Case Report

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Robot-assisted laparoscopic retroperitoneal lymph node dissection in testicular cancer using a single-position supine approach: A case report and literature review

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Abstract

This case study demonstrates a single-position supine approach for robotic retroperitoneal lymph node dissection (R-RPLDN) for the treatment of nonseminomatous germ cell tumors and residual masses after chemotherapy. We performed a bilateral R-RPLDN in a 33-year-old man with nonseminomatous germ cell tumors and residual postchemotherapy masses. For this approach, the patient was placed in a steep Trendelenburg position, and a 5-port transperitoneal technique was used, with the robot docked so that the arms were oriented cephalad. This approach allowed simultaneous access to both sides of the retroperitoneum, thereby eliminating the need for bilateral lymphadenectomy and patient repositioning. Bilateral R-RPLDN was performed using a single-position supine approach. This versatile approach offers a less invasive, more efficient, and safer solution for removing residual postchemotherapy testicular cancer masses.

Keywords: Nonseminomatous germ cell tumor; Retroperitoneal lymph node dissection; Robotic surgery; Single-position supine approach

1. Introduction

Testicular cancer is one of the most common malignancies in young men, and multiple treatment options are available. Retroperitoneal lymph node dissection (RPLND) is an important treatment option for patients with stage I or II nonseminomatous germ cell tumors (NSGCTs), as well as for residual masses after chemotherapy.[1] Furthermore, in patients who have undergone chemotherapy, there is a high likelihood of the need for postchemotherapy RPLND for the removal of nonseminomatous masses. The National Comprehensive Cancer Network guidelines recommend surgical resection of postchemotherapy-positive masses >1 cm on NSGCT with negative tumor markers. Surgery may also be considered for patients with postchemotherapy-positive masses >3 cm on positron emission tomography.

Although open RPLND (O-RPLND) is the criterion standard, it is less frequently performed because of its high trauma and potential morbidity.[2–4] Robot-assisted RPLND (R-RPLND)[5–7] was first reported in a patient with a mixed germ cell tumor.[8] Compared with R-RPLND in the flank position, which is more familiar to urologists and involves patient repositioning, several recent reports have described the use of a supine approach that eliminates the need to reposition the patient or redock the robot.[9]

In this case report, we describe R-RPLND using a single-position supine approach that allows simultaneous access to both sides of the retroperitoneum, thereby eliminating the need for bilateral lymph node dissection and patient repositioning. The operative time, blood loss, and complications were consistent with our expectations.

2. Case report

2.1. Case description

A 33-year-old man presented with right testicular cancer comprising an embryonal carcinoma, yolk sac tumor, and teratoma. Although the tumor markers reached the normal range after 4 cycles of etoposide and cisplatin (EP) and the metastatic lesions partially responded to treatment, abdominal computed tomography (CT) showed multiple retroperitoneal lymphadenopathies with a short diameter of approximately 1.5 cm (Fig. 1). Treatment options for patients with stage II NSGCTs include primary RPLND in the early stage of disease or chemotherapy (BEP [bleomycin, etoposide, and cisplatin] for 3 cycles or EP for 4 cycles) followed by surgery if CT reveals the presence of negative markers and a residual mass (≥1 cm).[10–12] Therefore, RPLND was recommended, which we planned to perform using a supine single-position approach.

2.2. Single-position, supine approach R-RPLND protocol

2.2.1. Patient positioning and port placement

After general anesthesia, the patient was placed supine in the Trendelenburg position, and a catheter was inserted. All pressure points were well-padded with the robot placed beside the patient's head (Fig. 2A).

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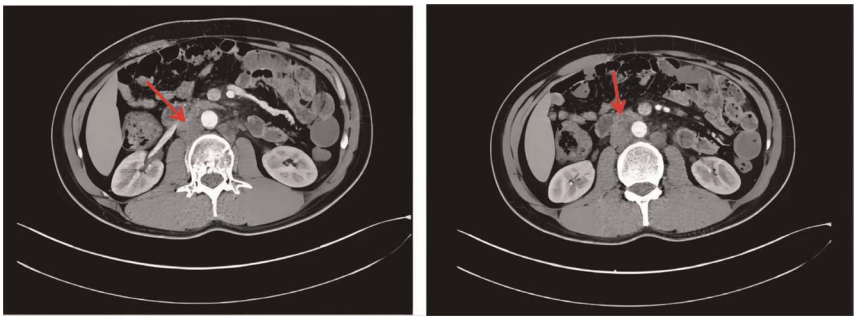

Figure 1. Computed tomography imaging of multiple retroperitoneal lymphadenopathies (residual mass) after radiotherapy and chemotherapy.

A 12-mm trocar was placed 3–4 cm below the umbilicus using the da Vinci Si system in the case. With the observation port as the midpoint, 8-mm trocars were placed on the left and right sides of the patient 8 cm from the midpoint. A 12-mm auxiliary trocar and an 8-mm trocar were inserted at the observation port and midpoint of the left and right sides, respectively. All the trocars were distributed in the abdomen in the shape of an arc (Fig. 2B).

2.2.2. Exposure of the retroperitoneum

The cecum and mesentery of the small intestine were removed, and the peritoneal connection of the mesenteric root of the small intestine was cut above the right iliac artery. The genital vessels and ureters crossing the right iliac artery segment were found and exposed. We turned toward the head of the patient near the bifurcation of the inferior vena cava and cut the peritoneum at the root of the mesentery of the small intestine until the ligament of Treitz was cut open. The duodenum was suspended horizontally under the fusion fascia with a needle and thread, and the small intestine, ascending colon, duodenum, and head and body of the pancreas were lifted toward the lower edge of the right renal vein (Fig. 3A).

2.3. Cleaning of the right retroperitoneal lymph nodes

We established the right plane behind the mesentery of the small intestine, reached the outer edge of the right ureter, and separated the fat and lymphatic tissues behind the ureter from the quadratus lumborum muscle. The inferior vena cava sheath was cut open, and the inferior vena cava was freed as it descended into the right renal vein. The right side of the inferior vena cava was separated top-to-bottom from the front of the lumbar vertebrae, ligating the lumbar veins encountered at the midpoint and preserving the genital vein until it reached approximately 2 cm below the right common iliac artery. The lymphatic and fatty tissues around the right common iliac artery and vein were cleared (Fig. 3B).

2.4. Cleaning of the left retroperitoneal lymph nodes

Starting 2 cm below the left common iliac artery, where the left ureter crosses over, a symmetrical incision was made on the left side to expose the left ureter and genital vessels by opening the anterior peritoneum of the left common iliac artery. The incision was joined to the opening of the small intestinal mesentery to establish a plane behind the left side. The left lymphatic duct of the abdominal aorta was cleared from the outer edge of the left ureter to the same depth as the right ureter. The left iliac artery was ligated, and the venous and arterial vessels under the mesentery were preserved up to the left renal vein (Fig. 3C).

2.5. Cleaning of the lymph nodes between the abdominal aorta and the inferior vena cava

The lower border of the left renal vein was set as the upper surgical border, the left wall of the abdominal aorta was set as the medial border, and beginning of the inferior mesenteric artery was set as the lower border (Fig. 3D).

The specimen was retrieved (Fig. 4), bleeding was stopped completely, the absence of any unplanned injury to organs or major blood vessels was checked, and a drain was placed inside the abdominal cavity. The incision was sutured. The surgery proceeded smoothly, anesthesia was effective, and the patient safely returned to the ward (Supplementary video, http://links.lww.com/CURRUROL/A61).

2.6. Preoperative and postoperative care

The patient was fed a low-fat diet for 3 days before and after the surgery to prevent lymphatic leakage. The drainage tube was removed on

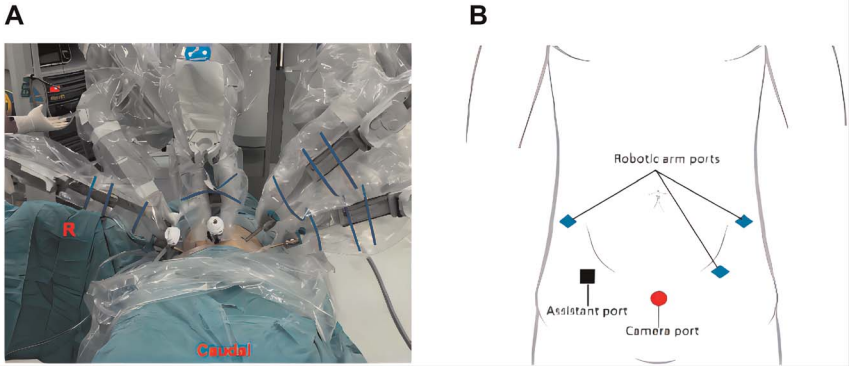

Figure 2. Schematic showing the da Vinci Si robot installation. (A) The da Vinci Robot is positioned beside the head of the patient. (B) The da Vinci Si system port locations.

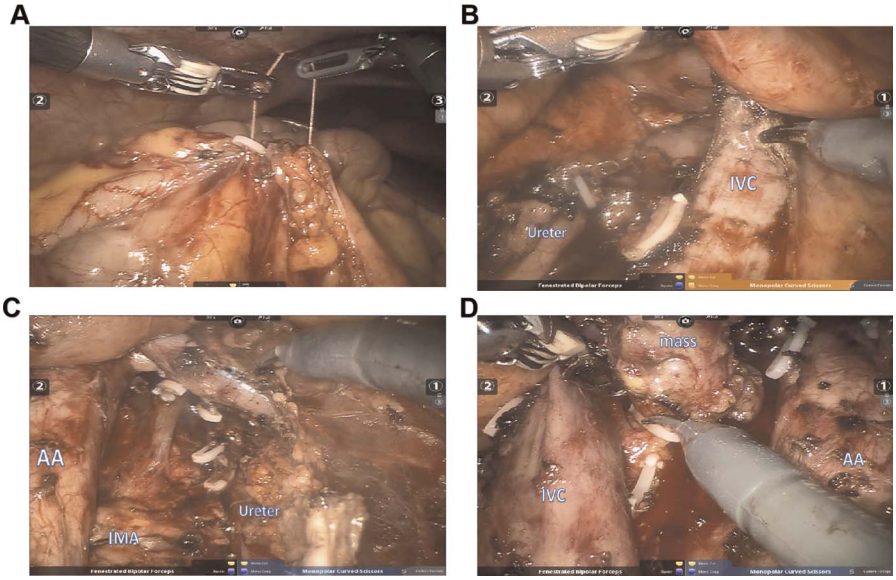

Figure 3. (A) Imaging of suspension of the bowel for retroperitoneal exposure. (B) Imaging after removal of the right lymph nodes. (C) Imaging after removal of the left lymph nodes. (D) Imaging of the lymph nodes between the abdominal aorta and inferior vena cava. AA = abdominal aorta; IMA = inferior mesenteric artery; IVC = inferior vena cava.

the fifth day after surgery, when the drainage volume was less than 20 mL. The patient recovered and was discharged from the hospital.

2.7. Patient outcome

The operative time and estimated blood loss were 257 minutes and 200 mL, respectively, with no blood transfusions required and the successful removal of 27 lymph nodes, with the biggest lymph node being 2.5 cm. The patient did not relapse at follow-up 3-6 months later (Fig. 5). Depending on the treatment regimen, patients underwent regular CT and tumor marker assessments. In addition, we summarized the operative time, blood loss, lymph node detection rate, and complications (lymph leakage) in patients with NSGCT who underwent R-RPLND in Table 1.

3. Discussion

Bilateral RPLND is an important treatment modality in patients with NSGCT who develop residual masses after chemotherapy. Previous studies have demonstrated the safety and efficacy of R-RPLND for the treatment of postchemotherapy masses in patients with NSGCT.[7,9] The lateral decubitus and supine positions are the two most used positions in the transperitoneal approach for R-RPLND, and we compared our findings using the supine position with preexisting data regarding the lateral decubitus position for transperitoneal R-RPLND.

The da Vinci S® or Si® systems have been used for R-RPLND in the lithotomy position and found to allow better access to the great vessels and facilitate vascular injury management without repositioning for bilateral dissection compared with the initial lateral position.[13,14] However, these reports have identified disadvantages associated with the lithotomy position, such as difficulties in the initial docking of the robot and anesthesia access because the robot is docked from the head of the patient. Furthermore, the robot must be redocked between legs for ipsilateral gonadal vein dissection. A novel single-dock technique was used to treat postchemotherapy masses in patients with NSGCT.[15] With the patient in the left lateral decubitus position and the robot docked to the right, the single-dock technique allowed bilateral RPLND without repositioning the patient or redocking the robot. This

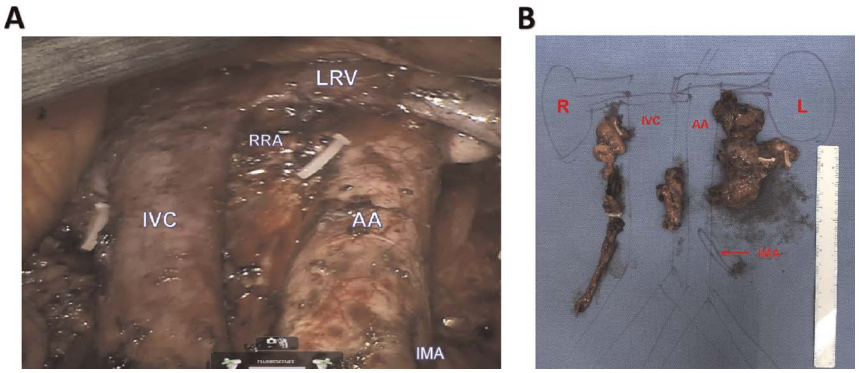

Figure 4. Imaging after removal of lymph nodes. (A) Imaging of the intraoperative complete dissection template. (B) Representation of specimen as per location. AA=Abdominal Aorta; IMA=Inferior Mesenteric Artery; IVC=Inferior Vena Cava; LRV=Left Renal Vein; RRA=Right Renal Artery.

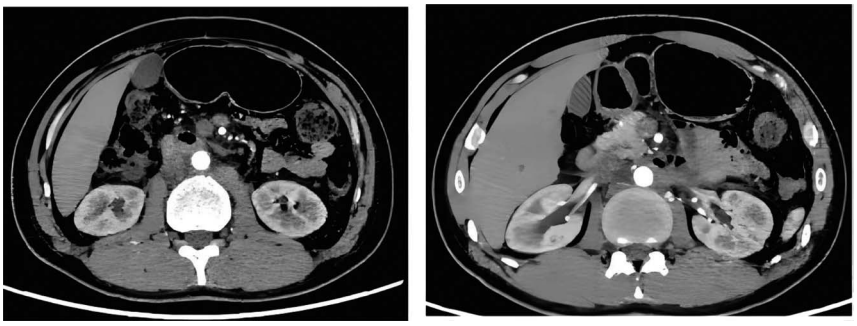

Figure 5. Computed tomography imaging at the 3- and 6-month follow-up.

approach overcomes the problem of patient repositioning and robotic docking of the bilateral template dissection described previously and indicates a low follow-up recurrence rate among patients treated with single-sided R-RPLND.[14] Bilateral RPLND performed in the lateral decubitus position eliminates patient repositioning and robotic redocking, shortens operative time, and reduces postoperative recurrence.

However, many surgeons believe that R-RPLND is most effective when performed in the supine position. A study using the da Vinci Xi® system has found that R-RPLND in the supine position effectively shortens the operative time while reducing hospital stay and postoperative complications.[16] Tamhankar et al. concluded that R-RPLND in the supine position exhibits all the advantages mentioned above and is safe for removing residual masses after chemotherapy in patients with NSGCT.[9] Singh et al. found it challenging to access the opposite template in the lateral decubitus position and were forced to reposition the patient; however, R-RPLND in the supine position allows bilateral dissection without patient repositioning and saves operative time.[4] Pooleri et al. reported a case of robot-assisted supine extraperitoneal lymph node dissection to remove a residual mass after chemotherapy and observed that a retroperitoneal supine approach provided more physiological ventilation pressure, reduced posture-related complications, and avoided emergency resuscitation during prolonged anesthesia.[17] Another study has also shown that R-RPLND in the supine approach can provide better access and facilitate full bilateral template dissection without the need for redocking and is the preferred method for primary and chemotherapeutic NSGCT.[16] Nason et al. confirmed these conclusions and showed that the follow-up outcomes of this approach were comparable to those of O-RPLND in oncology.[18]

Collectively, R-RPLND can be performed in either the lateral or supine position; however, compared with the lateral position, R-RPLND in the supine position has the following advantages: (1) there is no need for repositioning of patients or robot redocking, thereby reducing operative time; (2) this approach can shorten hospital stay; (3) it provides greater physiological ventilation pressure during prolonged anesthesia, potentially helping reduce postoperative complications or posture-related complications, as well as emergency resuscitation because surgeons can use the same bilateral template dissection used in O-RPLND; and (4) R-RPLND in the supine position is comparable to O-RPLND in terms of oncological outcomes and is worthy of consideration.[19–22]

This study had some limitations. First, although urologists can complete R-RPLND in the supine position with robotic visualization and instrument dexterity, RPLND surgery is still challenging because of the large space and multiple internal organs present in the abdominal cavity. Therefore, surgeons must continuously accumulate experience and improve their knowledge and technical skills to better perform R-RPLND in the supine position. Schermerhorn et al. also supported the idea that experience reduces the operative time and complication rates for R-RPLND,[23] consistent with the learning curves of other technically advanced surgical techniques. Second, owing to the limited data on such cases and the short follow-up period, the long-term efficacy of R-RPLND should be prospectively studied and further explored using a much larger number of patients.

Robotic retroperitoneal lymph node dissection uses a supine, single-position approach, allowing bilateral RPLND and complete removal of lymph nodes with a faster recovery time. The surgeon does not need to change the patient's position perioperatively, making this approach worthy of consideration by care providers.

Table 1

Number of cases of R-RPLND for NSGCT in the literature.

References	Patient no.	Robot system	Position	Operative time, min	Blood loss, mL	Lymph node, mm, median/average	Postoperative complication
Tamhankar et al.[9]	1	Si	Supine	200	120	20	No
Tandstad et al.[3]	3	Xi	Supine	257	333	52	No
Rukstalis and Chodak[5]	17	Xi	Lithotomy	329	103	44	Pulmonary recurrence in 2 patients
Nicolai et al.[6]	12	Si	Lithotomy	312	475	12	Complications in 3 patients
Hiester et al.[7]	2	Si	Lateral	375	150	26.5	No obvious complications
Davol et al.[8]	19	Si	Supine	293	50	19.5	Ejaculation disturbance in 2 patients
Kamel et al.[13]	27	Si	Supine	525	200	Unknown	Complications in 4 patients

NSGCT = nonseminomatous germ cell tumor; R-RPLND = robotic retroperitoneal lymph node dissection.

Acknowledgments

None.

Statement of ethics

This study has obtained approval from the institutional review board of The Third Xiangya Hospital, Central South University (no. 2021-S316). All patients provided informed consent for the use of their clinical information in research studies, and the confidentiality of the data was guaranteed. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Conflicts of interest statement

CL is an early career editorial board member of *Current Urology*. This article was accepted after normal external review. The other authors declare that they have no competing financial interests or personal relationships that may have influenced the work reported in this study.

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Author contributions

LZ, CL: Writing of the main manuscript text;
KY, WX: Preparation of Fig. 1 and 5;
LW: Preparation of Figs. 3–4;
WH, BW: Preparation of Fig. 2;
LX: Preparation of Table 1;
All authors: Review of the manuscript.

Data availability

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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