

Prognostic value of peritoneal cancer index in primary advanced ovarian cancer



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Abstract

Background: Effective tumor debulking is a major factor associated with a favorable prognosis in patients with advanced ovarian cancer (AOC). However, FIGO staging fails to take full account of the extent of the disease in the peritoneum, making it difficult to plan appropriate surgical treatment. In contrast, the peritoneal cancer index (PCI) can provide more detailed information about peritoneal spread.

Method: We evaluated the prognostic value of PCI and its association with clinicopathological features in patients with AOC. Data for 80 patients with AOC who underwent primary debulking surgery were analyzed retrospectively. PCI scores of 0–39 were calculated based on the sizes of lesions in 13 abdominopelvic regions, and patients were classified into three categories with scores of 1–10, 11–20, and >20, respectively. Clinicopathological features, including the presence of residual tumor after surgery and the incidence of postoperative complications, were assessed in relation to PCI score.

Results: PCI was significantly associated with suboptimal surgery and postoperative complications, as well as with preoperative CA125, ascites, prolonged surgery, FIGO stage, positive aortic lymph nodes, prolonged hospitalization, and number of visceral resections. Overall and disease-free survival was also associated with PCI, with an optimal cut-off value of 15. Multivariate analysis identified age, residual tumor, and PCI as independent prognostic factors for survival. A PCI >10 is positively associated with a poor prognosis in patients with AOC.

Conclusion: Given the importance of effective tumor debulking, PCI may provide important information for surgical planning in patients with AOC.

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Keywords: Advanced ovarian cancer; Debulking surgery; Peritoneal cancer index; Prognosis; Residual tumor; Survival

Introduction

Ovarian cancer remains a major cause of gynecologic cancer-related death in women, despite recent treatment advances. It accounts for 5% of all cancers among women,

and causes more deaths than any other female genital tract cancer. Approximately eight in every 100,000 women per year in Spain will develop ovarian cancer [1].

The strongest prognostic factor in patients with advanced ovarian cancer (AOC) is surgery with no residual tumor [2], and optimal debulking with no macroscopic evidence of residual tumor is associated with better overall survival in the event of disease spread throughout the peritoneal cavity [2,3]. In this context, an appreciation of the degree of peritoneal carcinomatosis is crucial, given that

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a description and quantification of the tumor burden are essential for planning surgical procedures, with direct impacts on surgical morbidity [4].

The International Federation of Gynecology and Obstetrics (FIGO) classification is considered to be the reference staging system for ovarian cancer. However, the simplicity of the FIGO classification does not accurately describe the tumor burden and localization of the disease throughout the peritoneal cavity in cases of AOC.

The peritoneal cancer index (PCI) was first described by Sugarbaker in 1998 and was considered as the standard for describing carcinomatosis of colorectal cancer and mesothelioma [5]. We therefore considered that PCI might be a suitable method for accurately describing peritoneal spread in AOC. The aim of this study was to analyze the clinical impact and prognostic value of PCI in patients with primary AOC.

Methods

Patients

A total of 110 consecutive patients with AOC were treated at the Multidisciplinary Unit of Abdominal Pelvic Oncology Surgery (MUAPOS) of the University General Hospital of Castellon (Spain) from January 2013 to December 2016. The risk of suboptimal cytoreductive surgery was evaluated with the radiologic-laparoscopic criteria for unresectability (RLCU) (Table 1) in the preoperative studies. Age and health status were also taken into account. All procedures were carried out by the same surgical team. Information on the patients' clinical and pathological characteristics, surgical procedures, and residual disease at surgery were collected prospectively and analyzed retrospectively for the purpose of this study.

Methods

PCI is used to assess cancer distribution in the peritoneum quantitatively, based on calculating the sizes of lesions in 13 abdominopelvic regions. The sizes of the lesions are then converted to scores of 0–3: a lesion size score (LSS) of 0 defines no visible tumor burden in the peritoneum; while LSSs of 1, 2, or 3 describe lesions with a maximum diameter of 0.5, 5.0, and >5 cm or lesions confluence, respectively.

Table 1
Radiologic-Laparoscopic criteria of unresectability (RLCU).

CT scan	Lung metastasis Hepatic metastasis in 3 or more hepatic segments Severe hepatic pedicle involvement Progression after NACT
Diagnostic laparoscopy	Diffuse serous small bowel disease

NACT: Neoadjuvant chemotherapy

PCI is calculated by summarizing the LSSs for all regions, giving a maximum PCI of 39 (13×3) [6].

PCI was determined in all patients in the current study by preoperative thoracoabdominal computed tomography (80 patients) and/or laparoscopy (49 patients). To quantify the radiological PCI, the largest tumor implant in the assessed region was chosen and assigned a score of 0–3. The sum of the scores for each region was then used to calculate the radiological PCI. PCI was calculated before and during surgery, and was categorized into three ordinal levels: 1–10, 11–20, and >20. Finally, all specimens were collected and labeled in relation to PCI areas, and the final PCI was determined by the pathologist.

Although the principal reference for cytoreductive surgery was defined in the consensus statement for colonic cancer [7], nowadays some authors [8] have been more restrictive with respect to the presence of residual tumor after surgery in AOC. Complete cytoreductive surgery (CCS) was defined as no residual macroscopic tumor, optimal cytoreductive surgery (OCS) as a residual tumor < 1 cm in diameter, and suboptimal cytoreductive surgery (SCS) as a residual tumor > 1 cm in diameter. Postoperative complications were described according to the Clavien–Dindo classification [9]. Grade III–IV complications were considered major complications. Follow up of patients started with the diagnosis. First line adjuvant chemotherapy was applied in all patients receiving 6 to 8 cycles of intravenous carboplatin and platinaxel. After primary adjuvant chemotherapy the patients were evaluated every 3–6 months. The occurrence of relapse and the response to first line chemotherapy were detected according to response evaluation criteria in solid tumors [10].

Informed consent was obtained from patients and the study was approved by the ethics committee of our institution.

Statistical analysis

Associations between PCI and clinical factors were analyzed using χ^2 , Mann-Whitney, or Kruskal–Wallis H tests, or Spearman's rho, as appropriate. Univariate and multivariate survival analyses were performed using the Kaplan–Meier method and Cox regression models, respectively. PCI cut-off values for overall survival (OS) and progression-free survival (PFS) were evaluated using the log-rank test. Statistical analysis was performed using MedCalc 15 for Windows (MedCalc Software, Ostend, Belgium). For all tests, a p value < 0.05 was considered statistically significant.

Results

A total of 110 patients with suspected AOC were treated at the MUAPOS at the University General Hospital of Castellon (Spain) from January 2013 to December 2016. Among these, 80 patients were eligible for primary

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