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CASE REPORT

Robot-assisted supine extraperitoneal retroperitoneal lymph node dissection: a novel approach for template dissection in post-chemotherapy residual mass in non-seminomatous germ cell tumours

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Abstract
Robot-assisted retroperitoneal lymph node dissection (RA-RPLND) in testicular cancer is conventionally performed through transperitoneal route. We report a case of robot-assisted supine extraperitoneal RPLND (RASE-RPLND), not previously described in the literature, which was performed for post-chemotherapy residual mass in a case of non-seminomatous germ cell tumour (NSGCT). RASE-RPLND apart from providing the benefits of robotic assistance has a significant advantage over transperitoneal approach, as the procedure can be performed in supine position without any bowel handling. Herein, we provide a detailed description of the novel surgical technique employed by us in this case.

Keywords Retroperitoneal lymph node dissection · RPLND · Testicular tumour · Supine retroperitoneoscopy · RASE-RPLND · Extraperitoneal RPLND · Robotic RPLND

Introduction

Robotic retroperitoneal lymph node dissection for testicular tumour in post-chemotherapy setting is a challenging surgery and is done only in specialized centers. Traditionally, the procedure is done in lateral decubitus position or in trendelenberg position [1]. We report a novel approach for retroperitoneal lymph node dissection using daVinci Xi system in supine position, which is, to the best of our knowledge, not previously described in the literature.

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Case report

A 31-year-old gentleman, married, with complete family, presented to the Department of Medical Oncology with a testicular mass with large retroperitoneal lymph nodes and elevated serum markers (T1N2M0S2). He was diagnosed to have NSGCT on biopsy of the retroperitoneal lymph node and underwent four cycles of chemotherapty with Bleomycin, Etoposide, and Cisplatin (BEP). After chemotherapy, the tumour markers normalized. Follow-up computerised tomogram (CT) abdomen showed a $3 \times 2 \times 4$ cm mass in aortocaval region draping over Inferior Vena Cava (IVC) below right renal vein with lateral displacement of right ureter causing hydronephrosis. There was a linear filling defect in infrarenal IVC extending to right iliac vein suggestive of bland thrombus. Pulmonology evaluation showed severe bleomycin-induced interstitial lung disease for which he was started on treatment with steroids. He was started on low-molecular-weight heparin at therapeutic dose and underwent pre-operative deployment of Greenfield™ IVC filter (Boston Scientific) 48 h prior to the surgery, in view of the IVC thrombus. He was planned for retroperitoneal lymph node dissection and right-side high inguinal orchiectomy after adequate optimization. Considering the high possibility of per operative issues, he was planned for surgery in supine position.

The patient was positioned in supine position with a small sandbag underneath the pelvis on the right side. Through a 12 mm incision, 3 cm anterosuperior to anterior superior iliac spine extraperitoneal space was entered. Under finger guidance through the incision, three robotic ports and one working port were inserted (Fig. 1). Extraperitoneal space was further developed by finger dissection through the same incision under vision using camera through one of the robotic ports. A 12 mm laparoscopic port was inserted through the initial incision and muscle layer was approximated using 2–0 vicryl to avoid air leak. 8 mm robotic port was introduced through the 12 mm port in a port-in-port fashion. The robotic instruments used were [1]: Prograsp through the highest port at the renal angle [2]; Fenestrated bipolar forceps through the second port 6 cm above the camera port [3]; Monopolar shears through the third port, 2.5 cm above the mid inguinal point. 5 mm working port was put slightly posterior to and mid way between the camera port incision and the second port (Fig. 1).

Fig. 1 Image showing patient and port positioning. Ports labeled 1–4 for following instruments: 1 Prograsp, 2 fenestrated bipolar, 3 camera port (port-in-port), and 4 monopolar shears; (asterisk) Assistant port

DaVinci Xi system (Intuitive Surgical, Sunnyvale, CA) was docked from opposite side.

Initially, zero-degree camera was used which was changed to 30 ° after creating adequate space. The boundaries of the dissection were the same as those described by Weissbach and Boedefeld for the open procedure [2]. Extraperitoneal dissection started from the surface of the psoas muscle and continued anterior to the mass. The peritoneal sac was displaced anteriorly with pneumatic pressure and gave excellent space for dissection without much retraction (Fig. 2a). Ureter and gonadal vein were traced and dissected off the mass. Gonadal vein was clipped and divided at inguinal ring. The dissection continued over IVC and iliac vessels and the entire paracaval lymph nodal mass was lifted away from IVC (Fig. 2a). The dissection was done across the midline till the opposite ureter was visualized (Fig. 2b) preserving the inferior mesenteric artery. The entire lymph node mass on sides of IVC and aorta, including the inter aortocaval group, was removed along with right gonadal vein after clipping it at its confluence with IVC (Fig. 2a). Left sympathetic nerves were preserved. Right-side high inguinal orchiectomy was done after completion of the robotic procedure. The entire specimen was sent for histopathology.

Intraoperatively, there were no complications. The total operating time was 240 min. Estimated blood loss was 60 ml. Postoperatively, the patient recovered uneventfully. He resumed physical activity and oral intake on postoperative day (POD) [1]. Drain was removed on POD. (2) The patient was discharged on POD 3 on warfarin after titrating the coagulation profile. He developed chylothorax after

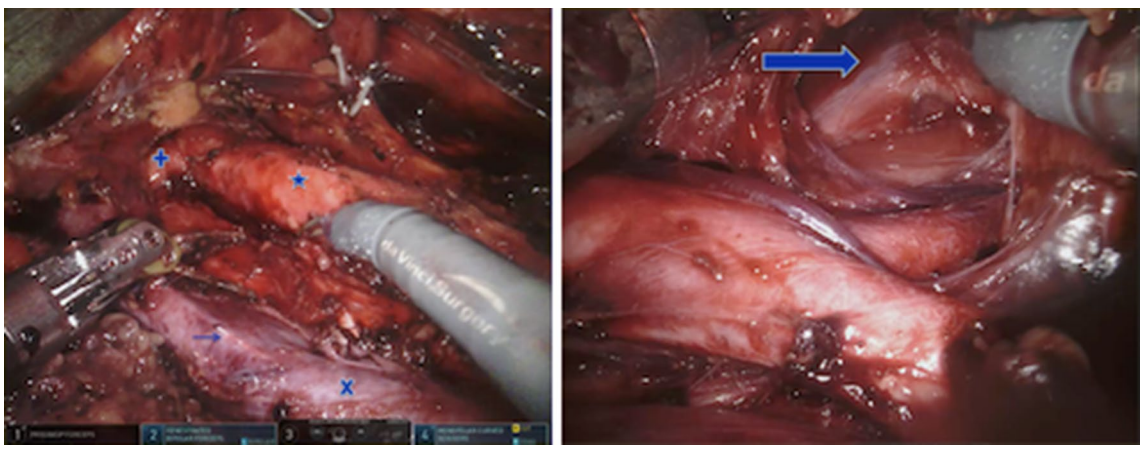

Fig. 2 **a** Intraoperative image of complete dissection template showing: aorta (asterisk), IVC (times), right renal artery (plus), and IVC filter (arrow). **b** Intraoperative image showing aortic bifurcation and opposite (left side) ureter (arrow)

1 week, which was managed with intercostal tube drainage. The final histopathology showed teratoma with 10% yolk sac component, for which he received two cycles of adjuvant etoposide and cisplatin (EP).

Discussion

Post-chemotherapy RPLND is considered to be a challenging surgery because of the technical difficulty and possible life-threatening complications. Although open RPLND is the gold standard procedure, it has high postoperative morbidity and poor cosmesis due to a long midline abdominal incision [3]. Laparoscopic RPLND was initially criticized due to lack of curative intent of the procedure as retrocaval and retroaortic dissection was often avoided [4]. There was gradual evolution of the technique and contemporary analysis shows equivalent oncological outcomes with laparoscopic RPLND with superior morbidity outcomes. However, steep learning curve and technical challenges involved have limited its widespread acceptance [1].

Tong et al., in their retrospective review of 21 patients, concluded that extraperitoneal RPLND was superior to the transperitoneal approach in terms of the operation time, estimated blood loss, and postoperative intestinal function recovery time, with comparable oncological outcomes [5].

RA-RPLND that is usually done through transperitoneal approach either in lateral or trendelenberg position requires extensive reflection of the posterior peritoneum with additional maneuvers to retract the bowel [1, 6]. Jie Quin et al. have recently reported robot-assisted extraperitoneal RPLND in lateral position for primary RPLND in pre-chemotherapy setting. Extraperitoneal approach has significant advantages such as fewer complications of injury to surrounding visceral organs, bowel paralysis, and adhesion [7].

Robot-assisted supine extraperitoneal RPLND (RASE-RPLND) is a unique approach for surgical management of retroperitoneal lymph nodal mass devised at our center. Le Blanc et al. described a similar approach of para-aortic lymph node dissection in the early stage NSGCT, but it has not been adopted in robotic surgery till now [8]. A bilateral, full template RPLND with preservation of sympathetic plexus on one side was possible in this case, even in post-chemotherapy setting, using this novel technique. Apart from advantages of early postoperative recovery and minimal bowel handling, supine position provides more physiological ventilatory pressures during prolonged anesthesia. Reduced position-related complications and emergency resuscitation is also possible with this technique.

Conclusion

RASE-RPLND appears to be safe even in post-chemotherapy setting with favorable perioperative outcomes. It provides the advantage of early postoperative recovery, minimal bowel handling, physiological ventilator pressures, and provision for emergency resuscitation if need arises.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent Written informed consent was obtained from the patient for publication of this Case Report/any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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