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Robot-assisted laparoscopic surgery in patients with advanced ovarian cancer: Farghaly's technique

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Minimally invasive surgery for gynecological cancers demonstrated its safety and feasibility to treat those disorders [1-3]. Surgeon's 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. The da Vinci surgical system is a robotic surgical platform that was approved by the FDA in April 2005 for gynecologic application. The robot is a telesurgical system that allows the surgeon to operate at a consol rather than at the patient's bedside. The three-dimensional image provided by the camera gives the surgeon a life-like view of the surgical field with magnification. The surgeon manipulates instruments equipped with "endowrist" movements that duplicate the movements of the hand. The small instruments and magnification allow for accuracy. Robot-assisted surgery leverages the advantages of standard laparoscopy while restoring three-dimensional vision, ergonomic and 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 and 2) patients who cannot tolerate a steep Trendelenberg position.

For many institutions, assisted robotic surgery has become the technique of choice for performing surgery for endometrial and cervical cancer patients. In patients with advanced ovarian cancer, optimal debulking could be achieved, through performing total hysterectomy, bilateral salpingo-ophrectomy, para-aortic lymphadenectomy, bilateral pelvic lymphadenectomy (including obturator, hypogastric, external iliac, and common iliac lymph nodes), and partial omentectomy. It is important to operate in all quadrants of the abdomen. This could be achieved by rotating table and redocking the robot at the patient's head. This position allows para-aortic lymphadenectomy to the level of renal vessels, and performs debulking of cancerous tissue of the upper abdomen, diaphragm, and liver to less than 0.5 cm residual tumor. The advantage of using this method is low blood loss; reasonable operative time with short hospital stay. The preferred surgical technique (Farghaly's Technique), involves bowel prep beginning one day before surgery with Half Lytely and Bisacodyl Tablet bowel Prep Kit. The empty bowels are less likely to obstruct the surgical field view. The day prior to surgery a pressure-controlled anesthesia is used for ventilating patients in steep Trendelenberg position. After induction of anesthesia, the patient is placed in steep Trendelenberg position with lithotomy position to facilitate exposure. Disposable foam egg crate beneath the torso is used to prevent slippage during surgery. The patient's arms are tucked to her sides, and shoulder blocks are placed to minimize patient positional shifts and prevent nerve injury. Then a vaginal probe is used to identify the vaginal margin below the cervix. The patient is prepped and draped in a standard fashion. A six-trocar transperitoneal approach is used. A two-mm laparoscopic port is placed in the left upper quadrant two cm below the costal margin in the mid clavicular line. All subsequent ports are placed under direct visualization. The abdomen is then insufflated with CO_2 gas to a maximum pressure of 15 mmHg. The patient is subsequently placed in a steep Trendelenberg position, and the secondary trocars are placed. After that, the two-mm left upper quadrant port is converted to a 10-12 mm assistants' port. The da Vinci 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 endowrist instrument is placed in the fourth robotic arm and used for retraction. The abdominal cavity is inspected systemically by using atraumatic forceps: the ovaries, fallopian tubes, uterus, pelvic peritoneum, serosa, and mesentery of the large bowel, liver surface, paracolic gutters, and diaphragm are thoroughly visualized. It is important to operate in all four quadrants of the abdomen. The surgical procedure begins with right para-aortic lymphadenectomy, followed by left para-aortic dissection, pelvic lymphadenectomy, and total hysterectomy, bilateral salpingo-ophrectomy, and partial omentectomy. The boundaries of dissection of the pelvic-aortic lymphadenectomy are consistent with the Gynecologic Oncology Group (GOG) surgical procedures manual. For pelvic lymphadenectomy, this includes the middle psoas muscle (laterally), deep circumflex iliac vein (inferiorly), mid-

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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. Also, segmental resection and cauterization of the diaphragm, peritoneal ablation, and stripping of pelvic peritoneum are carried out. The cancerous tissues are thoroughly debulked to less than 0.5 mm in diameter residual tumor, by using the electrosurgical loop excision procedure (LEEP) and argon beam coagulator (ABC). A ten-mm loop electrode with several extensions is inserted through a port. The loop electrode extension is attached to a handheld cautery and is used on the cutting mode at 50-W cutting/50-W coagulation setting. Small seedling tumors and bases of tumors are coagulated by using the ABC through the laparoscopic port at a setting of 85. For operating instruments, a monopolar spatula instrument is used in the right hand and a plasma kinetic grasper in the left hand. For large pedicles, a Ligasure tissue Fusion System is used for a combined vessel sealing and cutting through the assistant's port. A vaginotomy is performed. The specimens are placed in endocatch bags and delivered vaginally. The vaginal cuff is closed with two-0-coated vicryl sutures, 8-18 inches in length on CT-1 36 mm needle, beginning from each corner and meeting in the middle. Pelvic drain is inserted through the ten-mm port and ports are removed under vision. For the trocars site, all layers of the abdomen are closed separately only at level of the umbilical trocar site insertion to avoid trocar metastases, using vycril 1 with J needle for the fascia, monocryl 2-0 for the subcutaneous, and nylon 3-0 for the skin with a subcuticular suture. Postoperatively, patient is given a regular diet the night of surgery and oxycodone/acetaminophen for pain relief. The Foley catheter is left in place and discharge from the hospital and a voiding trial is scheduled in clinic within one week. The pelvic drain is kept for 24-48 hours depending on the outflow. Operative time could be maintained at 240 minutes and surgical blood loss of 100 cc. The patient is discharged on postoperative day two but could be discharged one day following surgery. In general, the goal of minimally invasive robot-assisted laparoscopic surgery is to duplicate traditional open procedures via small incisions in the skin with surgical outcomes equivalent or superior to a traditional surgical approach. It has been demonstrated that minimally invasive surgery is associated with less blood loss, shorter hospital stay, less postoperative pain, improved cosmesis, and faster recovery compared to traditional approaches [4-6]. Robotics and laparoscopy appear preferable to laparotomy for the surgical treatment of ovarian cancer patients requiring primary tumor excision alone or with one additional major procedure. Sert and Abeler described their experience with robotic radical hysterectomy with an operative time of 241 minutes and blood loss of 71 cc [7]. Kim *et al*. reported on ten cases with an operative time of 207 minutes, blood loss of 355 cc, and nodal yield of 27. No conversion to laparotomy was reported [8]. Fanning *et al*. reported on their experience with robotic radical hysterectomy for cervical cancer. They reported operative time of 390 minutes without conversion to laparotomy. They reported hospital stay of one day and surgical blood loss of 300 cc [9]. Magrina *et al*. emphasized that optimal debulking is more important than the type of surgical method, as there was no difference in the overall and progression-free survival for robotic and laparotomy patients. However, one of the most important factors to consider is the challenge associated with the need to explore all four quadrants of the abdomen in cases of advanced ovarian cancer with carcinomatosis [10]. They have suggested the rotation of operative table and redocking the robot at the patient's head. This way, it was easier to excise para-aortic lymph nodes to higher levels and other upper abdominal metastases. Also, the reverse-docking position was helpful when the transverse colon needed mobilization for bowel resection in their study. Farghaly presented a technique of robotic-assisted laparoscopic anterior pelvic exenteration in patients with advanced ovarian cancer, involving the lower urinary tract. He found that it was safe, feasible, and cost-effective with acceptable operative, pathological and short- and long-term clinical outcomes. It retained the advantage of minimally invasive surgery [11]. To conclude, robot-assisted laparoscopic surgery for patients with advanced ovarian cancer is safe and effective alternative to laparoscopic and laparotomy surgery. It has the advantage of three-dimensional vision, ergonomic and intuitive control, and wristed instrument that approximate the motion of the human hand. It can decrease the incidence of intraoperative complications and postoperative 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 outcomes. It retains the advantage of minimally invasive surgery.

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