Royal Australasian College of Surgeons

Robotic retroperitoneal lymph node dissection in colorectal cancer

Introduction

The presence of radiologically abnormal retroperitoneal lymph nodes (RPLN) is classified as stage IV disease in colorectal cancer,[1,2] albeit only 1–2% of patients present in this manner.[3,4] Management of these nodes is controversial, as there are no randomized control trials or multicentre trials that have evaluated the efficacy of surgery. RPLN may occur at initial diagnosis (synchronous) or present at a later stage (metachronous). In the era of modern chemotherapy, patients with RPLN nonresponsive to treatment may be ideal candidates for surgery as the nodes may harbour chemoresistant tumour cells. A study by Ogishame and colleagues found that patients with synchronous disease who underwent RPLN dissection (RPLND) approached 5-year survival rates of almost 40%, although they had a high recurrence rate.[5] A systematic review found that metachronous RPLND had a more varied 5-year overall survival, but median overall survival was 34–40 months compared with 3–14 months for those who did not undergo surgery.[6]

RPLND may be broadly divided into either *complete* or *selective*, but more commonly in colorectal cancer a targeted approach to excise the relevant lymph nodes is performed. The advent of robotic surgery has provided several benefits in comparison to laparoscopic as well as traditional open surgery. This includes 3D visualization, precise and meticulous dissection in high-risk areas, as well as the post operative benefits of enhanced recovery with reduced morbidity.[7] In select patients with isolated metastases to the RPLN, robotic resection can be a useful adjunct to the treatment paradigm. Anatomically, the lymph nodes may be divided into three groups; those lying left of the aorta (left lateral or left paraaortic), those lying between the aorta and inferior vena cava (IVC) (interaortocaval), and those lying to the right of the IVC (right paracaval).[8] We discuss the technical steps for robotic RPLND with intraoperative imaging highlighting relevant anatomy.

Perioperative workup

The patient is placed in a supine position with both arms tucked in. Prophylactic intravenous antibiotics are given. Mechanical calf compression device is applied, and an indwelling catheter is inserted. Our institution utilizes the da Vinci Surgical System (Intuitive Surgical, Sunnyvale, CA, USA) Xi system.

Access

Optical entry is performed using a 5 mm port and 5 mm 0° endoscope. After pneumoperitoneum is safely achieved, three additional 8 mm robotic ports are placed across the lower abdomen, the 5 mm port is upgrade to an 8 mm robotic port, and a 12 mm assistant port is inserted in the right iliac fossa (Fig. 1a). Instrument configuration is a tip-up fenestrated grasper in port 1, fenestrated bipolar forceps in port 2, camera in port 3, monopolar curved scissors in port 4 (or vessel sealer), and a 12 mm right iliac fossa assistant port (labelled a in Fig. 1a). Single dock can be performed for access to all retroperitoneal lymph nodes.

Operative technique

There are 3 main approaches to RPLND; left para-aortic, right paracaval, and infra-aortic (predominantly for nodes near the aortic bifurcation or interaortocaval). The technical steps and relevant anatomy are outlined below, with accompanying illustrative photos.

Left para-aortic approach

Step 1: Transverse mesocolon is sutured with 2/0 vicryl to the anterior abdominal wall and secured with Hem-o-lok (Fig. 1b).

Step 2: Medialisation of the duodenojejunal flexure (DJF) to expose the retroperitoneum, with visualization of the inferior mesenteric vein (IMV) and dissection of the tissue below it (Fig. 1c).

Step 3: Defining the superior and lateral boundaries of the dissection; exposing the left gonadal vein (lateral border) as it enters the left renal vein (superior border) (Fig. 1d). The fibrofatty tissue along the gonadal vein is dissected with a fenestrated bipolar in the left hand and a vessel sealer in the right hand.

Step 4: Exposing the anterior aorta as the medial border of the dissection (Fig. 1e). All lymphovascular tissue anterior to the aorta will be excised.

Step 5: Complete clearance of the left para-aortic lymphatic tissue (Fig. 1f), down to the left common iliac artery (inferior boundary, not pictured in the figure). The nodal tissue is gently rolled off the aorta and placed into an Endocatch bag for extraction.

Right paracaval approach

Step 1: The ileocolonic mesentery and duodenum is retracted by a modified venetian blind suture technique (with 2/0 PDS) to the anterior abdominal wall (Fig. 1g, h).

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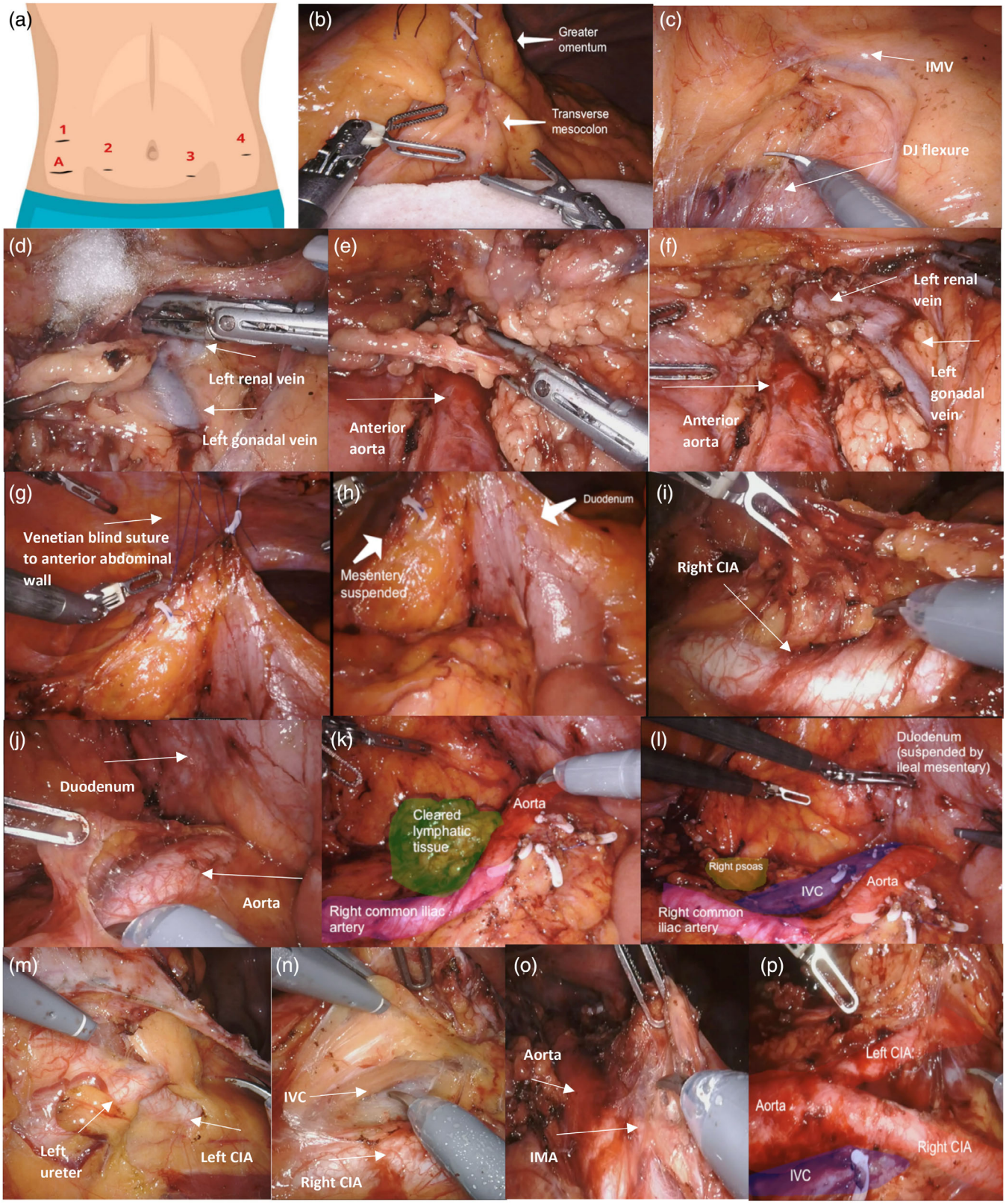

Fig. 1. Robotic RPLND in CRC with (a) port placement, and *left para-aortic approach* showing (b) transverse mesocolon suspension, (c) medialisation of the DJF, (d) exposing the left gonadal vein and left renal vein, (e) exposure of the anterior aorta, and (f) completed left para-aortic dissection; *right paracaval approach* showing (g) venetian blind suture to anterior abdominal wall, (h) mesenteric retraction, (i) right CIA exposure, (j) anterior aorta exposure, (k) clearing lymphatic tissue over the IVC, and (l) completed dissection; and *infra-aortic approach* showing (m) left CIA and left ureter, (n) IVC lateral to right CIA, (o) superior border of dissection at level of IMA and (p) completed dissection with the relevant anatomical boundaries.

Step 2: Incision along the right common iliac artery (forms the inferior boundary) (Fig. 1i), taking note of the right ureter. Dissection is continued along the anterior aorta as this forms the lateral border (Fig. 1j). The monopolar curved scissors are utilized in the right hand.

Step 3: Dissection is continued over the IVC and the fibrofatty tissue anterior and lateral to the IVC is excised (Fig. 1k), all the way to the right psoas muscle which forms the lateral border, and to the superior border which is formed by the duodenum. Any small vessels encountered during the dissection are controlled with hem-o-loks. The completed dissection with the relevant boundaries are shown in Figure 1l.

Infra-aortic approach

Step 1: Incise the peritoneum overlying the left CIA and head superiorly towards the aortic bifurcation. The left ureter should be identified and preserved (Fig. 1m).

Step 2: The dissection is continued laterally to expose the IVC, which forms the lateral border of the dissection (Fig. 1n).

Step 3: The fibrofatty tissue overlying the aortic bifurcation and anterior aorta is carefully dissected. This is taken up to the level of the inferior mesentery artery which forms the superior border (Fig. 1o).

Step 4: Completed dissection with the inferior aorta and its bifurcation as well as the IVC are pictured in Figure 1p.

Robotic RPLND is a useful adjunct in select patients with colorectal cancer and is an important skill in the armamentarium of the colorectal surgeon. We present the relevant anatomy and outline the steps in order to perform this procedure. The robotic platform provides the experienced surgeon with the tools to perform meticulous dissection in a technically difficult region.

Author contributions

Bushra Othman: Conceptualization; writing – original draft; writing – review and editing. **Dora Huang:** Data curation. **Amrish Rajkomar:** Data curation. **Toan Pham:** Resources. **Philip Smart:** Supervision. **Satish Warrier:** Conceptualization; supervision.

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Consent of patient

Patient consent was obtained.

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