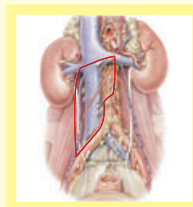


Surgery Illustrated



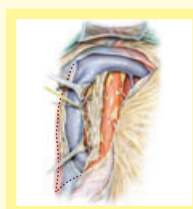
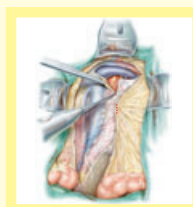
Surgical Atlas

Modified retroperitoneal lymphadenectomy

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ILLUSTRATIONS by STEPHAN SPITZER, www.spitzer-illustration.com



PLANNING & PREPARATION

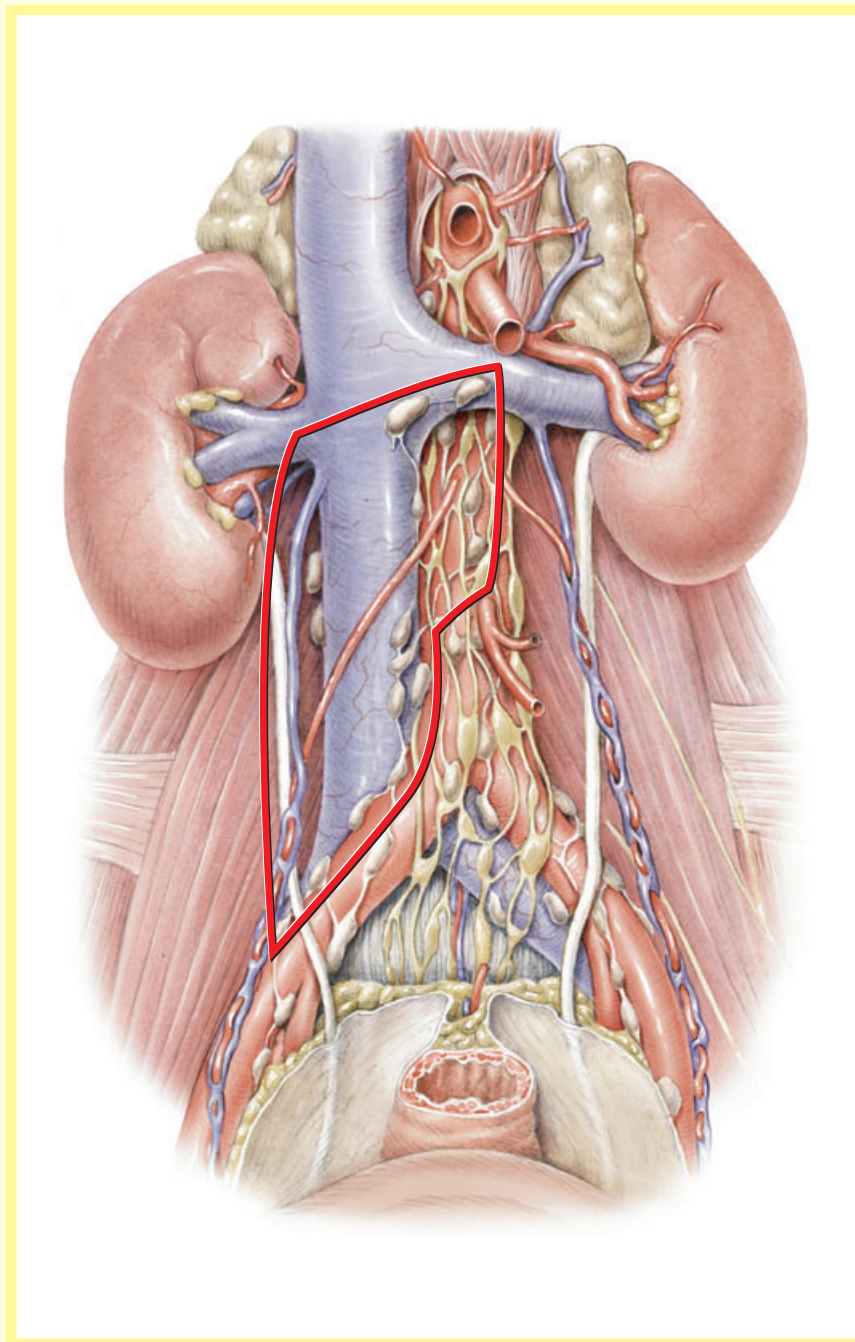
Nonseminomatous testicular cancer is unique in many aspects of behaviour and biology. From a surgical perspective testis cancer is unique in that it is curable in many patients merely by removing involved retroperitoneal lymph nodes. In moderate- to high-volume retroperitoneal tumour, a full bilateral retroperitoneal lymph-node dissection (RPLND) is used, which involves removing all lymphatic tissue from the crus of the diaphragm to the bifurcation of the iliac arteries, from ureter to ureter. This full bilateral RPLND was used before the publication of mapping studies, which proved that with lower-volume retroperitoneal tumour the likelihood of having contralateral metastasis is very low.

These mapping studies led to the development of the so-called modified retroperitoneal lymphadenectomy (RPLA). Various investigators from around the world independently developed these templates, which generally require removal only of lymph nodes on the same side as the testicular primary. The advantage of such an approach is that contralateral efferent sympathetic fibres are preserved and

therefore the attendant loss of emission and ejaculation which occurs after full bilateral RPLND is minimized when using modified templates.

Adding the preservation of ipsilateral efferent fibres to a modified template virtually eliminates the loss of emission and ejaculation which follows full bilateral RPLND. Therefore, the modified nerve-sparing RPLND is essentially two separate operations. The first is the dissection and preservation of ipsilateral efferent sympathetic fibres, and the second the use of the modified template.

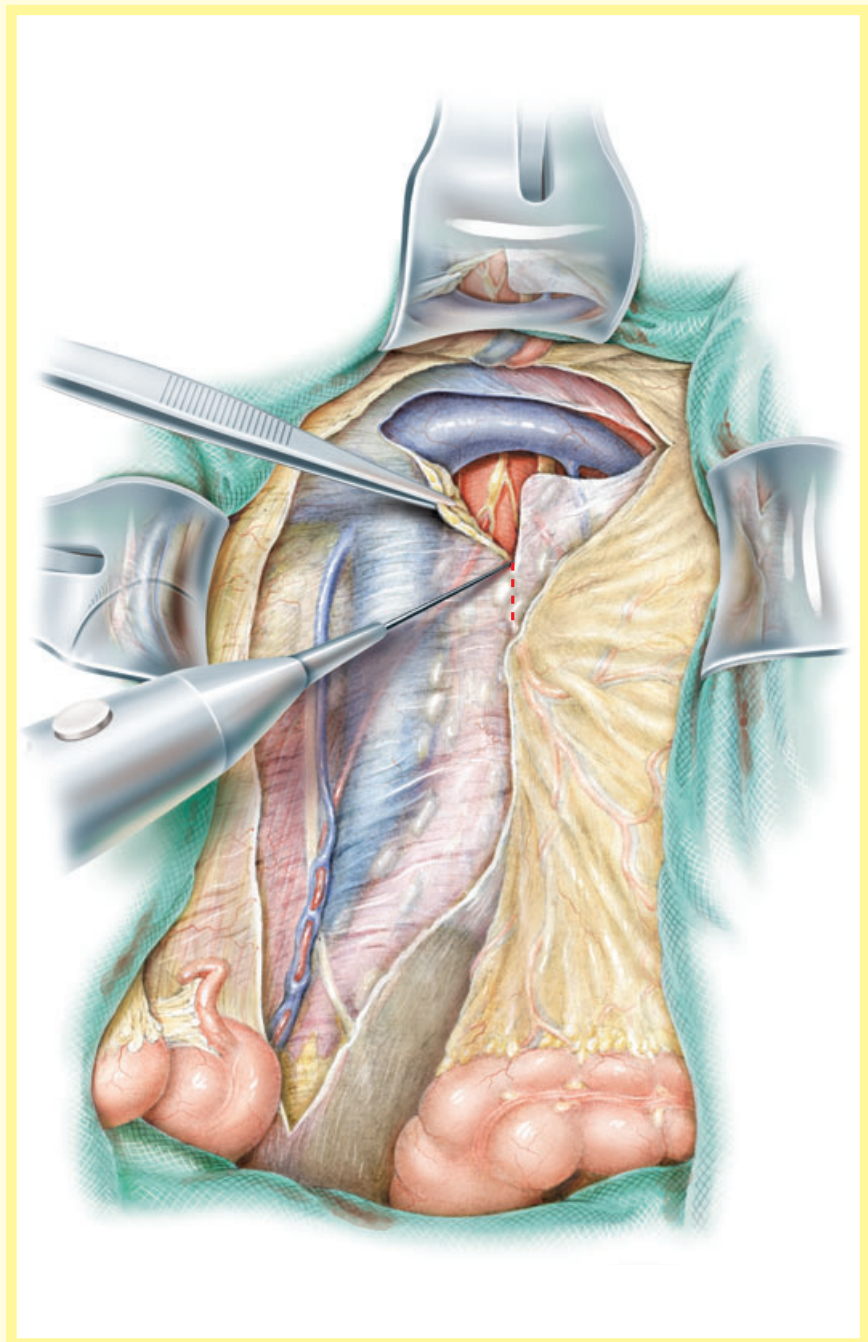
Patients with clinical stage I nonseminomatous or low-volume stage II testis cancer are candidates for modified RPLA with or without nerve sparing. There are no specific details of patient preparation for this procedure and at Indiana University Hospital patients are admitted on the morning of the procedure. No bowel preparation is necessary and the only admonition is to not have anything by mouth after midnight the day before the procedure. Patients are anaesthetized, a Foley catheter anchored and the patient placed supine on the operating table.

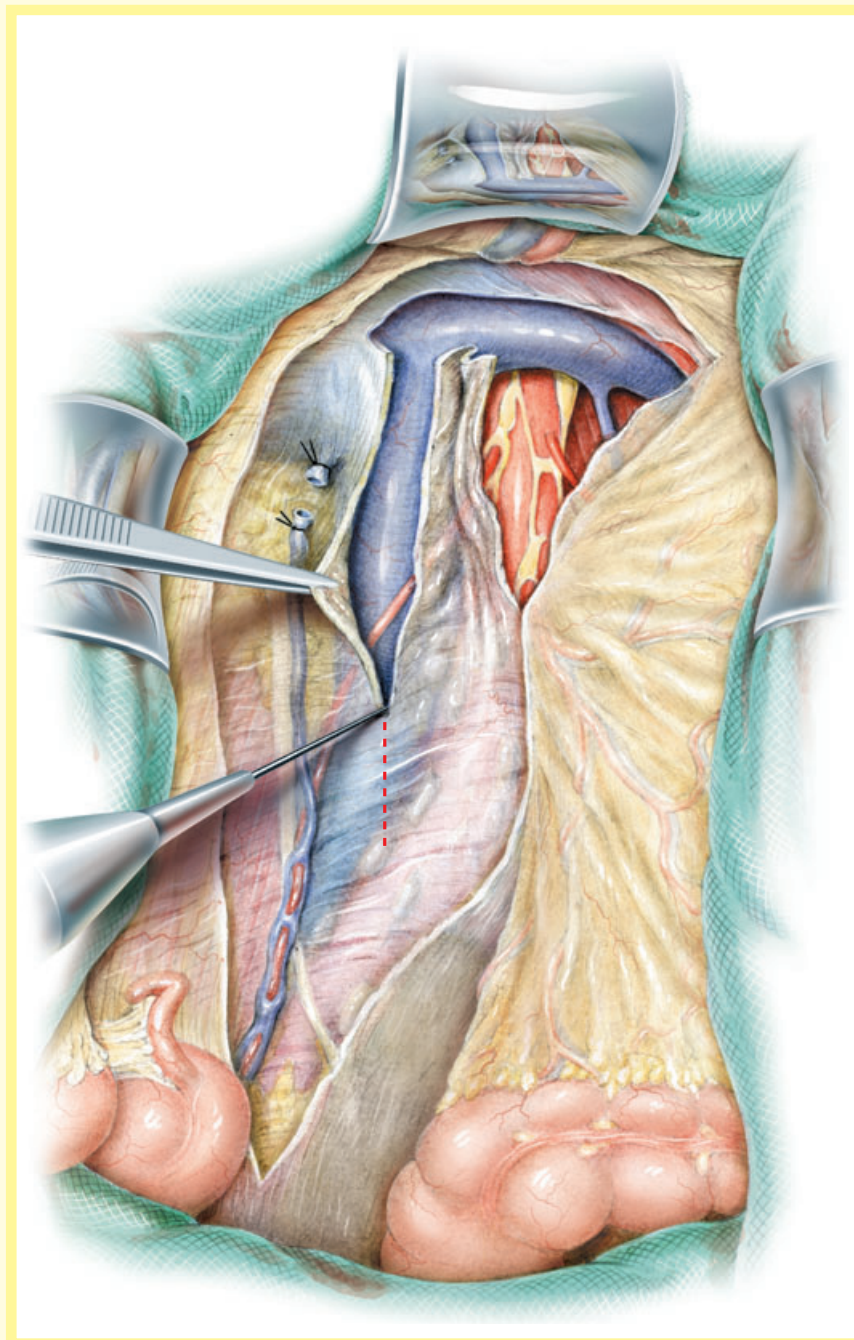
**Figure 1**

A midline incision is made and the peritoneal cavity entered. The abdomen is explored. If no or minimal (≤ 2 cm) adenopathy is found, a modified template is appropriate. However, higher volumes of retroperitoneal metastasis are an indication for a full bilateral RPLND, as the probability of contralateral metastasis is increased. Therefore, this initial exploration is extremely important.

Figure 2

A self-retaining Bookwalter retractor is used. An incision is made in the posterior peritoneum from the area of the caecum up to the area of the ligament of Treitz, which corresponds to the inferior mesenteric vein. For a right-sided approach the inferior mesenteric vein is generally preserved. Initially the so-called split manoeuvre is used over the left renal vein, and the lymphatic tissue rolled inferiorly allowing exposure of the aorta at the 12 o'clock position. A split of lymphatic tissue is carried out from the crossing of the left renal vein distally to approximately the origin of the inferior mesenteric artery. Lymphatic tissue is then rolled into the inter-aortocaval area, to determine whether or not a right-sided lower pole precaval renal artery is present.

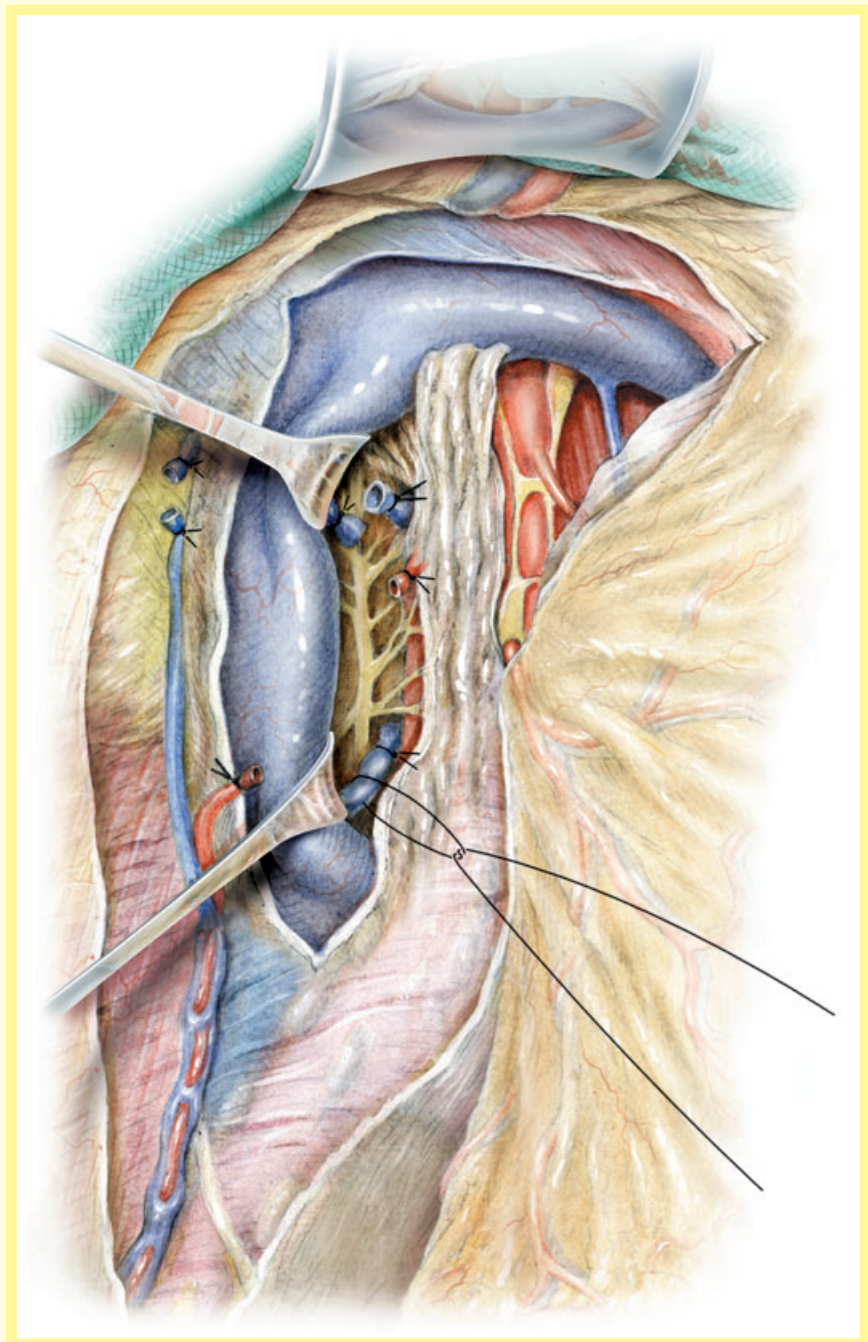


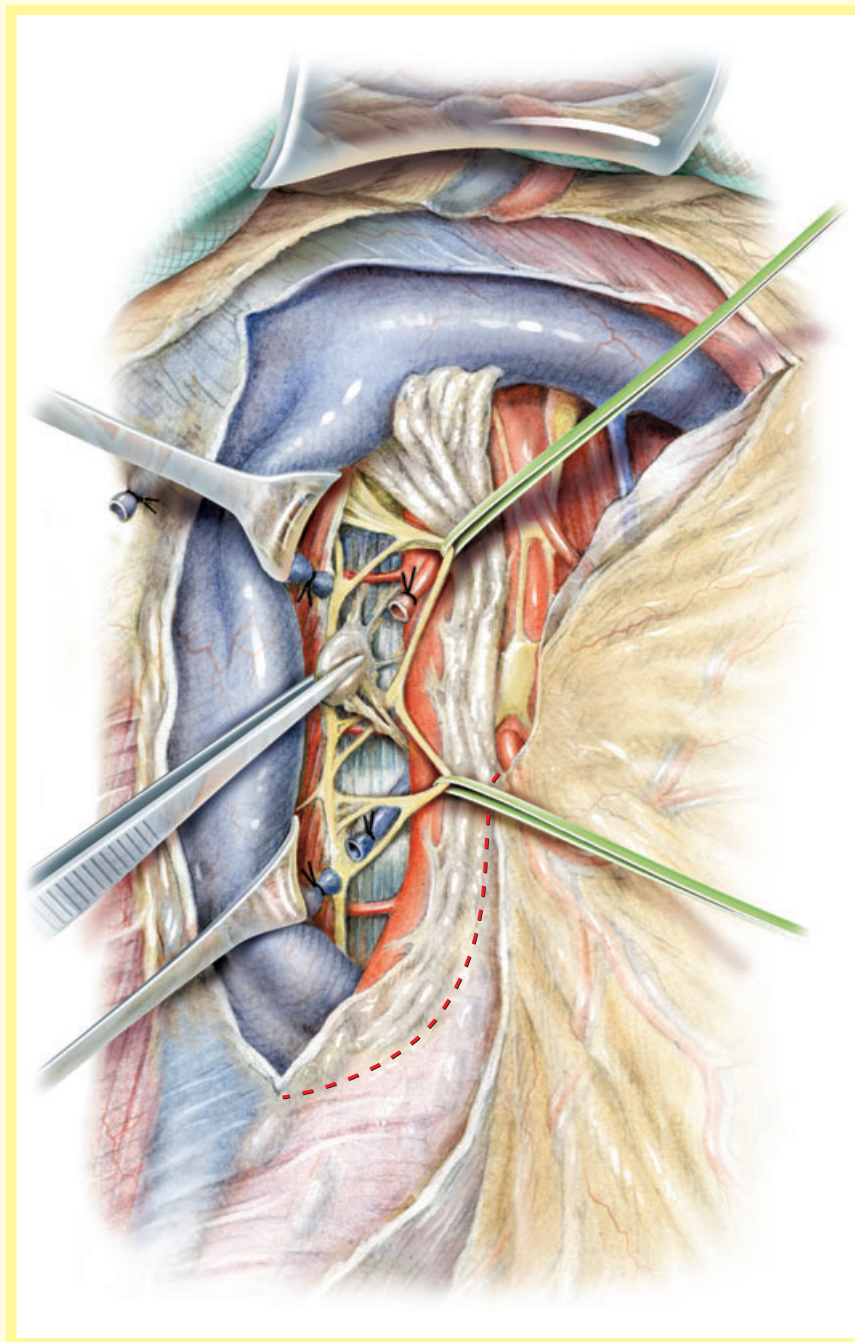
**Figure 3**

Attention is then turned to the vena cava. The origin of the right gonadal vein is identified, dissected and divided between silk ties. The gonadal vein is then dissected distally to the internal ring, at which point the vas deferens is divided between silk ties and the cord stump mobilized from the internal ring. The specimen is harvested as right gonadal vein.

Figure 4

Attention is then turned back to the vena cava. The split of lymphatic tissue over the anterior aspect of the vena cava at the 12 o'clock position is carried out from the origin of the left renal vein distally to the crossing of the common iliac artery. Tissue is rolled medially and laterally and the lumbar veins sequentially identified, dissected and divided between silk ties. Special attention should be given to staying very close to the vena cava, to avoid the efferent sympathetic fibres.

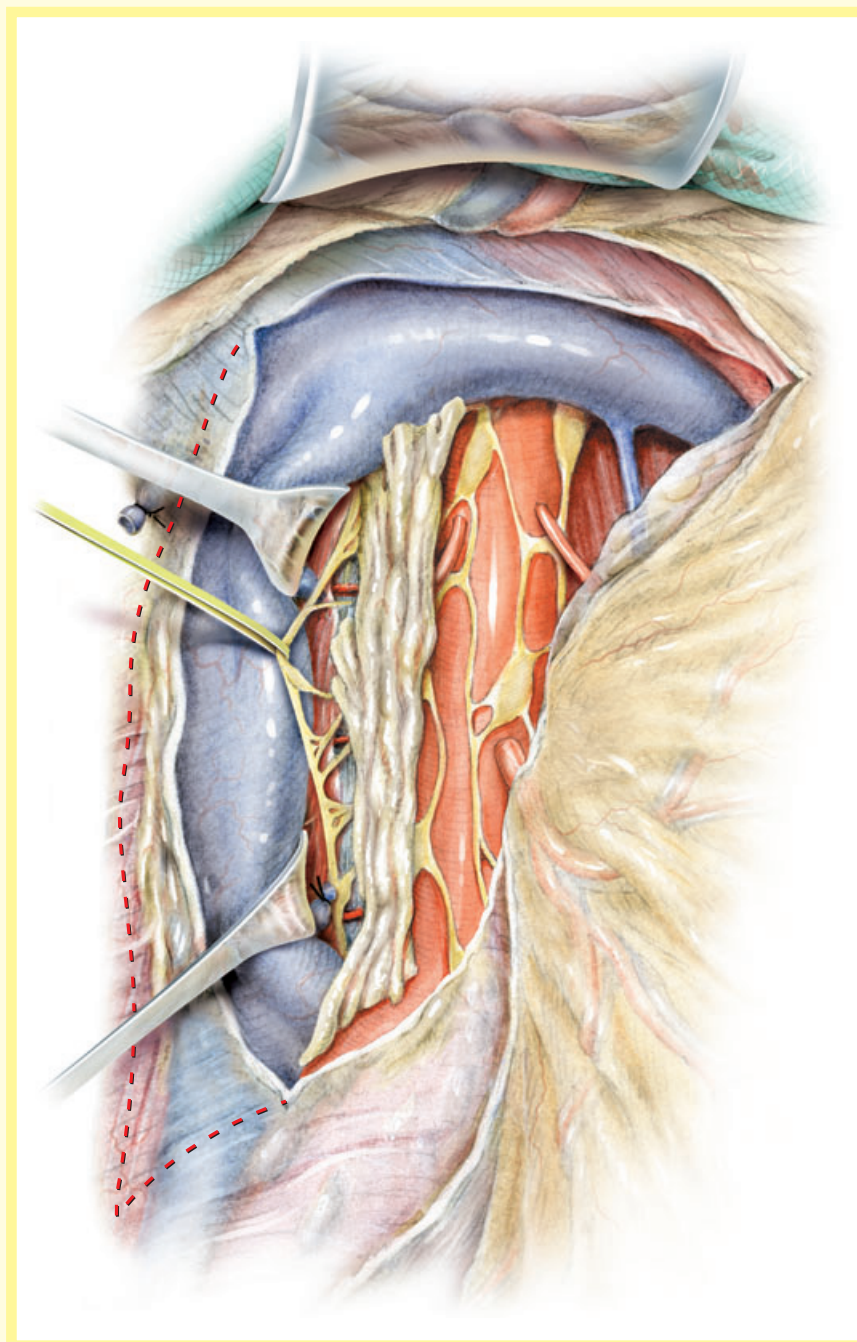


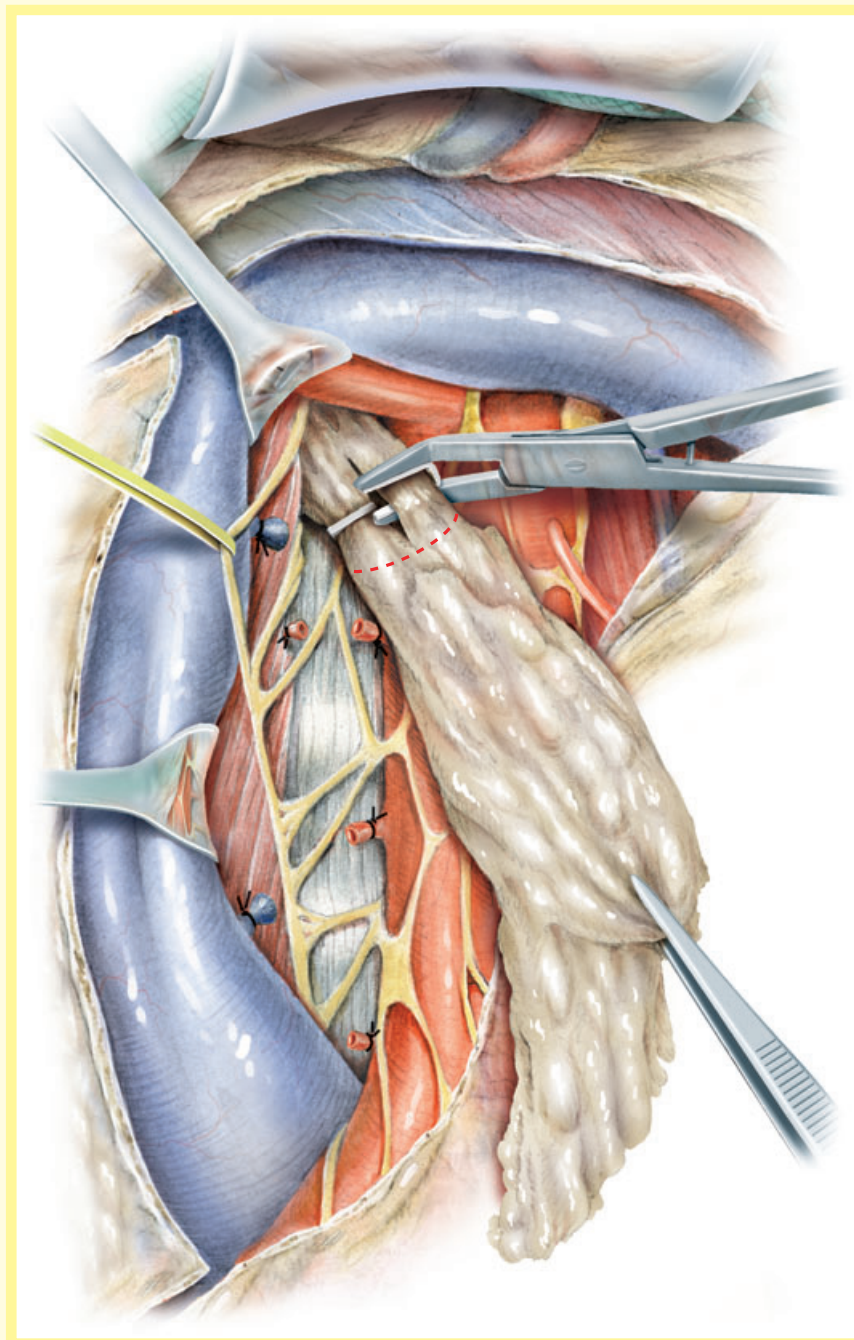
**Figure 5**

If the surgeon chooses to spare the nerves the vena cava is retracted anteriorly and the sympathetic chain, and the efferent sympathetic fibres dissected from lymphatic tissue and placed in vessel loops. If nerves are not to be spared this step can be omitted.

Figure 6

Attention is then turned back to the aorta and the split of lymphatic tissue is continued from approximately the origin of the inferior mesenteric artery distally to the bifurcation of the aorta and along the right common iliac artery. Tissue is rolled medially into the inter-aortocaval area and the right sided lumbar arteries identified, dissected and divided between silk ties. Superiorly the superior limit of the dissection is the crus of the diaphragm. Typically the right renal artery will pass anterior to the crus and scissors are used to dissect lymphatic tissue away from the right renal artery. Finally, the lateral border of the dissection is the ureter and the ureter is dissected away from lymphatic tissue in this area (dotted line).



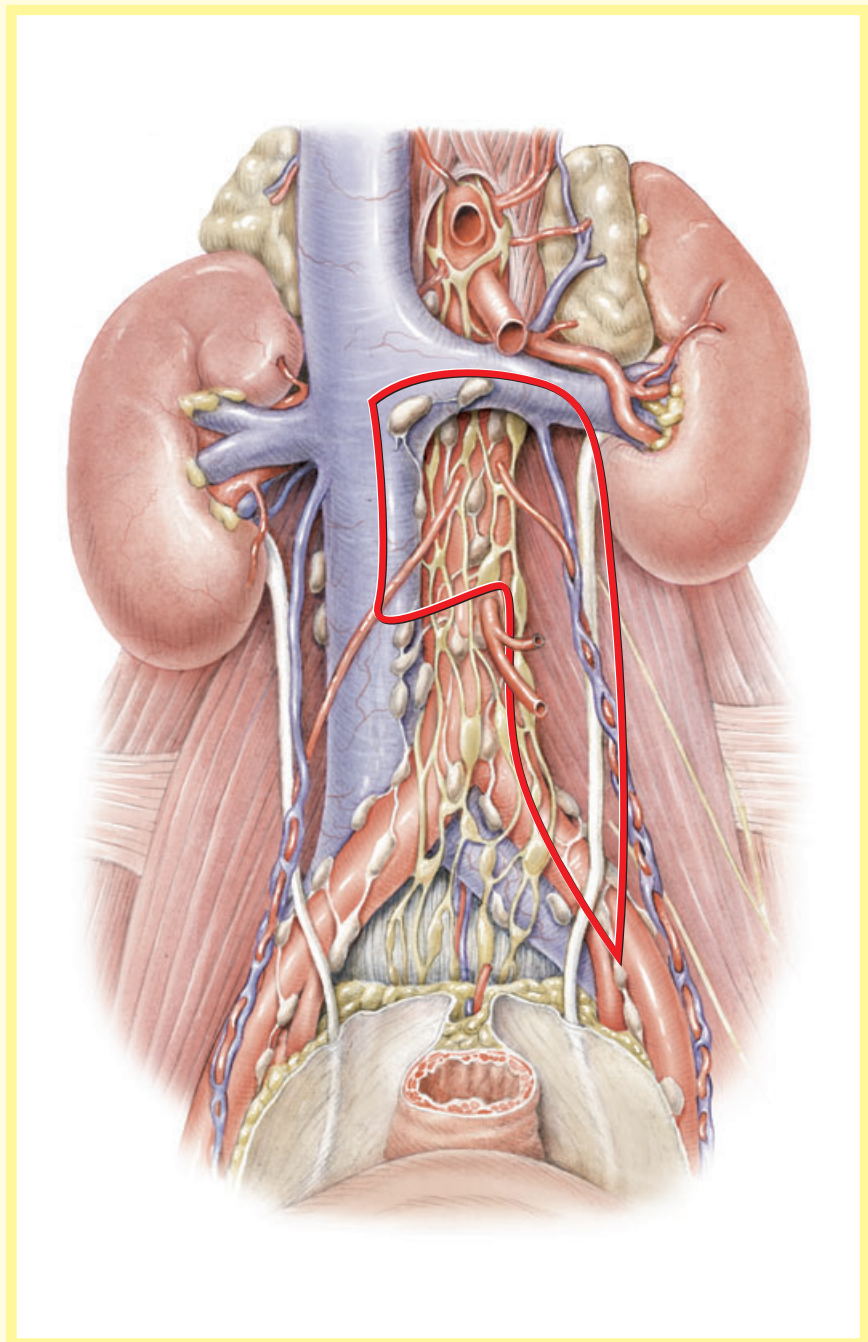
**Figure 7**

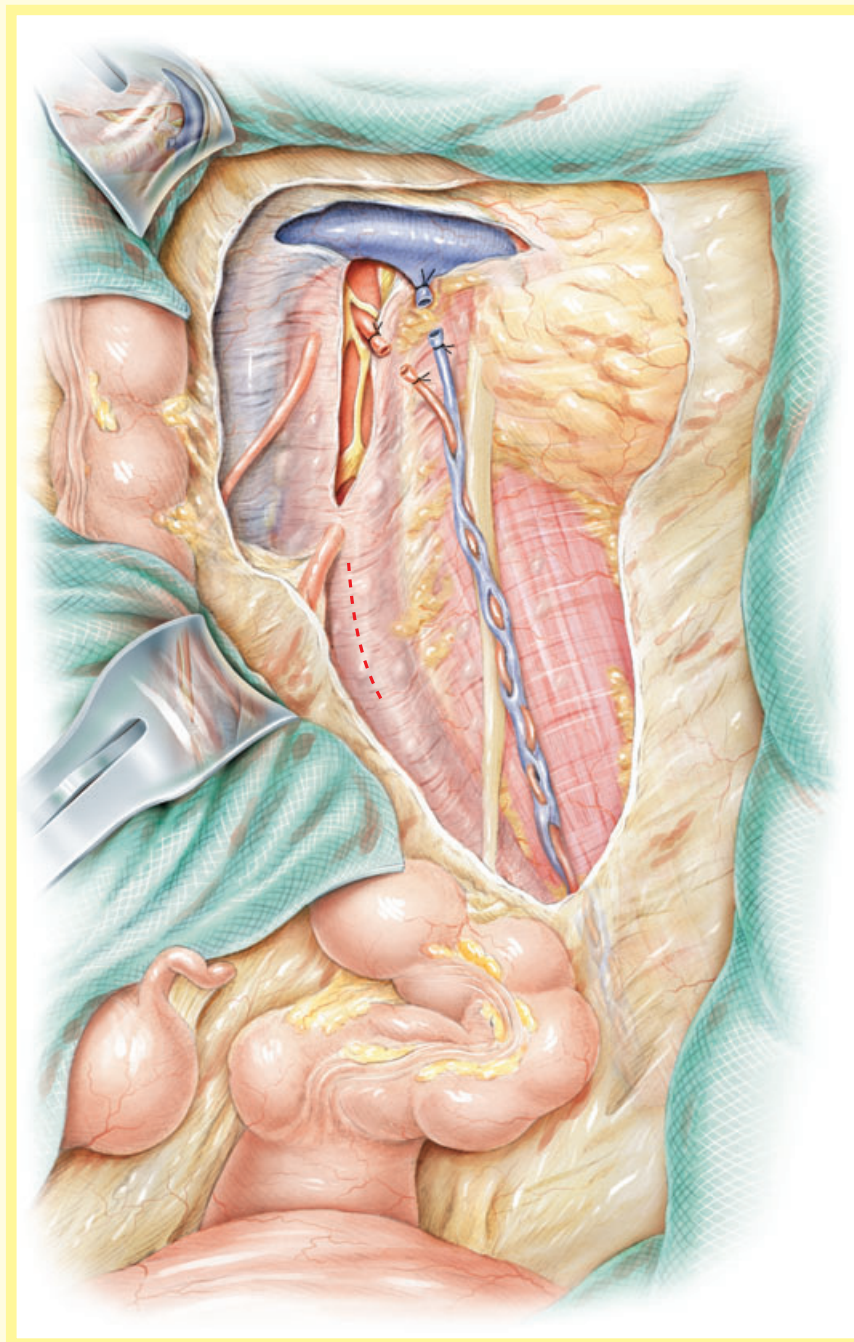
It then remains to harvest the right paracaval and inter-aortocaval packages off the posterior body wall. This will involve dividing lumbar arteries and veins as they penetrate the posterior body wall, and these vessels are controlled with either clips or cautery. At the crus of the diaphragm clips are applied to avoid a lymphatic leak.

Irrigation is then used, after which the posterior peritoneum is closed using a running absorbable suture. The midline incision is then closed using a running looped absorbable suture.

Figure 8

After the midline incision the abdomen is explored and if ≤ 2 cm of lymphadenopathy is identified in the left peri-aortic area, a modified template can be used.

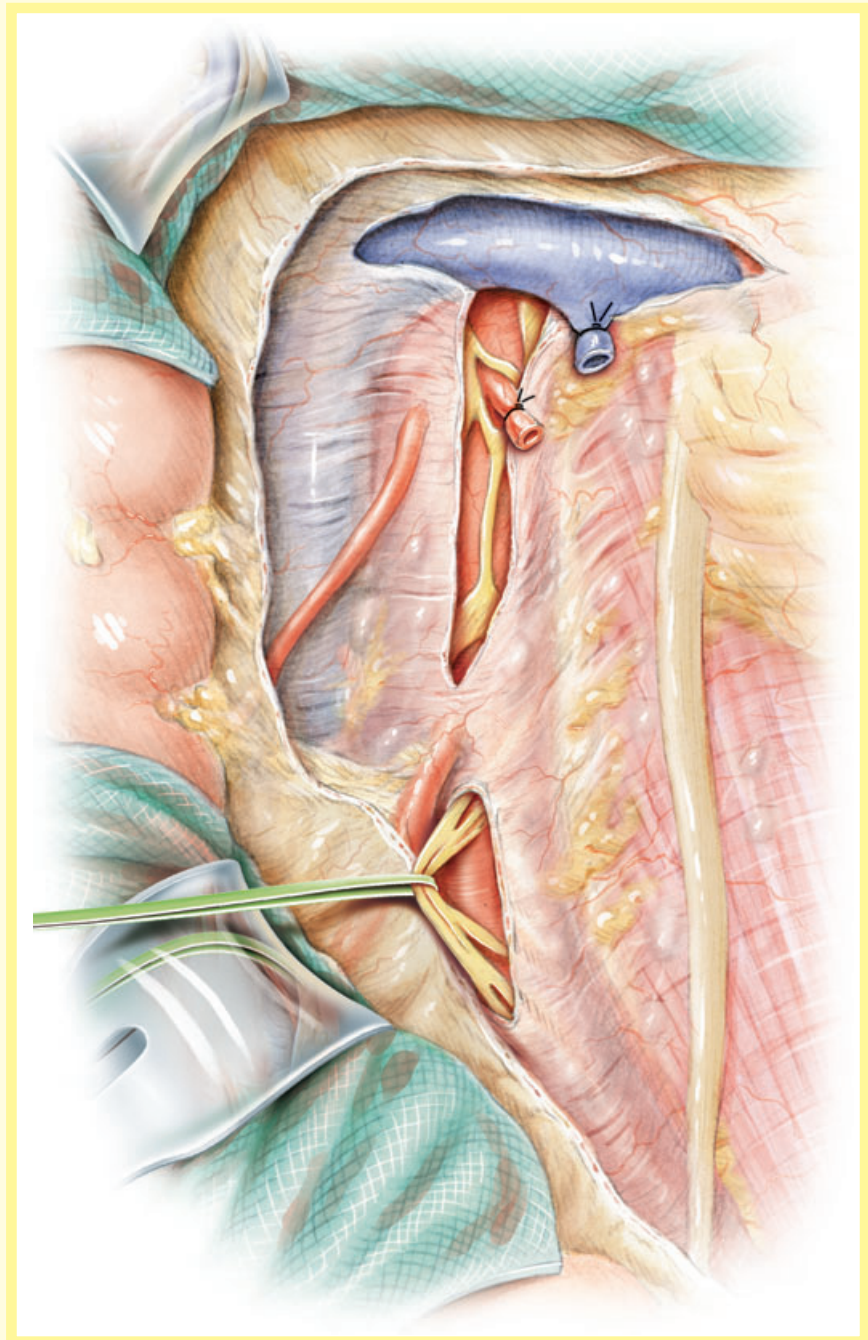


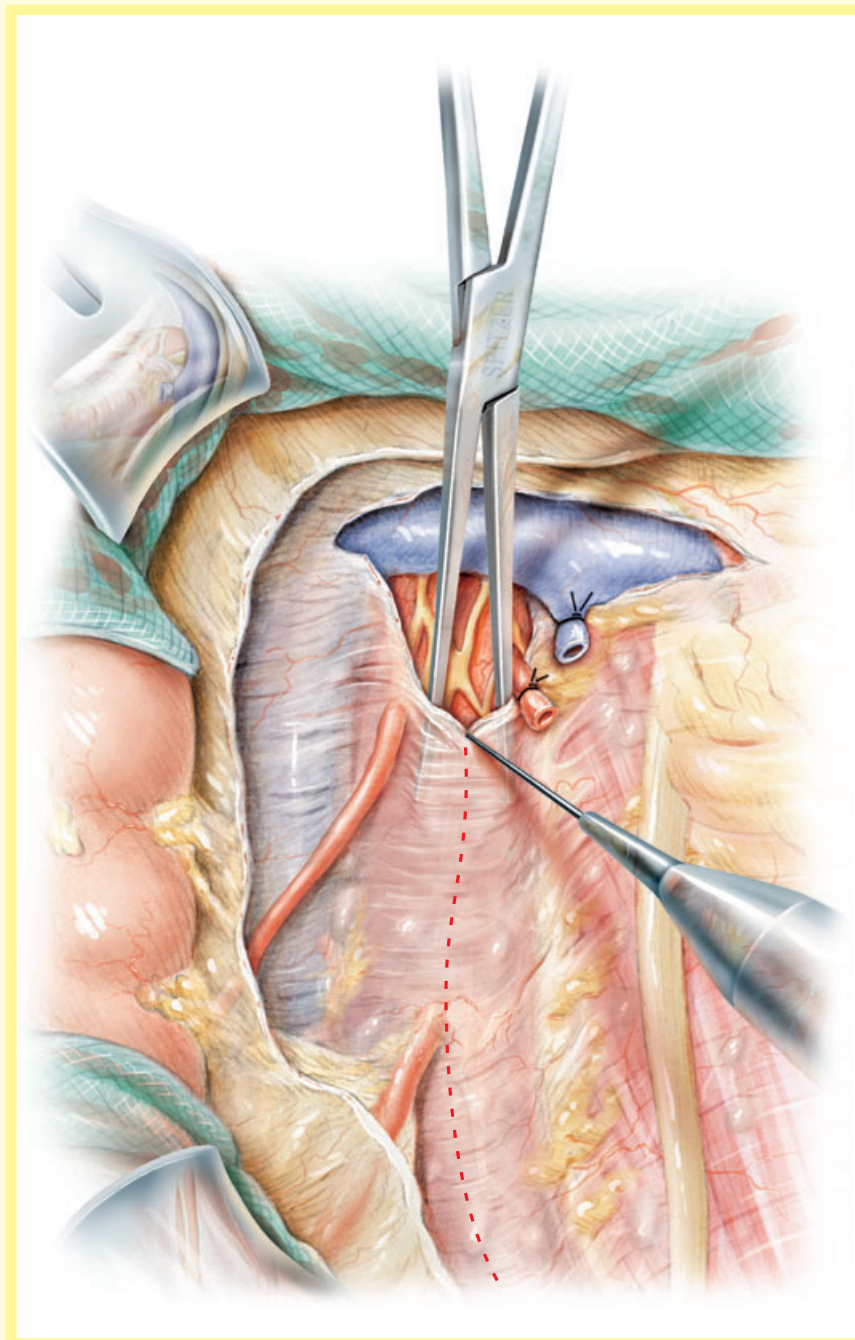
**Figure 9**

The retroperitoneum is exposed by incising the posterior peritoneum lateral to the left colon. The left colon is then mobilized medially, exposing the left peri-aortic and pre-aortic areas. The split of lymphatic tissue is carried out over the left renal vein. The origin of the left gonadal vein is identified and divided between silk ties. The gonadal vein is then dissected to the internal ring, at which point the vas deferens is divided between ties and the cord stump mobilized from the internal ring. This specimen is passed off as left gonadal vein.

Figure 10

If nerve sparing is to be used the left-sided efferent sympathetic fibres are identified passing anteriorly over the left common iliac artery. They are dissected away from lymphatic tissue and placed in vessel loops. Subsequently they are dissected cephalad away from lymphatic tissue as they pass to the sympathetic chain. Again, if nerve sparing is not used this step is omitted.

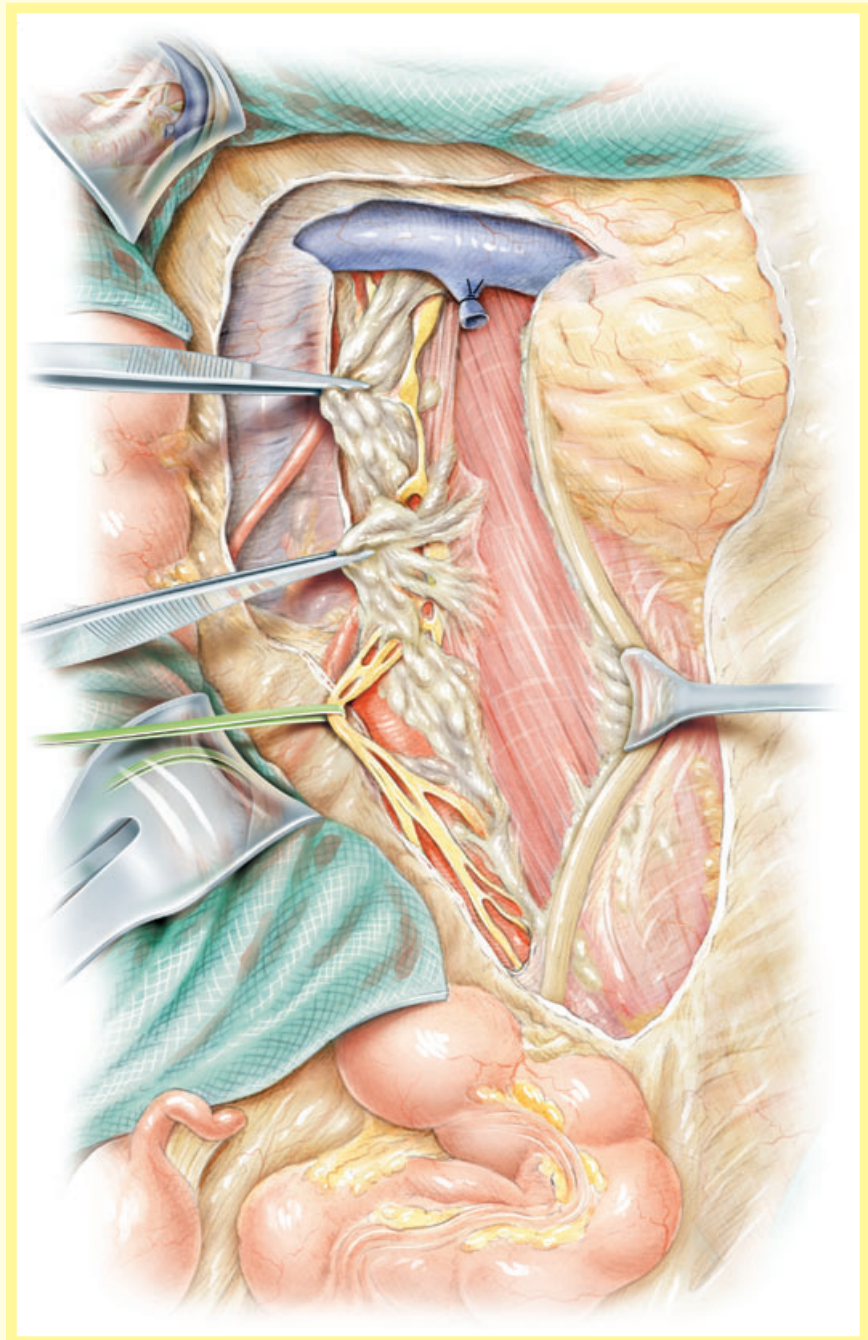


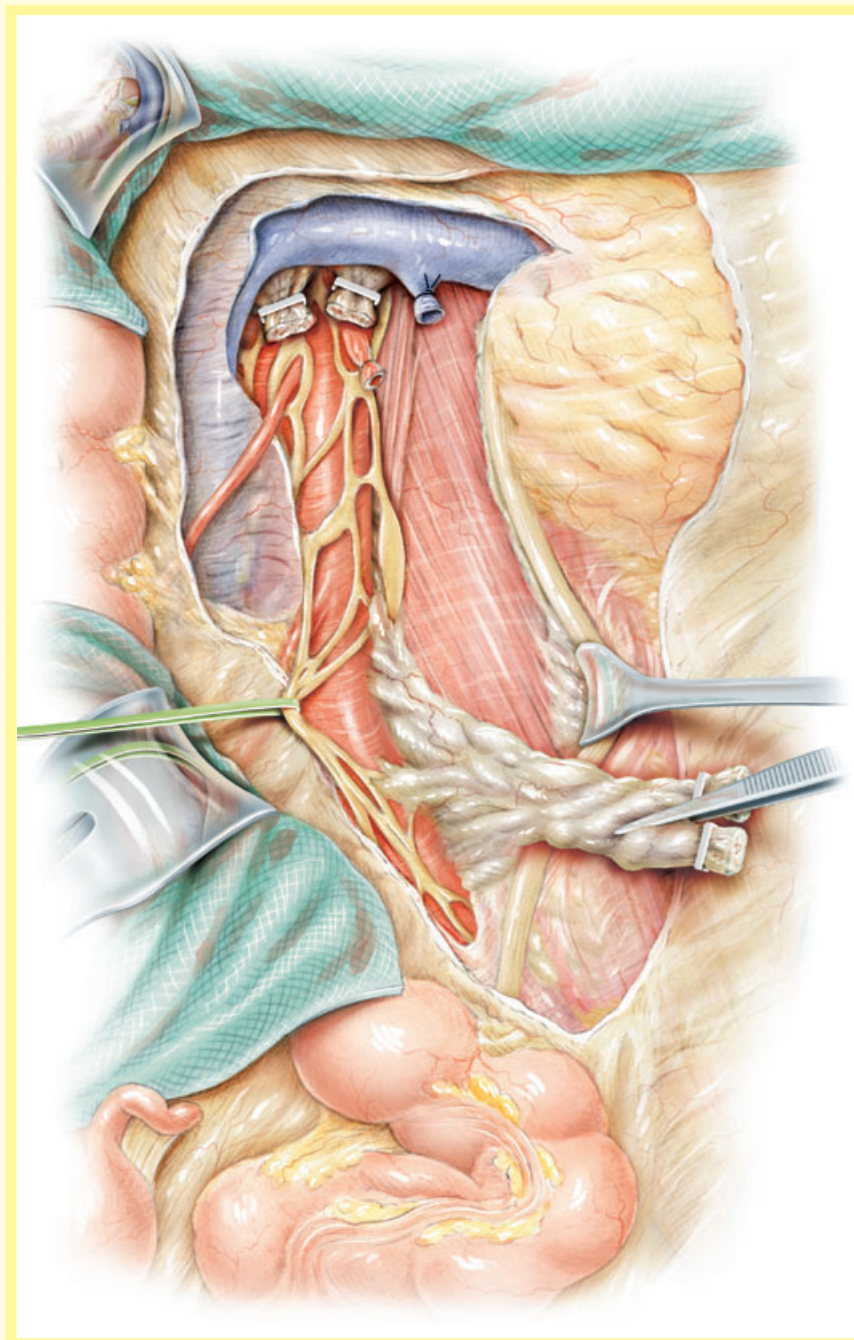
**Figure 11**

The so-called split manoeuvre is then used on the aorta, from the crossing of the left renal vein distally to the bifurcation of the left common iliac artery. In using this manoeuvre the pre-aortic lymphatic tissue is rolled to the patient's left side.

Figure 12

If nerve sparing has been used the nerves are carefully avoided as the split manoeuvre is carried out. The tissue is then rolled into the left peri-aortic area and the left-sided lumbar arteries identified, dissected and divided between silk ties. Superiorly the renal artery is dissected away from lymphatic tissue at approximately the area of the crus of the diaphragm. Laterally the left ureter is mobilized away from lymphatic tissue denoting the lateral aspect of the dissection. At the superior extent of the dissection care must be taken to identify a lumbar vein passing posteriorly from the left renal vein. This lumbar vein is present $\approx 40\%$ of the time and must be divided to ensure adequate mobilization of lymphatic tissue from the renal artery.



**Figure 13**

Finally, the left peri-aortic and pre-aortic lymphatic tissue is dissected from the posterior body wall. Again, lumbar arteries and veins must be controlled as they penetrate the posterior body wall, and clips are applied at the crus of the diaphragm to avoid a lymphatic leak. After irrigation the left colon is placed back into anatomical position and the abdomen then closed using a running looped absorbable suture.

POSTOPERATIVE CARE

A sterile gauze dressing is applied to the midline incision, after which the patient is placed in the lateral decubitus position and intrathecal narcotic and/or local anaesthetic administered to help with pain control immediately after surgery. Supplemental pain control is provided by patient-controlled analgesia. The Foley catheter is removed 2 days after surgery. No nasogastric tubes are used. The patient is given a liquid diet the evening of surgery or the morning after surgery, and the diet advanced to full on the following day. The mean hospitalization is ≈ 3.3 days.

FROM SURGEON TO SURGEON

The length of the midline incision is dictated by patient habitus, i.e. in thin young men the midline incision can be very minimal; heavier patients need more of a 'xyphoid-to-pubis' midline incision. The Bookwalter self-retaining retractor makes the operation much easier and cautery is used liberally to dissect. Conceptually, approaching the great vessels initially simplifies the surgical technique. This concept of 'subtracting' the great vessels from the remainder of the retroperitoneum was first described by John Donohue and not only makes this procedure much easier but is helpful in all types of retroperitoneal

genitourinary surgery. Surgeons using this procedure need to be completely versed in various techniques of vascular surgery, and should be taught the use of vascular techniques and procedures. With experience, significant bleeding is not a part of this procedure, as the tissues and vessels are generally predictable in course and supply in texture. Transfusion should be extremely rare and typically patients are not cross-matched before surgery.

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