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Feasibility and perioperative outcomes of robotic-assisted surgery in the management of recurrent ovarian cancer: A multi-institutional study

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HIGHLIGHTS

- Patients with recurrent isolated ovarian cancer may be candidates for surgical cytoreduction via a robotic approach.
- An optimal cytoreduction was achieved in 86% of the patients, and 80% of the patients underwent an organ-sparing resection.
- The median operative time was 3 h, median EBL was 50 cc, and the median length of stay was 1 day.

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ABSTRACT

Objectives. Minimally invasive surgery for recurrent ovarian cancer is generally not performed. The aim of this study was to assess the feasibility and surgical outcomes of robotic-assisted surgery in the management of recurrent ovarian cancer.

Methods. Eligible patients included those with confirmed recurrent ovarian cancer amenable to surgical resection and in which a complete resection was thought to be feasible with the use of the robotic platform. Patients with evidence of carcinomatosis were not considered for a robotic approach. Clinical and pathologic data were abstracted from the medical records. Appropriate statistical tests were performed using SPSS statistical software program (SPSS 20.0 Inc., Chicago, IL).

Results. A total of 48 patients were identified. Thirty-six (75%) patients had a recurrent mass or masses isolated to one anatomic region (pelvis or abdomen). Conversion to laparotomy was necessary in 4 (8.3%) cases. In cases not requiring conversion to laparotomy, the median operative time, EBL, and length of stay were 179.5 min, 50 cc, and 1 day, respectively. An optimal debulking was achieved in 36 (82%) cases. Complications occurred in 6 (13.6%) cases. The median operative time, EBL, length of stay, and complications were all statistically significantly lower in the cases not converted to laparotomy compared to those that were ($p < 0.001$).

Conclusions. This study suggests that select patients with recurrent ovarian cancer in the absence of carcinomatosis may be candidates for secondary surgical cytoreduction via a robotic approach. Surgical and postoperative outcomes appear to be favorable compared to reports of laparotomy in recurrent ovarian cancer.

Introduction

Secondary cytoreductive surgery in the treatment of recurrent ovarian cancer remains controversial with no randomized trials completed. The goals of treatment in the recurrent setting are different compared to the upfront setting with a much greater emphasis on quality of life and limited morbidity. Evaluation of published data regarding secondary cytoreductive surgery is complex due to its retrospective and heterogeneous nature, thus, making it difficult to identify which patients will benefit from such intervention. However, the majority of the available retrospective data supports secondary cytoreductive surgery for select patients, especially those with long disease-free interval (DFI) (>12 months), good performance status (GOG 0–2) and relatively isolated single region tumor recurrences [1–4].

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Secondary cytoreduction for ovarian cancer has been, and still is, most often performed via laparotomy. While a minimally invasive surgical (MIS) approach via laparoscopy has been proven to result in improved perioperative outcomes in patients with newly diagnosed uterine cancers [5], MIS approaches in the management of early or, advanced stage ovarian cancer or in the management of recurrent disease remain controversial among many gynecologic oncologists in the United States as outcomes data are limited. MIS approaches are infrequently considered or offered in cases of recurrent ovarian cancer due to the extent of disease and/or the anticipated complexity of the procedure. The robotic surgical platform is being increasingly incorporated in the surgical armamentarium of gynecologic surgeons for various reasons. Small retrospective series have suggested that MIS approaches, with or without the use of the robotic platform, may be feasible and offer a potential value in surgical cytoreduction [6–9]. The purpose of this multi-institutional study was to evaluate and describe the feasibility and perioperative outcomes of robotic-assisted surgery for the management of recurrent ovarian cancer.

Methods

The institutional review board at each participating center approved this retrospective, multi-institutional study. Between January 2006 and December 2012, all patients undergoing surgical resection of presumed ovarian cancer recurrence were identified from the respective institutional tumor registry databases. Following initial eligibility screening, eligible patients included those with a probable recurrence by preoperative imaging (position tomography (PET), computer tomography (CT), magnetic resonance imaging (MRI)) and physical examination, and planned for surgical cytoreduction using the robotic platform.

All patients had a disease-free interval (DFI) after completion of primary surgery and platinum/taxane based first line chemotherapy of at least 6 months. Patients with carcinomatosis were not considered for a robotically assisted attempt at surgical cytoreduction. Optimal resection was defined as no visible residual disease (R0). Clinical and pathologic data were abstracted from the medical records and tumor registry. Data included age, estimated blood loss (EBL), operative time, conversions to laparotomy/laparoscopy, histology, body mass index (BMI), length of stay (days), procedure, site of recurrence and complications. Interval data were analyzed using the Mann–Whitney U test. Nominal data were analyzed using Chi square test or Fisher's exact test when appropriate. All statistical tests were performed using SPSS statistical software program (SPSS 20.0 Inc., Chicago, IL).

Results

A total of 48 patients from 5 institutions met the inclusion criteria for this study. Patient's age ranged from 27 to 82 years old with a median of 58 years, and the median BMI was 26.8 with a range of 19–47. Most patients (~70%) had high grade serous histology, and 20% had mixed histology. Seventy five percent of patient's who underwent robotic secondary cytoreduction recurred in a single region, of which 40% were in the pelvis and 35% were in the abdomen, with some having more than one mass within that region. Twenty-three percent of patients recurred in both the abdomen and pelvis, and 1 patient recurred in both the pelvis and diaphragm (Table 1). Fourteen patients (29%) had disease recurrences isolated to the lymph nodes (pelvic and/or para-aortic).

Surgical cytoreduction using the robotic platform without converting to laparotomy was possible in 44 (91.7%) cases. For these 44 patients, the median operative time was approximately 3 h, median estimated blood loss was 50 cc, and the median time in the hospital following the procedure was 1 day. Twenty-eight (63.6%) patients were discharged on the same day of surgery [n = 11 (25%)] or the following day [n = 17 (38.6%)]. The maximum stay in the hospital was 23 days. Most patients (82%) were cytoreduced to no visible residual disease (Table 2).

Table 1
Characteristics of all planned cytoreductive surgery.

Variables	Total N = 48
Age (years) median (range)	58 (27–82)
BMI (kg/m^2) median (range)	26.8 (19–47)
Histology N (%)	
High grade serous	33 (68.8)
Low grade serous	2 (4.2)
Endometrioid	2 (4.2)
CS	1 (2.1)
SCC	1 (2.1)
Mixed	9 (18.8)
Sites of recurrence N (%)	
Single region	36 (75)
Multiple region	12 (25)
Sites of recurrence[a] N (%)	
Pelvis	19 (39.6)
Abdomen	17 (35.4)
Pelvis & abdomen	11 (22.9)
Pelvis & diaphragm	1 (2.1)

Key:
BMI — Body mass index.
CS — Carcinosarcoma.
SCC — Squamous cell carcinoma.
[a] Includes retroperitoneal nodal recurrences.

Nine patients required resection of additional organs in order to achieve optimal cytoreduction, most of which were bowel resections (small bowel, large bowel or appendectomy). Additionally, one patient who required a bowel resection also required a liver resection, and 3 patients required upper abdominal surgery (2 diaphragm resections and 1 splenectomy).

Postoperatively, 6 (13.6%) patients developed complications. These included 1 patient with a pneumothorax and 2 patients with postoperative ileus; 4 patients also were found to have post-operative infections including *Clostridium difficile*, sepsis, cellulitis, and a wound infection (Table 2). All were managed and resolved without long-term sequelae. No intraoperative complication occurred and there were no postoperative deaths.

Four patients ultimately required conversion to exploratory laparotomy. The pre-operative factors in these 4 cases did not differ

Table 2
Perioperative outcomes of cases not converted to laparotomy.

Variables	Total N = 44
OR time (min) median (range)	179.5 (67–482)
EBL (cc) median (range)	50 (0–300)
LOS (days) median (range)	1 (0–23)
LOS (days) N (%)	
0 days	11 (25)
1 day	17 (38.6)
>1 day	16 (36.4)
Tumor residual N (%)	
R0 (no visible residual disease)	36 (82)
R+ (visible residual disease)	8 (18)
Procedures N (%)	
Organ sparing	35 (79.5)
Appy	1 (2.3)
LB resection	3 (6.8)
LB & SB resection	1 (2.3)
Liver & LB resection	1 (2.3)
Diaphragm resection	2 (4.5)
Ureteral resection	0 (0)
Splenectomy	1 (2.3)
Complications N (%)	6 (13.6)
Complication type N (%)	
Pneumothorax	1
Ileus	2
C. difficile colitis	1
Cellulitis	1
Sepsis	1
Wound infection	1