Current surgical treatment option, utilizing robot-assisted laparoscopic surgery in obese women with endometrial cancer: Farghaly’s technique

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Abstract

Background: Endometrial cancer is the most prevalent cancer of the female genital tract in North America. Minimally invasive laparoscopic-assisted surgery and panniculectomy in obese women with endometrial cancer are associated with an improved lymph node count, and lower rate of incisional complications than laparotomy.

Methods: Technique for robot-assisted laparoscopic surgery for obese women with endometrial cancer is detailed.

Results: Robot-assisted laparoscopic surgical staging, pelvic and para-aortic lymphadenectomy and panniculectomy allow us to avoid the use of postoperative pelvic radiation which is recommended in women with histopathology high-risk findings: deep myometrial invasion or high grade histology. The procedure has the advantage of three-dimensional vision, ergonomic, intuitive control, and wristed instrument that approximate the motion of the human hand.

Conclusion: Robot-assisted laparoscopic surgical staging, and panniculectomy in these patients are a safe, and effective alternative to laparoscopic, and laparotomy surgery. It is an ideal tool for performing the complex oncologic procedures encountered in endometrial cancer staging that requires delicate retroperitoneal, pelvic and para-aortic lymph node dissection, while maintaining the principles of oncologic surgery but in a minimally invasive fashion.

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Introduction

Uterine cancer is the most common gynecological cancer in the USA. The American Cancer Society estimates about 47,130 new cases of cancer of the body of the uterus, and about 8010 deaths in 2012. These numbers include both endometrial cancers and uterine sarcomas. About 2% of uterine body cancers are sarcomas. The median age of diagnosis of endometrial cancer is 63 years, and the median age of death is 73 years. In
the US, the highest incidence is in Caucasian women, with 24.3 per 100,000 per year, and the highest mortality is in African–American women with 7.6 per 100,000 per year. The majority of these cases are endometrial cancers. The operative management of these cases is hysterectomy with bilateral salpingooophorectomy. The American College of Obstetricians and Gynecologists recommends lymphadenectomy for all patients except in young women with low grade tumor in a background of complex endometrial hyperplasia or women with significant co-morbidities [1]. It has been shown that 77% of patients with para-aortic node involvement had metastasis above the inferior mesenteric artery. Pelvic and para-aortic lymphadenectomy up to the renal vessels is indicated in those patients. The latter should include excision of the gonadal veins. Conversely, lymphadenectomy does not benefit patients with grade 1 or 2 endometrioid lesions with myometrial invasion less or equal to 50% or primary tumor diameter less than or equal to 2 cm [2]. Risk factors for the development of endometrial cancer include early menarche, late menopause, history of infertility, anovularity cycles, nulliparity, obesity, tamoxifen use, hereditary nonpolyposis colorectal cancer (HNPPC or Lynch syndrome), estrogen-secreting tumors (i.e., granulose cell), estrogen therapy, diabetes, and prior pelvic radiation [3]. Approximately 85% of endometrial cancers are of endometrioid histology. The remaining 15% are of papillary serous and clear cell cancers. Type I uterine cancer is considered to be grade 1 and 2 endometrioid adenocarcinoma. It is common in peri-and post menopausal obes women and in women taking unopposed estrogen. Type II is composed of grade 2 endometrioid adenocarcinomas, papillary serous and clear cell cancers. These cancers are more aggressive with tendency to present with advanced-stage disease.

Laparoscopic assisted surgery for endometrial cancer

The re-emergence of radical vaginal surgery and the ability to perform complete laparoscopic staging procedures have allowed minimally invasive surgery to have a very important role in patients with gynecological cancer. It has been shown that, minimally invasive surgery in the management of early-stage endometrial cancer is safe, and feasible. It lowers hospital costs and produce results comparable with those of abdominal approach. The laparoscopic procedure includes laparoscopically assisted or total vaginal hysterectomy with pelvic and para-aortic lymph node dissection, peritoneal washings, and an omentectomy in patients with serous type malignancies of the endometrium. Abu-rustum et al. [4] have described these procedures in the management of endometrial carcinoma. The laparoscopic surgery for endometrial cancer has been compared with open laparotomy surgery. There was no difference between the two groups with regard to mean Quetelet index, number of lymph nodes and mean operating time. The recurrence-free survival rate was not significantly different between the laparoscopy (97.3%) and laparotomy (93.3%) groups. The survival rate was 83.9% in the laparoscopic group and 90.9% in the laparotomy group. Thorough pelvic and para-aortic lymphadenectomy is important, as the extent of lymphadenectomy is related to the number of metastatic lymph nodes identified. Patients undergoing multiple-site lymphadenectomy have a significantly better survival than did those patients not undergoing lymphadenectomy. Low-risk patients (disease confined to the uterus) with lymphadenectomy have better survival than those without lymphadenectomy. High risk patients (disease in the cervix, adnexae, uterine serosa, or washings) who undergo lymphadenectomy also have a better survival than those without lymphadenectomy. In addition, it seems feasible that partial vaginectomy of the upper one third of the vagina would minimize the chances of vaginal vault recurrence [5].

Port site tumor implantation following laparoscopic surgery

While laparoscopic procedures for gynecologic cancer continue to be effective with favorable outcomes confirmed, reports of metastases at the site of trocar insertion (PSMs) have been reported. Ramirez et al. [6] estimated that the overall incidence of PSMs after laparoscopic surgery for gynecologic cancer was 1–2%. There are several postulated causes for developing PSMs; of these, tumor aggressiveness appears to be the most favored. From the Cancer biology standpoint, the more aggressive the tumor, the most likely that tumor is to metastasize. In an experimental study on rats using intraluminal tracer, Polate et al. [7] showed that trocar-site contamination was more common when the primary tumor manipulated traumatically. Hence, it promotes the tumor cell seeding. Immune depression might be a factor predisposing to metastases, including the port sites. It is well recognized that the trauma of surgery can depress immune function and this in theory predispose to the spread of tumor metastases. Animal models have shown that the body immune system is significantly more depressed after open surgery than after laparoscopy, and this might explain why PSMs appear less commonly than wound metastases from open surgery [8]. It has been recommended that peritoneal lavage with large volumes of saline and 500 U/L heparin would decrease the adherence of malignant cells to a denuded surface [9]. Jurczok et al. [10] showed that in a murine model, tumor implantation and PSMs after laparoscopic surgery might be prevented by intraperitoneal administration of specific oligopeptides or cytotoxic agents such as mitomycin. It is reasonable to assume that if the following protective measures are applied, it will, undoubtedly, decrease the risk of the development of port-site metastasis: trocar fixation, prevention of insufflation gas leaks, rinsing of instruments with 1% povidine–iodide solution, minilaparotomy protection, rinsing off trocars with 1% povidine–iodide solution [11].

Surgical approach to obese women

The incidence of obesity among American women has increased dramatically over the past 40 years. Obese women undergoing pelvic surgery are more likely to experience intraoperative and postoperative complications. Pitkin [12] reported the effect of overweight in patients undergoing gynecological surgery. Those patients had longer operating times, increased blood loss, postoperative wound complications, and febrile morbidity. Similarly, obese women undergoing surgery for endometrial cancer have longer operating times, greater blood loss, longer hospital stays, higher rate of wound infection, and wound dehiscence [13]. Obesity is associated with a 10-fold increased risk for endometrial cancer. Obese patients have an increased risk of laparotomy conversion and less complete lymph nodal dissection [14]. Maintenance of exposure during aortic lymph node dissection and adequate ventilation can be a challenge to the gynecological surgeon and
the anesthesiologist. In obese women, the necessity of designing and standardization of surgical approaches that allow adequate staging is important. Laparoscopic surgery for endometrial cancer, in obese women, is impeded by thick adipose tissue interfering with trocar placement, less adequate peritoneal distension, intraperitoneal adipose tissue hindrance, lymph node dissection, and a bulky omental and mesenteric fat obstructing adequate retraction of the bowel and omentum during lymph node dissection. It has been shown that women with body mass index (BMI) of more than 40 were more likely to have tumor and a lower stage than women with BMI of less than 30 [15]. Also, it has been suggested that obesity was associated with favorable pathological variables and trend toward increased survival. In addition, obese women develop endometrial cancer through the hormone-dependent pathway (type I) relative to normal weight patients who may develop the disease through autonomous oncogenesis (type II). Obese patients are noted to more likely have lower grade histology when compared to normal weight patients. Conversely, normal weight patients with endometrial cancer had significantly higher rates of high-grade histology and were significantly of younger age group. Obese women less frequently have the DNA mismatch repair gene mutations that result in hereditary nonpolyposis colorectal carcinoma (HNPCC) and therefore fewer metastachons HNPCC-related cancer. For patients undergoing surgery for endometrial cancer, it is important to evaluate obesity by measuring body mass index, waist-to-hip ratio, waist circumference, and intra-abdominal visceral fat (IVF) assessment using ultra sonography and computed tomography. Intra-abdominal visceral fat computed tomography is a reliable predictor to choose the type of surgery either the laparoscopic or laparotomy approach [16]. It is, generally accepted that panniculectomy improved operative exposure, staging, and increased pelvic and paraaortic lymph node yield and well tolerated in patients undergoing surgery for endometrial cancer [17]. Abdominal panniculectomy is performed for several reasons a large pannus can cause chronic irritation, rashes, chronic ulcers and fistulas and could decrease the pulmonary reserve. Wound and post-operative complications are directly proportional to the degree of obesity [18]. Risks associated with operating through a large pannus include limited surgical exposure, increased blood loss, increased operative time, increased thromboembolic complications and decreased wound healing [19].

It seems feasible to assume that robotic assisted panniculectomy using the da Vinci system in patients with endometrial cancer is practical and safe. Care must be taken when raising the superior adipocutaneous flap to only dissect enough to provide adequate exposure for the procedure and to allow closure with minimal tension on the skin edges. The umbilicus should be preserved to minimize wound problems. The umbilicus could be excised in case of umbilical hernia, an umbilical stalk that is longer than 5 cm, or a previous open cholecystectomy. Also, the umbilicus could be scarified, if the abdominal wall thickness is such that excessive tension would be put on the stalk to exteriorize the umbilicus. To minimize wound complications, the deep muscle fascia should be incorporated. Some of the sutures are used for Scarpa fascia closure to minimize the dead space. The dermis and the superficial fat are closed with a separate layer of sutures, and then surgical staples applied to skin. Every staple is removed after 6 days. Adequate wound drainage with drains should prevent the formation of serous seromas which may later become infected.

**Role of robot-assisted laparoscopic surgery in endometrial cancer**

Surgeons’ experience, training and limitations of oncologic laparoscopic surgery that include counter-intuitive emotion, non-wristed instrumentation and a reliance of skilled surgical assistance contribute to a difficult and long learning curve. Laparoscopic surgery for endometrial cancer is more difficult in patients with adhesive disease, large uterus, fatty mesentery, and inability to tolerate steep Trendelenburg. Robotic-assisted surgery leverages the advantages of standard laparoscopy while restoring three-dimensional vision, ergonomic, intuitive controls, and wristed instruments that approximate the motion of the human hand. The only absolute contraindications to robotic surgery are:

1. Patients who cannot tolerate general anesthesia,
2. Patients who cannot tolerate a steep Trendelenberg position.

For many institutions, assisted robotic surgery has become the technique of choice for performing surgical staging including hysterectomy, and lymphadenectomy for endometrial cancer patients. Robotic assisted surgical staging is feasible in obese patients with endometrial cancer and may result in comparable outcomes as patients are staged by laparotomy with fewer complications and shorter length of hospital stay. It has been shown that 15.6% (95% confidence interval {CI} 9.5–24.25%) of obese patients who underwent robotic-assisted surgery for endometrial cancer were converted to laparotomy [20]. The advantage of using this method was satisfactory lymph node yield, low blood loss; reasonable operative time with short hospital stays [21]. Farghaly’s technique of robot-assisted laparoscopy for treatment of obese patients with endometrial cancer utilizes the da Vinci surgical system, and involves perioperative mechanical bowel prep with 4 L of polyethylene glycol [Golytely (R)]. The day prior to surgery a pressure-controlled anesthesia is used for ventilating patients in steep Trendelenburg. After induction of anesthesia, the patient is placed in the low dorsolithotomy position using universal Allen stirrups. A gel pad is placed underneath the patient on the surgical table. The patient’s arms are tucked to her sides, and shoulder block is placed to minimize patient’s position shifts and prevent nerve injury. Then a large rectal dilator (EEA sizer) is placed in the vagina with a pneumo-occluder balloon. The patient is prepped and draped in a standard fashion. A five-trocars transperitoneal approach is used. A 2 mm laparoscopic port is placed in the left upper quadrant 2 cm below the costal margin in the mid clavicular line. All subsequent ports are placed under direct visualization. The abdomen, is then, insufflated with CO₂ gas to a maximum pressure of 15 mmHg. The patient is subsequently placed in a steep Trendelenburg position, and the secondary trocars are placed. After that, the 2 mm left upper quadrant port is converted to a 10–12 mm assistants’ port. The da Vinci (R) surgical system is then docked between the legs at the foot of the bed. A zero-degree camera is used for the entire procedure. Maryland grasper is used in the left robotic arm; also a bipolar
endoscopic wrist instrument is placed in the fourth robotic arm and used for retraction. The surgical procedure begins with right robotic lymphadenectomy, followed by left aortic dissection, pelvic lymphadenectomy and total hysterectomy. The boundaries of dissection of the pelvic-aortic lymphadenectomy are consistent with the Gynecologic Oncology Group (GOG) surgical procedures manual [22]. For pelvic lymphadenectomy, this includes the middle psoas muscle (laterally), deep circumflex iliac vein (inferiorly), mid-common iliac vessels (superiorly), and obturator nerve (posteriorly). The aortic lymph node dissection superior boundaries are to the ovarian vessel on the right and to the inferior mesenteric artery on the left. Monopolar spatula instrument is used in the right hand and a plasma kinetic grasper in the left hand. For large pedicles an Ensel Tissue sealing system (Surg Rx, Redwood, California, USA) or Ligasure tissue Fusion System (Valley Lab, Boulder, Colorado, USA) was used for a combined vessel sealing and cutting through the assistant’s port. A vaginectomy is performed. The specimens are placed in endocatch (R) bags and delivered vaginally. The vaginal cuff is closed with two 0-vicryl sutures on a CT-1 needle cut to 12 in., starting from each corner and meeting in the middle. Postoperatively, the patient is given a regular diet the night of surgery and oxycodeone/acetaminophen for pain relief. The Foley catheter is left in place and discharged from the hospital and a voiding trial is scheduled in the clinic within 1 week. The patient is discharged on post operative day 2. Seamon et al. [23] reported that, of 105 patients with endometrial cancer, 13 (12.4%) with a BMI ranging from 47 to 58 and grade 1 cancer did not undergo complete staging: six patients underwent pelvic lymphadenectomy without aortic dissection and seven had no lymphatic staging. There were also 12.4% conversions to laparotomy. The mean conversion BMI was 40 ± 7 kg/m² compared to 34 ± 9 kg/m² for those completed robotically. The feasibility for completing robotic aortic lymphadenectomy was 67% and 35% for BMI 45 and 50 kg/m², respectively. Subramaniam et al. [24] compared outcomes for a group of obese patients with endometrial cancer undergoing robotic and open hysterectomy. Lymphadenectomy (total mean node count 8.0) was performed in 66% of robotic cases and conversion to laparotomy was 11%. Blood transfusions, hospital stay and complications were all improved in the robotic-assisted surgery group.

Surgical cost comparison

In the model of Barnett et al. [25], laparoscopy was least expensive at $10128.00 per case. Robotic surgery and open surgery costs exceeded laparoscopy by $1348 and $2719, respectively. The authors proposed that reducing disposable costs for the robot to $1046 from the average reported at $2394 would make it equal to laparoscopy. This analysis makes several assumptions about institution-specific variables that could influence the amortized per-case costs of the da Vinci system and laparoscopic equipment. High volume centers can reduce the cost gap between robotics and laparoscopy because the per-case cost of the da Vinci system is reduced. Jonsdottir et al. [26] hypothesized that, robotic surgeons and their operating room teams improved efficiencies with reductions in operative and turnover times. The study showed the importance of analyzing costs over time for institutions, as efficiencies may be gained or lost as the patterns of care change.

Conclusion

Robot-assisted laparoscopic panniculectomy combined with radical hysterectomy and pelvic and para-aortic lymphadenectomy in obese patient with endometrial cancer is a safe and effective alternative to laparoscopic and laparotomy surgery. It has the advantage of three-dimensional vision, ergonomic, intuitive control, and wristed instrument that approximate the motion of the human hand. It can decrease the incidence of intraoperative complications and post operative wound complications without significantly increasing operative time or blood loss. The procedure is cost effective with acceptable operative, pathological and short and long term clinical outcome. It retains the advantage of minimally invasive surgery.

Conflict of interest

I declare that I have no conflict of interest, financial and personal relationships that bias this work.

References


