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Evaluation of single-port laparoscopy for peritoneal carcinomatosis assessment in advanced ovarian cancer

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ABSTRACT

Objectives: Ovarian cancers are usually diagnosed at an advanced stage. The extent of the disease before surgery partly determines the ability to perform a complete cytoreduction. The peritoneal cancer index (PCI) is used to evaluate peritoneal carcinomatosis and has been validated in ovarian cancer and correlated with resectability. The aim of our study was to assess the feasibility of single-port laparoscopy (SPL) for suspicion of advanced ovarian cancer and to describe the ability to calculate the PCI score at the time of laparoscopy.

Study design: Between February 2011 and January 2013, 33 patients underwent SPL for suspected advanced ovarian cancer. Individual records for all patients were prospectively reviewed and analyzed. For each patient, we determined the PCI score.

Results: 33 patients underwent initial SPL, 85% had increased carcinological markers and 67% a radiological suspicion of peritoneal carcinomatosis. The median operative time was 90 min. During SPL, 76% of patients underwent ascites evacuation; all patients had peritoneal cytology and peritoneal biopsies. Only 3 patients experienced perioperative complications. Two open conversions were recorded. Quotation of the PCI score was possible for all patients. Eighteen patients (55%) had a PCI score below 10; one had a maximal PCI score of 39. The PCI score was null for 9 patients. Non-browsing areas marked 8 procedures.

Conclusions: SPL appeared to be feasible, with satisfying immediate results and postoperative outcome, compared to conventional laparoscopy. It allowed a satisfying exploration of the abdomino-pelvic cavity and a good description of peritoneal carcinomatosis with only a few non-browsing PCI areas.

Introduction

Ovarian cancers are usually diagnosed at an advanced stage, with massive, widespread intra-abdominal disease. Multiple studies reported that the completeness of the primary cytoreductive surgery independently influences survival for these patients [1,2]. Median and five-year survivals after removal of all visible disease (complete cytoreduction) were reported to exceed survival rates resulting from suboptimal procedures (residual disease $\leq$1 cm)[2]. The extent of the disease before surgery partly determines the ability to perform a complete cytoreduction. The ability to predict complete resection at the time of diagnosis could be suggested during the preoperative course with a clinical examination, a CA125 level check or radiological examinations. However, it has been demonstrated that these data were insufficient to predict with precision resectability [3]. To quantify with more precision the intra-abdominal extent of the disease, a number of numerical ranking systems have been proposed and could be used during the first step of surgery. The most described was the peritoneal cancer index (PCI), used to evaluate the peritoneal spread in malignant intraperitoneal and pelvic tumors [4,5]. Its use for ovarian cancer has also been reported and its correlation with resectability has been demonstrated in advanced ovarian cancer [6,7].

The performance of a laparoscopy to determine resectability has been demonstrated for advanced ovarian cancer and specific scores were proposed [8–12]. However, some studies underlined the possibility of post site metastasis. In this setting, the use of a

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single port could allow a better exploration and description of peritoneal carcinomatosis (2 to 3 instruments in addition to a camera), no additional scar and a larger biopsy for diagnosis.

To date, to our knowledge, no study has reported the exploration of peritoneal carcinomatosis using a single-port approach.

The aim of this study was to assess the feasibility of a single-port exploratory laparoscopy for suspected advanced ovarian cancer and to describe the ability to calculate the PCI score at the time of the laparoscopy.

Materials and methods

Patient population

Between February 2011 and January 2013, 33 consecutive patients underwent a laparoscopy for suspected advanced ovarian cancer in Paoli-Calmettes Institute, Marseille, France.

Individual records for all patients were prospectively analyzed: patient and tumor characteristics, per-operative findings and post-operative course. For each patient, we determined the PCI score.

Peritoneal cancer index (PCI)

Sugarbaker first described the PCI for colon cancer in 1995 [4]. A few years later, Tentes et al. evaluated the PCI for ovarian cancer [6]. The PCI quantitatively combines the distribution of the tumor throughout 13 abdomino-pelvic regions with a lesion size (LS) score. Lines define nine regions, which are numbered in a clockwise direction, with zero at the umbilicus and one defining the space beneath the right hemidiaphragm. Regions 9 to 12 divide the small bowel into upper and lower jejunum and upper and lower ileum.

Each region is also defined by the anatomic structures found there. The LS score is determined after complete lysis of all adhesions. LS-0 means no visible tumor; LS-1 indicates implants less than 0.5 cm in size, LS-2 between 0.5 and 5 cm, and LS-3 greater than 5 cm. This refers to the largest diameter of tumor implants. If there is a confluence of disease matting abdominal or pelvic structures together, this is automatically scored as LS-3. The LS are then summed for all abdomino-pelvic regions. A numerical score from 0 to 39 indicates the extent of the disease within all regions. In the report by Tentes et al. [6], there was a significant difference in the five-year survival rates between patients with a PCI $>$ 10 and $\leq$10. A previous study demonstrated the ability of the PCI to predict resectability, post-operative morbidity and outcome in advanced ovarian cancer [7].

Surgical management

The patient was placed in the dorsal decubitus position, and one 3-cm incision was performed across the umbilicus and the single port was installed. As reported previously for extraperitoneal para-aortic lymphadenectomy, we used a single port GelPOINT® device (Applied Medical) (Fig. 1) [13]. The peritoneal cavity was inflated with carbon dioxide up to a maximum pressure of 10 mmHg. We used a 10 mm laparoscope and 5 mm standard instruments, including fenestrated forceps, bipolar forceps, and monopolar scissors if necessary. No additional trocar was used.

Results

Thirty-three patients underwent an initial single-port laparoscopy (SPL) in the context of suspected advanced ovarian cancer. The median age of the patients was 62 years (range: 32–84). The average BMI was 24 Kg/m^2 (range: 17–42). Seventy-five percent of the patients had a history of abdominal surgery and six patients had previous cancer history (Table 1).

In 76% of cases (n = 25), SPL was performed for clinical or radiological ascites. For 28 of the 33 patients (85%), SPL was motivated by an increase of carcinological markers, and for 22 of patients (67%), by radiological suspicion of peritoneal carcinomatosis (Table 2).

The median operative time, from initial umbilical section to last skin stitch, was 90 min (range: 30–188 min).

Surgical characteristics are reported in Table 3. During SPL, 25 patients (76%) underwent ascites evacuation. Peritoneal cytology and peritoneal biopsies were performed for all patients. In a few cases, surgical resections were made (4 oophorectomies and 1 salpingectomy). One patient had a bacteriological study of a thickened and purulent peritoneal fluid. Three patients experienced perioperative complications: two small-bowel injuries and one bladder injury. Two open conversions were recorded because of exploration difficulties (adhesions or small bowel injuries). No perioperative transfusion and no major complication occurred. The median hospital stay was 1.84 days (range: 0–12 days).

Quotation of the PCI score was possible for all patients (Table 4). Eighteen patients (55%) had a PCI score below 10, one patient had a maximal PCI score of 39 (Fig. 2). The PCI score was null for nine patients. Non-browsing areas marked eight procedures (24%). Three patients had two or more than two non-browsing areas: one for malignant lymphoma and two patients because of major extensive carcinomatosis (Table 5). Region 6, corresponding to the pelvic area, could not be explored in six patients because of blinded pelvis and adhesions. This observation's failure was noticed in 2 cases for the region "left lower" (region 5) and also for each of the following regions "right upper" (region 1), "left upper" (region 3), "right lower" (region 7), "upper jejunum" (region 9) and "lower jejunum" (region 10) [4].

Comments

A single-port laparoscopic approach has been recently developed and evaluated. As already reported, it appeared to be feasible, with a satisfying immediate result and post-operative outcome, compared to conventional laparoscopy [13]. It also allowed a reliable evaluation of peritoneal carcinomatosis of our 33 patients, even though 76% of them had undergone previous abdominal surgery. In our study, for 76% of the patients the PCI score has been calculated without missing an area. A median operative time of 90 min, limited hospital stay and absence of major complications also highlighted its interest.

Indeed, before surgery, the ability to perform a complete primary cytoreduction is influenced by the extent of disease. Multiple studies have reported that residual disease after surgery was the best predictive factor for survival [2]. In the aim to select patients eligible for complete surgery, surgeons need the tools to establish the precise extent of the disease. In this setting, the FIGO classification is insufficient. Consequently, more detailed quotation systems are necessary at the time of surgery. One previous study has compared the ability of various carcinomatosis scores to predict the extent of the disease in relation to resectability. In this study, PCI and Fagotti modified scores were the most pertinent [1,7]. They outperformed Fagotti and Eisenkop scores [11,14].

PCI score

The PCI score gives valuable information about the precise distribution of seeding and tumor volume, representing in detail the peritoneal extent [15]. For ovarian cancer, Tentes et al. reported