Robotic-assisted infrarenal aortic lymphadenectomy and pelvic lymphadenectomy for endometrial staging using a single docking procedure

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Introduction

Endometrial cancer is the most common gynecological malignancy in the United States (Jemal et al., 2009). The surgical treatment of endometrial cancer involves hysterectomy, resection of adnexal structures and appropriate surgical staging in patients at risk for extra uterine disease (Amant et al., 2005). Modern methods for the treatment of endometrial cancer include laparotomy, laparoscopy and robotic-assisted surgery (Boggess et al., 2008). The some advantages of robotic surgery over laparoscopy include the acquisition of 3D images, an increased number of basic hand movements of laparoscopic devices (from 4 to 7) and ease of left hand use (Oehler, 2009). Mariani et al. reported the significance of infrarenal para-aortic lymphadenectomy in patients with endometrial cancer. They demonstrated that 67% of patients with lymphatic dissemination had para-aortic lymph node metastases, and 77% of patients with para-aortic node involvement had metastases above the inferior mesenteric artery (IMA) (Mariani et al., 2008). However, the dissection of lymph nodes above the IMA with robotic-assisted surgery has limitations due to the docking procedure that is used to access the entire abdomen and complete the endometrial staging procedure. The relocation of the robotic column has been suggested previously (Magaina et al., 2009; Jacob et al., 2011; Magrina et al., 2010; Narducci et al., 2009). As we know, there is no published study in the literature including the surgical steps of the para-aortic lymphadenectomy are provided in the present study.

Material and methods

Between April and August 2011, 13 patients were seen with endometrial cancer. Pelvic and para-aortic lymphadenectomy was omitted in seven patients considered to be at low risk for lymphatic dissemination. These patients were no disease beyond corpus and endometrioid (grade 1 or 2), myometrial invasion ≤50%, and primary tumor diameter ≤2 cm; or endometrioid and no myometrial invasion (independent of grade and primary tumor diameter). Six patients with endometrioid type endometrial adenocarcinoma were treated with complete, systematic robotic-assisted endometrial cancer staging. A review of the patients’ medical records and operation reports provided the clinical data for analysis. Intra- and postoperative data, including patient characteristics and operation time, were recorded. All patients were appropriately counseled, and written informed consent was obtained from all patients. This study was approved by the institutional review board at our hospital. All surgeries were performed by the senior author (A.G.). The operative outcomes included operative time, console time, estimated blood loss (EBL), length of hospital stay, conversion rate to laparotomy, operative complications, pathology, lymph node count and status.

All procedures were performed under general anesthesia with the patient in a low dorsolithotomy position. The patient was prepped and draped, and a Foley catheter was placed in the bladder. A five-trocar transperitoneal approach was used. The first skin incision for the 12-mm trocar was performed at least 10 cm above the umbilicus. A 12-mm trocar for the camera was inserted directly into the abdomen. CO2 insufflation was continued until the intra-abdominal pressure was 16 mm Hg. An initial survey of the abdominopelvic anatomy was performed. All subsequent ports were placed under direct visualization. The 8-mm trocar was introduced into the left upper quadrant of the abdomen, 8–10 cm lateral and 1–2 cm below the camera port. The 8-mm right trocar was introduced directly into the abdomen, and CO2 insufflation was continued until the intra-abdominal pressure was 16 mm Hg. An initial survey of the abdominopelvic anatomy was performed. All subsequent ports were placed under direct visualization. The 8-mm trocar was introduced into the left upper quadrant of the abdomen, 8–10 cm lateral and 1–2 cm below the camera port. The 8-mm right trocar was placed symmetrical to the left port. The third robotic instrument port was placed 8 cm lateral to the left trocar and 2–3 cm below the left port. A 10-mm assistant port was placed to the left of the costal margin between the camera and the left upper trocar. The assistant port was used for suction, irrigation, suture preparation and retraction. The trocar insertion sites are shown in Fig. 1. V-care (Conmed, USA) was used for uterine manipulation. Standard laparoscopic techniques prior to the docking of the robot were used to lyse any ventral wall adhesions when necessary. The patient was placed in a steep Trendelenburg position with a 15 degree right tilt after port placement to aid the visualization and bowel mobilization away from the surgical field. The bowels were folded into the right paracolic region using a grasper to expose anatomy until the ligament of Treitz. The da Vinci S surgical system (Intuitive Surgical, Sunnyvale, CA, USA) was docked between the legs of the patient. The camera and endowrist instruments available for da Vinci S were introduced through the trocars.

The staging began with the para-aortic lymphadenectomy. The surgical steps of the para-aortic lymphadenectomy are provided in Fig. 2. The ureter and the psoas muscles were identified after the dissection of the peritoneum over the right common iliac artery. A fenestrated grasper in the fourth arm was used to retract the ureter out of the operative field. The right para-aortic lymph nodes were resected...
until the insertion of the right ovarian vein into the vena cava. Perito-
neal dissection was performed by following the left iliac artery and
the psoas muscle leading to the lateral side of the aorta. The inferior
mesenteric artery was identified. The ureter and the psoas muscle
were identified under the IMA at the left side. The peritoneum
above the aorta was dissected up to the ligament of Trietz and the
left renal vein was identified cranially. The lymphatic chain above
and below the IMA was determined. Lymph nodes between the levels
of the IMA up to the renal vein were dissected. Clips or bipolar forceps
were used at renal vein level to prevent lymphatic chylous ascites.
Lower para-aortic lymph nodes were dissected from the region be-
tween the middle point of the left common iliac artery and the inferi-
or mesenteric artery. The staging procedure was followed by pelvic
lymphadenectomy and hysterectomy. Dissected lymph nodes within
the endobags were removed through the vagina after completion of
the hysterectomy. A drain was placed to cul-de-sac and the volume
of fluid from drain was measured daily. The drain was removed
when the fluid drainage was < 100 ml/day.

Results

Six patients underwent robotic-assisted endometrial staging using
a single docking procedure. The mean age and body mass index of the
patients were 55.6 years (range 39–67) and 30.2 kg/m² (range
19–44), respectively. The mean number of lymph nodes retrieved
was 57.1 (range 36–86). The mean number of para-aortic lymph
nodes retrieved was 25.5 (11–37). No conversions to laparotomy
were recorded, and no intraoperative complications occurred. Demo-
graphic and clinical data of the patients who underwent robotic-
asisted endometrial staging are provided in Table 1. One patient de-
veloped chylous ascites after the completion of surgical staging that
was resolved in 4 days with treatment with a somatostatin analog
(0.5 mg subcutaneous, 3 times daily) and a protein-rich, fat-poor diet.

![Fig. 1. Placement of the trocars.](image)

![Fig. 2. The surgical steps of the para-aortic lymphadenectomy. A: Peritoneal dissection overlying the right common iliac artery. B: Identification of the right ureter and the psoas muscle. C: Dissection of the lymphatic chain from the right para-aortic region. D: Dissection continued to right gonadal vein. E: Identification of the inferior mesenteric artery. F: Identification of the left ureter and the psoas muscle. G-H: Dissection of the lymphatic tissue to the inferior mesenteric artery. I: The view after the dissection of the right and left para-aortic regions to the IMA. J: Identification of the left renal vein. K: Dissection of the lymphatic tissue between the IMA and left renal vein. L: The view after the completion of the dissection to the left renal vein. RCIA: right common iliac artery, IVC: inferior vena cava, RGV: right gonadal vein, IMA: inferior mesenteric artery, LCIA: left common iliac artery, LRV: left renal vein.)
The incidence of the isolated paraaortic nodal metastasis in the setting of negative pelvic nodes is controversial in the literature. Abu Rustum et al. reported that isolated para-aortic nodal metastasis in the setting of negative pelvic nodes occurs in approximately 1% of surgically staged endometrial cancer cases (Abu-Rustum et al., 2009). However, Mariani et al. reported that lymph node metastases isolated to the para-aortic area is 16% (Mariani et al., 2008). In our study, six cases have all negative pelvic and para-aortic nodes. The aim of our report was only describing the new technique.

Our experience with a single docking procedure revealed that one important problem was the limited access to the upper abdominal region in patients whose body mass indexes were greater than 35 kg/m². The excess retroperitoneal tissue in these patients made the upper abdominal cavity difficult to reach. However, this problem did not result in any conversions to laparotomy, even in the patient whose BMI was 44 kg/m². High port placement may be a problem in regard to access of the pelvis especially in some patients who have a long distance between the xiphoid and the symphysis pubis. High port placement makes the hysterectomy more challenging in such tough cases. Distance problems may be overcome with longer instruments and closure of the vaginal cuff from below in some cases may be the solution of the problem. If it is needed, additional two trocars may be used to access the pelvis which can be located 4–5 cm below the inserted right and left robotic ports. In this study, we didn’t need such alternative recommendations. We closed the vaginal cuff intracorporeally in all cases.

This study described the trocar insertion sites for complete robotic-assisted endometrial cancer staging using a single docking procedure. This technique is feasible for complete endometrial cancer staging.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.gynor.2011.12.005.

References


### Table 1

Demographic and clinical data of the patients.

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EBL: estimated blood loss, Ng: negative, LN: lymph node, PLND: para-aortic lymph node dissection.

Discussion

The detection of the extent of the lymphadenectomy becomes more important for the surgical staging of the endometrial cancer after the identification of the infrarenal aortic nodes as an isolated site of metastatic aortic nodes in patients with endometrial cancer. Combined pelvic and para-aortic lymphadenectomy is the recommended treatment for endometrial carcinoma patients with an intermediate or high risk of recurrence (Todo et al., 2010). The robotic-assisted infrarenal aortic lymphadenectomy has some limitations due to technical problems, such as the relocation of the robotic column to perform the remaining surgical staging in pelvic lymphadenectomy and hysterectomy. The first robotic-assisted infrarenal para-aortic lymphadenectomy for complete endometrial staging using a single docking procedure was described in this study. All of the staging procedures were completed without the relocation of the patient side cart. Different approaches for infrarenal lymph node access, including a right extraperitoneal approach (Magrina et al., 2009), left transperitoneal lateral approach (Jacob et al., 2011) and a transperitoneal midline approach with a head docking procedure (Magrina et al., 2010), have been identified. All of these techniques require a relocation procedure and additional trocar insertions, or they are performed in patients who require only para-aortic lymphadenectomy. The relocation of the robotic column during operative procedures requires important cautions. Patient preparation must be performed secondly, which creates a risk of injury and anesthesia problems. The approaches that require a docking procedure with the patient’s head limits patient access for the anesthesiologist.

Jacob et al. reported a left lateral approach for robotic transperitoneal infrarenal aortic lymphadenectomy that included patient rotation and a redocking procedure to provide access to the pelvis for pelvic lymphadenectomy (Jacob et al., 2011). This new technique uses a total of six abdominal trocars for pelvic and upper abdominal dissection. However, only five trocars for complete endometrial staging up to the renal veins were used in our technique, and no relocation of the robotic column was required. Magrina et al. performed robotic transperitoneal infrarenal aortic lymphadenectomy in 33 patients using a technique that required a 180° rotation of the operating table and additional trocar placement (Magrina et al., 2010). This procedure is time consuming and requires a well-trained surgical and anesthesia team. An extraperitoneal approach for aortic lymphadenectomy has also been described (Magrina et al., 2009; Narducci et al., 2009), and it is an option in patients with preoperative indications for the removal of the aortic nodes. However, this technique is not suitable for a complete endometrial staging procedure.