Journal of Obstetrics, Gynecology and Cancer Research | ISSN: 2476-5848

Comparative Study of Laparascopy Scoring and Laparatomy Staging in Advanced Ovarian Cancer

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Article Info

10.30699/jogcr.7.1.32

Received: 2021/05/19;
Accepted: 2021/07/12;
Published Online: 09 Sep 2021;

Use your device to scan and read the article online

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ABSTRACT

Background & Objective: Comparative study between laparoscopic and laparotomy scoring in patients with advanced ovarian cancer.

Materials & Methods: This prospective study included 27 patients with advanced ovarian cancer who underwent laparoscopy and laparotomy scoring at hospitals affiliated with Isfahan University of Medical Sciences (IUMS) during 2020 and 2021. The laparoscopic predictive index value (PIV) score (range: 0-14) was calculated for all patients. In patients with PIV scores <8, primary cytoreductive surgery (PCS) was performed, and patients with scores ≥8 were candidates for neoadjuvant chemotherapy (NACT). In the PCS group, laparotomy scoring and surgical findings for each anatomical area were registered for all patients, and concordance between laparoscopy and laparotomy findings was compared. Residual disease following PCS was documented for all patients.

Results: A total of 27 patients underwent laparoscopic scoring surgery; 25 patients (92/5%) had a PIV score <8, and two patients (7/5%) had a PIV score ≥8. There was 92% agreement between PIV scores at laparoscopy and laparotomy. Agreements in different anatomical regions in laparoscopy and laparotomy were as follows: involvement of the bowel 76%, mesenteric 92%, liver 96%, omental 92%, diaphragm 96%, stomach 100%, peritoneal carcinomatosis 96%. A laparoscopic PIV score of <8 had a PPV of 84% at predicting R0 at PCS.

Conclusion: Laparoscopic scoring is a precise approach in the management of patients with advanced ovarian cancer. Laparoscopic scoring is a screening method of selecting patients for primary surgery or NACT and improved R0 resection at PCS. The present study was designed to assess patients who would gain the maximum benefits from primary surgery.

Keywords: Laparoscopy, Laparotomy, Neoadjuvant chemotherapy, Ovarian cancer

Introduction

Ovarian cancer is the third gynecologic malignancy (1). About 60% of patients are in advanced stages (2). The standard treatment for these patients is primary cytoreductive surgery (PCS).

For women with extensive disease for whom the complete resection of the tumor was not possible we suggested neoadjuvant chemotherapy (NACT) (3). It is important to determine which patients should undergo PCS and which should be candidates for NACT to reduce complications and increase the percentage of optimal debulking surgery (4, 5). .There have been several methods to select patients who have complete resection. Using a cutoff of 500 (IU) of CA125 have shown that a low predictive value for prediction optimal resection in patients with advanced ovarian cancer (6). CT scans have been used to predict optimal resection but the accuracy of CT in predicting optimal cytoreduction were lower 34% in some studies (7).

Of all the methods, diagnostic laparoscopic surgery can be used as a method for resectability of ovarian cancer. If the disease was resectable, PCS was done. If complete resectability was impossible, patients were referred to NACT.

Laparoscopic scoring system for primary debulking assigned a score of 2 (positive) or 0 (absence). The sum of these scorings is called predictive index value (PIV) (8). The followings are factors for scoring:

Peritoneal carcinomatosis, liver metastases, diaphragmmatic, mesenteric, omental, bowel, and stomach infiltration.

Optimal resection was not possible at a PIV score ≥8, and patients should be referred to NACT. Other studies have shown that laparoscopic scoring prevents unnecessary primary surgery in patients for whom optimal debulking (R=0) would not be possible **(9)**. These studies have shown that NACT cannot improve the prognosis of patients with advanced ovarian cancer when compared to PCS. More studies have demonstrated that patients who have no residual disease were the best prognosis. However, having no residual disease after NACT is prognostically not as favorable as having no residual disease after PCS **(10)**.

Studies have shown that patients with R=0 and PCS have better survival compared to chemotherapy and R>1 cm **(11)**; So far, the existing research has failed to be conducted in this field in our region. Considering that appropriate management in these patients results in a significant effect on their survival.

In this study, we used this approach in patients with advanced ovarian cancer who underwent laparoscopic scoring, using a scale previously developed by Fagotti *et al.* **(12)**.

We determined laparoscopic scoring and its comparison with laparotomy staging in predicting tumor resectability, optimal debulking at PCS in advanced ovarian cancer.

Materials and Methods

This prospective study included 27 patients with advanced ovarian cancer referred to hospitals affiliated with Isfahan University of Medical Sciences (IUMS) during 2020 and 2021. The Ethics Committee of IUMS approved the study. After explaining the aims of the study, informed written consent was taken from the participants. Patients with bulky lymphadenopathy, pleural effusion, distant metastatic lesion (parenchymal liver and lung metastases), and unresectable tumor were excluded from the study.

In patients who met the inclusion criteria, diagnostic laparoscopy was done to determine resectability using the Fagotti scoring **(12)**.

After a sub-umbilical vertical incision, a 10 mm trocar was inserted, and pneumoperitoneum was provided by insufflation of CO_2 (14 mm Hg). Then, a 5 mm trocar in the lower abdomen was inserted; the bowels, omentum, peritoneum, liver, stomach, mesenteric, and diaphragm were assessed (Table 1 describes scoring in laparoscopy). Patients with a score <8 at laparoscopy underwent PCS, and those who scored ≥8 were candidates for NACT. The PCS group laparotomy scoring and surgical findings for each anatomical area were also registered for all patients.

Residual disease following PCS was documented for all patients. R0 was defined as no gross residual disease, and R1 was used if any gross residual disease was presented after debulking surgery.

Table 1. Fagotti laparoscopic scoring algorithm (10)

Tumor Characteristic	Score
Peritoneal carcinomatosis: Massive peritoneal involvement and/or miliary pattern of distribution	0 (not present) or 2 (present)
Diaphragmatic surface involvement: Widespread infiltrating carcinomatosis and/or confluent nodules to most of diaphragm surface	0 (not present) or 2 (present)
Mesenteric involvement: Large infiltrating nodules and/or involvement of the root of the mesentery based on limited movement of intestinal segments	0 (not present) or 2 (present)
Omental involvement: Tumor diffusion of the omentum up to the greater curvature of the stomach	0 (not present) or 2 (present)
Bowel involvement: Tumor infiltration of large or small bowel requiring intestinal resection (excludes rectosigmoid colon) and/or	0 (not present) or 2 (present)
Stomach involvement: Obvious tumor infiltration into gastric wall	0 (not present) or 2 (present)
Liver involvement: Liver surface lesions >2 cm in size	0 (not present) or 2 (present)

Positive predictive value (PPV) was calculated for the ability of the PIV score in laparoscopy at PCS to resection status (R0 vs R1). PIV scoring at laparoscopy and PCS was calculated (Figure 1).

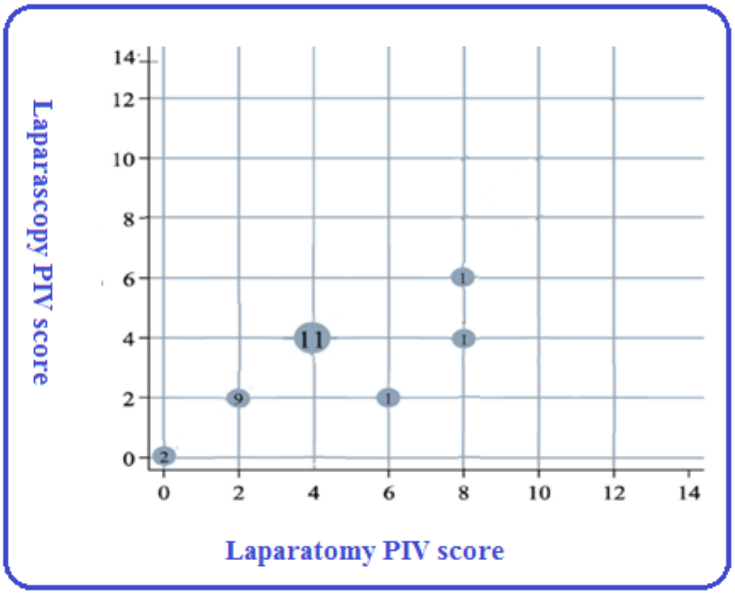

Figure 1. **PIV score at laparoscopy and laparatomy surgery.**

The kappa coefficient was employed to assess the agreement between laparoscopy and laparotomy scoring. Chi-square and Mann–Whitney tests were also used. The analysis was performed using MedCalc 15 (MedCalc Software, Broekstraat 52, B-9030 Mariakerke, Belgium) **(13)**.

Results

In this study, 27 patients with advanced ovarian cancer underwent laparoscopic scoring to describe the extension of disease. The PIV score at laparoscopy was calculated for these patients. In the following, patients with a PIV score <8 underwent PCS. Two patients did not undergo laparotomy. One case was a 32-year-old woman with severe ascites, bilateral ovarian tumor, and normal endoscopy that was found earlier. In laparoscopy, the stomach was tumoral and source of metastasis. The second case was a 69-year-old woman with bilateral ovarian tumor and extensive disease with a PIV score of 10 referred to NACT.

Accordingly, 25 patients with a PIV score <8 underwent PCS. In PCS, we achieved no residual disease in 21 patients. Furthermore, four patients had R>1 cm at PCS. One case was a 40-year-old woman with a supracolic omental tumor, in which completing the resection of the omentum tumor was impossible. The second patient was a 43-year-old woman with a tumor of the ovary involved rectosigmoid, and optimal resection was impossible.

Also, two patients presented with peritoneal seeding and severe ascites were pseudomyxoma peritonei in laparoscopic surgery and histologic mucinous carcinoma. In two cases, optimal cytoreduction surgery was not possible. Subsequently, the PIV score in laparoscopy and laparotomy was calculated.

Clinical and demographic data on patients in laparoscopy surgery are summarized in Table 2. The mean age of the participants was 53/5 ranged from 32 to 69 years. The median body mass index (BMI) was 27/4. Three patients were nulligravid, and more patients have stage IIIB and serous carcinoma histology. The ovary was the most common source of tumor in 92/5%. Median serum CA125 was 620 (U/mL). According to patients with pseudomyxoma peritonei (mucinous carcinoma tumor in pathology), the median *carcinoembryonic antigen* (CEA) and CA19-9 serum were sequentially 58 (U/mL) and 17 (U/mL).

Table 2. **Demographic and clinical characteristics-. BMI=body mass index R0=No gross residual disease.**

	N=27
Age (median years)	53/5
BMI (median kg/m2)	24/7
Ca125(U/ML)	620
Ca19-9(U/ML)	17
CEA(U/ML)	58
Primary tumor site	
Ovary	92%
Another site	8%
Stage	
IIA	4%
IIB	16%
IIIA	24%
IIIB	36%
IIIC	20%
Histology	
Serous	88%
Mucinus	12%
Residual disease	
R0	92%
R>1CM	8%

The results from the surgical data (the PIV score in laparoscopy and laparotomy) are presented in Table 2. In this experiment, there was 92% concordance between the PIV score in laparoscopy and PCS when a PIV score of 8 was a cut-off point. For 25 patients at laparoscopy and laparotomy PIV score were less than 8. Furthermore, 2 patients with PIV scores less than 8 in laparoscopy had PIV score more than 8 in laparotomy.

Bpercentage for location of seeding in laparascopy and laparatomy. Peritoneal carcinomatosis 96% stomach involvement 100% diaphragmatic seeding 96% omental disease92% liver surface involvement 96% mesentric involvement 92%bowel infiltration76% (Figure 2).

Laparoscopic scoring had a PPV of 84% to optimal cytoreductive surgery (R0). The kappa measure of agreement between laparotomy and laparoscopy is equal to 0/812 with a significant value of 0.000. There is a large agreement between these methods (Table 3).

Table 3. *Kappa* measure of agreement between laparotomies and laparoscopy is equal to 0.812 with significant value 0.000. That is, there is a large agreement between these methods.

Kappa measure		Value	Asymptotic Standardized Errora	Approximate Tb	Approximate Significance
Measure of Agreement	Kappa	0.812	.093	5.925	.000

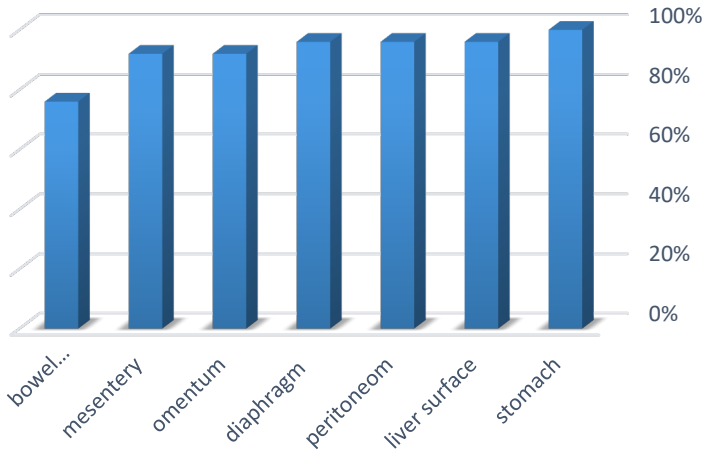

Figure 2. Percentage for location of seeding in laparascopy and laparatomy. Peritoneal carcinomatosis 96% stomach involvement 100% diaphragmatic seeding 96% omental disease92% liver surface involvement 96% mesentric involvement 92%bowel infiltration76%.

Discussion

In this study, we compared laparoscopic and laparotomy scoring systems to predict the optimal debulking surgery (R0) in patients with advanced ovarian cancer.

Laparoscopic scoring is a screening method of selecting patients for primary surgery or NACT and assesses the resectability of ovarian cancer as a result of improvement R0 resection rates at PCS.

In laparoscopic surgery, when the disease is resectable, primary surgery is performed. If completing the resectability is impossible, patients are referred to NACT. The laparoscopic approach has been successful in diagnosing subdiaphragmatic infiltration, stomach, peritoneum, and liver surface involvement. However, in the mesentery, omentum, and bowel infiltration, especially in the rectosigmoid region, it had not enough accuracy.

The PIV score of laparoscopy had excellent concordance with the PIV score at PCS. In this study, a laparoscopic PIV score of <8 had a PPV of 84% at predicting R0 resection at the time of PCS.

Diagnostic laparoscopy is a minimally invasive surgery to assess intra-abdominal cavity compared to laparotomy, but it had limitations. In this study, bowel infiltration (rectosigmoid), mesentery, and supracolic omental tumor were difficult areas to visualize on laparoscopy.

In a prospective study published by Hansen1 *et al.* The concordance of laparoscopic and laparatomy findings in patients with advanced ovarian cancer, that showed agreement rates of 75% for bowel infiltration and 85% for mesenteric involvement in laparascopic and laparatomy surgery **(14)**.

In another prospective study by Sathyanaryana *et al.*, comparative between laparascopic surgery and ct scan findings to evaluate optimal debulking surgery in ovarian cancer, omental and peritoneal deposits in 87% and

95.7% patients as compared to 60.9% and 39% on CT scan. Laparoscopy could diagnose mesenteric and bowel infiltration in 34.8% of patients, but CT scan was not able to detect tumor involvement in these areas **(15)**.

In another study by Rutten *et al.*, patients were randomized to either laparoscopy (102 patients) or primary surgery (99 patients). Laparoscopy was used to select patients for PCS or NACT. In the laparoscopy group, 62% of patients had primary surgery. There were more patients with residual R≥1 cm in the PCS group (39%) compared to 10% in the group selected for upfront surgery with an initial laparoscopy. However, R0 resection was only achieved in 57% of patients at PCS. The authors concluded that diagnostic laparoscopy reduced the number of futile laparotomies in advanced-stage ovarian cancer **(16)**.

In a meta-analysis of 18 studies (including 1,563 participants), including one randomized trial, laparoscopic assessment suggested that the disease was suitable for optimal debulking (no macroscopic residual disease or residual disease <1 cm) in approximately 70% to 100% of women **(17)**.

In a prospective study by Fleming, the PIV score at laparoscopic and laparotomy was calculated. R0 resection was achieved in 88% of patients in the PCS group and 74% in the NACT group. Patients with PCS had an improved progression-free survival of 21.4 months compared to 12.9 months in those patients undergoing NACT (*P*<001) **(18)**.

Also, in this study, a PIV score <8 had a PPV of 84% at predicting optimal debulking (R0) in patients with ovarian cancer undergoing PCS. Laparoscopic scoring is an appropriate screening method to determine resectability for patients with advanced ovarian cancer.

The strengths of the study are standardized methods for selecting patients with advanced ovarian cancer and prospective data collection. The limitation of our study is the non-randomized approach and time limitation.

Laparoscopic scoring is a precise approach to the management of patients with advanced ovarian cancer. We did not have any complications in laparoscopic surgery, and this method helped patients selecting to surgery and avoid unnecessary treatment.

Acknowledgments

We would like to express our gratitude to the Vice Chancellor for Research and Director of the Department of Gynecology (Oncology) of Isfahan University of Medical Sciences for providing the necessary research facilities and equipment.

Conflict of Interest

The authors declared no conflict of interest.

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How to Cite This Article:

Behnamfar F, Rouholamin S, Allameh T S, Sabet F, Mousavi Seresht L, Nazemi M. Comparative Study of Laparascopy Scoring and Laparatomy Staging in Advance Ovarian Cancer. J Obstet Gynecol Cancer Res. 2022; 7 (1) :32-37.

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