

# Robotic surgery in obese patients with early-stage endometrial cancer

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## Abstract

**Aim:** The objective of this study was to assess the clinical effectiveness of robotic surgery for obese patients (body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup>) with early stage endometrial cancer.

**Material and methods:** This study is a retrospective review of women who underwent robotic surgery for early-stage endometrial cancer from 2008 to 2017. Patients were subdivided into those with BMI  $< 30$  kg/m<sup>2</sup> (group 1), and those with BMI  $\geq 30$  kg/m<sup>2</sup> (group 2). Basic demographics and perioperative period outcomes were extracted from the medical records and compared.

**Results:** Group 1 included fifty patients and group 2 included 24 patients. There were no significant differences in surgical outcomes or complication rates between the two groups ( $p > 0.05$  for all). There were no differences in pelvic nodal counts or length of stay.

**Conclusions:** Robotic surgery was found to be feasible and safe for obese patients with endometrial cancer. Its widespread application needs a larger sample with longer follow-up.

**Key words:** robotic surgery, obese, endometrial cancer, body mass index.

## Introduction

Endometrial cancer is one of the most common gynecological malignancies in the world [1]. Women have a lifetime risk of 1 in 38 of developing uterine cancer [2]. Obesity is a recognized risk factor for multiple cancers, cancer-related deaths and all causes of death. Previous studies have found that obesity and increasing body mass index (BMI) are most closely related to the incidence and mortality of endometrial cancer [3–5]. Obesity increases the risk of cancer tenfold, and in 40% of patients with endometrial cancer it is due to obesity [6].

Obese patients face unique surgical and technical challenges related to their multiple perioperative

complications and difficult surgical treatment [7]. As the patient becomes fatter, to achieve the same therapeutic effect, several surgical techniques need to be evaluated. Fortunately, laparoscopic surgery reduces some of the surgical difficulties inherent in dealing with obese patients [8]. Some studies have demonstrated the benefits of robotic surgery and robotic techniques for endometrial cancer compared with laparotomy [9–11]. Studies have also demonstrated that robotic surgery for obese patients is associated with higher costs due to greater equipment use and longer operating times [12–14]. However, no reports have studied the use of robotic surgery for obese patients with endometrial cancer to compare robotic surgery for normal BMI endometrial cancer patients.

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The primary objective of this study was to compare perioperative outcomes of robotic surgery for obese patients with endometrial cancer and normal BMI patients. This is the first study of robotic surgery for obese patients with endometrial cancer in China.

## Aim

The aim of this study was to assess the clinical curative effective of robotic surgery for obese patients (BMI  $\geq 30$  kg/m<sup>2</sup>) with early stage endometrial cancer.

## Material and methods

This study obtained the institutional review board approval of our hospital, We prospectively collected 74 patients with early stage endometrial cancer who accepted robotic surgery. Robot cases were collected when robotic surgery was introduced into this practice from January 2008 to December 2017. Robot cases are completed by a team of gynecologic oncologists who are qualified to use the availability of robotic platforms and robotic platforms themselves in our hospital. There are no other criteria for selecting surgical methods. During informed consent, patients were counseled that the RSS platform would be a novel therapeutic strategy for early stage endometrial cancer. Surgical consent was obtained from all patients.

Eligible patients have no tumors other than endometrial cancer and no cardiovascular, pulmonary or endocrine diseases. Eligibility criteria included pelvic magnetic resonance imaging (MRI) and ultrasonography in patients with endometrial carcinoma suspected of early lesions, as well as patients with preoperative biopsies showing endometrioid histology. All patients provided detailed consent to undergo robotic surgery. The included patients were divided into two groups based on their BMI. Patients with BMI less than 30 kg/m<sup>2</sup> were included in group 1, and those with BMI equal to or greater than 30 kg/m<sup>2</sup> were included in group 2.

Demographic data, operative data, perioperative complications, and the pathologic result were collected and analyzed. Demographic data included age, BMI, the patient's comorbidities, the history of surgery, and menopausal status. Surgical statistics include the operation time, conversion rate, and estimated blood loss. Surgical complications include blood loss requiring blood transfusion and major

nerve, vascular, gastrointestinal or urinary tract injuries. Postoperative complications include unplanned readmission within 30 days after the operation, wound complications (seroma, hematoma, wound separation, wound infection), venous thromboembolism, or any other major event that can be considered a direct result of the operation.

All patients accepted antibiotic prophylaxis before surgery, and bowel preparation with polyethylene glycol electrolyte powder. All patients accepted three times cleansing of the vagina with povidone iodine solution preoperatively. Stretch socks were used to prevent venous thrombosis and Foley catheters were placed intraoperatively. All patients underwent robotic hysterectomy bilateral adnexectomy and pelvic lymphadenectomy using the Da Vinci Si surgical system (Intuitive Surgical Inc., Sunnyvale, CA). All operations were performed under anesthesia with endotracheal intubation. It was placed in the position of the sarcophagus and its arms were sandwiched on both sides. Three robotic arms were used and five trocars in all. The location and layout of trocars on the abdominal wall were consistent with the results of our previous research on robotic cervical cancer [15].

## Statistical analysis

SPSS version 16.0 (SPSS Inc, Chicago, IL, USA) was used for statistical analyses. The continuous variables with a normal distribution are represented as the mean (range), and the categorical variables are represented as the absolute quantity (percentage). We used Student's *t* test to compare continuous variables with a normal distribution, and the  $\chi^2$  test or Fisher's exact test was used to compare categorical variables. *P* < 0.05 was considered statistically significant.

## Results

There were 74 patients included this study between January 2008 and December 2017 in our hospital. All patients met the inclusion criteria. They all accepted robotic surgery for endometrial cancer. Base on the BMI of patients, all the included cases were divided into two groups. Fifty (67.6%) patients were included in group 1 with BMI < 30 kg/m<sup>2</sup>, and 24 (33.4%) patients with BMI  $\geq 30$  kg/m<sup>2</sup> were included in group 2. Figure 1 shows the flow chart of inpatients.

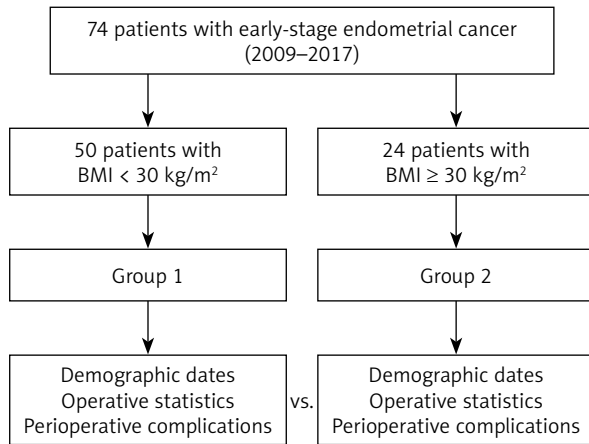


Figure 1. Flow chart of inpatients

The characteristics of the selected patients are shown in Table I. The median age of group 1 was 61 years (36 to 77 years). The median age of group 2 was 62 years (range: 30–76 years). Comparing the ages of the two groups of patients, there was no significant difference. The two groups had similar previous pelvic surgery history. BMI was higher in group 2 than in group 1 (35.0 vs. 26 kg/m<sup>2</sup>, respectively; *p* < 0.05). There was no case that had contraindications to robotic surgery in either group.

The operative and pathologic outcomes of included women are summarized in Table II. There was no difference between the groups in the International Federation of Obstetrics and Gynecology (FIGO) stage. The number of total nodes that were retrieved was 16 (11–23) in women of group 1 vs. 14 (13–25) nodes in group 2; there was no significant difference in the number of pelvic nodes. The median operative time of group 1 was 190 min (range: 150–240 min) and the median estimated blood loss was 75 ml (range: 30–150 ml). The length of hospital stay of group 1 was 11 days (range: 9–13 days). The median operative time of group 2 was 180 min (range: 120–270 min) and the median estimated blood loss was 90 ml (range: 30–200 ml). The duration of hospitalization of group 2 was 11 days (8–15 days). There was no difference in terms of operation time, estimated blood loss or length of hospital stay between the two groups.

No ureteral injury, bladder injury, bowel injury, hernia or dehiscence, infection, or conversion to laparotomy was noted intraoperatively (Table III). There was no significant difference in the incidence of intraoperative complications between the two

Table I. Characteristics of included patients

Variables	Group 1 (n = 50)	Group 2 (n = 24)
BMI [kg/m <sup>2</sup> ]	26 (23–29)	35 (30–42)*
Age, median (range) [years]	61 (36–77)	62 (30–76)
Post-menopausal, n (%)	20 (40)	12 (50)
Prior abdominal surgery, n (%)	10 (20)	5 (20.8)
Contraindication for robotic surgery, n (%)	0 (0)	0 (0)

BMI – body mass index. Data are expressed as number (%) or median (range); \**p* < 0.05.

Table II. Operative and pathologic outcomes among women who underwent surgery

Variables	Group 1 (n = 50)	Group 2 (n = 24)
FIGO stage:		
IA	8	3
IB	19	10
IC	22	10
IIA	1	1
IIB	0	0
Total pelvic nodes	16 (11–23)	14 (13–25)
Operative time [min]	190 (150–240)	180 (120–270)
Estimated blood loss [ml]	75 (30–150)	90 (30–200)
Length of hospital stay [days]	11 (9–13)	11 (8–15)

Data are expressed as number (%) or median (range). \**P* < 0.05. FIGO – International Federation of Gynecology and Obstetrics.

Table III. Intraoperative and postoperative complications

Variables	Group 1 (n = 50)	Group 2 (n = 24)
Ureteral injury (n/N)	0 (0%)	0 (0%)
Bladder injury (n/N)	0 (0%)	0 (0%)
Bowel injury (n/N)	0 (0%)	0 (0%)
Blood transfusion (n/N)	0 (0%)	0 (0%)
Hernia/dehiscence (n/N)	0 (0%)	0 (0%)
Infection (n/N)	0 (0%)	0 (0%)
Lymphedema (n/N)	3 (6%)	1 (4.2%)
Voiding dysfunction (n/N)	0 (0%)	0 (0%)
Venous thromboembolism (n/N)	0 (0%)	0 (0%)
Wound complications (n/N)	0 (0%)	0 (0%)
Conversion (n/N)	0 (0%)	0 (0%)

Data are expressed as number (%). \**P* < 0.05.

groups ( $p > 0.05$ ). There were no postoperative complications such as intestinal trauma or obstruction, incisional hernia or dehiscence and reoperation occurred in either group. There were 3 patients in group 1 and one in group 2 who had a symptomatic lymphocyst; there was no difference between the two groups. No patient had venous thrombosis in the perioperative period.

## Discussion

Surgical treatment has always been the cornerstone of early treatment of endometrial cancer. A variety of surgical methods are available for gynecologic oncologists through the newly developed minimally invasive surgical approach. In addition, with the increasing number of obese patients, the choice of surgical methods is becoming more and more important.

This study data suggest that robotic hysterectomy bilateral adnexectomy and pelvic lymphadenectomy for obese patients with early-stage endometrial cancer are technically feasible and safe. The operative time and estimated blood loss of obese patients were similar to patients with BMI  $< 30 \text{ kg/m}^2$  with early-stage endometrial cancer. It has been suggested that the number of resected lymph nodes is the most important parameter for lymphadenectomy. The pelvic lymph node count and the length of hospital stay of patients in group 2 were similar to those observed in group 1. Especially, the incidence of surgical complications was low in both groups. Previous studies have found that obese patients who underwent pelvic surgery have longer operations, more intraoperative bleeding, and a higher incidence of complications, and the pelvic surgery for obese patients is technically challenging [16]. This is inconsistent with our findings. We obtained better results, which might be due to the advantages of Da Vinci robotics, and the surgical team's proficiency in gynecological operations using the Da Vinci robot.

In 2005, the American Food and Drug Administration (FDA) approved the robotic surgery system for gynecological treatment, which has had far-reaching significance for the surgical treatment of gynecologic malignancies. Compared with conventional surgical approaches, robotic surgery has various differences. First, the robotic surgery system has three-dimensional stereo vision. Second, the operation of the robotic arm is superior in dexterity and precision, due

to the ability of the arm to rotate 360 degrees. Based on the above advantages, the robotic surgery system has become widely accepted by gynecologic oncologists for treatment of gynecologic malignancies. The popularity of robotics is reflected in the increase in its use, especially in the population of gynecological tumors. More than 66% of 386 gynecologists plan to increase the use of robotics in their practice, according to a Mabrouk *et al.* survey [17].

Boggess *et al.* compared open staging, laparoscopic staging and robotic staging of endometrial cancer; the advantages of robot technology were demonstrated. In their laparoscopic and robotic group comparison of 322 women, the BMI and pelvic lymph node count of the robot group were the highest, the blood loss of the robotic group was lowest, and the robotic group had the shortest hospitalization time. In addition, the incidence of postoperative complications in the robotic group was significantly reduced [18]. A study by Seamon *et al.* produced similar results. The BMI of the robotic cohort was significantly higher than that of the laparoscopic cohort (34 vs. 29,  $p < 0.001$ ), the robotic cohort had lower estimated blood loss and conversion to laparotomy rate, and robotic surgery had a shorter operating time [19]. These studies' results suggest that robots may be the first choice for the surgical approach of endometrial cancer. The question that followed was whether these developments were related to surgery in obese people.

In this study, the clinical outcome of robotic surgery for obese patients with early-stage endometrial cancer is consistent with the normal patients. There was no significant difference in operating time, estimated blood loss, inpatient time or perioperative complications between the two groups, and BMI is an exception. In this retrospective cohort study, robotics provided the same approach to the surgical staging of morbid obesity. There were no case transitions in this study, especially for our normal obese patients. There was no difference in dissected lymph node count between the two groups. Robotic surgery for obese endometrial cancer seems to be an attractive option. The shortcoming of this study is the absence of long-term follow-up results, and the long-term survival. It is an important index to evaluate the clinical effect of the surgery approach for malignant tumors. According to our data, robotic surgery was acceptable for surgical treatment of obese women with endometrial cancer. However,

the limited number of included patients represents the main limitation of the study.

Widespread application of robotic surgery for obese patients with early stage endometrial cancer needs a larger sample with data from a longer follow-up. At the same time, the management of endometrial cancer should be personalized, taking into account the performance status of the patient, in particular in the case of elderly women [20, 21].

## Conclusions

Robotic surgery for obese patients with early stage endometrial cancer is feasible and safe. Robotic surgery could be the better choice of treatment approach for obese patients with early stage endometrial cancer. Moreover, the robotic surgery system allows the surgeon to operate in a more comfortable situation. Widespread application of robotic surgery for obese patients with early stage endometrial cancer needs a larger sample with longer follow-up data.

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Yanyan Zhao and Zhongyu Liu contribution equally for this article.

## Conflict of interest

The authors declare no conflict of interest.

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