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Published online: 28 Sep 2024.

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Robotic-assisted, laparoscopic, and vaginal hysterectomy in morbidly obese patients with endometrial hyperplasia and endometrial cancer

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ABSTRACT

Background: Hysterectomy for endometrial hyperplasia and endometrial cancer in morbidly obese patients is challenging. Here, we reported data regarding three minimally invasive approaches.

Method: This is a multicenter retrospective study evaluating 30-day and 90-day surgery-related outcomes of morbidly obese patients (those with BMI $> 40 kg/m^2$) undergoing robotic-assisted, laparoscopic, and vaginal hysterectomy.

Results: Charts of 95 morbidly obese patients who underwent surgery for endometrial cancer were retrieved. Overall, robotic-assisted, laparoscopic, and vaginal surgeries were performed in 35 (36.8%), 38 (40%), and 22 (23.2%) patients, respectively. Patients having robotic-assisted surgery experienced longer operative time than patients having vaginal and laparoscopic approaches ($p < 0.001$). Surgical approaches did not influence the risk of having intraoperative and severe (Clavien-Dindo grade 3 or more) postoperative complications. No 90-day mortality occurred.

Conclusions: Robotic-assisted, laparoscopic, and vaginal surgery represent three safe and feasible minimally invasive approaches to manage morbidly obese patients with endometrial hyperplasia and endometrial cancer.

Introduction

Endometrial cancer exhibits varying incidence and prevalence rates in different populations and regions. In developed countries, it stands out as one of the most frequently diagnosed gynecologic malignancies [1]. It is frequently identified in women presenting with postmenopausal bleeding (PMB) or with a thickened endometrium visualized by transvaginal ultrasonography (TVS), both of which are common presentations that prompt further investigation [2]. To enhance diagnostic accuracy and diminish the rate of underdiagnosed cases, hysteroscopy coupled with targeted biopsy is instrumental in confirming diagnoses [3]. In cases where fertility preservation is a concern, particularly in younger patients or those with a desire for future fertility, treatment options include hormonal therapies such as oral progestins or the levonorgestrel-releasing intrauterine system, as well as hysteroscopic resection, sometimes in combination [4]. Global cancer statistics indicate a rising incidence, influenced in part by factors like extended life expectancy, shifts in reproductive behaviors, and the prevalence of obesity and metabolic syndrome, notable risk factors for the disease [1,5]. Indeed, almost 65% of patients with endometrial cancer are obese [6].

Hysterectomy (with or without oophorectomy) represents the cornerstone for managing endometrial cancer at every stage [7]. Although a hysterectomy represents a simple procedure for gynecologic oncologists, performing a hysterectomy in obese patients might be

challenging [7–9]. Performing a hysterectomy in obese patients presents several difficulties due to the increased amount of adipose tissue, airway access, peripheral vascular access, presence of comorbidities, and patient positioning. In particular, the amount of abdominal fat can limit the surgeon's ability to access the pelvic cavity and manipulate instruments effectively. Limited exposure may compromise the surgeon's ability to perform the hysterectomy with precision and may increase the risk of surgery-related morbidity (including surgical site infections). Moreover, anesthesiological issues (e.g., difficulties in airway management and increased risks of respiratory complications) might influence the possibility of performing minimally invasive surgery. Anesthesia management becomes a critical aspect of the overall care for obese patients undergoing surgery for endometrial cancer [10,11].

Several investigations evaluated different surgical routes in managing obese endometrial cancer patients. However, there is no consensus about the preferred minimally invasive approach for managing morbidly obese endometrial cancer patients, defined as having a body mass index (BMI) equal to or greater than $40 \, kg/m^2$ [10]. Although a minimally invasive approach is considered safe and effective in those patients, the conversion to open surgery and postoperative complication rates are non-neglectable. In the present paper, we reported a multicenter experience evaluating three minimally invasive approaches for managing morbidly obese patients with endometrial hyperplasia and apparent early-stage endometrial cancer. Robotic-assisted, laparoscopic, and vaginal approaches were compared to assess the 30- and 90-day morbidity of those approaches.

Methods

This is a multicenter retrospective study. The ethical review and institutional review board approval were waived for this study due to the retrospective nature of the investigation. All patients included signed informed consent for data collection for research purposes.

For the purpose of this study, we included:

- Patients with histological diagnosis of endometrial hyperplasia and endometrial cancer;
- Morbidly obese patients (obese Class III with a BMI equal or greater than $40 kg/m^2$ according to World Health Organization (WHO) classification [6]);
- Data regarding 30-day and 90-day outcomes.

Exclusion criteria were:

- Consent withdrawal;
- Patients with peritoneal disease;
- Execution of retroperitoneal staging (including sentinel node mapping).

This latter was considered an exclusion criteria since nodal dissection was not performed in patients undergoing vaginal surgery.

The primary endpoint measure was to investigate short-term outcomes of three minimally invasive approaches for managing morbidly obese endometrial cancer patients. As secondary endpoints, we aim to describe conversion rates and details of the postoperative course for those patients.

Chart of patients undergoing hysterectomy for endometrial hyperplasia and apparent early-stage endometrial cancer between January 1, 2017, and December 31, 2022, were retrospectively reviewed. Demographic details, data about endometrial disease, and data on surgical treatment were collected. Charlson Comorbidity Index was calculated from medical records [12]. Patients underwent staging based on the International Federation of Obstetrics and Gynecologists (FIGO) staging system. The histological classification and degree of glandular differentiation were determined according to WHO and 2009 FIGO classification systems, respectively [13–15]. Endometrial cancers were categorized into low, intermediate, high-intermediate, and high-risk using the ESGO/ESTRO/ESP classification [14]. Previous studies provided details on surgical techniques and pathological evaluation [16,17].

In summary, all patients underwent surgical treatment, including total hysterectomy with or without bilateral salpingo-oophorectomy. Our focus is on reporting intraoperative and 90-day postoperative complications. The Clavien-Dindo severity system was employed to classify severe complications, and the Martin criteria were used to enhance the reporting quality of complications [7,18]. Data on complications were collected only for patients with 30- and 90-day information regarding their postoperative complications. Criteria for administering adjuvant therapy and detailed follow-up protocols are outlined elsewhere [7]. Adjuvant therapy decisions were made by radiation oncologists and medical oncologists [7]. Throughout the study period, various surgeons with a decade of experience in oncologic surgery conducted procedures across the participant centers. However, there were no discernible differences in the facilities and services related to patient care. Further

details on the follow-up schedule and examination were reported elsewhere [7,16].

We employed basic descriptive statistics to characterize the two populations. Differences in categorical variables were assessed using the chi-square test, while T-tests and Mann-Whitney U tests were used to compare continuous variables, as appropriate. P values less than 0.05 were considered statistically significant. Statistical analyses were conducted using GraphPad Prism version 6.0 (GraphPad Software, San Diego, CA, USA) and IBM-Microsoft SPSS version 20.0 (IBM SPSS Statistics, International Business Machines Corporation, Armonk, NY, USA) for Mac.

Results

Charts of 95 morbidly obese patients undergoing hysterectomy for endometrial cancer were retrieved. Overall, robotic-assisted, laparoscopic, and vaginal surgeries were performed in 35 (36.8%), 38 (40%), and 22 (23.2%) patients, respectively. Baseline patients characteristics are reported in Table 1. Median (range) BMI was 42.5 (40, 52) kg/m^2. Patients' characteristics, endometrial hyperplasia rate, and cancer FIGO stage after final pathology are similar between groups. No statistical differences between the three groups were found among previous caesarean sections and vaginal deliveries. Patients having vaginal hysterectomy were older and less likely to be affected by endometrial cancer in comparison to patients having robotic-assisted and laparoscopic surgery ($p = 0.02$).

All patients included in the robotic and laparoscopic groups underwent hysterectomy plus bilateral salpingo-oophorectomy. Seventeen (77.2%) out of 22 patients having vaginal surgery underwent hysterectomy plus bilateral salpingo-oophorectomy. Three (13.6%) patients underwent unilateral salpingo-oophorectomy alone and and two patients (9.1%) underwent hysterectomy alone, due to technical issues.

No conversion occurred in the robotic-assisted group. Two (5.3%) conversions occurred in patients having laparoscopic surgery. One patient required conversion to open surgery due to intraoperative bleeding; while the other patient had conversion due to technical difficulties at the time of colpotomy (related to poor surgical field). Three (13.6%) patients in the vaginal surgery group received (not planned) laparoscopic assistance for completing the procedure (including the execution of salpingo-oophorectomy).

Looking at perioperative outcomes, we observed that patients undergoing robotic-assisted surgery experienced longer operative time than patients undergoing vaginal and laparoscopic approaches ($p = 0.001$). The length of hospital stay was similar between groups. Median (range) length of hospital stay was two (1–8), two (1–7), and two (1–6) days in the robotic-assisted, laparoscopic, and vaginal group, respectively. Table 2 shows perioperative details.

One (1%) intraoperative complication occurred. Intraoperative uncontrolled bleeding from the right uterine artery during a laparoscopic procedure. No intraoperative complications were registered among patients undergoing robotic-assisted and vaginal surgeries. Five (5%) patients had blood transfusions. One (1%), two (2.1%), and two (2.1%) in the robotic-assisted, laparoscopic, and vaginal group, respectively. Surgical approaches did not influence the risk of developing severe (Clavien-Dindo grade 3 or more) postoperative complications. Four (4%) severe complications occurred. Thirty-day severe postoperative complications included: vaginal cuff abscess causing sepsis requiring vaginal drainage and prolonged antibiotic therapy ($n = 1$, in the robotic-assisted group), pelvic hematoma requiring percutaneous drainage and blood transfusions ($n = 1$, in the laparoscopic group), postoperative bleeding requiring laparoscopic re-operation ($n = 1$, in the vaginal group). The other complication, which occurred in the 90-day period,

Table 1. Baseline characteristics.

	Robotic-assisted surgery ($n = 35$)	Laparoscopic surgery ($n = 38$)	Vaginal surgery ($n = 22$)	p-value
Age, yrs	60 (40, 66)	61 (42, 76)	66 (45, 82)	0.045
BMI, kg/m^2	43 (40, 52)	42.5 (40, 49)	42.6 (40, 48)	0.245
CCI > 2				0.290
No	31 (88.6%)	32 (84.2%)	16 (72.7%)	
Yes	4 (11.4%)	6 (15.8%)	6 (17.3%)	
Previous vaginal delivery				0.358
No	6 (17.2%)	6 (15.8%)	1 (4.6%)	
Yes	29 (82.8%)	32 (84.2%)	21 (95.4%)	
Previous C-section				0.726
No	31 (88.6%)	32 (84.2%)	20 (90.9%)	
Yes	4 (11.4%)	6 (15.8%)	2 (9.1%)	
Surgical indication				0.020
Endometrial hyperplasia	8 (22.9%)	9 (23.7%)	12 (54.5%)	
Endometrial cancer	27 (77.1%)	29 (76.3%)	10 (45.5%)	

Data are reported as median (range), or number (%). Abbreviation: BMI, body mass index; CCI, Charlson comorbidity index; C-section, caesarean section.

Table 2. Perioperative outcomes.

	Robotic-assisted surgery ($n = 35$)	Laparoscopic surgery ($n = 38$)	Vaginal surgery ($n = 22$)	p value
Operative time, minutes	110 (55, 220)	80 (40, 140)	60 (30, 120)	0.001
Estimated blood loss, ml	100 (50, 500)	100 (50, 1000)	100 (100, 300)	0.780
Length of hospital stay, days	2 (1, 8)	2 (1, 7)	2 (1, 6)	0.565
Blood transfusion				0.590
No	34 (97.1%)	36 (94.7%)	20 (90.9%)	
Yes	1 (2.9%)	2 (5.3%)	2 (9.1%)	
Conversion to open surgery				>0.99
No	35 (100%)	36 (94.7%)	22 (100%)	
Yes	0 (0%)	2 (5.3%)	0 (0%)	
Intraoperative complication				>0.99
No	35 (100%)	37 (97.3%)	22 (100%)	
Yes	0 (0%)	1 (2.7%)	0 (0%)	
Postoperative complication				0.873
No	34 (97.1%)	36 (94.7%)	21 (95.4%)	
Yes	1 (2.9%)	2 (5.3%)	1 (4.6%)	

Table 3. 90-Day surgery-related complications.

	Robotic-assisted surgery ($n = 35$)	Laparoscopic surgery ($n = 38$)	Vaginal surgery ($n = 22$)
Vaginal cuff abscess	1 (2.9%)	0 (0%)	0 (0%)
Vaginal cuff dehiscence	0 (0%)	1 (2.6%)	0 (0%)
Hemoperitoneum	0 (0%)	1 (2.6%)	0 (0%)
Pelvic hematoma	0 (0%)	0 (0%)	1 (4.5%)
Sepsis	1 (2.9%)	0 (0%)	0 (0%)

was a vaginal cuff dehiscence requiring vaginal re-operation ($n = 1$, in the laparoscopic group). Details about postoperative morbidity are reported in Table 3. No 90-day mortality occurred.

Discussions

The present study reported data regarding short-term outcomes of morbidly obese endometrial cancer patients undergoing robotic-assisted, laparoscopic, and vaginal hysterectomy. Those three minimally invasive approaches correlated with favorable short-term outcomes.

Minimally invasive surgery is considered a safe and effective method to manage apparent early-stage endometrial cancer [12,13,19,20]. The results of independent randomized trials are concordant in underlining that patients having minimally invasive surgery experienced improved short-term outcomes in comparison to patients having open surgery; without neglecting long-term oncologic outcomes [21]. In the randomized phase III LAP-2 study, obesity—in particular abdominal wall thickness—was considered one of the main risk factors for having to convert to open surgery, with a 25.8% laparotomic conversion rate [21]. Other experiences highlighted the challenge of performing hysterectomy in obese patients [10]. An open approach should be avoided due to the high risk of having wound complications (surgical site infections) and pulmonary events due to prolonged hospitalization [10,11].

Recently, Lechartier et al. reported data about a Canadian experience with robotic-assisted surgery in women with BMI $\geq$40 kg/m^2 [22]. They included 139 and 46 endometrial cancer patients with Class III (BMI: 40–49 kg/m^2) and Class IV (BMI $\geq$ 50 kg/m^2) obesity. Conversion to open surgery (due to poor surgical field exposure) occurred in 4.3% and 6.5% of patients with Class III and Class IV obesity. Severe postoperative complication rate was 2.7% [22]. Those data and other experiences corroborate our findings on the safety and feasibility of robotic-approach for patients with endometrial disease.

Different studies confirm our findings that patients having robotic-assisted surgery experienced longer operative time than patients having vaginal and laparoscopic approaches. A large retrospective study by Corrado et al. on 655 obese women (BMI $\geq$ 30 kg/m^2), comparing robotic vs. laparoscopic hysterectomy with or without pelvic and paraaortic lymphadenectomy in patients affected by endometrial cancer, showed that robotically treated patients had a statistically significant difference for longer operating time, but lower conversion rate and length of hospital stay [23].

The vaginal approach represents a valid alternative for managing patients with uterine disease (also in those without pelvic organ prolapse) [24]. De Souza Nobrega et al. reported outcomes of a series of 34 patients with endometrial cancer undergoing vaginal hysterectomy. Overall, 77% of women were obese (BMI $\geq$ 30 kg/m^2). Four patients had conversion to

open surgery [24]. Retractors of vaginal surgery might advocate that vaginal surgery does not allow to inspect the peritoneal cavity and to perform node dissection. However, we have to point out that no data supported the execution of nodal dissection in apparent early-stage endometrial cancer [25]. The cumulative results of independent randomized trials showed that the execution of pelvic (with or without para-aortic) lymphadenectomy did not improve oncologic outcomes in comparison to hysterectomy alone, but increased complication rates [25]. Indeed, the route of retroperitoneal staging appears to have no significant impact on the survival outcomes of patients with endometrial cancer and its necessity is under investigation [26,27]. Additionally, a secondary analysis of one randomized trial of this issue, suggested that patients with obesity are less likely to benefit from the execution of lymph node dissection [28]. Unfortunately, no data about sentinel node mapping is still available in this setting [29]. Further studies will clarify this issue [27,30,31].

Another point deserving attention is the difficulties in removing the adnexal structures during vaginal surgery. In our series, bilateral salpingo-oophorectomy was performed *via* vaginal route in 63.6% (14/22) of patients. In the other three patients, laparoscopic assistance was used to remove the adnexa. Those data are corroborated by another paper published by Bogani et al. [17]. This study reported that bilateral salpingo-oophorectomy is not always feasible during vaginal surgery [17].

The inherent biases of the study's retrospective nature are the study's main limitations. Additionally, four points of the present research have to be addressed: (i) although baseline characteristics are similar between groups, allocation biases might influence the interpretation of our results. (ii) We are not evaluating and reporting data on survival outcomes. This study aims to assess short-term outcomes of robotic-assisted, laparoscopic, and vaginal approaches. (iii) Referral centers collected data for this study; hence, our data are not fully projectable in a setting without experience in robotic-assisted, laparoscopic, and vaginal surgeries. (iv) This study serves as a preliminary investigation, laying the groundwork for a larger future prospective study. As a pilot study, its primary objectives include evaluating the feasibility of the research design and identifying potential challenges that may arise in subsequent larger-scale investigations.

Our study highlights that robotic-assisted, laparoscopic, and vaginal approaches are safe and feasible in managing morbidly obese patients affected by endometrial hyperplasia and endometrial cancer. However, surgery in morbidly obese patients is challenging. To address these challenges, a multidisciplinary approach involving experienced surgical teams, anesthesiologists, and perioperative care specialists is essential. Preoperative assessment and optimization, as well as careful postoperative monitoring, are crucial components of managing hysterectomy in obese patients to ensure the best possible outcomes.

Disclosure statement

The authors declare that there are no competing interests.

Author contributions

Conceptualization: GB, AG; Methodology: All authors; Project administration: EV, MAC; Supervision: GB, FR; Original draft: All authors; Review & editing: TGDA, AG and GB.

Ethics approval statement

The ethical committee approval was waived for this study due to the retrospective nature of this investigation.

Patient consent statement

All patients included signed informed consent for data collection for research purposes.

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Data availability statement

Data are available upon appropriate request.

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