Submitted: 10 July, 2023 Accepted: 14 August, 2023 Published: 15 February, 2024 DOI:10.22514/ejgo.2024.013

ORIGINAL RESEARCH

European Journal of Gynaecological Oncology

Comparison between robotic and laparoscopic surgery in women over 65 years old with gynecological malignancies

Myriam Gracia[1,*], Miguel Ángel Herraiz[2], Javier García-Santos[2], Mar Ramírez[2], Mónica Bellón[2], Pluvio Coronado[2]

[1]Gynecology Oncology Department, La Paz University Hospital, 28046 Madrid, Spain
[2]Gynecology Oncology Department, Institute of Women's Health José Botella Llusiá, Clinico San Carlos Hospital, 28040 Madrid, Spain

***Correspondence**
Myriam.gracia@salud.madrid.org
(Myriam Gracia)

Abstract

We aim to compare perioperative outcomes and complications between robotic and laparoscopic surgery for gynecologic oncology indications in patients over 65 years old. A prospective comparative study performed at a University Hospital, in patients over 65 operated by robotic (RS) or laparoscopic surgery (LS). All women were diagnosed with gynecological malignancies (cervical, endometrial or ovarian cancer). Data regarding the demographic preoperative characteristic of the patients, perioperative outcomes and surgical complications were analyzed. A total of 209 women underwent minimally invasive surgery (MIS) for gynecologic cancer: 141 (67.5%) by RS and 68 (32.5%) by LS. The median age was 73.4 years (range: 69–77 years) in RS group and 72.8 years (range: 67–78) in the LS group ($p = 0.506$). Hospital stays and blood loos were similar in both groups. Operating time was shorter in the RS group, having a median value of 125 min (range: 95–180 min) compared to 145 min (range: 94–220 min) in the LS group ($p = 0.277$). RS and LS were also found to be comparable in terms of peri- and postoperative complications. In conclusion, RS has comparable perioperative outcomes and complications rates to LS in women over 65.

Keywords

Elderly; Gynecological cancer; Laparoscopic surgery; Minimally invasive surgery; Robotic surgery

1. Introduction

As a result of increasing the life expectancy in Western Countries, there is a growing number of elderly patients requiring treatment for malignancies. The cohort of people over the age of sixty-five accounts for almost two-thirds of new cancer cases and three-fourths of cancer related deaths [1]. A recent study found that improvements in survival since 1990 for the most common cancers have been much more pronounced among patients aged 50 to 64 years than among those aged over 65, as this population has a higher incidence of advanced-stage and aggressive histology than younger patients [2]. This disparity may reflect differential care and/or lower efficacy or use of new therapies in the elderly population.

With traditional open surgery, elderly patients are believed to have a higher rate of postoperative cardiac, respiratory and thromboembolic complications. Likewise, they are thought to have longer hospital stay lengths and to be at a greater risk for loss of independence after surgery [3]. An important advantage of minimally invasive surgery (MIS) in the elderly population is that it can potentially offer a shorter hospital stay, shorter recovery period, less discomfort and improved quality of life. In any event, taking into account the poorer MIS survival outcomes when treating cervical cancer, we caution gynaecologic oncologists to individualise the surgical treatment approach, especially when offering MIS to a patient with a gynaecological malignancy [4].

Some authors have noted that additional goals of interventions should include maximizing the potential life span and independent function, relief of symptoms and maintenance of dignity. Keeping these goals in mind, along with the multiple advantages associated with minimally invasive surgery, this surgical approach may be the ideal method of treatment in elderly patients [4, 5]. Although the application of minimally invasive surgical techniques has rapidly evolved (especially computer-assisted surgery using robotics), there are limited data regarding its value in the elderly population [1].

Nevertheless, there are technical considerations when using robotics in the elderly [1]. Respiratory and cardio vascular systems can be adversely affected by the Trendelenburg position, necessitating even higher inspiratory pressures due to reduced ventilator compliance. These effects might overshadow the potential advantages of robotic surgery in the older patients [3].

Robotic surgery (RS) is gaining acceptance for treating gynecologic cancer, allowing the performance of more complex procedures using the MIS [6]. Due to the lack of scientific

evidence in the use of RS in elderly patients, we decided to compare both MIS approaches to investigate if the RS had advantages over the LS in patient over 65. In this context, the aim of this study was to compare perioperative outcomes and complications rates between RS and LS for gynecologic malignancies (cervical, endometrial and ovarian cancers) in elderly patients.

2. Material and methods

A prospective comparative study including a cohort of 209 consecutive patients who were operated by MIS at Clinico San Carlos Hospital in Madrid (Spain) from 2012 to 2018. Inclusion criteria were patients over 65 undergoing MIS due to gynaecological malignancies (endometrial, ovarian and cervical carcinomas). Patients subjected to open surgery or who did not sign informed consent were excluded. The indication of MIS approach and management of the patients were performed according to European Society of Gynecologic Oncology (ESGO) [7] and Spanish Society of Gynecology and Obstetrics (SEGO) guidelines. The selection of one of the two surgical approaches (robotic or laparoscopic) was left to the surgeon's discretion. The Da Vinci Surgical System was available just once a week; hence, the surgical approach (robotic or laparoscopy) was selected depending on this condition. Robotic surgeries were mostly performed both in the afternoon and on Fridays, with late discharge due to the weekend. The standard robotic model was used until 2015, and since then we have been using the Da Vinci Xi model. All procedures were performed by the same surgical team composed by trained gynecologic oncology surgeons with experience in both approaches of MIS. The surgical procedures included total hysterectomy and bilateral adnexectomy with or without pelvic and/or paraaortic lymphadenectomy for staging in ovarian or endometrial cancers or *in situ* cervical carcinomas, radical hysterectomy type B2 or C1 for early cervical cancers, and paraaortic lymphadenectomy as isolated procedure for staging in advanced cervical cancer. All patients underwent a complete preoperative work-up, including imaging techniques (Computed tomography can or Magnetic resonance imaging) and blood test. Pre-operative assessment of the expected anesthesiologic risk was based on the American Society of Anesthetic (ASA) score. In accordance with institutions protocols all patients received intraoperative antibiotic and thromboprophylaxis.

For the purpose of the present research, robotic and laparoscopic approach were compared in terms of baseline characteristics, perioperative outcomes and intra and postoperative complications based on severity using the Clavien-Dindo classification [8].

Baseline characteristics were drawn from the patients' medical records and they included age, body mass index (BMI), ASA score, clinical comorbidities (namely cardiovascular disease, lung diseases, diabetes mellitus and previous non-gynaecological malignancies), previous abdominal surgeries, type of surgery, diagnosis and FIGO (The international Federation of Gynecology and Obstetrics) stage. The perioperative outcomes compared were hospital satay, blood loss, surgery time (counted from the time of the skin incision to the time of its closure), number of nodes obtained, conversion rate, re-intervention rate and transfusion rate. Intra and postoperative complications (adverse event occurring within 90 days from surgery) were noted.

In accordance with the journal's guidelines, we will provide our data for the reproducibility of this study in other centers if such is requested.

Qualitative variables were present with frequencies and percentages and quantitative variables with median and interquartile range (IQR). A homogeneity study was made between the study groups. The association among qualitative variables was evaluated with the χ^2 test or Fisher exact test, in case more than 25% of the expected ones were less than 5. For the quantitative variables, an independent samples *t* test or Mann Whitney U test was used, depending on their parametrical distribution. For all tests, a p value less than 0.05 was considered statistically significant. Processing and analysis of data were carried out using IBM SPSS (IMB, Armonk, NY, USA) statistical software version 23.0.

3. Results

During the period of time analyzed 209 women over 65 underwent MIS for gynaecological cancer: 141 (67.5%) by RS and 68 (32.5%) by LS. In Table 1, the patient's baseline characteristics and the homogeneity study are displayed. No statistical difference was identified in the baseline characteristics between the two groups. Perioperative outcomes are presented in Table 2. No statistical differences between RS and LS were observed between the variables assessed. Surgical time was 25 min longer on average in LS group. We observed a conversion to laparotomy rate of 5.7% in RS group but no such cases occurred in LS group. The causes of conversion in RS group were four cases of severe adhesions in abdominal cavity due to previous surgeries, two cases of epigastric artery injurie and one case of obesity with hypercapnia and no Trendelenburg tolerance. The re-operation rate was 3% higher in LS than in RS (7.2% *vs.* 10.3%, $p = 0.723$). The main causes of re-intervention in the robotic group were vaginal vault dehiscence (5 patients), trocar site herniation (3 patients), pelvic infection (1 patient) and urinoma (1 patient). In the laparoscopic group causes of re-intervention were vaginal vault dehiscence (4 patients), trocar site herniation (1 patient) and abdominal wall hematoma which needed surgical drainage (2 patients). Intra and postoperative complications between groups are listed in Table 3. No statistical differences between surgical approaches were observed in terms of intra- and postoperative complications.

4. Discussion

Surgical complications and mortality rates increase with age. In gynaecological surgery complications have been greatly reduced with MIS. Previous studies have demonstrated that age should not be considered a contraindication to indicate a MIS [9, 10]. In fact, many studies confirm a decrease in morbidity in older patients who undergo MIS when compared to the laparotomy approach [6, 10]. Furthermore, some authors found that age <60 and MIS were associated with a decrease

TABLE 1. Baseline characteristics by surgical approach*.

	RS (n = 141)	LS (n = 68)	*p*
Age (yr)	73.4 (69–77)	72.8 (67–78)	0.506
BMI (kg/m^2)	28.7 (25–32)	27.6 (24–30)	0.146
ASA			
I/II	75 (53.0)	44 (64.7)	0.152
III/IV	66 (47.0)	24 (35.3)	
Comorbidities[a]	121 (85.8)	54 (79.4)	0.240
Previous abdominal surgeries	39 (27.7)	25 (36.8)	0.181
Type of surgery			
Total Hysterectomy (TH)	46 (32.6)	24 (35.3)	0.953
TH + Pelvic or/and Paraaortic Lymphadenectomy	85 (60.3)	39 (57.4)	
Radical Hysterectomy	2 (1.4)	1 (1.5)	
Para Aortic Lymphadenectomy[b]	8 (5.7)	4 (5.9)	
Diagnosis			
Endometrial cancer	123 (87.2)	57 (83.8)	0.803
Ovarian cancer	8 (5.7)	5 (7.4)	
Cervical cancer	10 (7.1)	6 (8.8)	
FIGO stage			
Endometrial cancer (FIGO staging 2018)			
I–II	101 (71.6)	55 (81.0)	0.143
IIIA	2 (1.4)	0	
IIIB	1 (0.7)	0	
IIIC1	9 (6.3)	1 (1.4)	
IIIC2	6 (4.2)	0	
IVA	1 (0.7)	1 (1.4)	
IVB	3 (2.1)	0	
Ovarian cancer (FIGO staging 2014)			
I–II	8 (5.6)	5 (7.3)	0.118
III–IV	0	0	
Cervical cancer (FIGO staging 2018)			
IA1	0	1 (1.4)	0.433
IB1–IB2	2 (1.4)	1 (1.4)	
IIB	8 (5.6)	4 (5.8)	
III–IV	0	0	

**Data are given in the form of median values (interquartile range) and frequency (percentage).*
RS: Robotic Surgery; LS: Laparoscopic Surgery; BMI: Body Mass Index; ASA: American Society of Anesthesiologists; FIGO: The international Federation of Gynecology and Obstetrics.
[a] *Cardiovascular disease, lung diseases, diabetes mellitus and previous malignancies.*
[b] *Cervical cancer staging.*

TABLE 2. Perioperative outcomes for the two surgical approaches*.

	RS (n = 141)	LS (n = 68)	*p*
Hospital stay (day)	3 (2–3)	3 (2–4)	0.382
Blood loos (mL)	100 (57.0–150.0)	100 (57.5–156.0)	0.437
Skin to skin surgery time (min)	125 (95–180)	145 (94–220)	0.277
Paraaortic Nodes	9 (3–11)	10 (6–15)	0.136
Pelvic Nodes	16 (9–20)	15 (9–19)	0.591
Conversion	8 (5.7)	0 (0)	0.056
Re-operation	10 (7.2)	7 (10.3)	0.723
Transfusion	2 (1.4)	1 (1.5)	0.997

**Data are given in the form of median values (interquartile range) and frequency (percentage).*
RS: Robotic Surgery; LS: Laparoscopic Surgery.

TABLE 3. Complications comparing both surgical approaches*.

	RS (n = 141)	LS (n = 68)	*p*	OR (95% CI)
Intra-operative complications	8 (5.6)	2 (2.9)	0.508	1.92 (0.38–9.33)
Urinary	5 (3.5)	1(1.4)		
Vascular (Epigastric artery)	3 (2.1)	1 (1.4)		
Post-operative complications	8 (5.6)	10 (14.7)	0.062	0.38 (0.14–1.02)
Infection[a]	4 (2.8)	2 (2.9)		
Abdominal wall hematoma	1 (0.7)	2 (2.9)		
Vaginal vault hematoma	0	1(1.4)		
Vaginal vault dehiscence	0	2 (2.9)		
Hernia	1 (0.7)	0		
Ileus	1(0.7)	2 (2.9)		
Arritmia	1(0.7)	1 (1.4)		
Total complications	16 (11.3)	12 (17.6)	0.292	0.64 (0.28–1.43)
Clavien Dindo classification				
Grade 1	5 (3.5)	4 (5.8)	0.482	
Grade 2	8 (5.6)	6 (8.8)	0.558	
Grade 3B	3 (2.1)	2 (2.9)	0.663	

**Data are given in the form of frequency (percentage).*
[a] Urinary infection, wound infection, lower limb cellulite, pelvic abscess.
RS: Robotic Surgery; LS: Laparoscopic Surgery; OR: Odds ratio; CI: Confidence interval.

risk of hospital readmission [11].

In the present study there was no difference between RS and LS in terms of perioperative outcomes. The length of our hospital stays—with a median of 3 days in both approaches—aligns with that of other studies on robotic surgery in elderly patients, whose data ranges between 1 and 3 days [6]. Robotic surgeries were performed mainly in the afternoon and on Fridays (with late discharge due to the weekend), which could be a disadvantage for RS in comparison to LS, which was performed in the morning.

We also found similar estimated blood loss in both groups, although some prior studies have demonstrated a less blood loss in RS in comparison to LS, as when comparing MIS versus laparotomy in elderly patients [12–14]. Our results are in line with other studies that did not find differences in blood loss comparing RS and LS between young and elderly patients [5].

Operating time has previously been reported to be longer for RS in elderly population with endometrial cancer (244.2 and 217.7 min in RS *vs.* open surgery; $p = 0.009$) [1] and also in patients with cervical cancer who underwent radical hysterectomy [15]. Other centers with expertise in gynecology oncology surgery have not showed any difference in the

operation time (105 min in RS *vs.* 107 min in open surgery; $p = 0.704$) [16]. In our series, patients undergoing RS had on average a 20-minute shorter operation time than those undergoing LS. Although this is not considered statistically significant, it could be important in patients with high morbidity due to the fact that anaesthetic time is reduced and, thus, so are possible intraoperative complications. Differences in time between studies may be due to the experience of the surgical team, number of patients treated per center or due to different oncological protocols regarding when to add lymphadenectomy. Nevertheless, the low operation time in RS is also in line with previous data reported by our group [12].

The median number of lymph nodes obtained was similar comparing both approaches. Our results are comparable to another study assessing RS in the elderly which obtained a mean lymph nodes number of 19.8 [5]. In terms of reoperation, we had a lower rate in the RS group when compared to LS. In a study assessing perioperative outcomes in patients operated by RS, a higher percentage of patients over 75 underwent reintervention compared to younger women (2% *vs.* 0.3%; $p = 0.20$) [10]. RS is associated with a lower need of transfusion [12]. In our study the transfusion rate was similar between both surgical approaches. These findings are in line with other studies; for instance, in one study with a large sample of 915 very elderly patients, no statistically significant differences were found (10.6% in LS *vs.* 8.3% in RS; $p > 0.05$) [17]. In our research, 8 (5.7%) patients were converted to laparotomy in RS group and none in the LS group, which could be explained by selection bias at the beginning of the RS learning curve when the robotic approach was used to operate on more complex patients. However, this conversion rate is lower than that of other studies. Dos Reis *et al.* [15] reported an increase in conversion rate as age increased in patients undergoing RS (<50 years old: 5.8%; 50–59 years old: 4.8%; ≥60 years old: 15.4%; $p = 0.396$).

Elderly patients usually present medical comorbidities that could increase surgical complications. A retrospective analysis of patient from GOG (Gynecologic Oncology Group) LAP2 study by age showed no significant differences in intraoperative complications rate in laparoscopic approach ($p = 0.942$) [18]. However, there was an increasing rate of postoperative complications in patient older than 60 years (16.3% *vs.* 245%, $p = 0.002$) [18]. We did not observe statistically significant differences between RS and LS in our complications rate, although we had more intraoperative complications in the RS group. The rate of postoperative complications was lower in RS (5.6% RS *vs.* 14.7% LS) with a similar percentage of grade 3B complications in both groups. 8 (5.6%) patients of the RS group experienced postoperative complications, a frequency that aligns with some previously published results published in elderly patients operated by robotic surgery (range: 9–34 patients with postoperative complications) [7, 13, 19]. Along the same lines, several recent high-volume analyses of oncologic patients undergoing RS (comparing <65 *vs.* >65 years old) found a similar intra and postoperative complications rate, regardless of the age [20, 21]. Additionally, older patients had less surgical blood loss despite similar operative time, but not reaching statistical significance [21].

Most studies regarding gynecological surgery in elderly patients compare MIS with laparotomy or assess perioperative outcomes of a unique surgical approach in different ranges of age, and are generally focused on endometrial cancer. The novelty and strength of our study is our comparison between two different MIS approaches and, to the best of our knowledge, ours is one of the largest studies focused on MIS and gynaecological cancer in patients over 65 years old. The major weakness of our study is the lack of patient randomisation (thus, there may be selections biases) and the fact that it was undertaken at a single institution.

5. Conclusions

In conclusion, RS and LS are comparable in terms of perioperative outcomes without increasing intra or postoperative complications. RS and LS are equivalent in terms of surgical management for the treatment of gynaecological malignancies in women over 65 years old, although this data would be best confirmed in a randomized prospective trial.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

MG—data collection, statistics, writing and manuscript preparation. MÁH—manuscript corrections. JGS—data collection. MR—data collection. MB—data collection. PC—writing and manuscript preparation.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the local Ethical Committee (Reference number 12/035-E. Date of approval 08 February 2012) and all patients included signed the specific consent form.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Lavoue V, Zeng X, Lau S, Press JZ, Abitbol J, Gotlieb R, *et al*. Impact of robotics on the outcome of elderly patients with endometrial cancer. Gynecologic Oncology. 2014; 133: 556–562.

[2] van Walree IC, Bretveld R, van Huis-Tanja LH, Louwers JA, Emmelot-Vonk MH, Hamaker ME. Reasons for guideline non-adherence in older and younger women with advanced stage ovarian cancer. Gynecologic Oncology. 2020; 157: 593–598.

[3] Hotton J, Koual M, Gosset M, Rossi L, Delomenie M, Ngo C, *et al*. Outcomes of robotic surgery for endometrial cancer in elderly women. Surgical Oncology. 2020; 33: 24–29.
[4] Lyons YA, Stephan J, Gonzalez Bosquet J, Goodheart MJ. Gynecologic oncology: challenges of minimally invasive surgery in a field of maximal complexities. Clinical Obstetrics & Gynecology. 2020; 63: 30–39.
[5] Tanaka T, Yamashita S, Kuroboshi H, Kamibayashi J, Sugiura A, Yoriki K, *et al*. Oncologic outcomes in elderly patients who underwent hysterectomy for endometrial cancer: a multi-institutional survey in Kinki District, Japan. International Journal of Clinical Oncology. 2022; 27: 1084–1092.
[6] Gallotta V, Conte C, D'Indinosante M, Federico A, Biscione A, Vizzielli G, *et al*. Robotic surgery in elderly and very elderly gynecologic cancer patients. Journal of Minimally Invasive Gynecology. 2018; 25: 872–877.
[7] Cibula D, Raspollini MR, Planchamp F, Centeno C, Chargari C, Felix A, *et al*. ESGO/ESTRO/ESP guidelines for the management of patients with cervical cancer—update 2023. International Journal of Gynecologic Cancer. 2023; 33: 649–666.
[8] Dindo D, Demartines N, Clavien P. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Annals of Surgery. 2004; 240: 205–213.
[9] Sung VW, Weitzen S, Sokol ER, Rardin CR, Myers DL. Effect of patient age on increasing morbidity and mortality following urogynecologic surgery. American Journal of Obstetrics and Gynecology. 2006; 194: 1411–1417.
[10] Krause AK, Muntz HG, McGonigle KF. Robotic-assisted gynecologic surgery and perioperative morbidity in elderly women. Journal of Minimally Invasive Gynecology. 2016; 23: 949–953.
[11] Pyrzak A, Saiz A, Polan RM, Barber EL. Risk factors for potentially avoidable readmissions following gynecologic oncology surgery. Gynecologic Oncology. 2020; 159: 195–200.
[12] Gracia M, García-Santos J, Ramirez M, Bellón M, Herraiz MA, Coronado PJ. Value of robotic surgery in endometrial cancer by body mass index. International Journal of Gynecology & Obstetrics. 2020; 150: 398–405.
[13] Doo DW, Guntupalli SR, Corr BR, Sheeder J, Davidson SA, Behbakht K, *et al*. Comparative surgical outcomes for endometrial cancer patients 65 years old or older staged with robotics or laparotomy. Annals of Surgical Oncology. 2015; 22: 3687–3694.
[14] Shoraka M, Wang S, Carbajal-Mamani SL, Han H, Amaro B, Cardenas-Goicoechea J. Oncologic outcomes in older women with endometrial carcinoma (≥70 years). Journal of Obstetrics and Gynaecology. 2022; 42: 2127–2133.
[15] Dos Reis R, Andrade CEMC, Frumovitz M, Munsell M, Ramirez PT. Radical hysterectomy and age: outcomes comparison based on a minimally invasive *vs* an open approach. Journal of Minimally Invasive Gynecology. 2018; 25: 1224–1230.
[16] Lindfors A, Åkesson Å, Staf C, Sjöli P, Sundfeldt K, Dahm-Kähler P. Robotic *vs.* open surgery for endometrial cancer in elderly patients: surgical outcome, survival, and cost analysis. International Journal of Gynecologic Cancer. 2018; 28: 692–699.
[17] Zakhari A, Czuzoj-Shulman N, Spence AR, Gotlieb WH, Abenhaim HA. Hysterectomy for uterine cancer in the elderly: a comparison between laparoscopic and robot-assisted techniques. International Journal of Gynecologic Cancer. 2016; 26: 1222–1227.
[18] Bishop EA, Java JJ, Moore KN, Spirtos NM, Pearl ML, Zivanovic O, *et al*. Surgical outcomes among elderly women with endometrial cancer treated by laparoscopic hysterectomy: an NRG/gynecologic oncology group study. American Journal of Obstetrics and Gynecology. 2018; 218: 109.e1–109.e11.
[19] Zhou L, Guo F, Li D, Qi J, Chan L, Yuan Y. Short- and long-term outcomes of laparoscopic surgery for elderly patients with clinical stage I endometrial cancer. Journal of B.U.ON. 2020; 25: 764–771.
[20] Moore MS, Vo EH, Bhattarai B, Farley JH, Monk BJ, Willmott LJ, *et al*. Robotic-assisted gynecologic surgery in an older population: a comparison study. Journal of Geriatric Oncology. 2023; 14: 101533.
[21] Mothes AR, Kather A, Cepraga I, Esber A, Kwetkat A, Runnebaum IB. Robotic-assisted gynecological surgery in older patients—a comparative cohort study of perioperative outcomes. Geburtshilfe Und Frauenheilkunde. 2023; 83: 437–445. (In German)

How to cite this article: Myriam Gracia, Miguel Ángel Herraiz, Javier García-Santos, Mar Ramírez, Mónica Bellón, Pluvio Coronado. Comparison between robotic and laparoscopic surgery in women over 65 years old with gynecological malignancies. European Journal of Gynaecological Oncology. 2024; 45(1): 83-88. doi: 10.22514/ejgo.2024.013.