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Robotic versus laparoscopic radical hysterectomy in early cervical cancer: A case matched control study

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ABSTRACT

Background: This study aims at evaluating the feasibility, surgical outcome and oncological results observed after robotic radical hysterectomy (RH) compared to laparoscopy for patients with early stage cervical cancer (ECC) patients.
Methods: Between January 2010 and October 2016, 210 patients underwent RH for treatment of ECC: 70 underwent robotic approach (Cases), and 140 underwent laparoscopic approach (Controls).
Results: There was no statistically significant difference between the two approaches with regard to clinical patient characteristics and in terms of extent of RH and rate of pelvic and aortic lymphadenectomy. Operative time was significantly longer in the robotic versus laparoscopic group (median = 243 min, range 90–612 versus median = 210 min, range 80–660; p value = 0.008). Conversion to laparotomy was necessary in 4 patients (1.9%) in the whole series.
No difference was found in terms of intraoperative and postoperative complications between the two groups. Overall, during the observation period, 34 (16.2%) patients experienced any grade postoperative complications, and 21 (10.0%) had >G2 complications.
The 3-yr DFS was 88.0% versus 84.0% in robotic and laparoscopic group, respectively (p value = 0.866). Central and/or lateral pelvic disease represented the most common site of relapse. The 3-yr OS was 90.8% in patients underwent robotic RH versus 94.0% in patients underwent laparoscopic RH (p value = 0.924).
Conclusions: The present study shows the equivalence of robotic and laparoscopic approaches to radical surgery of ECC patients, in terms of perioperative and postoperative outcomes with equivalent survival figures, and thus the choice of approach can be tailored to the choice of patient and surgeon.

Introduction

Cervical cancer is the second most common gynecologic malignancy, and represents the leading cause of cancer related deaths in women from low- and middle income countries [1]. Radical hysterectomy (RH) is the standard surgical procedure for treatment of early stage cervical cancer (ECC) patients, resulting in 5-year survival rates of 75–90% [2,3].

Minimally invasive approach to RH has been increasingly performed over the last two decades, and has now been established as the preferred surgical modality for treating ECC patients [4–7].

The shift of surgical approach from open to minimally invasive procedures for this neoplasia is based on the demonstration of equivalent survival figures and better surgical outcome compared to the open approach: in particular, several studies in this clinical setting showed the feasibility and safety of laparoscopic and robotic radical hysterectomy which carry out some advantages, such as less postoperative pain, lower incidence of postoperative complications, faster recovery, etc compared to open approach [5,8–11].

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As far as the comparison between robotic and laparoscopic approach is concerned, the recent meta-analysis by Shazly et al. [11] has concluded that laparoscopy and robotic RH are equivalent in terms of perioperative outcomes; however, it has to be acknowledged that heterogeneity was elevated for all analyses of peri- and postoperative outcomes with the exception of intra-operative morbidity, thus making the pooled estimates less reliable. This weakness could be ascribed to the different methods employed to assess the outcomes as well as to small sample size of some series [11].

In this context, we were prompted at comparing surgical outcomes, including also intra-operative morbidity as well as early and late complications in a large series of ECC patients triaged to robotic RH (RRH), and laparoscopic RH (LRH). Exploratory analysis of survival outcome has been also carried out.

Materials and methods

Study groups

This is a case-control study comparing surgical and clinical outcomes of 210 ECC patients submitted to RRH (*Cases)* versus LRH *(Controls*), between January 2010 and October 2016, at the Catholic University of Rome, Italy.

All patients gave a written informed consent for their data to be collected and analyzed for scientific purpose. The Institutional Review Board approved the study.

We planned to select for this analysis patients with histologic diagnosis of cervical cancer (any histotype) and FIGO stage IA2-IB2 at gynecologic examination under anesthesia according to FIGO staging rules, and maximum tumor size of 5 cm. In order to reduce as much as possible the heterogeneity related to surgeons' skillfulness, only the data of patients operated by surgeons (V. G., G. S., F. C., V. C.) with a long experience in laparoscopic and robotic gynecologic oncologic procedures were collected. To avoid imbalance between the 2 groups *Cases* were matched with *Controls* using the propensity score with a 1:2 ratio.

The following data were collected: preoperative radiological work out, clinical and pathological features, extent of radical hysterectomy defined according to Querleu and Morrow classification [12], perioperative details (operative time, estimated blood loss-EBL-), intra- and postoperative early (i.e. any adverse event occurring within 30 days from surgery) and late complications (i.e. any adverse event occurring after 30 days from surgery) classified according to Memorial Sloan Kettering Cancer Center (MSKCC) surgical grading system [13], and duration of hospital stay calculated since the first day after surgery.

Details about procedures employed in robotic and laparoscopic surgery have been extensively described elsewhere [14–17]. Data relative to eventual adjuvant radiotherapy in high risk patients were also collected. Occurrence of recurrent disease as well as pattern and treatment of disease were extracted, and update of follow up was carried out.

Statistical analysis

Differences of surgical outcome between *Cases* and *Controls* were analyzed using the Fisher's test or $\chi 2$ test for categorical data, and with the Wilcoxon rank sum non parametric test in case of continuous values, as appropriate. Differences were considered statistically significant at p value <0.05. Disease-free survival (DFS) was calculated from the date of surgery to the date of relapse or the date of the last follow-up; overall survival (OS) was calculated from the date of diagnosis to the date of death or the date of the last follow-up. Medians and life tables were computed using the product limit estimate by Kaplan–Meier method [18], and the log-rank test was used to assess the statistical significance [19].

All statistical analyses were carried out by SPSS statistical software program, version 17.0 (SPSS Inc.,Chicago, IL, USA).

Results

Patient features are shown in Table 1: in the whole series, median age of patients at surgery was 47 years, and median BMI was 24.1 kg/m^2; there was no difference in the distribution of these parameters between the 2 groups. Rate of previous abdominal surgery and previous cervical conization did not differ between *Cases* and *Controls*.

Most patients were clinically staged as Stage IB1 disease (77.6% of the whole series); pelvic lymph node status at imaging was negative in 92.4% of all patients. There was no difference between *Cases* and *Controls* in terms of extent of RH and rate of pelvic and aortic lymphadenectomy.

As shown in Table 2, 25 patients in the whole series (11.9%) were found to harbour stage II tumors; however, there was no difference in the distribution of pathologically assessed extension of disease between the 2 groups. In addition, no difference has been found in the distribution of other pathological features with the exception of number of aortic lymph nodes removed, which was significantly higher in patients undergoing robotic than laparoscopic surgery

Table 1
Patient characteristics.

Characteristics	Whole series N. (%)	*Cases* RRH N. (%)	*Controls* LRH N. (%)	p value
All cases	210	70	140	–
Age, years				
median (range)	47 (25–80)	46 (28–73)	47 (25–80)	0.575[a]
Body Mass Index (BMI), kg/m^2				
median (range)	24.1 (17–48)	24.6 (18–48)	23.5 (17–34.9)	0.118[a]
BMI, kg/m^2				
<30	172 (81.9)	54 (77.1)	118 (84.3)	
≥30	37 (18.1)	16 (22.9)	22 (15.7)	0.254[b]
Previous abdominal surgery				
Yes	64 (30.5)	21 (30.0)	43 (30.7)	
No	146 (69.5)	49 (70.0)	97 (69.3)	0.874[b]
Previous cone biopsy				
Yes	76 (36.2)	24 (34.3)	52 (38.8)	
No	134 (63.8)	46 (65.7)	88 (62.8)	0.546[b]
Clinical FIGO Stage				
IA2	36 (17.1)	12 (17.1)	24 (17.1)	
IB1	163 (77.6)	50 (71.4)	113 (80.8)	
IB2	11 (5.2)	8 (11.5)	3 (2.1)	0.980[b,d]
Clinical tumor size (mm)				
Median (range)	18 (5–50)	20 (4–50)	17 (5–50)	0.531[a]
<20	102 (48.6)	28 (40.0)	74 (52.8)	
≥20 < 40	84 (40.0)	33 (47.1)	51 (36.4)	
≥40 < 50	24 (11.4)	9 (12.9)	15 (10.7)	0.203[c]
Pelvic LN status at imaging				
Negative	194 (92.4)	63 (90.0)	131 (93.6)	
Positive	16 (7.6)	7 (10.0)	9 (6.4)	0.411[b]
Aortic LN status at imaging				
Negative	210 (100)	70 (100)	140 (100)	–
Type of radical hysterectomy				
B1	42 (20)	11 (15.7)	31 (22.1)	
B2	54 (25.7)	14 (20.0)	40 (28.6)	
C1	114 (54.3)	45 (64.3)	69 (49.3)	0.217[c]
Lymphadenectomy				
Pelvic	205 (97.6)	68 (97.1)	137 (97.8)	0.999[b]
Aortic	25 (11.9)	9 (12.9)	16 (11.9)	0.826[b]

[a] Calculated by Mann-Whitney test.
[b] Calculated by Fisher's exact test for proportion.
[c] Calculated by $\chi 2$ test BMI= Body Mass Index. LN = lymph nodes.
[d] Calculated subgrouping Stage IA2 versus IB1-IB2.

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