

# Short-term Outcome of Robotic and Laparoscopic Surgery for Gynecological Malignancies: A Single-center Experience

Corina-Elena Minciuna<sup>1,2#</sup>, Mihail Ivanov<sup>1#</sup>, Sanziana Aioanei<sup>1</sup>, Stefan Tudor<sup>1,2</sup>, Monica Lacatus<sup>1,2</sup>, Catalin Vasilescu<sup>1,2\*</sup>

<sup>1</sup>Department of General Surgery, Fundeni Clinical Institute, <sup>2</sup>Department of General Surgery, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

<sup>#</sup>These authors have contributed equally to this work

## Abstract

**Objectives:** Minimally invasive surgery (MIS) has become the preferred option for many gynecologic pathologies since complication rate and postoperative recovery time have decreased considerably. Postoperative complications remain an important aspect when using the MIS approach, if they are not timely or accurately diagnosed and treated. The main aim of the study is to first assess their incidence, followed by identifying possible risk factors. Furthermore, the secondary aim is to identify if the type of MIS approach used, robotic or laparoscopic, may render some additional benefits.

**Materials and Methods:** The database of the General Surgery Department was queried between 2008 and 2019 for patients with gynecologic pathology: 2907 cases were identified. An additional selection was performed using the following filters: MIS and neoplasia. All emergency surgeries were excluded. One hundred and ninety-eight cases were obtained.

**Results:** The majority of complications were urological (11.6%) with only 7.07% requiring a specific urological procedure. The second most common was lymphorrhea 4.5%. Dindo–Clavien classification correlates positively with the postoperative hospital stay (PHS) ( $P = 0.000$ ), the type of surgery ( $P = 0.046$ ), the primary tumor location ( $P = 0.011$ ), conversion rate ( $P = 0.049$ ), the expertise of the lead surgeon ( $P = 0.012$ ), and the operative time ( $P = 0.002$ ). The urological complications correlate positively with the type of surgery ( $P = 0.002$ ), the tumor location ( $P = 0.001$ ), early reintervention ( $P = 0.000$ ), operative time ( $P = 0.006$ ), postoperative hemorrhage ( $P = 0.000$ ), pelvic abscess ( $P = 0.000$ ), venous thrombosis ( $P = 0.011$ ), and postoperative cardiac complications ( $P = 0.002$ ). Laparoscopic and robotic approaches were comparatively assessed. The PHS ( $P = 0.025$ ), the type of surgery performed ( $P = 0.000$ ), and primary tumor location ( $P = 0.011$ ) were statistically significantly different.

**Conclusion:** Postoperative complications reported after MIS for gynecological malignancies show similar incidence as in the current literature, also taking into consideration those for the open approach. The robotic approach seems to be able to perform more complex surgeries with no difference in the postoperative complication rates. The expertise of the lead surgeon in gynecology correlates with lower postoperative complications. Further prospective studies are needed to confirm these results.

**Keywords:** Gynecologic neoplasms, gynecologic surgical procedures, laparoscopy, minimally invasive surgical procedures, neoplasms, postoperative complications, robotic surgical procedures

## INTRODUCTION

In recent years, minimally invasive surgery (MIS) for gynecologic pathology has become the preferred option for many gynecological disorders<sup>[1]</sup> since complication rate and postoperative recovery time have decreased considerably.<sup>[2]</sup>

In endometrial cancer, MIS is the preferred approach,<sup>[3]</sup> since in 2009, the LAP2<sup>[4]</sup> study demonstrated fewer postoperative complications and a shorter hospital stay for laparoscopy compared to open. For cervical cancer, until recently, the

### Article History:

Submitted: 12-Dec-2022

Revised: 27-Apr-2023

Accepted: 18-May-2023

Published: 07-Sep-2023

### Access this article online

#### Quick Response Code:



Website:  
<https://journals.lww.com/gmit>

DOI:  
10.4103/gmit.gmit\_137\_22

**Address for correspondence:** Prof. Dr. Catalin Vasilescu,  
Department of General Surgery, Fundeni Clinical Institute, 258 Fundeni  
Street, Bucharest, Romania.  
E-mail: catvasilescu@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Minciuna CE, Ivanov M, Aioanei S, Tudor S, Lacatus M, Vasilescu C. Short-term outcome of robotic and laparoscopic surgery for gynecological malignancies: A single-center experience. *Gynecol Minim Invasive Ther* 2023;12:236-42.

guidelines accepted both MIS and open surgery (OS) for performing the radical hysterectomy for Stage IA2–IIA.<sup>[5]</sup> These recommendations led to the widespread use of MIS despite the few prospective randomized studies assessing the survival outcomes.<sup>[5]</sup> In 2018, a major paradigm shift occurred in the surgical treatment: MIS was linked with lower survival than OS and as well with lower rates of disease-free survival, after the prospective study conducted by Ramirez *et al.*<sup>[5]</sup> In addition, this finding was also backed up by the epidemiological study of Melamed *et al.*<sup>[6]</sup> After that ESMO<sup>[7]</sup> included in the guidelines that MIS cannot be regarded as the preferred treatment option, patients should be counseled about the risks and benefits of the different approaches. However, the question still remains: should we carry on, discard, or modify?<sup>[8]</sup> The action to discard MIS is still to be concluded as some surgeons consider that the prospective study has some biases<sup>[9,10]</sup> that may refute the conclusions and studies that show superiority or at least not inferiority start to get published.<sup>[11,12]</sup>

If inadequate diagnosis and treatment, intraoperative and postoperative complications associated with MIS are a critical issue, particularly the urological ones. For example, the latter, that includes the vesicovaginal fistula, vesical or ureteral fistulas, and/or ureteral stenoses, can lead to long-term complications such as varying degrees of hydronephrosis or renal failure.<sup>[13]</sup> This is one of the basic issues in gynecological MIS, both from a clinical and a medico-legal point of view.<sup>[13]</sup>

The main aim of the study is to assess the incidence of postoperative complications occurring in MIS for gynecological malignancies and their specific management, emphasizing the urological ones. The second purpose is to perform an assessment of risk factors on pre- and intraoperative variables and to identify if the type of MIS approach used, robotic or laparoscopic, may render some additional benefits.

## MATERIALS AND METHODS

### Data source and patient selection

The retrospective cohort study used the database of the General Surgery Department, searching between 2008 and 2019 for patients with gynecologic pathology. Two thousand nine hundred and seven cases were acquired. An additional selection was performed using the following filters: MIS and neoplasia. All emergency surgeries were excluded. One hundred and ninety-eight cases were obtained. The following variables were assessed age, American Society of Anesthesiology (ASA) score, postoperative hospital stay (PHS), comorbidities, type of surgery, primary tumor location, approach (laparoscopic/robotic), conversion rate, expertise

of the lead surgeon, the operative time, and postoperative complications. If the latter was present the Clavien-Dindo classification was used for an objective characterization and its specific management was presented.

### Ethics

Informed consent was obtained prior to surgery from all patients. Approval from the Local Review Board was acquired for the retrospective use of the patient's data in the present study. All the procedures performed in the study were in accordance with the Ethical Standards of the Institutional Research Committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards (IRB number: 35889).

### Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows (version 23.0, IBM, Chicago, IL, USA). Categorical variables were described in frequencies and percentages. Continuous variables were represented as mean  $\pm$  standard deviation or median and range, after checking for normality. Categorical variables were compared using the Chi-square test. Continuous variables with quasi-normal distributions were compared using Student's *t*-test and those with a severe deviation from normality, with appropriate nonparametric tests. For correlation analyses, Spearman's Rho coefficient was employed.

## RESULTS

The mean age was 53 years with a minimum of 23 and a maximum of 78 years. In Table 1, the preoperative and intraoperative variables are evaluated in terms of frequencies and percentages. For the PHS, the study registered one missing case with a mean of 7.58 days. The minimum PHS was 3 days and the maximum of 64 days. Regarding the operative time, the mean was 240 min with a minimum of 80 min and a maximum of 570 min. The primary tumor was located in the cervix for most of the patients, 65.15%. For the rest of the patients, the tumor was located in the uterus 28.79%, pelvic recurrences 5.56%, and ovary 0.51%.

Most of the patients, 151 (76.3%), had a Piver III hysterectomy. Twenty patients, 10.1%, had a Piver II hysterectomy. 5.1% of the patients, 10 cases, associated other resections to the Piver III hysterectomy and the same number of patients with anterior pelvic exenteration. For total pelvic exenteration, 3 cases, 1.5%, were registered for the resection of the local recurrence. Only one patient had a posterior pelvic exenteration (0.5%).

85.4% of the surgeries were performed by a surgeon with experience both in MIS and proficient in gynecological surgery. The rest of the cases, 14.6%, were performed by surgeons with experience in MIS.

**Table 1: Preoperative and intraoperative variable assessment of the entire cohort of gynecological malignancy that underwent minimally invasive surgery in the General Surgery Department between 2008 and 2019**

Variable	Frequency (%)
ASA	
2	116 (58.6)
3	69 (34.8)
4	13 (6.6)
Cardiac disease	
No	132 (66.7)
Yes	66 (33.3)
Lung disease	
No	189 (95.5)
Yes	9 (4.5)
Neurological disease	
No	189 (95.5)
Yes	9 (4.5)
Obesity	
No	171 (86.4)
Yes	27 (13.6)
Autoimmune disease	
No	181 (91.4)
Yes	17 (8.6)
Diabetes	
No	184 (92.9)
Yes	9 (7.1)
Chronic venous insufficiency	
No	189 (95.5)
Yes	9 (4.5)
Hepatitis virus	
No	194 (98)
Yes	4 (2)
Tumor location	
Uterus	57 (28.8)
Cervix	129 (65.2)
Ovary	1 (0.5)
Recurrence	11 (5.6)
Exploratory laparoscopy	
No	194 (98)
Yes	4 (2)
Conversion	
No	191 (96.5)
Yes	7 (3.5)
Group	
Laparoscopy	63 (31.8)
Robotic	135 (68.2)

ASA: American Society of Anesthesiologists

The Dindo–Clavien classification was used in order to reduce the biases when reporting postoperative complications. 76.3% of cases had no complications. In 2.02% of cases, the study reports Grade I complications, and in 13.13%, 26 cases, Grade II. Eleven cases, 5.56%, had grade IIIA complications and 3.03%, 6 cases, had IIIB complications. The detailed assessment of the postoperative complications is depicted in

**Table 2: Postoperative complications assessment in the entire cohort that underwent minimally invasive surgery for gynecologic malignancies**

Variable	Frequency (%)
Urological	
No	174 (87.9)
Yes	23 (11.6)
Missing	1 (0.5)
Wound and parietal	
No	192 (97)
Yes	4 (2)
Missing	2 (1)
Hemorrhage	
No	193 (97.5)
Yes	3 (1.5)
Missing	2 (1)
Pelvic abscess	
No	192 (97)
Yes	4 (2)
Missing	2 (1)
Lymphorrhea	
No	187 (94.4)
Yes	9 (4.5)
Missing	2 (1)
Ileus	
No	191 (96.5)
Yes	5 (2.5)
Missing	2 (1)
Venous thrombosis	
No	194 (98)
Yes	2 (1)
Missing	2 (1)
Cardiac	
No	192 (97)
Yes	4 (2)
Missing	2 (1)

Table 2. The majority of the complications were urological, 11.6% of which 7.07% required specific urological procedures. In only 1.51% of cases a surgical intervention was needed. The most frequent urological procedure used was insertion of double-J catheter 3.03%, followed by urethrovesical catheterization 2.02% and in 0.5% cases by nephrostomy.

In order to assess a possible correlation between the Dindo–Clavien classification and the other variables, the Spearman's rho coefficient was employed. Dindo–Clavien classification correlates positively with the PHS ( $P = 0.000$ ), the type of surgery ( $P = 0.046$ ), the primary tumor location ( $P = 0.011$ ), conversion ( $P = 0.049$ ), the expertise of the lead surgeon ( $P = 0.012$ ), and the operative time ( $P = 0.002$ ).

Other correlations were evaluated for specific postoperative complications. All postoperative complications (urological,

wound and parietal, hemorrhage, etc.), except lymphorrhea, correlated positively and statistically significantly with the PHS. The urological complications correlate positively with the type of surgery ( $P = 0.002$ ), the tumor location ( $P = 0.001$ ), early reintervention ( $P = 0.000$ ), operative time ( $P = 0.006$ ), postoperative hemorrhage ( $P = 0.000$ ), pelvic abscess ( $P = 0.000$ ), venous thrombosis ( $P = 0.011$ ), and postoperative cardiac complications ( $P = 0.002$ ).

Wound and parietal complications correlate positively with postoperative hemorrhage ( $P = 0.000$ ), pelvic abscess ( $P = 0.000$ ), lymphorrhea ( $P = 0.001$ ), ileus ( $P = 0.000$ ), venous thrombosis ( $P = 0.000$ ), and cardiac complications ( $P = 0.000$ ). The presence of cardiac disease does not correlate with the postoperative cardiac complications ( $P = 0.088$ ). Obesity does not correlate with postoperative complications and neither does diabetes. Chronic venous insufficiency does not correlate with postoperative venous thrombosis ( $P = 0.66$ ). Primary tumor locations correlate positively with postoperative hemorrhage ( $P = 0.026$ ), pelvic abscess ( $P = 0.015$ ), venous thrombosis ( $P = 0.001$ ), and cardiac complications ( $P = 0.015$ ).

The type of surgery correlates positively with postoperative hemorrhage ( $P = 0.017$ ) and venous thrombosis ( $P = 0.002$ ). The operative time correlates positively with wound and parietal complications ( $P = 0.025$ ), pelvic abscess ( $P = 0.027$ ), and venous thrombosis ( $P = 0.013$ ). Conversion correlates positively with the presence of wound and parietal complications ( $P = 0.000$ ), postoperative hemorrhage ( $P = 0.046$ ), and venous thrombosis ( $P = 0.020$ ).

In order to evaluate the differences between the types of MIS approach used, the cohort was divided into the robotic group (RG) and the laparoscopic group (LG). In order to perform the analysis, the *t*-test was used for continuous quasi-normal distributed variables and Chi-square test for categorical variables. All variables were comparatively assessed between the RG and the LG, and the results are resumed in Table 3. The patients in the RG had a mean PHS of 8.38 days, as opposed to those in the LG of only 5.89 days.

15.87% of patients from the LG were ASA 4 compared with only 2.23% from the RG. The percentage of ASA 3 patients was 30.15% in the LG and 37.31% in the RG and for ASA 2: 53.98% in the LG and 60.46% in the RG. These differences were statistically significant, as shown in Table 3.

The RG included 69.62% of patients with cervical cancer, as opposed to the LG that had only 55.55% of patients with cervical cancer. Uterine malignancies were predominantly operated on using the laparoscopic approach, 41.26% of cases, rather than the robotic one, 22.96% of cases. The local

**Table 3: Comparative assessment of the previously analyzed variables by group: Laparoscopic versus robotic approach in gynecologic malignancies**

Variable	P
Age	0.779
ASA score*	0.001
Cardiac disease	0.056
Lung disease	0.121
Neurological disease	0.929
Obesity	0.52
Autoimmune disease	0.163
Diabetes	0.134
Chronic venous insufficiency	0.169
Hepatitis virus	0.762
Primary tumor location*	0.011
Exploratory laparoscopy	0.61
Conversion	0.851
Surgeon	0.101
Type of surgery*	0.000
Operative time (min)	0.316
Early reintervention	0.566
Late reintervention	0.493
Postoperative hospital stay*	0.025
Dindo–Clavien classification	0.606
Urological complications	0.755
Wound and parietal complications	0.595
Postoperative hemorrhage*	0.302
Pelvic abscess	0.111
Lymphorrhea	0.622
Postoperative ileus	0.249
Venous thrombosis	0.386
Cardiac complications	0.111

\*The statistical different variables are orange-marked/highlighted/ etc.  
ASA: American Society of Anesthesiologists

recurrences were addressed predominantly to the RG, 7.4% of patients, as opposed to the LG with only 1.58%.

Regarding the type of surgery performed using the laparoscopic approach, 68.25% of patients had undergone a Piver III hysterectomy, 26.98% a Piver II hysterectomy, 3.17% a Piver III hysterectomy with other resections, and only 1.58% a total pelvic exenteration. The type of surgery differentiated significantly between the groups. In the RG, 80% of the cases had undergone a Piver III hysterectomy, being the predominant procedure performed. Also, more complex procedure were tackled using this approach: different types of pelvic exenteration and resection of the local recurrence, both accounting for 11.85% of cases and in 5.92% of cases a Piver III hysterectomy associated with other resections was performed.

## DISCUSSION

The incidence of cervical cancer in Romania ranks among the first in Europe, with the maximum incidence by age in



the fifth decade of life.<sup>[14]</sup> Given the fact that 65.2% of the patients suffer from cervical cancer, this explains the mean age of 53 years of the cohort. The youngest patient in the cohort, 23 years old, was diagnosed with cervical cancer stage IA1 with lymphovascular space invasion and underwent a robotic Piver II hysterectomy. The postoperative period was uneventful and was discharged on day 4.

Most of the patients were ASA 2 and 3 with only 6.6% ASA 4 suggesting a relatively homogenous cohort. There were significant statistical differences between the LG and the RG, with more ASA 3 and 4 cases in the LG. This difference is a selection bias due probably to the substantial risk of conversion. These patients have a high probability of not tolerating the pneumoperitoneum, and given the higher cost of the robotic surgery, they were assigned to the LG.

One-third of the patients had cardiac disease ranging from high blood pressure, arrhythmias (atrial fibrillation and supraventricular tachycardia), cardiac ischemic disease, heart valve disease, heart failure Grade I–II New York Heart Association functional classification to one patient with Fallot pentalogy with left pulmonary artery agenesis which was classified as ASA 4. Only 4.5% had lung disease (asthma, chronic obstructive pulmonary disease, tuberculosis sequelae, sleep apnea, and pulmonary hypertension), and the same percentage of patients had neurological diseases (peripheral polyneuropathy, previous ischemic stroke, chiasmal syndrome, and subdural meningioma). Chronic venous insufficiency was recorded in 4.5% of cases, and 13.6% of the patients were obese.

65.2% of patients had cervical cancer, and 28.8% had uterine neoplasia as endometrial cancer or uterine sarcoma. Only one case of ovarian carcinoma had undergone MIS, which was an early stage, IA. 5.6% were recurrences after cervical cancer (8 cases), endometrial cancer (2 cases), and uterine sarcoma (1 case).

Two percent of cases had undergone an exploratory laparoscopy. The conversion rate was 3.5%. In the literature, the numbers vary drastically from 0% to 26.3%.<sup>[15]</sup> The present study deals only with oncological cases as opposed to other studies that consider benign pathology. A conversion from MIS to OS correlates with the presence of wound and parietal complications. 68.2% of the patients underwent robotic surgery because of a selection bias. The advantages brought by robotic surgery seem to have overpassed some of the difficulties encountered in oncologic-gynecologic surgery, thus being preferred by surgeons in such cases.

The mean PHS was 7.58 days. The maximum PHS was 64 days. This PHS was registered in a patient with cervical cancer recurrence with bladder invasion for which an

anterior pelvic exenteration was performed with bilateral Bricker ileal conduit diversion. The postoperative course was marked by early reintervention for pelvic hematoma. Subsequently, the patient develops fever. A pelvic abscess is identified on computer tomography and drained transvaginal. Specific antibiotic therapy was initiated, and the outcome was favorable.

The mean operative time was 240 min. The maximum operative time was 570 min. It was recorded in a case of cervical cancer with invasion of the left pelvic ureter for which, using the robotic approach, besides the Piver III hysterectomy, the resection of the left terminal ureter was performed with ureteroneocystostomy. Singh *et al.*<sup>[16]</sup> reported that longer operative time is associated with increased postoperative complications for MIS in endometrial cancer. The present study reports, as well, a positive correlation between postoperative complications and longer operative time. This may be due to the fact that recurrences and higher stages of cancer need more complex surgeries associated with longer operative time.

The cohort was divided into two groups in order to assess the impact of the lead surgeon's expertise in gynecologic surgery on the postoperative complications: 85.4% of the surgeries were performed by a general surgeon with experience in MIS and proficient in gynecological surgery and 14.6% by general surgeons with vast experience in MIS. Even if the general surgeon is proficient in MIS, having extensive knowledge in gynecologic OS correlates with lower postoperative complications reported using Dindo–Clavien classification. The gynecological proficient surgeon had no complications in 79.88% of the cases while the others in 55.17% of cases. When complications were present, the MIS general surgeons had higher Dindo–Clavien Grades, 6.89% IIIB, 11.11% IIIA, 24.13% II, and 10.34% Grade I as opposed to the gynecological proficient surgeon: 2.36% IIIB, 5.91% IIIA, 11.24% II, and 0.59% I.

The study reports a slightly higher overall complication rate of 23.74% as compared with other studies in the literature (18.4%<sup>[15]</sup>). However, the present study reports the overall complication rate for oncologic gynecologic surgery while the other studies also included benign pathology. 8.6% of patients had complications that were Grade III with no case of Grade IV or V. As expected, Dindo–Clavien classification correlates positively with PHS and conversion. The type of surgery, tumor location, and operative time correlate with the postoperative complications. The presence of complications is associated with more complex surgeries such as recurrence resection, exenteration, and Piver III hysterectomy associated with other resections, which also had longer operative time.

Obesity does not correlate with postoperative complications. Neither does diabetes. For obese patients, MIS seems to have important advantages in terms of postoperative recovery, thus avoiding the possible wound complications from laparotomy. All the patients with diabetes were switched on insulin regimens perioperative.

One of the most critical issues in oncologic gynecologic surgery is the elevated risk of urologic complication. The study recorded an incidence of 11.6% of urological complications, ranging from urinary tract infection (including one case of pyelonephritis), urinary incontinence, ureteral stenosis with secondary ureterohydronephrosis to ureteral fistula. A recent study evaluated the incidence of urologic complications requiring urological procedure in radical hysterectomy and the differences in incidence after open and laparoscopic approaches.<sup>[17]</sup> The general incidence was 7.4%, with the most common urological procedure being the insertion of double-J catheter 5.18% followed by bladder repair 0.9%,<sup>[17]</sup> with no significant difference in urological complications after open or laparoscopic radical hysterectomy, but with significantly higher incidence of bladder repair after the laparoscopic approach. In the present study, the urological complication requiring urological procedures was 7.07% with 3.03% requiring a double-J catheter, 2.02% urethrovaginal catheterization (Foley probe), 1.51% surgical management, and 0.5% nephrostomy. The urological complications correlate, as Dindo–Clavien classification, with the type of surgery, tumor location, and operative time, but unlike it, the urological ones correlate with postoperative hemorrhage and pelvic abscess.

The second most common complication recorded was lymphorrhea with 4.5% of the patients. Ghezzi *et al.*<sup>[18]</sup> evaluated the incidence of lymphoceles, lymphorrhea, and lymphedema after laparoscopic and OS for endometrial cancer revealing that symptomatic lymphoceles were more frequent after OS and had a case, 0.7% of lymphorrhea in the MIS group and 2.8%, 4 cases, in the OS group, but did not reach statistical significance. Numerous strategies are proposed in order to reduce the likelihood of lymphorrhea by using: advanced sealing devices,<sup>[19]</sup> clips,<sup>[19]</sup> surgical patched<sup>[19]</sup> and biological agents, as synthetic cyanoacrylic glue.<sup>[20]</sup> Lymphorrhea does not correlate with PHS since frequently the patients are discharged with pelvic peritoneal drainage tube until the output is <50 mL in 24 h, with subsequent removal.

2.5% of the patients had postoperative ileus that was managed with prokinetics. Pelvic abscess has been identified as a postoperative complication in 2% of the cases and as many had wound and parietal complications consisting in wound infection. The latter positively correlated with

the conversion from MIS to laparotomy. In our center, the management of these patients is done initially with twice-a-day sterile dressing after appropriately applying a local antiseptic (povidone-iodine 10% solution). If there are no signs of improvement, specific antibiotics will be introduced after performing antibiogram. Wound and parietal complications correlate with pelvic abscess, lymphorrhea, and ileus.

In three cases, 1.5%, postoperative bleeding was registered: two cases of vaginal bleeding that were managed by transvaginal hemostatic sutures and one patient developed a pelvic hematoma that required early laparoscopically reintervention and hemostasis. In the literature, the rate was 5%,<sup>[15]</sup> more common in oncological patients.

In terms of cardiovascular complication, 1% of the patients had venous thrombosis. These patients received in accordance with the clinic's protocol intermittent compressive stockings and perioperative prophylactic anticoagulation with low-molecular-weight heparin. Venous thrombosis is associated with the type of surgery mainly because complex operations have longer operative time with the patient in Trendelenburg and dorsal lithotomy position. Two percent of cases had postoperative cardiac complications consisting of heart failure deterioration.

In what concerns the comparative assessment of the LG and RG, the PHS was statistically different between the groups, in favor of the LG. However, this is a bias given by the more difficult cases being selected for robotic surgery, as prior presented. Other studies report as well more complex cases in the RG than in the LG.<sup>[3]</sup> This may be attributed to the fact that the robotic approach offers technological advantages over laparoscopy in terms of instrument movement and vision. Even though the presence of obesity was marginally significantly higher in the RG ( $P = 0.52$ ), other studies report significantly higher body mass index in the RG than for the LG.<sup>[3]</sup> This may be attributed to the fact that multiple studies link robotic surgery in obese women with lower operative time, lower rates of conversion, postoperative complications, and decreased length of hospital stay.<sup>[3]</sup>

No significant differences were noted in terms of prior medical history suggesting homogeneous groups. Furthermore, there were no statistically significant differences in terms of conversion rate, reintervention early or late, and postoperative complications assessed globally through Dindo–Clavien classification. The postoperative complications do not differ significantly between the groups even though the types of surgery approached differentiated significantly (with more complex surgeries in the RG) and the tumor location (more cervical cancer and recurrences being selected in the RG).

## Limitations

An important limitation is given by the retrospective study design and the small cohort size. Another one is the selection bias given that the patients were not randomly assigned to a surgical approach or to the surgeons.

Even though the present study emphasizes the short-term aspects of postoperative gynecologic oncology patients, we consider that long-term monitoring is necessary in order to evaluate the quality of life, late postoperative complications, and also the oncological parameters (overall survival, disease-free survival, etc.). An important research direction remains that of the oncological safety of MIS.

## CONCLUSIONS

Postoperative complications after MIS for gynecological malignancies remain a critical issue that needs to be addressed timely, but the data reported show comparable results as those in the current literature, also taking into consideration the postoperative complication rate for the open approach. Urological complications remain an important problem in oncologic gynecologic surgery and need to be diagnosed and addressed rapidly. Another important complication identified was lymphorrhea, even though some studies report lower rates after MIS. The robotic approach is able to perform more complex surgeries with no difference in the postoperative complication rates. Another important aspect is the expertise of the lead surgeon in gynecologic surgery that correlates with reduced postoperative complications. Further prospective studies are needed to confirm the superiority of one approach over the other.

## Acknowledgments

This paper and the research behind it would not have been possible without the exceptional support of the local staff.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

- Chapron C, Querleu D, Mage G, Madelenat P, Dubuisson JB, Audebert A, *et al.* Complications of gynecologic laparoscopy. Multicentric study of 7,604 laparoscopies. *J Gynecol Obstet Biol Reprod (Paris)* 1992;21:207-13.
- Kaplan JR, Lee Z, Eun DD, Reese AC. Complications of minimally invasive surgery and their management. *Curr Urol Rep* 2016;17:47.
- Barrie A, Freeman AH, Lyon L, Garcia C, Conell C, Abbott LH, *et al.* Classification of postoperative complications in robotic-assisted

compared with laparoscopic hysterectomy for endometrial cancer. *J Minim Invasive Gynecol* 2016;23:1181-8.

- Walker JL, Piedmonte MR, Spirtos NM, Eisenkop SM, Schlaerth JB, Mannel RS, *et al.* Laparoscopy compared with laparotomy for comprehensive surgical staging of uterine cancer: Gynecologic Oncology Group study LAP2. *J Clin Oncol* 2009;27:5331-6.
- Ramirez PT, Frumovitz M, Pareja R, Lopez A, Vieira M, Ribeiro R, *et al.* Minimally invasive versus abdominal radical hysterectomy for cervical cancer. *N Engl J Med* 2018;379:1895-904.
- Melamed A, Margul DJ, Chen L, Keating NL, Del Carmen MG, Yang J, *et al.* Survival after minimally invasive radical hysterectomy for early-stage cervical cancer. *N Engl J Med* 2018;379:1905-14.
- Marth C, Landoni F, Mahner S, McCormack M, Gonzalez-Martin A, Colombo N, *et al.* Cervical cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2017;28:v72-83.
- Minciuna CE, Bitere O, Lacatus M, Tudor S, Anghel RM, Vasilescu C. Is there a role for minimally invasive surgery in cervical cancer treatment: Carry on, discard, or modify? A literature review and case series presentation. *Chirurgia (Bucur)* 2022;117:258-65.
- Lee CL, Huang KG, Nam JH, Lim PC, Shun FW, Lee KW, *et al.* The statement of the Asia-pacific association for gynecologic endoscopy and minimally invasive therapy for LACC study. *Gynecol Minim Invasive Ther* 2019;8:91-3.
- Chua PT, Lee CL, Huang KG. 100% 5-year survival rate in laparoscopic radical hysterectomy for early-stage cervical cancer is an achievable task. *Gynecol Minim Invasive Ther* 2020;9:53.
- Lim TY, Lin KK, Wong WL, Aggarwal IM, Yam PK. Surgical and oncological outcome of total laparoscopic radical hysterectomy versus radical abdominal hysterectomy in early cervical cancer in Singapore. *Gynecol Minim Invasive Ther* 2019;8:53-8.
- Lee CL, Huang KG, Chua PT, Mendoza MC, Lee PS, Lai SY. Standardization and experience may influence the survival of laparoscopic radical hysterectomy for cervical cancer. *Taiwan J Obstet Gynecol* 2021;60:463-7.
- Sioy A, Nikam YA, Ng C, Su MC. Urological complications of laparoscopic hysterectomy: A four-year review at KK women's and children's hospital, Singapore. *Singapore Med J* 2007;48:217-21.1.
- Lyon, F.I.A.f.R.o.C. Global Cancer Observatory: Cancer Today. Available from: <https://gco.iarc.fr/today/data/factsheets/cancers/23-Cervix-uteri-fact-sheet.pdf>. [Last accessed on 2022 Jan 12].
- Wechter ME, Mohd J, Magrina JF, Cornella JL, Magtibay PM, Wilson JR, *et al.* Complications in robotic-assisted gynecologic surgery according to case type: A 6-year retrospective cohort study using Clavien–Dindo classification. *J Minim Invasive Gynecol* 2014;21:844-50.
- Singh S, Swarer K, Resnick K. Longer operative time is associated with increased post-operative complications in patients undergoing minimally-invasive surgery for endometrial cancer. *Gynecol Oncol* 2017;147:554-7.
- Kim H, Jeong HJ, Kim BW, Hwang JH. The incidence of urologic complications requiring urologic procedure in radical hysterectomy and difference between abdominal radical hysterectomy and laparoscopic radical hysterectomy. *J Gynecol Oncol* 2021;32:e84.
- Ghezzi F, Uccella S, Cromi A, Bogani G, Robba C, Serati M, *et al.* Lymphoceles, lymphorrhea, and lymphedema after laparoscopic and open endometrial cancer staging. *Ann Surg Oncol* 2012;19:259-67.
- Gorostidi M, Villalain C, Ruiz R, Jaunarena I, Cobas P, Lekuona A. Prevention of lymphorrhea in aortic lymphadenectomy. *Int J Gynecol Cancer* 2019;29:645-6.
- Bifulco G, Giampaolino P, Morra I, Tommaselli GA, Tarsitano F, Chiacchio G, *et al.* Synthetic cyanoacrylic glue in the prevention of post-operative lymphocele after pelvic lymphadenectomy in patients with uterine malignancies: A prospective, single-blind, preliminary study. *Gynecol Oncol* 2014;134:556-60.