

Feasibility and ability of laparoscopy to predict respectability in ovarian cancer: A cohort study

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Abstract

Background: Ovarian cancer is one of the deadliest cancers, as it is the seventh most prevalent type of cancer in women worldwide.

Objectives: This study aimed to assess the feasibility and efficacy of diagnostic laparoscopy in predicting optimum respectability in ovarian cancer cases.

Patients and methods: it was a prospective cohort study, including 38 ovarian cancer cases. The duration of the study ranged from 6-24 months. A receiver-operating characteristic (ROC) curve was constructed to assess the diagnostic ability of laparoscopy. Overall survival (OS), disease-free survival (DFS), and recurrence-free survival (RFS) were calculated using the Kaplan-Meier method.

Results: of the studied patients, 30 (78.9%) were diagnosed with stage III, and 6.5% of surgically resectable cases were found to be unresectable at laparoscopy, with a 93.5% true positive. To assess resectability, the diagnostic utility revealed that laparoscopy had 93.6% sensitivity, 100% specificity, 77.8% NPV, and 100% PPV with an accuracy of 94.7%. Serous cystadenocarcinoma was the most common histopathology type in 24(63.15%) patients. The OS during the observation period was 26.8 months \pm 1.1 (CI: 24.6–29.0). The estimated DFS was 9.15 months for all patients, 10 months for 25% of patients, and 8 months for 75% of patients. The RFS was 9.56 months.

Conclusion: Diagnostic laparoscopy has effective feasibility and great efficacy when added to the conventional initial diagnostic workup in predicting optimum resectability of ovarian cancer.

Keywords: Laparoscopy; Adjuvant chemotherapy; Ovarian neoplasms; Ovarian pathology; Ovarian surgery.

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Introduction

Ovarian cancer claims the lives of approximately 140,000 women each year, out of more than 225,000 women who are diagnosed with the disease each year (Jemal et al., 2011). The American Cancer Society ranks ovarian cancer as the sixth-largest cause of mortality from cancer (Siegel et al., 2015). Ovarian cancer is the fourth most common type of cancer in Egyptian women, accounting for 4.5 percent of all cancer cases (Ibrahim and Mikhail, 2010). The majority of ovarian cancers, 90 to 95 percent, are epithelial (Quirk and Natarajan, 2005).

About two-thirds of patients will be diagnosed with stage III-IV illness, and the most beneficial outcomes can be achieved with sequenced multimodality therapy (Earle et al., 2006). In most cases, transvaginal sonography is the most helpful imaging technique for distinguishing between benign tumors and early stages of ovarian cancer. Other imaging modalities include computed tomography, which plays an important part in the treatment planning process for women who have advanced ovarian cancer, particularly if upper abdominal organs are affected. This helps to guide surgical cytoreduction, or it can demonstrate that the disease is manifestly unrestorable. Magnetic resonance imaging (often known as MRI) and ultrasound are two more important types of imaging modalities (Suidan, 2014). The findings of a randomized phase III study conducted on 634 individuals with stage IIIc, or IV epithelial ovarian cancer were reported by Vergote et al. (1998). A significant number of these patients had severe upper abdominal illnesses. According to the findings of that trial, neoadjuvant chemotherapy followed by interval debulking was no less effective than primary cytoreductive surgery.

The purpose of this research was to investigate the capability of diagnostic laparoscopy to accurately predict the degree of ovarian cancer after complete surgical debulking. To assess perioperative complications, overall survival

(survival until death from any cause) after primary debulking or interval debulking surgery, disease-free survival (DFS), and recurrence-free survival (RFS).

Patients and methods

This was a prospective study carried out in the obstetrics and gynecology department, a tertiary care center, at South Valley University hospitals. Qena, Egypt.

This study included 38 patients out of 53 who attended outpatient clinics at Qena University Hospital with an ovarian mass and met the inclusion criteria between February 2020 and December 2021.

Inclusion criteria: a case with a suspected malignant ovarian mass either by international ovarian tumor analysis (IOTA) group criteria, which include irregular solid tumors, presence of ascites, at least four papillary structures, and very strong blood flow by color Doppler, computed tomography, and magnetic resonance imaging (MRI).

Exclusion criteria: Patients with an advanced stage of ovarian carcinoma in a previous exploration and complete resectability is impossible; patients with a huge ovarian mass filling the abdomen; patients in whom laparoscopy may be contraindicated due to medical comorbidities as decided by the medical team; and patients with multiple extensive abdominal surgeries.

All cases were subjected to the following:

Complete history, including the duration of symptoms, a history of previous surgeries, and any medical problems that may be present.

Examinations including general, abdominal, and vaginal examinations, are performed.

Laboratory investigations: Routine laboratory investigations include CBC, liver function, kidney functions, electrolytes, random blood sugar, and tumor markers like CA 125, CA 19-9, HCG, LDH, and alpha-fetoprotein, as well as pathological assessment of the tumor histopathological types.

Other investigations: computed tomography (CT) scan, MRI, lower gastrointestinal endoscopy, and upper endoscopy if indicated.

The procedure: The same gynecologic oncology team was responsible for performing all of the procedures, and the same radiologist evaluated the MRI and CT scans. Through conventional laparoscopic entry. KARL-STORZ (G16/scope rigid 11) laparoscopy (Tuttlingen, Germany) was used. During the procedure, the patient was placed in a lithotomy or dorsal position, and standard sterilization techniques were utilized. General anesthesia was administered. Patients were examined carefully under anesthesia to assess the mass and to choose the optimum way of entry, considering both preoperative investigation and examination under anesthesia.

During laparoscopy, the Fagotti score was assessed as described by **Fagotti et al.(2005)**. This score was based on the evaluation of seven parameters: omental cake, peritoneal carcinomatosis, diaphragmatic carcinomatosis, mesenteric retraction, stomach infiltration, bowel infiltration, and liver metastases. Each parameter is valued at 0 if absent or 2 if present. The total value is between 0 and 14. A value above or equal to 8 is related to suboptimal surgery.

Ethical approval code (SVU MED OBG024 2020 2 24)

Dealing with data and data dissemination was confidential. Women were informed by a statement describing the study protocol. All women signed a written informed consent before starting the study, with counseling about the risk and benefits of the study. The proposal was carried out by highly qualified and trained personnel. The ethical committee of the Faculty of Medicine at South Valley University reviewed and approved the proposal.

Statistical analysis

Qualitative variables were recorded as frequencies and percentages and compared by the chi-square test. The quantitative measure was presented as mean and standard deviation (SD) and compared by a student t-test. The receiver-operating characteristic (ROC) curve was constructed to assess the diagnostic ability of laparoscopy to assess surgical resectability. Overall survival and disease-free survival (DFS) were calculated using the Kaplan-Meier method. All significance tests were two-sided; *P* values less than 0.05 were considered statistically significant. All analyses were conducted using the Statistical Package for Social Sciences (SPSS) software program (version 23).

Results

Table 1. Demographic data of the studied ovarian cancer patients.

Variables	N(%)
Age (years)Mean ± SD	55.02 ± 17.18
Range	19 – 75
19 – 40 years	6 (15.8%)
41 – 60 years	11 (28.9%)
> 60 years	21 (55.3%)
ParityMean ± SD	5.63 ± 1.86
Nullipara	9 (23.7%)
1 – 3	18 (47.4%)
≥ 4	11 (28.9%)
BMI (kg/m²)Mean ± SD	24.11 ± 2.78
21 – 25 kg/m²	11 (28.9%)
26 – 30 kg/m²	19 (50%)
> 30 kg/m²	8 (21.1%)

Table (1) shows that age of the study population ranged from 19 – 75 years with and (57.9%) of

them were post-menopause. Mean parity was 5.63 ± 1.86, and mean BMI was 24.11 ± 2.78 kg/m².

Table 2. Social data distribution of the studied patients.

Variables	N(%)
Marital status	
Married	23 (60.5%)
Virgin	2 (5.26%)
Widow	10 (26.31)
Divorced	3 (7.89)
Socioeconomic status	
Low	13 (34.2%)
Moderate	18 (47.4%)
High	7 (18.4%)

Table (2) This table shows that (60.5%) of patients were married. (5.26%) were virgins and 47.4% of the patients had moderate socioeconomic status and 18.4% were high.

Table 3. Number of patients in every stage of cancer ovary

Variables	N(%)
Stage I	1 (2.6%)
Stage II	2 (5.2%)
Stage III	30 (78.9%)
Stage IV	5 (13.15%)

Table (3) shows that 78.9% were diagnosed at stage III of the disease.

Table 4. Radiological findings among the studied ovarian cancer patients.

Variables	N(%)
Bilaterality	29 (76.31 %)
Ascites	24 (63.2 %)
Consistency	
Solid	18 (47.4 %)
Cystic	9 (23.7 %)
Mixed	11 (28.9 %)

Table (4) 76.31% of the patients had bilateral tumors and 63.2% of the patients presented with ascites. Meanwhile 47.4% of the patients showed solid tumors and 23.7% showed cystic.

Table 5. Histopathology data among the studied ovarian cancer patients

Variables	N(%)
Endodermal sinus tumor	2 (5.3%)
Lymphoma	1 (2.6%)
Mucinous cystadenocarcinoma	10 (26.3%)
Primary peritoneal carcinoma	1 (2.6%)
Serous cystadenocarcinoma	24 (63.51%)

Table (5) The major finding was serous cystadenocarcinoma (63.51%) followed by mucinous cystadenocarcinoma (26.3%).

Table 6. Histopathology data concerning the stage of cancer ovary

N(%)	I	II	III	IV
Serous cystadenocarcinoma		2 (5.3 %)	20(52.6 %)	2 (5.3 %)
Mucinous cystadenocarcinoma			8(20.05 %)	2 (5.3 %)
Endodermal sinus tumor			2 (5.3 %)	
Lymphoma	1 (2.6 %)			
Primary peritoneal carcinoma				1 (2.6 %)
Total	1 (2.6 %)	2 (5.3 %)	30(78.9 %)	5(13.2 %)

Table (6) shows that (52.6%) of serous cystadenocarcinoma patients were diagnosed at stage III.

Table 7. Fagotti scoring of the studied ovarian cancer patients

Fagotti scoring	N (%)
Resectable:	29 (76.3%)
Score (0-4)	12 (31.57%)
Score (5-7)	17 (44.73%)
Non-resectable	9 (23.7%)
Score (8-10)	9 (23.7%)

Table (7) 29 (76.3%) patients had resectable tumor and 9 (23.7%) had non-resectable tumor.

Table 8. Comparison of laparoscopy to assess surgical resectability of ovarian cancer

Laparoscopy	Surgery				Total	*P-value
	Resectable (n=31)		Unresectable (n=7)			
	N	%	N	%		
Resectable	29	93.5%	0	--	29 (76.3%)	0.001
Unresectable	2	6.5%	7	100%	9 (23.7%)	
Total	31	100%	7	100%	17	

***Chi-square test**

Table (8) In the studied patients, 6.5% of resectable by surgery found to be unresectable at laparoscopy with true positive was 93.5%

Table (9):Laparoscopy diagnostic value to assess surgical resectability of ovarian cancer

*Statistics parameters	Value	95% CI
Sensitivity	93.55%	78.58% - 99.21%
Specificity	100%	59.04% - 100%
Positive Predictive Value (PPV)	100%	---
Negative Predictive Value (NPV)	77.78%	47.81% - 93.04%
Accuracy	94.74%	82.25% - 99.36%

***ROC curve analysis.**

Table (9) The laparoscopy sensitivity was 93.6%, specificity was 100%, NPV was 77.8% and PPV was 100% with accuracy of 94.7% to assess respectability

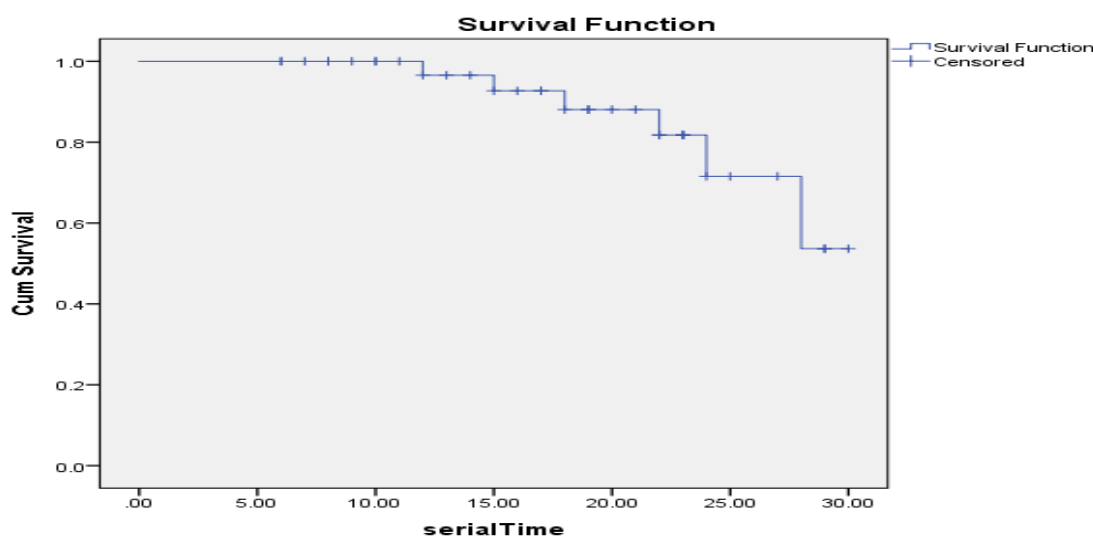


Fig.1. Overall survival curve by Kaplan Meier method

The mean survival during the observation period for the patients was 26.8 months ±1.1 (CI: 24.6 – 29.0)

Table 10. Disease-free survival (DFS)

Mean			25% percentiles median		75% percentiles median	
Estimate	S.E.	95% Confidence Interval	Estimate	S.E.	Estimate	S.E.
9.154	0.517	8.141 - 10.167	10	0.760	8	0.449

This table shows that the estimated DFS was 9.15 months for all patients, 10 months for 25% of patients, and 8 months for 75% of patients.

Table 11. Recurrence-Free Survival (RFS)

Mean	Std. Error	95% Confidence Interval
9.569	0.989	7.631 - 11.507

This table shows that RFS was 9.56 months.

Discussion

Currently, available examples of non-invasive diagnostic methods include the following: a physical examination, an abdominal computed tomography (CT), an ultrasound, and the measurement of blood tumour markers such as CA125 and carcinoembryonic antigen. These methods do not properly predict whether surgery will be successful. There is a pressing need for more precise prognostication, which appears to be attainable with diagnostic laparoscopy performed before surgical intervention (**Engbersen et al., 2021**).

The study included 38 cases of ovarian cancer with a mean age of 55.02 ± 17.18 years, ranging from 19-75 years, and 57.9% of them were post-menopause. The mean parity was 5.63 ± 1.86 and the mean BMI was 24.11 ± 2.78 kg/m². 60.5% were married and 39.5% were single, while 47.4% of the patients had moderate socioeconomic status and 18.4% had high socioeconomic status. Our results were supported by the study of **Moro et al.(2021)**. They revealed that the age at diagnosis ranged from 25 to 76 years, with the median age being 59, and that 37(75.5 %) were postmenopausal, with an average BMI of 25 kg/m². In the study of **Chesnais et al.(2017)**, the mean age of their involved cases was 59.3 ± 13.5 years, with a mean BMI of 25.4 ± 6.3 . The mean parity was 1.6 ± 1.4 .

The current study showed that 63.2% of the patients had bilateral tumors and 52.6% of the patients presented with ascites. Meanwhile, 47.4%

of the patients showed solid tumors and 23.7% showed cystic masses. Our findings were in line with **Moro et al.(2021)**.

Ascites was present in 37(75.5%) patients, and a pelvic mass was observed in 46(93.9%) of those patients. Based on what they discovered, the percentage of patients with both conditions is as follows: The majority of these masses 33(71.1%) had a solid morphology, 29(63%) were bilateral, and 34(73.9%) were moderately or abundantly vascularized.

In our study regarding histopathology, the major finding (63.15%) was serous cystadenocarcinoma of which 20(52.6%) were at stage III, followed by mucinous cystadenocarcinoma (26.3%), of those patients 8(20.05%) were stage III. The study by **Wentzensen et al.(2016)** found 378 cases of serous carcinoma, 606 cases of endometrioid carcinoma, 331 cases of mucinous carcinoma, and 269 cases of clear cell carcinoma. Furthermore, **Petrillo et al.(2015)** found that 86.7 percent had FIGO Stage IIIc and 82.5 percent had epithelial ovarian cancer. In our study, 78.9% of patients had FIGO stage III. In addition, **Rutten et al.(2017)** demonstrated that adenocarcinoma of the ovary, tubes, or peritoneum was found in 174(87 %) of the 201 patients, with serous adenocarcinoma being present in the majority of the cases. This was proved by the fact that the final pathology showed adenocarcinoma in 174 of the 201 patients, which is an 87% success rate. In addition, **Kim et al.(2021)** revealed that the

predominant histological subtype of the tumors, was high-grade serous carcinoma.

The present study showed that 29(76.3%) of patients had a resectable tumour and 9(23.7%) had a unresectable tumor. All cases of unresectable tumors had adjuvant chemotherapy. Furthermore, 3 of them had surgery after 5 cycles of platinum-based chemotherapy. Recurrence occurred in 10 (26.3%) cases, and 7(18.4%) underwent another surgery.

In the study by **Petrillo et al.(2015)**, the surgical procedures performed on the 135 women receiving complete primary debulking surgery included pelvic and abdominal peritonectomy in 101 (74.8%) and 89 (65.9%) cases, respectively. Forty-two patients (31.1%) were submitted for rectosigmoidectomy, and 32 women (23.7%) received large bowel resections.

Furthermore, **Rutten et al. (2017)** revealed that 28 out of 99 patients, in the primary surgery group received both primary and interval surgery. On the other hand, in the laparoscopy group, it was reported that three patients of 102 patients underwent both primary and interval surgery. The current study showed that in the studied patients, 2 patients or 6.5% of those resectable by surgery were found to be unresectable at laparoscopy, with a true positive rate of 93.5%. The ROC curve was constructed and revealed that the laparoscopy had a 93.6% sensitivity, 100% specificity, 77.8% NPV, and 100% PPV with an accuracy of 94.7% to assess resectability. However, **Petrillo et al.(2015)** found that in almost every instance, it was not difficult to evaluate any of the laparoscopic parameters. Each of the six laparoscopic parameters achieved a specificity of at least 75%, a PPV of at least 50%, and an NPV of at least 50%, with an accuracy of at least 60% overall. **Rutten et al. (2014)** conducted a meta-analysis. They took into consideration that somewhere between 27% and 64% of the women were deemed to have an illness that was too significant to warrant a referral for laparotomy (the index test was positive). The remaining 36-73 percent of patients underwent laparotomies because doctors believed the procedure would

benefit them (these patients had negative test results).

At laparotomy, it was discovered that between 4% and 31% of patients still had some residual tumour following surgery. This finding suggests that these patients could have avoided laparotomy. For the majority of the trials, the number of patients who were mistakenly given neoadjuvant therapy when they should have been given debulking therapy first (also known as the number of false positives) is unknown.

Conclusion

Laparoscopy has effective feasibility and a great ability to predict optimum resectability in ovarian cancer cases.

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