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Perioperative and clinical outcomes in the management of epithelial ovarian cancer using a robotic or abdominal approach ☆

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HIGHLIGHTS

- Compared to laparotomy, robotic surgery was feasible and effective.
- Robotic operative times were reasonable, hospital stay and blood loss were reduced.
- Debulking, one year survival, and recurrence rates were similar between groups.

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ABSTRACT

Objective. To evaluate the feasibility and efficacy of robotic-assisted management of epithelial ovarian cancer.

Methods. Retrospective review of robotic-assisted or abdominal ovarian cancer cases presenting with pelvic mass, initial staging, or debulking after neoadjuvant chemotherapy performed by a single surgeon (2008–2012). Patient characteristics and outcomes were compared using chi-squared or Student's t-tests.

Results. There were 63 robotic and 26 abdominal cases. Patient characteristics were similar for age, uterine weight, and BMI, with prior abdominal surgery more common in the abdominal group ($p = 0.0257$). Robotic operative time was longer ($p < 0.0001$), while blood loss ($p < 0.0001$) and hospital stay ($p = 0.0009$) were reduced. Major complication rates (16% vs. 23%, $p = 0.4209$) and lymphadenectomy yields (13 vs. 11 nodes, $p = 0.2310$) were similar. Neoadjuvant chemotherapy was more common in the robotic group (52% vs. 15%, $p = 0.0013$). Residual disease rates for all cases (73% vs. 50%, $p = 0.880$) and for Stage II–IV cases (61% vs. 40%, $p = 0.929$) were equivalent. Follow-up was longer for the abdominal group; however, an equivalent percentage of patients had at least 1 year of follow-up (57% vs. 77%, $p = 0.0789$). At 1 year, survival and no evidence of disease (NED) rates were equivalent for all cases (survival: 97% vs. 90%, $p = 0.2501$; NED: 81% vs. 85%, $p = 0.6773$) and for Stage II–IV cases (survival: 96% vs. 88%, $p = 0.3080$; NED: 76% vs. 81%, $p = 0.6920$).

Conclusions. A robotic approach for the management of epithelial ovarian cancer, including patients treated with neoadjuvant chemotherapy, is feasible and effective. Debulking, recurrence, and survival rates were similar to laparotomy at 1 year.

Introduction

Ovarian cancer is the second most common pathology of the female reproductive tract, representing 3% of all cancer cases, with a 92% 5-year survival rate for localized disease. However, with few clinical symptoms and no accurate early screening tests, many ovarian cancer patients present with advanced disease. Because of this, ovarian malignancies result in greater mortality and are estimated to account for 5% of all deaths by cancer in women for 2013 [1].

Minimally invasive surgery (MIS) to treat localized ovarian cancer results in equivalent oncological outcomes and decreased morbidity, pain, and recovery time when compared to an abdominal approach [2]. A few studies have reported on the feasibility of robotic assisted surgery for the management of ovarian cancer [3–7]; however, the current recommendation is to constrain MIS to localized cases due to the limited data available for advanced disease.

Neoadjuvant cytoreductive chemotherapy followed by interval surgery has been presented as an alternative approach to major upfront debulking surgery in cases of advanced ovarian cancer [8]. It has been suggested that the selective use of neoadjuvant chemotherapy may broaden the patient population eligible for a minimally invasive approach [4].

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The objective of this study is to evaluate the feasibility and efficacy of robotic-assisted management of epithelial ovarian cancer.

Materials and methods

Institutional Review Board (IRB) approval was obtained to retrospectively collect data from hospital records of consecutive ovarian cancer cases managed with robotic-assisted or abdominal surgery performed by a single surgeon (2008–2012). Cases presenting with pelvic mass, initial staging, or debulking after neoadjuvant chemotherapy that were diagnosed as epithelial ovarian cancer were included in the analysis. Stromal, borderline, and metastatic ovarian cancer cases were excluded. Patients who had neoadjuvant chemotherapy were restaged with CT, an abdominopelvic exam, and endoscopic examination. All patients underwent a consultation on the risks of each surgery, including conversion to laparotomy. Patients with a tumor <15 cm who did not require multiple advanced procedures were offered robotic surgery. Patients with extensive disease (computerized axial tomography (CAT) and exam showed four quadrant disease or extensive disease volume) and patients requiring multiple major procedures were operated with laparotomy. All patients signed consent forms prior to surgery.

Surgical procedure

For all robotic cases, surgical management included a thorough upfront laparoscopic evaluation of the pelvis, descending and ascending colon, splenic area, diaphragm (using a flex scope), and the small bowel to at least the mid-jejunum. For localized cancer or patients requiring interval staging, hysterectomy with unilateral or bilateral salpingooophorectomy, omentectomy (interval staging) or greater omentectomy (appendectomy), and bilateral pelvic and para-aortic lymph node dissection were performed. For clinical Stage II–IIIC or patients requiring interval debulking, hysterectomy (radical if indicated) with unilateral or bilateral salpingooophorectomy, greater omentectomy, appendectomy, gastrocolic omentectomy, peritonectomy, bowel resection, diaphragm stripping and debulking (not to full thickness, no liver or spleen resection), and resection of uterosacral ligaments and uterine artery ligation were performed as needed. Omentectomy included infracolic or greater (infracolic and infragastric) based on whether there was gastrocolic disease. Appendectomy was performed as a routine part of staging [9] as it is a common location for metastasis and we believe that removing it increases survival.

The da Vinci Surgical System (Intuitive Surgical, Sunnyvale, CA) was used for the robotic cases, with a double-dock technique for cases of diaphragm, gastrocolic, or extensive (in the upper abdomen) disease. For these cases, if significant disease was suspected preoperatively (based on CAT), a fifth port was placed in the left upper quadrant. Specimens were extracted through the ports in an endobag (for small specimens), or through the vagina for larger (i.e. omentectomy) specimens. In cases with significant peritoneal disease, the vascular pedicles were addressed early (including a bilateral uterine artery ligation) and a lap pad moistened with dilute betadine was introduced through the vagina to soak up excess blood and to be sure that there were no tumor fragments. A Foley catheter was placed for 1–7 days based on the amount of dissection around the ureter. Patients were discharged once off intravenous pain medication, able to ambulate, and able to tolerate fluids. Robotic patients with peritonectomies were kept in the hospital at least until late on the second day (POD 2) for administration of fluids to prevent dehydration as a precaution against readmissions. For cases requiring bowel resection, patients were also required to pass gas prior to discharge. For cases with extensive surgery or excess bleeding, a drain in the pelvis was placed in order to decrease the chance of infection and for fluid collection. Patients were followed in a conventional fashion with frequent visits and CA 125 blood tests. They were followed up every month during chemotherapy, every 3 months for 2 years, every 4 months in the 3rd year, and then every 6 months. CAT scans were performed every 6 months or sooner if clinically indicated.

Chemotherapy protocol

Patients receiving neoadjuvant chemotherapy were given 3 induction cycles of IV Carboplatin and Taxol (sometimes 6 if referred from another practice) and 1 postoperative cycle of IV Carboplatin/Taxol, followed by 2–3 IV/IP doses as appropriate. Patients not receiving neoadjuvant chemotherapy were started on chemotherapy after surgery and were given 6 regular cycles or 1–6 IV/IP cycles and then 7–12 additional cycles of consolidation based on patient side effects and personal desires. All patients were given an opportunity to continue a maintenance chemotherapy regiment with Taxol every other week for a year. IP chemotherapy was offered to all patients who were optimally debulked if they were less than 70 years old and had a Zubrod performance status of 0 or less.

Measurements

Patient characteristics included age, body mass index (BMI), ethnicity, uterine weight, history of abdominal surgery, and indication. Perioperative parameters included type and number of surgical procedures, operative time (skin incision to skin closure), estimated blood loss (all irrigated and aspirated fluids), intra- and postoperative complications, and length of hospital stay. Complications were classified using the modified Clavien system [10] out to 6 weeks postoperatively. Pathologic parameters included FIGO stage, pathology, amount of residual disease (determined by visual examination at the completion of surgery), neoadjuvant chemotherapy, lymph node yield, length of follow-up, recurrence, and survival.

Statistics

Data analysis was conducted using SAS software (SAS, Version 9.2; SAS Institute Inc., Cary, NC). Continuous variables were expressed as means, SD, 95% CI, whereas discrete variables were expressed as frequencies and percentages. Groups were compared using chi-squared, contingency tables, or two-tailed Student's t-tests. In all cases, $p < 0.05$ was considered statistically significant.

Results

There were 63 consecutive epithelial ovarian cancer cases managed with a robotic approach and 26 managed with an abdominal approach during the study period. No patient offered a robotic approach chose laparotomy. There were no differences in average patient age ($p = 0.1371$), mean body mass index (BMI) ($p = 0.4805$), or in the race distribution between groups (see Table 1). There was a trend towards larger uteri in the abdominal group ($p = 0.0508$) and the rate of prior abdominal surgery was higher in the abdominal group (76% vs. 96%, $p = 0.0257$). Other than two peritoneal cases in the robotic group, indications were pelvic mass or ovarian cancer.

The types and numbers of procedures performed were similar, with the exception of a lack of diaphragm stripping in the abdominal group and a lack of bowel resection in the robotic group (see Table 2). There were no conversions to laparotomy. Operative time was longer (139 min vs. 95 min, $p < 0.0001$) and there was less blood loss (95 cm^3 vs. 385 cm^3, $p < 0.0001$) for the robotic group. Recovery in the hospital was shorter in the robotic group (2.3 d vs. 6.2 d, $p = 0.0009$), with more robotic patients discharged after a 1 day hospital stay (35/63, 55.6% vs. 1/26, 3.8%, $p < 0.0001$). Overall (33.3% vs. 34.6%, $p = 0.9074$) and major complication (15.9% vs. 23.1%, $p = 0.4209$) rates were similar (see Table 3).

Major complications in the abdominal group included 2 cases of hemorrhage, 1 patient with a cystotomy that went on to experience