comprehensive surgical staging via both modalities. Minimally invasive surgery has become the trend in surgical techniques even in the oncology field [14]. Laparoscopic surgery has been studied many times and revealing better results compared to laparotomy procedures in early-stage ovarian cancer [15-17]. Ovarian cancer may be associated with metastasis throughout the peritoneum, and this makes the laparoscopy a challenging tool in these cases. Using the laparoscope, surgeons miss the tactile sensation needed for proper detection of any metastasis in the peritoneal cavity [14].

Lee et al. [15] reported reduced blood loss, lower postoperative pain, shorter hospital stay with early diet resumption with laparoscopic staging compared to laparotomy in early-stage ovarian cancer. On the contrary, increased risks of

intraoperative tumor rupture, trocar-site metastasis, and reduced surgical accuracy have been related to the laparoscopic procedure. Romagnolo et al. [18] reported increased risk of tumor rupture in their patients underoing laparoscopic surgery when compared to the laparotomy group, however, they related this increased incidence to the higher portion of cystectomies done in this group. Tumor rupture during laparoscopy may be related to the surgical technique used. In our study there was no significant difference as regards the occurrence of intraoperative rupture of the ovarian mass that occurred in 3 (20%) cases from the LPS group and in 2 (13.3%) cases from the LPT group. Tumor rupture can be prevented by improving the surgeon's surgical skills [14]. Some authors reported also higher incidence of port-site metastasis [19, 20], but this was related only to advanced cancer stages. On the other hand, other studies showed no cases of port-site metastasis using the laparoscopic technique [15, 16, 21].

As regards the mean number of LNs, the current study revealed no significant difference in the mean number of detected LNs in between both groups. This was comparable to another study that reported the mean number of pelvic and para-aortic nodes as 14 and 12, respectively, they also reported with low rates of complication in their patients with early ovarian and fallopian tube cancers, mentioning that laparoscopic staging was feasible and comprehensive [22]. However, they did not compare their results with laparotomy staging. Another study revealed similar number of obtained LNS via laparoscopic or laparotomy approach even with a shorter operative time [17]. Our study also revealed shorter time following the laparoscopic approach. Moreover, blood loss was significantly less via the laparoscopic approach. This can be explained by the laparoscopic surgical skills experience we have in theses cases.

In the current work, conversion to laparotomy has been performed in 2 cases (13.3%). This was comparable to another study done in 2006 reporting that surgery was converted from laparoscopy to laparotomy in 12.4% of their cases [18]. In our study, few insignificant postoperative complications have been found in both groups, revealing the feasibility and safety of both modalities in staging of early ovarian cancer. Although laparoscopic surgery can deliver better visualization and intensification of small lesions, it still has some limitations in its access to some dangerous areas such as the unseen space in the folded intestine, the porta hepatis, hepatophrenic ligament, lesser sac, and splenophrenic ligament. Consequently, early stage of ovarian cancer detected by laparoscopy might be upstaged after laparotomy in some patients [14]. Following the procedure, the time needed for drain removal and the mean hospital stay time were significantly shorter in the LPS group, highlighting the preferability of this approach if we have a well-trained surgeon and the availability to perform this approach to save time and effort.

7. Conclusion

As a conclusion, the up-to-date literature lacks the essential power to state that both laparoscopy and laparotomy surgery are equivalent in terms of surgical feasibility/safety owing to the limitation of the retrospective study design and small sample size in most of the work done. Our study suggests that in early stage ovarian cancer, laparoscopic staging achieved by a well-trained, skilled surgeon has at least comparable surgical outcomes to laparotomy. More prospective randomized studies are essential to settle the feasibility and safety of laparoscopic surgery and to state the proper indication for laparoscopy as a treatment for ovarian cancer.

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