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Surgical and oncological outcome of robotic surgery compared to laparoscopic and abdominal surgery in the management of endometrial cancer

G. Corrado [a,*], G. Cutillo [a], G. Pomati [b], E. Mancini [a], I. Sperduti [c], L. Patrizi [b], M. Saltari [b], C. Vincenzoni [a], E. Baiocco [a], E. Vizza [a]

[a] Gynecologic Oncology Unit, "Regina Elena" National Cancer Institute, Rome, Italy
[b] Department of Surgery, Section of Gynaecology and Obstetrics, Tor Vergata University, Rome, Italy
[c] Scientific Direction, "Regina Elena" National Cancer Institute, Rome, Italy

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Abstract

Objective: To compare different techniques of minimally invasive surgery (laparoscopy and robotics) to abdominal surgery in order to identify the optimal surgical technique in the treatment of endometrial cancer.

Methods and materials: A single-institutional, matched, retrospective, cohort study was performed. All patients with clinical stage I or occult stage II endometrial cancer who underwent robotic hysterectomy, bilateral salpingo-oophorectomy ± lymphadenectomy from August 2010 and December 2013 were identified. Surgical and oncological outcomes were compared with patients matched by age, body mass index, tumor histology, and grade, who underwent abdominal or laparoscopic surgery between January 2001 and December 2013.

Results: Three groups were identified: 177 laparotomies (group A), 277 laparoscopies (group B) and 72 robotics (group C). There were no statistically significant differences between the three groups in terms of age, BMI and FIGO stage. The operative time was shortest in group B ($p = 0.0001$). Blood loss and transfusions were equivalent in group B and C, while they were greater in group A ($p = 0.0001$). The intra-operative, early and late postoperative complications, rate of conversion, the re-intervention and median hospital stay were lower in group C. The rate of recurrence and death from disease was similar in all three groups.

Conclusions: Minimally invasive surgery was superior to abdominal surgery in terms of surgical outcomes. Robotic surgery was superior to laparoscopy in terms of intra- and post-operative complications, conversion rates, length of hospital stay and re-interventions. In terms of oncological outcomes the three groups were equivalent.

Keywords: Robotic hysterectomy; Laparoscopic hysterectomy; Abdominal hysterectomy; Endometrial cancer; Minimally invasive surgery

Introduction

Endometrial cancer (EC) is the most common cancer of the female genital system. In 2013, 49.560 new cases of endometrial cancer were diagnosed with a 3% death rate in the USA.[1] Traditionally, the main treatment of endometrial cancer is surgery where it includes abdominal total hysterectomy, salpingo-oophorectomy and eventually pelvic and/or paraortic lymphadenectomy.

In 1993, Childers[2] was the first to propose the laparoscopic approach in performing complex surgical procedures such us total hysterectomy. The Gynecologic Oncologic group confirmed the superiority of laparoscopy compared to laparotomy in a randomized study (LAP-2),[3] in terms of complications and hospital stay. Afterwards, laparoscopy became the favorite surgical technique to employ in the endometrial cancer staging. Moreover, in the last few years, minimally invasive surgery has acquired a leading role in gynecologic oncology.[4]

* Corresponding author. Department of Oncological Surgery, Gynecologic Oncology Unit, "Regina Elena" National Cancer Institute – IFO, Via Elio Chianesi 53, 00144, Rome, Italy. Tel.: +39 06 5266 5172; fax: +39 06 5266 5173.
E-mail address: giacomo.corrado@alice.it (G. Corrado).

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Recently, the robotic system Da Vinci (Intuitive Surgical Inc®, 1266 Kifer Road, Building 101 Sunnyvale, CA) has been introduced. Its use in Gynecology was first approved in 2005 by the Food and Drug Administration. Robotic surgery allows surgeons to perform complex procedures, achieving three-dimensional vision, more accurate hand movements and better control of the instruments.[5] However, the actual benefits received by robotic surgery compared to laparoscopy are not yet clear, especially considering the high cost of purchase and maintenance of the robot.

The aim of this study is to compare three surgical techniques: laparotomy, laparoscopy and robotic surgery in order to identify the best method in terms of surgical outcome and survival in the staging of EC.

Material and methods

This is a retrospective study comparing surgical and oncological outcomes of three surgical techniques in the treatment of EC: laparotomy, laparoscopy and robotic. All the patients were treated by the same surgical team between January 2001 and December 2013 at the Gynaecologic Oncologic Unit, "Regina Elena" National Cancer Institute, Rome, Italy. All laparoscopic and robotic operations were performed by the same surgeon (E.V.) and his assistant (G.C.).

Study design

All patients with an histologically confirmed diagnosis of EC, both endometrioid and non-endometrioid, were included in the study. Before surgery, all patients were submitted to a clinical and instrumental evaluation, consisting of collecting medical history, and undergoing a physical examination, vaginal-pelvic examination, chest X-ray, an ultrasound scan and pelvic magnetic resonance imaging scan. Based on the clinical and instrumental evaluations, all the patients underwent either a type A or type B1 hysterectomy according to the Querleu–Morrow classification.[6] Pelvic lymphadenectomy were performed only when risk factors (myometrial invasion more than 50%, high grading and non-endometrioid histotype) were detected at the intraoperative histological examination. Paraaortic lymphadenectomy is not routinely performed unless pelvic lymph nodes are confirmed to have metastatic disease on frozen section evaluations in order to determine the field of postoperative radiation. With positive pelvic nodes we performed aortic lymphadenectomy until inferior mesenteric artery, if positive lymph nodes at this level we extend until the left renal vein.

Minimally invasive surgery (MIS) was introduced in our hospital in January 2004 and, thereafter, only patients with anesthesiological contraindications to minimally invasive surgery underwent abdominal hysterectomy. In our Institute robotic surgery began in August of 2010 and up to December 2011 all endometrial cancers that could be operated in minimally invasive surgery, if the patient gave his consent, was operated by robotics. From January 2012 to date, to contain the high cost of robotic surgery, we decided internal guidelines to our Institute in which the patients with endometrial cancer at high risk of recurrence or obese BMI>30 kg/m^2 underwent robotic surgery. Informed consent for abdominal or MIS (laparoscopic or robotic) was obtained from all patients in accordance with the local and international legislation (declaration of Helsinki).[7] All the data were collected independently from an internal review board.

Patient characteristics were recorded, including: age, body mass index (BMI), histology, FIGO stage,[8] grading, prior abdominal surgery and concomitant pathology such us other tumors, hypertension and diabetes. Then, the intra-operative parameters were recorded: operative time, blood loss, number of retrieved lymph nodes, transfusions, conversion rate and intra-operative complications. Operative time was calculated from the time of the first surgical incision to skin closure. Hematic blood loss was evaluated by the difference in the total amount of suction and irrigation fluids.

Postoperative parameters included early postoperative complications (in the first 30 days after surgery) and later postoperative complications (more than 30 days after surgery), type of adjuvant therapy (radiotherapy and/or chemotherapy), median follow up in one month, recurrence, 3-years disease free survival (DFS) and 3-years overall survival (OS). Adjuvant therapy was tailored to the pathologic findings at primary operation after multidisciplinary tumor board (gynecologic oncology, pathology, radiation oncology, medical oncology) discussion. Treatment was based on the results of prospective, randomized clinical trials and National Comprehensive Cancer Network Guidelines.[9] All the information concerning the follow up was collected over telephone calls to the patients.

Statistical analysis

Descriptive statistics was used to describe the patient characteristics. Continuous variables were compared using the Mann–Whitney test and categorical variables were compared using chi-square test or Fisher exact test, as appropriate. All significance was defined at the $p < 0.05$ level. The SPSS (SPSS Inc., Chicago, IL, USA) statistical program was used for all analyses. Survival was calculated by the Kaplan–Meier product-limit method from the date of surgery until the time of death for any causes (OS), relapse (DFS), or last visit (OS and DFS).

Results

Patient characteristics (Table 1)

A total of 526 patients underwent endometrial cancer staging between January 2001 and December 2013 at our Institute: 177 abdominal hysterectomies (Group A), 277