

Robotic Hysterectomy Strategies in the Morbidly Obese Patient

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ABSTRACT

Background and Objectives: The purpose of this study was to present strategies for performing computer-enhanced telesurgery in the morbidly obese patient.

Methods: This was a prospective, institutional review board-approved, descriptive feasibility study (Canadian Task Force classification II-2) conducted at a university-affiliated hospital. Twelve class III morbidly obese women with a body mass index of 40 kg/m² or greater were selected to undergo robotic-assisted total laparoscopic hysterectomy. Robotic-assisted total laparoscopic hysterectomy, classified as type IVE, with complete detachment of the cardinal-uterosacral ligament complex, unilateral or bilateral, with entry into the vagina was performed.

Results: The median estimated blood loss was 146.3 mL (range, 15–550 mL), the mean length of stay in the hospital was 25.3 hours (range, 23–48 hours), and the complication rate was 0%. The rate of conversion to laparotomy was 8%. The median surgical time was 109.6 minutes (range, 99–145 minutes).

Conclusion: Robotic-assisted total laparoscopic hysterectomy can be a safe and effective method of performing hysterectomies in select morbidly obese patients, allowing them the opportunity to undergo minimally invasive surgery without increased perioperative complications.

Key Words: Patient self-positioning, Robotic surgery, Minimally invasive surgery, Hysterectomy, Morbid obesity.

INTRODUCTION

The prevalence of morbid obesity presents a significant problem for women who require abdominal surgical procedures, such as a hysterectomy. Hysterectomy in these patients is associated with a higher degree of technical difficulty, as well as increased morbidity.^{1–3} Although laparoendoscopic surgery decreases the surgical morbidity as compared with open abdominal procedures,^{4,5} the risks of trocar-site herniation, wound infections, and conversion to laparotomy exist. The surgical limitations of conventional laparoscopy may be overcome with robotic-assisted laparoscopic surgery.⁶ The use of robotic-assisted surgery further facilitates total laparoscopic hysterectomy because of the increased dexterity provided by the robotic arms. Visualization is enhanced by the high-definition 3-dimensional vision system and retracting capability of the third robotic arm. In some obese patients robotic assistance may help surgeons avoid adverse outcomes.⁴ The positioning of the patient, once asleep, usually needs to be adjusted. Repositioning the asleep morbidly obese patient can become extremely difficult. The aim of this study was to present effective strategies for performing robotic-assisted total laparoscopic hysterectomy in the morbidly obese patient. These strategies were implemented in each of the study patients and monitored for their effectiveness.

METHODS

This study was approved by the Institutional Review Board of the University of South Alabama, Mobile. Between February 2011 and April 2012, a prospective feasibility study was undertaken with 12 consecutive morbidly obese women with a body mass index (BMI) of 40 kg/m² or greater and who required a hysterectomy. All 12 patients were selected to undergo a robotic-assisted total laparoscopic hysterectomy at the University of South Alabama Children's and Women's Hospital. Informed consent was obtained. BMI was calculated as weight in kilograms divided by height in square meters. Contraindications for robotic-assisted hysterectomy, applied preoperatively and intraoperatively, included immediate need for laparotomy to control bleeding, poor visualization or exposure, and

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patient intolerance to the prolonged steep Trendelenburg position.

Surgical Technique

All procedures were performed by one attending gynecologic surgeon experienced in advanced laparoscopic surgery who had performed >30 robotic-assisted hysterectomies before the beginning of this study. A preoperative bowel preparation was performed to improve visualization of the pelvis through bowel decompression and to decrease potential morbidity in the event of bowel injury. Surgical antibiotic prophylaxis, consisting of cefoxitin, was administered 30 minutes before the initiation of surgery. Patients allergic to penicillin or cephalosporins received clindamycin. Two registered nurses served as bedside assistants. The patient was instructed to move onto the operating table and, while still awake, to “self-position” in the dorso-lithotomy position according to the surgeon’s guidance. Shoulder blocks were not used because of the increased risk of brachial plexus injury in the event that the patient were to slide while in the steep Trendelenburg position. Instead, an egg-crate foam mattress was used to reduce sliding. Intermittent pneumatic compression boots were placed for deep venous thrombosis prophylaxis. After the patient underwent general endotracheal anesthesia, her arms were placed in the arms-tucked “military” position with liberal padding on the arms and legs. A pelvic examination was performed to assist with identification of the site of placement of the first trocar on the upper abdomen. The patient was then prepared and draped, and a Foley catheter was inserted. Uterine manipulation was obtained with the VCare device (ConMed Endosurgery, Utica, New York, USA).

With the angle of the operating table at 0°, 3 towel clips were placed around the umbilicus and the panniculus of the abdomen was elevated. With countertraction applied, a Veress needle was inserted at a 90° transumbilical angle at the central-most area of the umbilicus to create a pneumoperitoneum (**Figure 1**). The insufflation pressure was maintained at 15 mm Hg throughout the procedure for all cases. Five ports were used, 4 of them using the normal size 16-cm-long 8-mm trocars provided by Intuitive Surgical (Sunnyvale, California, USA) and a generic 12-mm trocar. Because the upper abdominal wall is thinner than the lower abdominal panniculus, the extra-long laparoscopic trocars were not necessary. The first trocar, used to accommodate the 0° laparoscope, was inserted several centimeters above the umbilicus at the site identified earlier during pelvic examination.



Figure 1. Countertraction provided by use of towel clips to insert Veress needle at 90° transumbilical angle.

The remaining 4 trocars were placed approximately 10 cm lateral to the previous trocar. Side docking of the da Vinci Si robot (Intuitive Surgical, Sunnyvale, CA, USA) was undertaken. The trocar housing robotic arm 1, placed on the right, controlled the EndoShear monopolar scissors. The trocar housing robotic arm 2, placed on the left, controlled the PK dissecting bipolar forceps Intuitive Surgical, Sunnyvale, CA, USA. The trocar housing the third robotic arm, placed on the left mid-axillary plane, used the ProGrasp retractor/grasper forceps Intuitive Surgical, Sunnyvale, CA, USA. The 12-mm trocar inserted on the patient’s right mid-axillary plane was used for suction/irrigation and insertion of suture. After separating the adnexa/adnexae and taking down the bladder, the surgeon opened the vagina through anterior and posterior colpotomies. After complete detachment of the uterus after its separation from the cardinal uterosacral ligament complex, the uterus was removed vaginally. The vaginal cuff was closed with a V-loc absorbable suture (Covidien, Mansfield, Massachusetts, USA).

RESULTS

During the study period, a total of 12 consecutive morbidly obese women (median age, 44.1 years; age range, 28–67 years; median weight, 118.7 kg; weight range, 93.4–140.6 kg; median BMI, 44.4 kg/m²; BMI range, 40.1–58.6 kg/m²) with a BMI of 40 kg/m² or greater who underwent a hysterectomy were analyzed. Patient demographic characteristics are summarized in **Table 1**. The overall mean preoperative American Society of Anesthesiologists health status score was 2.4. Indications for ro-

Table 1.
Patient Demographic Characteristics

| | Age (y) | Weight (kg) | BMI (kg/m ²) |
|-------------|---------|-------------|--------------------------|
| Patient No. | | | |
| 1 | 28 | 113.4 | 41.6 |
| 2 | 67 | 106.1 | 41.4 |
| 3 | 49 | 111.6 | 40.9 |
| 4 | 46 | 93.4 | 40.2 |
| 5 | 46 | 114.8 | 40.1 |
| 6 | 47 | 116.0 | 57.3 |
| 7 | 33 | 120.2 | 50.1 |
| 8 | 47 | 101.2 | 42.1 |
| 9 | 46 | 109.7 | 40.3 |
| 10 | 41 | 124.7 | 44.4 |
| 11 | 38 | 140.6 | 58.6 |
| 12 | 41 | 122.5 | 42.3 |
| Mean | 44.1 | 114.5 | 44.9 |

botic-assisted total laparoscopic hysterectomy included abnormal uterine bleeding (n = 7), chronic pelvic pain (n = 4), myoma (n = 1), and endometrial hyperplasia (n = 1).

No morbidly obese patients were excluded from the analysis. Of the 12 patients, 11 (92%) successfully underwent a robotic-assisted total laparoscopic hysterectomy. One patient with severe pelvic and abdominal adhesions attached to the bowel required conversion to laparotomy for her hysterectomy. No patient returned to the operating room for re-exploration, blood transfusion, or hospital readmission. Eleven patients were discharged within 23 hours. The patient who underwent a Total Abdominal Hysterectomy, Bilateral Salpingo-oophorectomy, with extensive adhesiolysis was discharged at 48 hours. Patients were followed up between 12 and 26 months without any late complications. The mean estimated blood loss was 146.3 mL (range, 15–550 mL). The mean uterine weight for the study group was 259 g (range, 128–637 g). The mean surgical time for the 11 patients who underwent a robotic-assisted total laparoscopic hysterectomy was 109.6 minutes (range, 99–145 minutes). To provide a meaningful, consistent metric of operating time in this study, the duration of surgery was measured from skin incision for trocar placement to robotic-assisted closure of the vaginal cuff because several patients had concomitant urogynecology procedures. There was no significant patient shifting noted while in the steep Trendelenburg position on

the egg-crate foam mattress. None of the 11 patients who underwent a robotic-assisted hysterectomy reported specific musculoskeletal complaints of their back and neck due to being in the prolonged Trendelenburg position.

DISCUSSION

Morbid obesity represents the most common chronic disease in the Western world.⁶ The World Health Organization estimates that worldwide obesity has more than doubled since 1980,^{7,8} reaching epidemic proportions in the United States.^{9,10} Obese patients have a greater incidence of comorbid disease and a higher risk of perioperative complications.^{2,3} Morbid obesity, which correlates to adipose deposition, is defined as having a BMI of 40 kg/m² or greater. BMI is related to the percentage of body fat and total body fat, calculated as weight in square kilograms. BMI appears to have a significant association with surgical outcomes in laparoscopic hysterectomy, which is most pronounced in the morbidly obese patient.¹¹

Hysterectomy is performed in approximately 600,000 women annually in the United States, second only to cesarean section as the most common surgery.¹² Vaginal hysterectomy offers the least invasive hysterectomy alternative in morbidly obese patients, resulting in a shorter hospital stay, surgery, and anesthesia time.¹³ Although, in retrospect, some of these patients could have had their surgeries performed as vaginal hysterectomies, these procedures would have been technically challenging because of poor uterine descent and patient positioning difficulties because of their morbidly obese habitus.

In 1989, Reich et al¹⁴ first reported total laparoscopic hysterectomy. A novel laparoscopic technique, microlaparoscopic-assisted vaginal hysterectomy was introduced in 2004 to provide obese patients in need of a hysterectomy with the benefits of minimally invasive surgery.¹⁵ Because dissection of the cervix and lower uterine segment performed vaginally may be more difficult in some morbidly obese patients, total laparoscopic hysterectomy may be a better option than Laparoscopic assisted vaginal hysterectomy.

In 2005, the Food and Drug Administration approved the da Vinci Surgical System (Intuitive Surgical) for gynecologic surgery. Since then, robotic-assisted gynecologic surgery has increased. According to internal data on file at Intuitive Surgical, the overall rate of total abdominal hysterectomy decreased from 64% to 37% from 2005 to July 2012 due to robotic-assisted hysterectomies accounting for 33% of the preferred current hysterectomy modality.

ties.¹⁶ The high-definition 3-dimensional vision system and increased dexterity in robotic-assisted procedures allow more difficult cases to be performed laparoscopically.^{17–19} Robotic-assisted laparoscopic hysterectomy in obese women appears to be associated with shorter hospitalization, less bleeding, and fewer complications compared with laparotomy in morbidly obese women.²⁰ Although conversion to open laparotomy has been observed with increasing BMI >30 kg/m²,²¹ a robotic-assisted hysterectomy has been reported in a patient with a BMI of 98% (height of 160 cm and weight of 252 kg).²²

This study endeavored to provide strategies for performing robotic-assisted total laparoscopic hysterectomies in morbidly obese patients, summarized in **Table 2**. Traditionally, patients undergoing laparoscopic surgery are placed in the dorso-supine position before general anesthesia. Once asleep, patients are repositioned in the dorso-lithotomy position. Repositioning of an asleep morbidly obese patient is extremely difficult because of the patient’s body habitus. Having the patient “self-position” under the surgeon’s guidance in the dorso-lithotomy position before undergoing general anesthesia will overcome this obstacle.

Because the prolonged steep Trendelenburg position is essential for robotic-assisted procedures in the morbidly obese patient, some centers use shoulder blocks to prevent patient sliding. This antiquated practice carries the risk of brachial plexus injury.²³ A safer, yet effective alternative is the use of an egg-crate mattress to minimize sliding during the steep Trendelenburg position.²⁴

One of the greatest obstacles in performing laparoscopic surgery in the morbidly obese patient, including robotic-assisted surgery, is the initial placement of the Veress needle to create a pneumoperitoneum. Although this patient population has a varying girth of the abdominal

panniculus, the umbilical approach provides the shortest distance from the skin into the peritoneal cavity. Elevation of the panniculus with towel clips provides excellent countertraction during insertion of the Veress needle. With few exceptions, the transumbilical approach at a 90° angle is recommended in the morbidly obese patient.²⁵ Because the umbilicus migrates caudally to the aortic bifurcation as BMI increases,²⁶ elevation of the panniculus around the umbilicus with towel clips minimizes the risk of injury to the underlying vessels.

Finally, a challenging obstacle facing the laparoendoscopic surgeon operating on the morbidly obese patient is adequate visualization already compromised by excess adipose tissue. Whether used to elevate a large uterus during the posterior colpotomy, retracting bowel, or adnexa, the retractor/grasper ProGrasp forceps facilitate visualization of the surgical field. In certain cases, the use of an EndoPaddle (Covidien, Mansfield, Massachusetts, USA) to retract the omentum is invaluable.

CONCLUSION

A case series of 12 consecutive morbidly obese patients planning to undergo robotic-assisted total laparoscopic hysterectomy was presented. The procedure was successful in 11 of 12 patients; 1 required conversion to laparotomy and underwent a TAH, BSO. Strategies to enhance successful completion of robotic-assisted total laparoscopic hysterectomy were presented. Although robotic-assisted total laparoscopic hysterectomy appears to be a safe, minimally invasive alternative for morbidly obese patients requiring a hysterectomy, large multicenter prospective studies would be useful to standardize surgical techniques in this patient population.

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Table 2.

Strategies for Performing Robotic-Assisted Total Laparoscopic Hysterectomy in Morbidly Obese Patient

- Patient “self positioning”
- Use of egg-crate mattress to avoid patient sliding during steep Trendelenburg position
- Elevation of panniculus with towel clips during insertion of Veress needle
- Insertion of Veress needle transumbilically at 90° angle
- Liberal use of third robotic arm for retracting and grasping
- Use of an endopaddle to retract the omentum

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