EUROPEAN UROLOGY XXX (2016) XXX–XXX

available at www.sciencedirect.com
journal homepage: www.europeanurology.com

European Association of Urology

Surgery in Motion

Robot-assisted Laparoscopic Retroperitoneal Lymph Node Dissection for Testicular Cancer: Evolution of the Technique

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Article info

Article history:
Accepted March 22, 2016

Associate Editor:
James Catto

Keywords:
Testicular cancer
Retroperitoneal lymph node dissection
Robotic surgery

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Abstract

Background: Retroperitoneal lymph node dissection (RPLND) is an accepted staging and treatment option for nonseminomatous germ cell tumor. Robotic surgery offers technical advantages and is being increasingly used in urologic procedures.
Objective: To determine the feasibility and safety of robotic surgery for RPLND.
Design, setting, and participants: A retrospective review of robotic (R)-RPLND performed by a single surgeon from April 2008 to October 2014 using two approaches was performed. In total, 20 procedures in 19 patients were evaluated. Eleven men had clinical stage (CS) I disease, six had CS II, one of whom had prior chemotherapy, and two had CS III disease and had also undergone previous chemotherapy.
Surgical procedure: A lateral robotic approach was initially used; however, a supine robotic approach was developed to allow for bilateral dissection in one setting without repositioning. Template dissection with nerve sparing was performed for CS I patients and full bilateral dissection for patients with CS II or higher disease and for those who had active disease according to intraoperative frozen section results.
Outcome measurements: Mean operative time, estimated blood loss, hospital stay, and lymph node count were retrospectively reviewed, as was the presence of recurrence or the need for adjuvant therapy over median follow-up of 49 mo (interquartile range [IQR] 37.4–70.5). Intraoperative and postoperative complications were also reviewed.
Results and limitations: R-RPLND was performed successfully in 20 procedures in 19 patients; 11 were performed from a lateral approach and nine from a supine approach. The median operating time (available for 19 of 20 cases) was 293 min (IQR 257.5–317). Median estimated blood loss and length of stay were 50 ml (IQR 50–100) and 1 d (IQR 1–2), respectively. Some 70% (14/20) of patients were discharged after one night. The median lymph node yield was 19.5 (IQR 13.8–27. 3). Eleven patients had pathologic stage I disease, and eight had residual disease on pathology. There was one ureteral transection that was repaired robotically at the time of surgery with no long-term sequelae. There were no open conversions or transfusions. Two patients had ejaculatory dysfunction following bilateral RPLND. There has been no evidence of retroperitoneal disease recurrence during the follow-up period. Limitations include the retrospective nature of the study and the single surgeon experience.
Conclusions: R-RPLND can be successfully performed and provides improved visualization and dexterity over conventional laparoscopy. Patients experience significantly reduced morbidity and the nodal yield is comparable to open surgical techniques.
Patient summary: We studied our experience with robot-assisted removal of lymph nodes from the abdomen among men with testicular cancer. This method was found to be safe and effective with a very short hospital stay.

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http://dx.doi.org/10.1016/j.eururo.2016.03.031
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1. Introduction

Testicular cancer is the most common malignancy affecting men between the ages of 30 and 40 yr, with excellent cure rates. Some 25–35% of patients will have metastatic disease on presentation despite no evidence of nodal involvement on radiographic imaging [1]. Retroperitoneal lymph node dissection (RPLND) has the ability to accurately stage the extent of disease and therefore identify patients who may benefit from chemotherapy. RPLND is typically indicated in patients with clinical stage (CS) I nonseminomatous germ cell tumor (NSGCT), low-volume CS II disease, and residual disease after chemotherapy. The traditional approach for RPLND has been via a midline (transperitoneal) or thoracolumbar (retroperitoneal) incision. While both approaches have shown excellent oncologic outcomes and remain the gold standard, they are associated with significant morbidity and prolonged hospitalization [2,3].

Laparoscopic (L)-RPLND was first described in 1992 and was initially performed for diagnostic purposes in the postchemotherapy setting [4]. The technique has since evolved and is now being performed for therapeutic purposes, offering similar staging accuracy and oncologic outcomes compared to the traditional open technique [5,6]. In addition, patients undergoing L-RPLND benefit from shorter hospital stays, quicker return of bowel function, and improved convalescence, which may allow appropriate candidates to receive chemotherapy sooner [7]. However, L-RPLND is technically challenging, requiring extensive laparoscopic surgery experience. The extended learning curve for L-RPLND has resulted in limited adoption.

With the introduction of robotic technology and advances that include high-definition three-dimensional (3D) visualization, increased freedom of movement, and minimization of tremor, several advanced laparoscopic urologic procedures are now being performed robotically with success. These include radical prostatectomy, transperitoneal and retroperitoneal partial nephrectomy, radical nephrectomy with caval thrombectomy, and pyeloplasty [8–10]. Robotic technology has been applied to L-RPLND and overcomes the technical limitations of conventional laparoscopy. To date, four case series have reported their technique and outcomes on a total of seven patients demonstrating feasibility [11–14].

In this report, we describe our experience with robot-assisted laparoscopic RPLND (R-RPLND), and demonstrate the safety and efficacy of this approach for the treatment of testicular cancer. We present two different surgical approaches using the daVinci Si and more recently the daVinci Xi surgical platforms.

2. Patients and methods

Medical charts for all patients who underwent R-RPLND performed by a single surgeon (J.P.) from April 2008 to October 2014 were retrospectively reviewed. This retrospective review was approved by the institutional review board at Swedish Medical Center (IRB number 5365S-13) and performed in accordance with the institution guidelines.

2.1. *Surgical technique*

2.1.1. *Initial lateral approach*

Our initial technique was an extension of our L-RPLND approach in which the patient was placed in the lateral position and a unilateral template dissection was performed [15]. This was a five-port technique with the 0° camera placed lateral to the left and right robotic arms and the robot docked over the patient's back. The fourth robotic arm was utilized. This technique was appropriate for CS I disease; however, the lateral approach did not allow a full bilateral dissection to be performed. We then adopted a robotic supine approach based on the technique of Dr. James L'Esperance of the US Naval Hospital in San Diego (personal communication, 2011) This allowed a full bilateral dissection to be performed without the need to reposition the patient.

2.1.2. *Supine approach: patient positioning and port placement*

For the supine approach, the patient is positioned with the arms padded and tucked at the sides. Pneumoperitoneum is achieved by placing a Veress needle in the left upper quadrant at Palmer's point [16]. Using the da Vinci Si, a 12-mm camera port is placed approximately 4 cm beneath the umbilicus on the midline. Two 8-mm robotic trocars are placed in the left lower quadrant, while an 8-mm robotic trocar and a 12-mm assistant trocar are placed in the right lower quadrant (Fig. 1). It should be noted that port placement remains the same irrespective of template laterality. The patient is then placed in Trendelenburg position, allowing the bowel to fall cephalad. The robot is then docked over the left shoulder. The bowel can be further retracted robotically, providing exposure to the iliac vessels and the cecum. For the daVinci Xi, a four-port linear configuration is used and the robot is docked alongside the patient, which simplifies room set-up (Fig. 2).

2.1.3. *Instruments and lens selection*

A monopolar scissors is placed in the right robotic port, a fenestrated bipolar forceps in the left robotic port, and a Prograsp forceps in the fourth robotic port. A 0° lens is used to start the case and is switched to a 30° down-angled lens once the retroperitoneum is exposed.

2.1.4. *Retroperitoneal exposure*

Access to the retroperitoneum begins with mobilization of the cecum and ileum by incising the posterior peritoneum medial to the cecum and

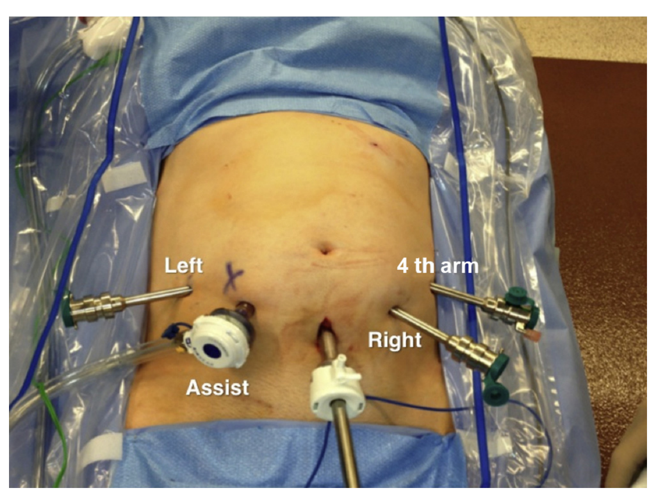

Fig. 1 – Robotic port placement for a supine approach with the da Vinci Si. Two 8-mm robotic ports are placed in the left lower quadrant, while an 8-mm robotic port and a 12-mm assistant port are placed in the right lower quadrant. Port placement remains the same for right, left, and bilateral templates.