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Surgery Illustrated – Surgical Atlas
Robotic radical cystectomy in the male

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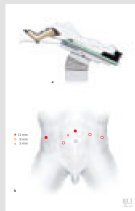
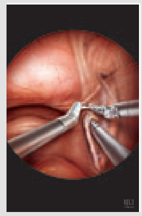
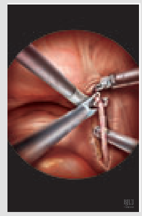
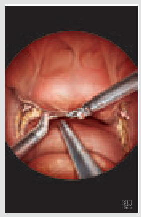
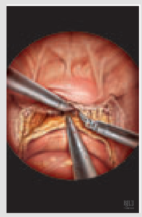
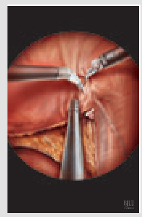

PLANNING AND PREPARATION

INDICATIONS

According to the European Association of Urology guidelines, radical cystectomy (RC) is the standard treatment for localized muscle-invasive bladder cancer T2-T4a, N0-Nx, M0. Other indications include high-risk and recurrent superficial tumours, BCG-resistant Tis, T1G3, as well as extensive papillary disease that cannot be controlled with transurethral resection and intravesical therapy alone. Salvage cystectomy is indicated when conservative therapy fails, recurrences after bladder-sparing treatments, non-urothelial carcinomas (these tumours respond poorly to chemo- and radiotherapy), and as a purely palliative intervention, e.g. for fistula formation, pain or recurrent macrohaematuria.

Given adequate robotic expertise, all patients with clinically organ-confined high-risk superficial or invasive bladder cancer are suitable candidates for robotic RC (RRC).

Contraindications are: (a) CT evidence of extravesical spread or bulky lymphadenopathy; (b) 'frozen pelvis' due to previous surgery, previously irradiated pelvis or inflammatory pathology; (c) fixation of the bladder to surrounding structures and pelvic wall on bimanual palpation. Previous aorto-iliac vascular surgery and endovascular stenting can make ureteric dissection challenging. A narrow pelvis could also make the robotic procedure more difficult; (d) severe chronic obstructive pulmonary disease or severe cardiac disease.

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PATIENT SELECTION

Proper patient selection is crucial during early experience to optimize technical efficiency and minimize complications. During the initial part of gaining experience, RRC should be reserved for non-obese patients with organ-confined, non-bulky bladder malignant disease with no concomitant pelvic lymphadenopathy, as determined by preoperative radiographic and clinical findings, or chronic cystitis with a non-functional bladder.

SPECIFIC EQUIPMENT AND MATERIALS

Equipment necessary for RRC

Robotic equipment:

- Three trocars (8 mm);
- 0° laparoscope;
- Hot Shears™ (monopolar curved scissors; (da Vinci, Intuitive Surgical, Mountain View, CA, USA)
- PK™ dissecting forceps (Da Vinci);
- Two large needle drivers;
- ProGrasp™ forceps (Da Vinci).

Laparoscopic equipment

- Two trocars (12 mm);
- One trocar (5 mm);
- 5 mm endoscopic long suction irrigator (45 mm);
- 5 mm endoscopic scissors;
- 5 mm endoscopic locking grasper;
- 5 mm endoscopic needle driver;
- 10 mm specimen retrieval bag;
- 30° traditional laparoscope with light cable;
- 10 mm Hem-o-lok® (Weck Closure Systems, Research Triangle Park, USA) clip applier;
- Laparoscopic staplers (60 mm, 3 mm).

Energy sources/haemostatics

- Monopolar electrocautery;
- Radiofrequency Gyrus device Gyrus medical, Cardiff, UK);
- 10 mm Hem-o-lok.

SPECIFIC PATIENT PREPARATION

As for conventional open RC, the patient is hospitalized 2 days before surgery, and assessed using an electrocardiogram and standard blood examinations. The position for an external stoma is evaluated and marked on the skin of the patient. All patients receive mechanical bowel preparation with polyethlene glycol and a clear liquid diet (4–5 L) on the day before surgery. Antibiotic therapy is commenced with augmentin 1 g when the procedure begins and continues at 1 g per/day for the first four days.

SPECIFIC PATIENT POSITIONING

Figure 1(a)

It is important that all elements of the patient set-up are consistent and reproducible to avoid plexus lesions or compartment syndrome. The patient is placed supine on the operating table. The head and shoulders are in contact with an anatomical pillow.

After general anaesthesia is induced, the patient's arms are tucked at the sides and the legs are placed in boots. They are gently separated to facilitate docking of the robot, which is positioned between the legs. The knees are flexed to facilitate docking of the robotic arms. It is imperative that the table is orientated correctly to allow a maximal Trendelenburg position.

A metallic bar is placed just over the patient's head and shoulders, without interfering with the endotracheal tube. This is useful in protecting the patient's head from the robotic camera and arms. Great care is taken to adequately pad and support the patient to avoid neuromuscular injury.

During the first part of the procedure, the patient is maintained in a steep Trendelenburg position (>20°), while a normal position is required during reconstruction. The entire procedure is performed using a DaVinci-S HD System.

Under general anaesthesia, the patient is placed supine, with a nasogastric tube and Foley urethral catheter in place. In patients where no neobladder is planned, an en-bloc cystoprostatourethrectomy is performed. To do so, the urethra is freed first through a small scrotal incision up to the bulbar urethra. After completing the RC, the urethra is taken out en bloc, together with the whole specimen. Subsequently, the ports are placed.

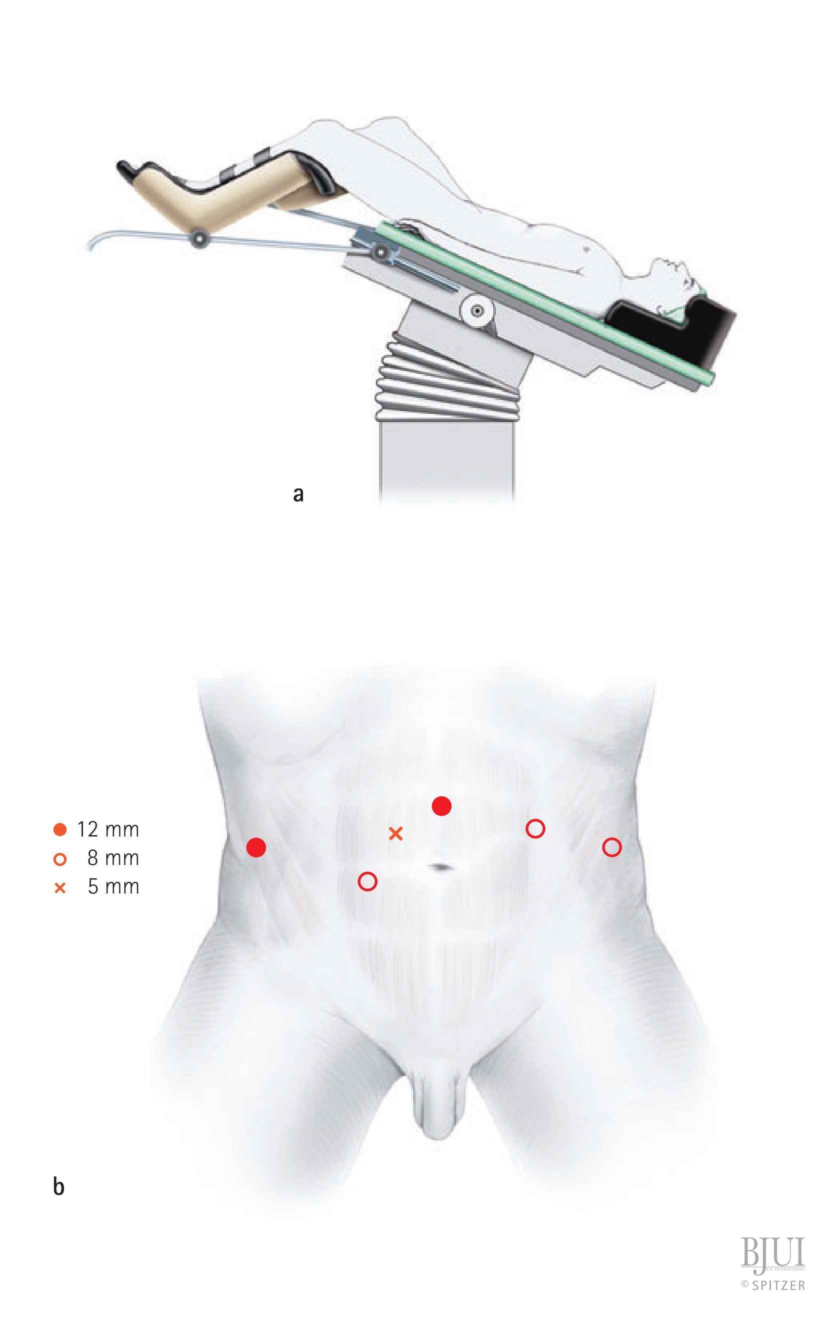


Figure 1(b)

First, a 12-mm port is placed 3–5 cm above the umbilicus, depending on the length of the patient; an 8-mm port is placed at the umbilicus level on the left pararectal line, the other 8 mm port is placed on the right side where the stoma sign was made, a 5-mm port at the right side between the optic and the 8 mm port, a 12-mm port 3 cm up from the iliac crest on the right side, and an extra 8 mm port symmetrically on the left side. During RC the patient is placed in a steep Trendelenburg position.

PROCEDURE

URETERIC ISOLATION

Figure 2

The goal of this step is to first mobilize the ureters from above the crossing of the iliac vessels up to the level of the bladder, then to ligate and transect them. The ureters are frequently identified just medial to the spermatic vessels or they can be found crossing over the iliac vessels. Ureteric dissection is carried out proximally as far as possible without disturbing its vasculature, and distally up to the level of the bladder.

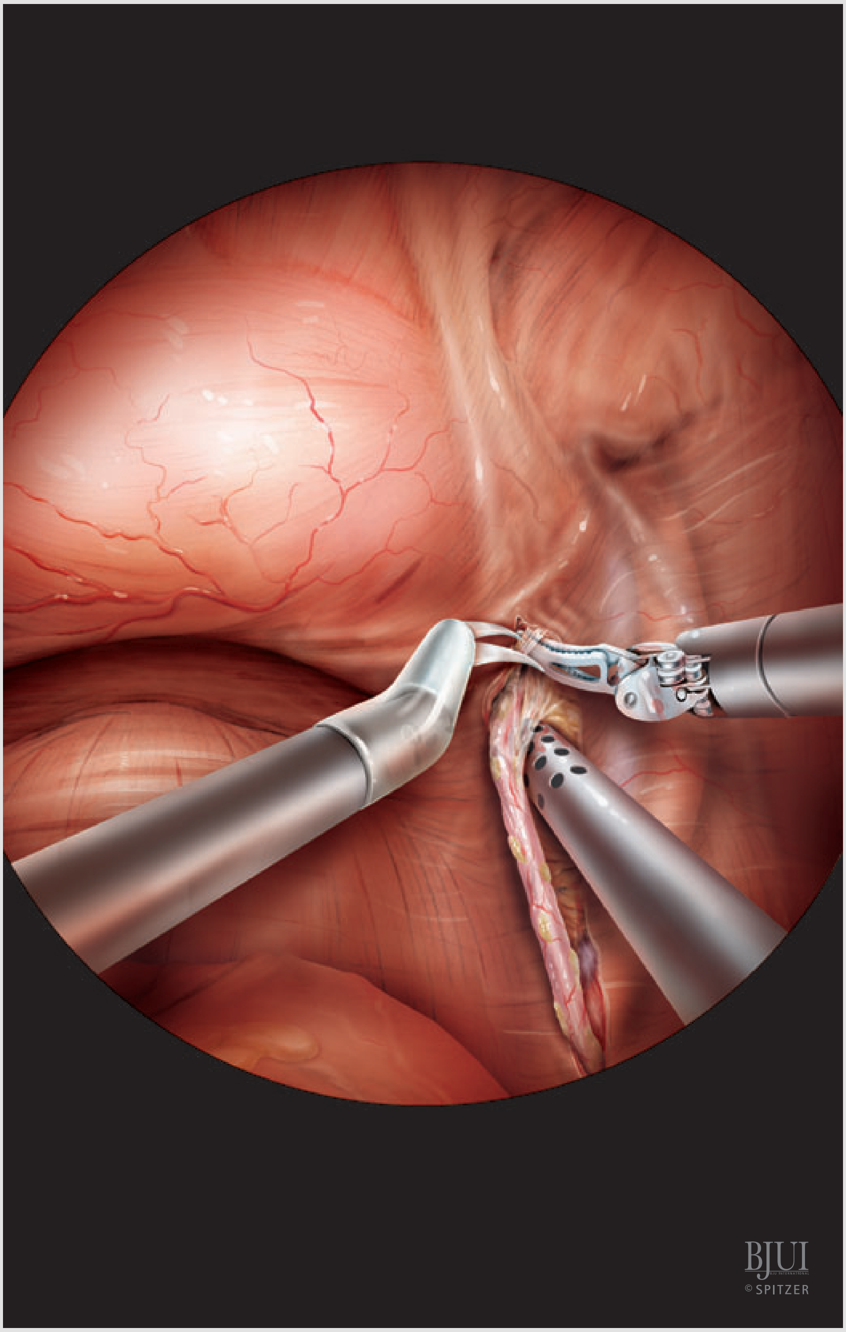
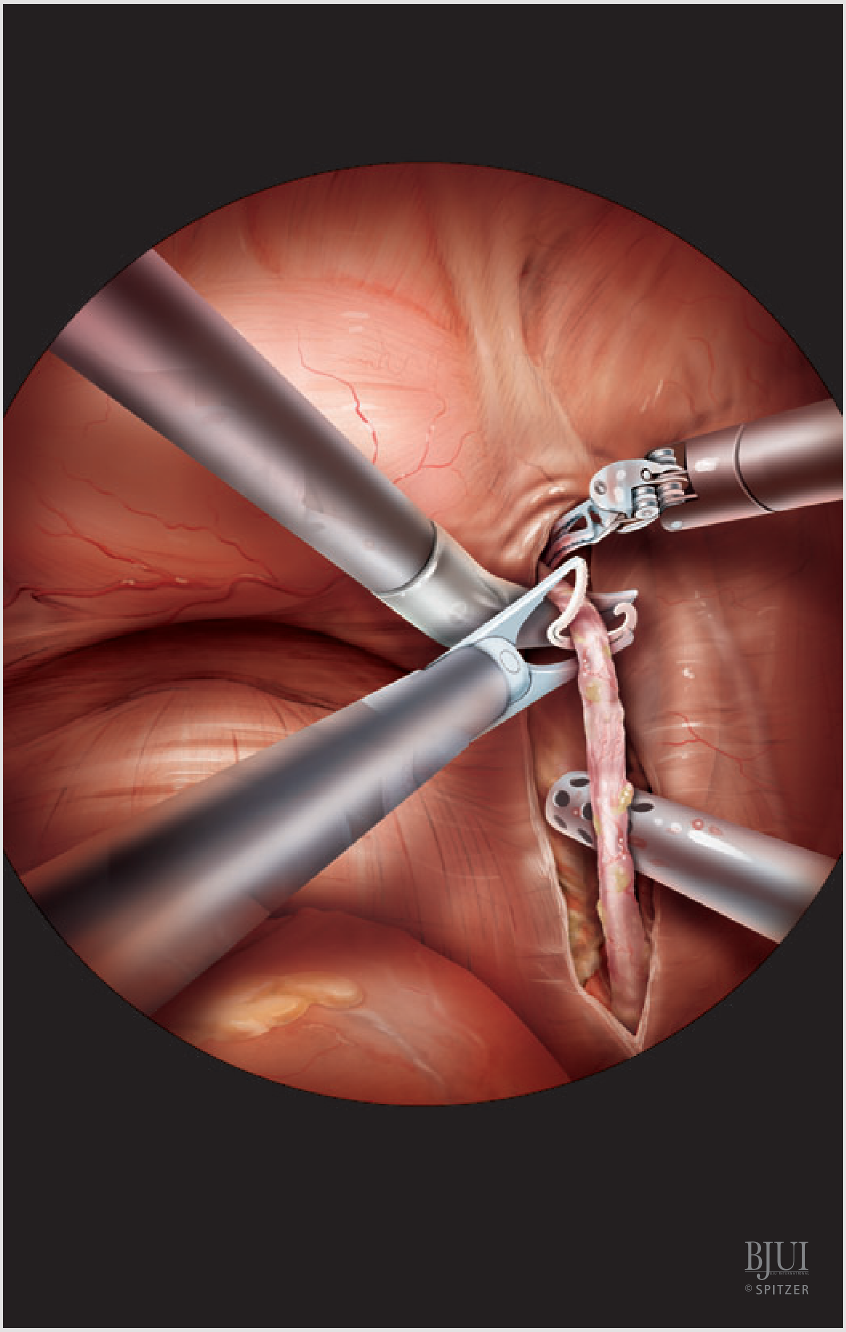


Figure 3

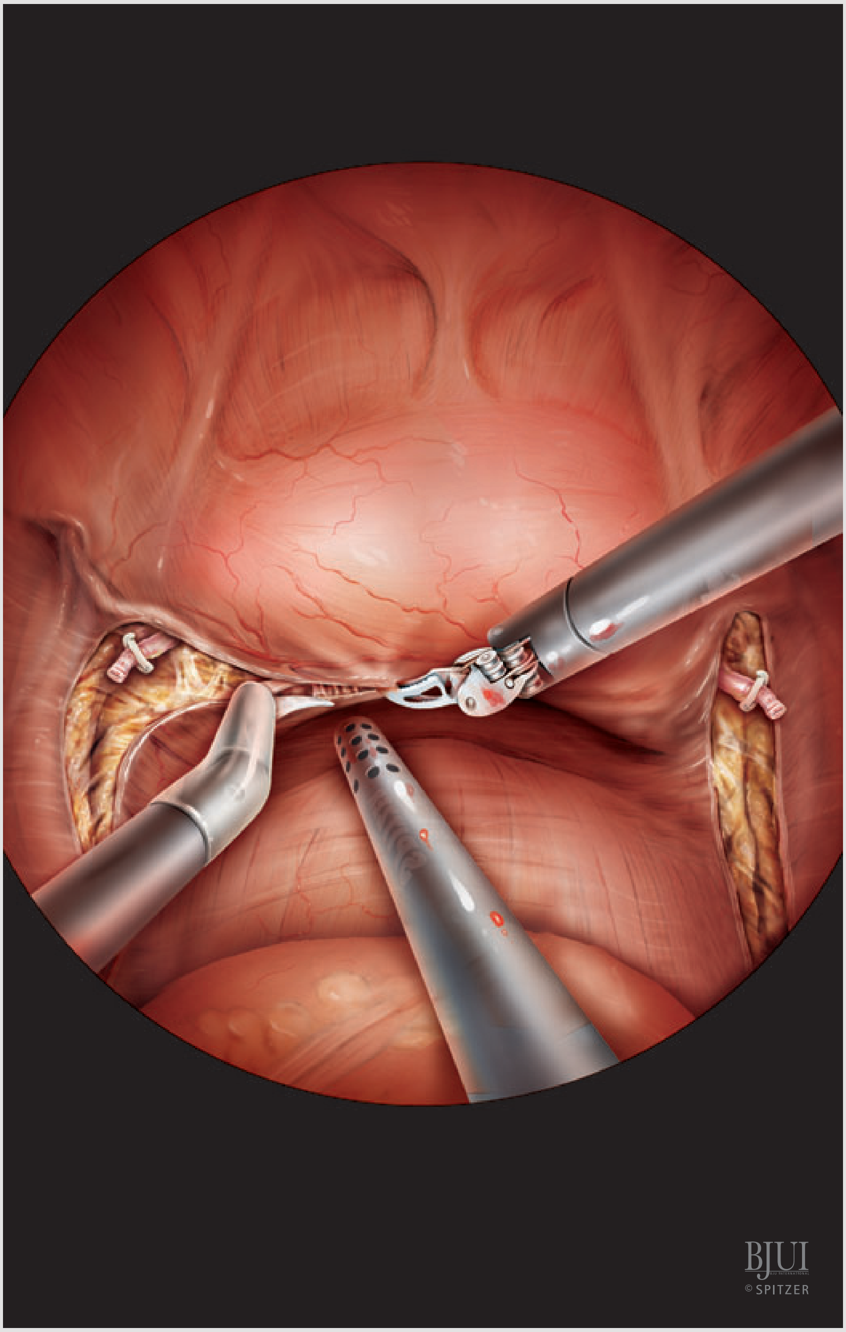
The ureters are ligated using a Hem-o-lok clip and transected. After transection, the ureters are released proximally and tucked into the upper quadrants, away from the pelvic dissection.



RETROVESICAL DISSECTION

Figure 4

The aim of this dissection is to mobilize the posterior bladder and base of the prostate off the rectum. The posterior peritoneum is incised just above its reflection over the rectum, connecting the incision previously made for the ureteric dissection.



DEVELOPING THE RECTOVESICAL SPACE

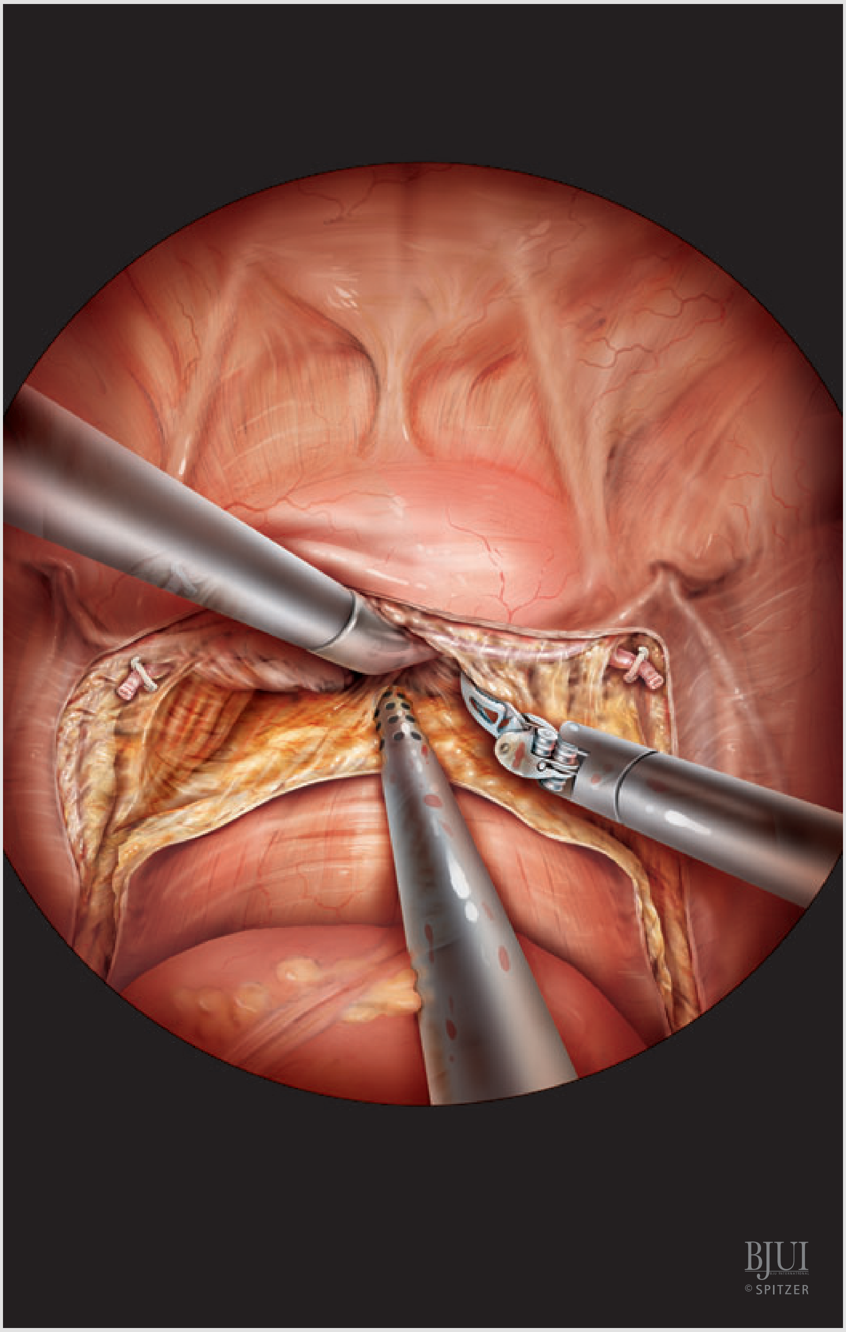


Figure 5

The seminal vesicles and vasa deferentia are freed, mainly bluntly. Medial vessels can be cauterized, lateral vessels are clipped and cut. Blunt dissection is used to develop the rectovesical cul-de-sac. Both seminal vesicles are lifted up and Denonvilliers' fascia is incised. The back of the prostate is freed until its apex.

LATERAL DISSECTION

Figure 6

The goal of this step is to develop the space between the bladder and lateral pelvic side-walls. This will facilitate exposure and isolation of the bladder pedicles. Lateral incisions in the peritoneum are made bilaterally to develop the perivesical space. Incisions are made upwards from lateral to the medial umbilical ligaments and downwards to connect with the posterior peritoneal incisions made during the initial ureteric dissection. The line of incision travels parallel to the spermatic cord. It is important not to drop the bladder at this point. The urachal and medial umbilical attachments are left intact, to suspend the bladder. This will facilitate posterior access.

The perivesical space is developed distally up to the level of the endopelvic fascia and continues posteriorly towards the bladder pedicles. At this point, the lateral vascular pedicles of the bladder are readily visualized.

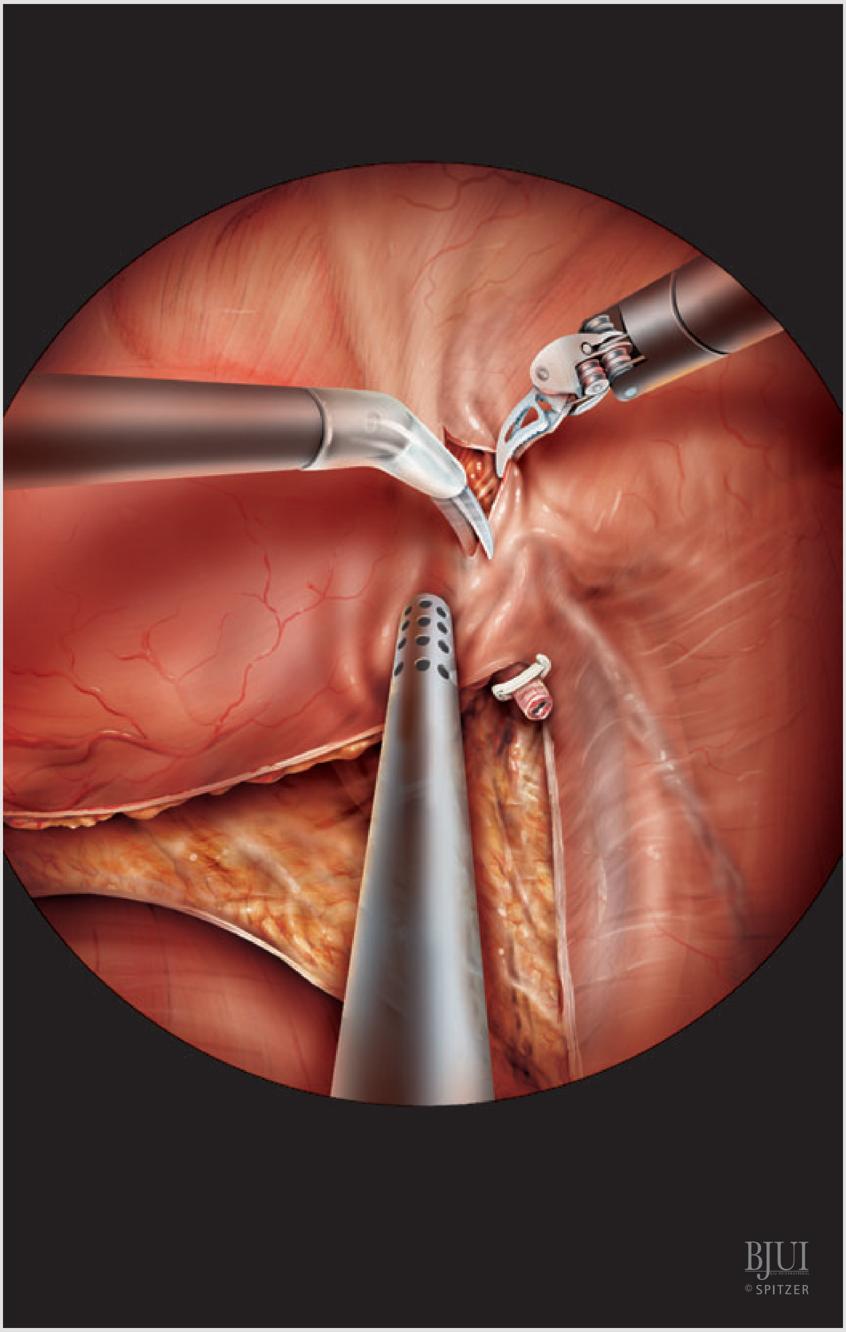


Figure 7

The lymphadenectomy is started at the left side with lateral freeing of the iliac vessels and the lymphatic tissue. The vessels are pushed medially. Doing so, the obturator fossa is entered and its lymphatic tissue freed lateral from the pelvic wall. The obturator nerve is visualized.

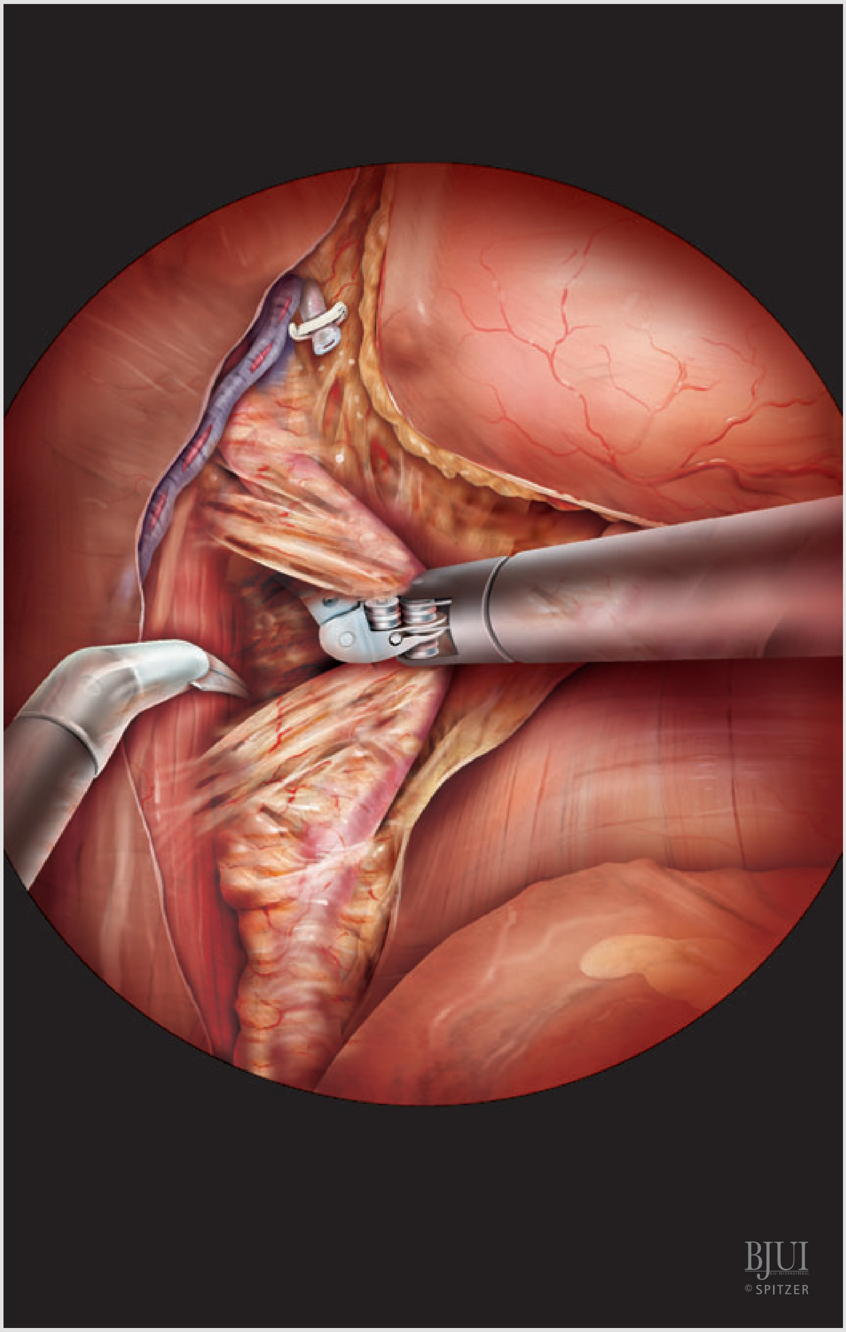


Figure 8

The lymphadenectomy continues to the level of the aortic bifurcation. Artery and vein are skeletonized using the split-and-roll technique. All tissue lying over the promontory and sacrum is freed.

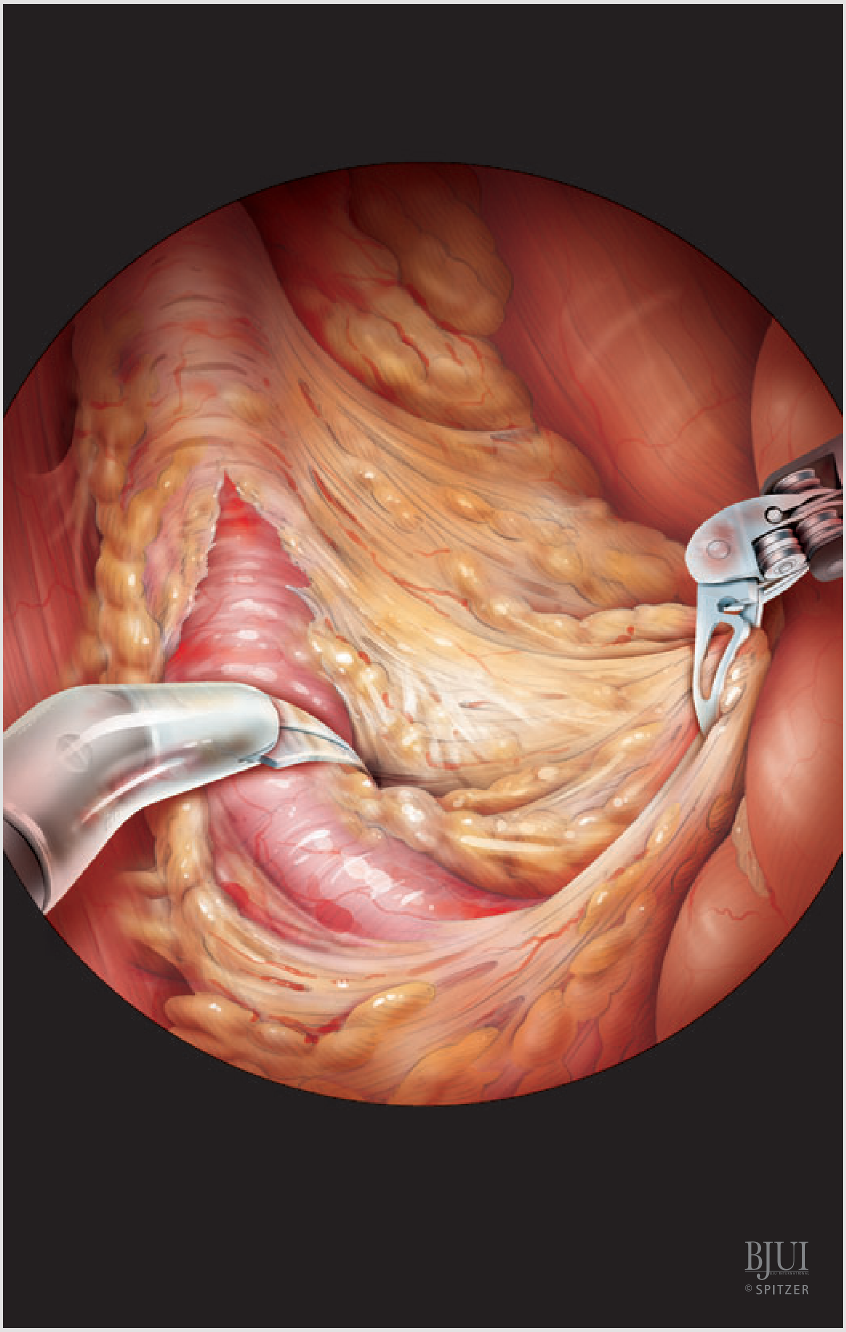


Figure 9

The lymphatic tissue is freed progressively downwards. External iliac artery and vein are split and skeletonized to perform a complete lymphadenectomy.

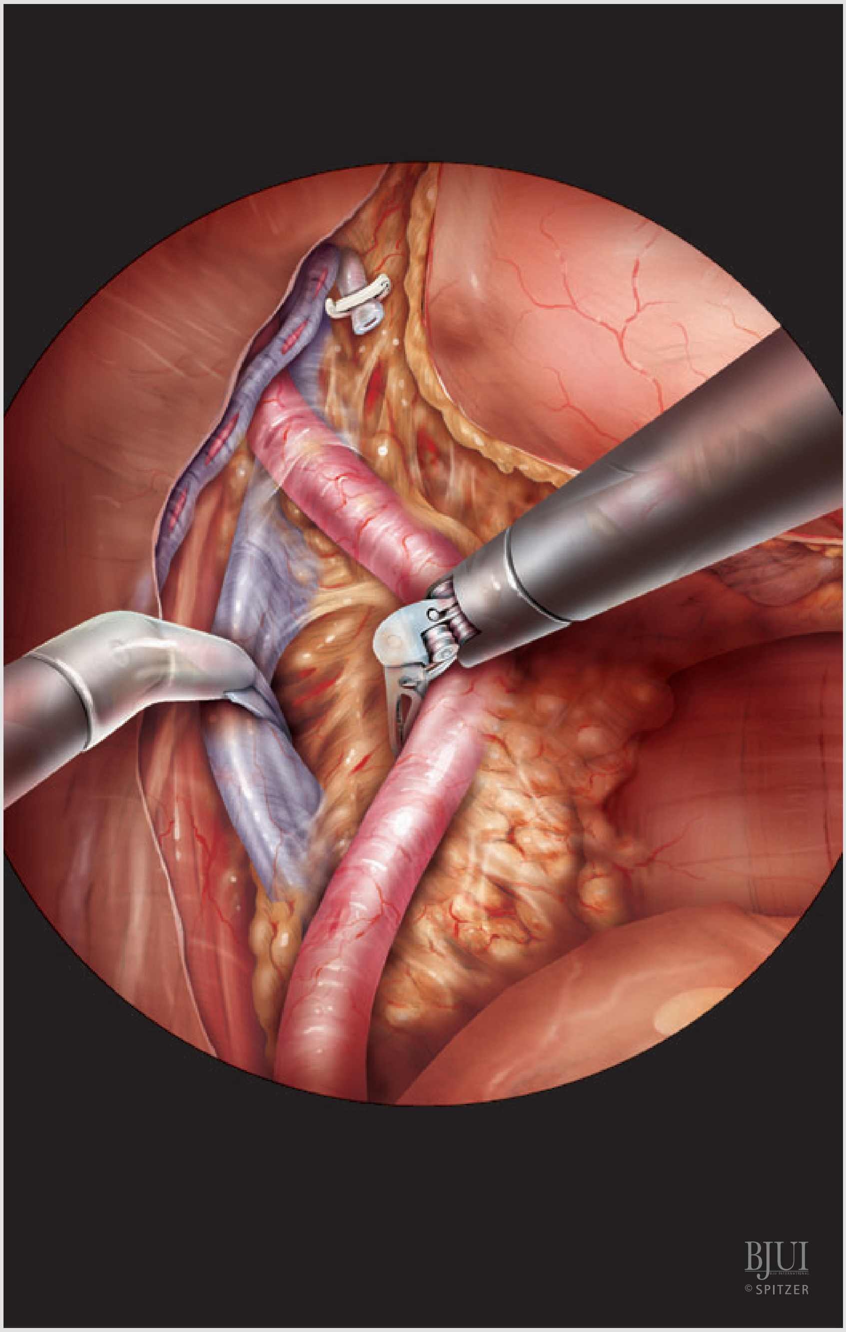
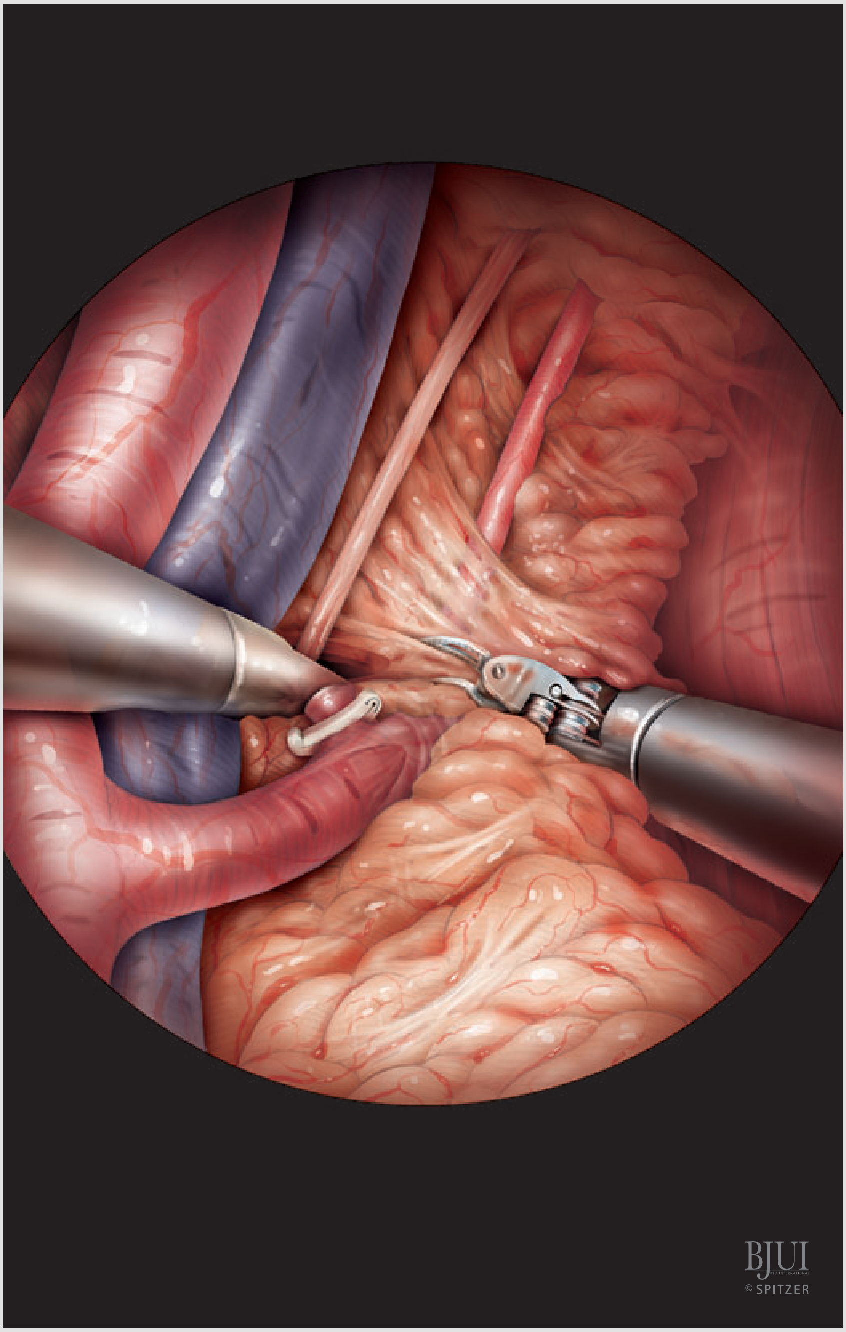


Figure 10

The superficial and deep obturator fossa are completely freed from all lymphatic and fatty tissue. One can see the external iliac vessels, obturator nerve and artery and hypogastric artery. This is the last stage of the lymphadenectomy. As the lymphadenectomy is performed caudally, all lymphatic tissue is left on the specimen.



SECURING THE BLADDER PEDICLES

Figure 11

An Endowrist robotic Gyrus radiofrequency device is used to coagulate the vascular pedicles of the bladder. Only the major vessels have to be clipped. The bladder pedicles are identified and isolated. The internal iliac arteries are followed downwards. The umbilical artery is secured with a clip at its origin and cut. Further distally, the upper vesical artery is encountered, clipped and cut. Smaller vessels and fatty tissue are coagulated using Gyrus. Larger vessels are clipped and cut.

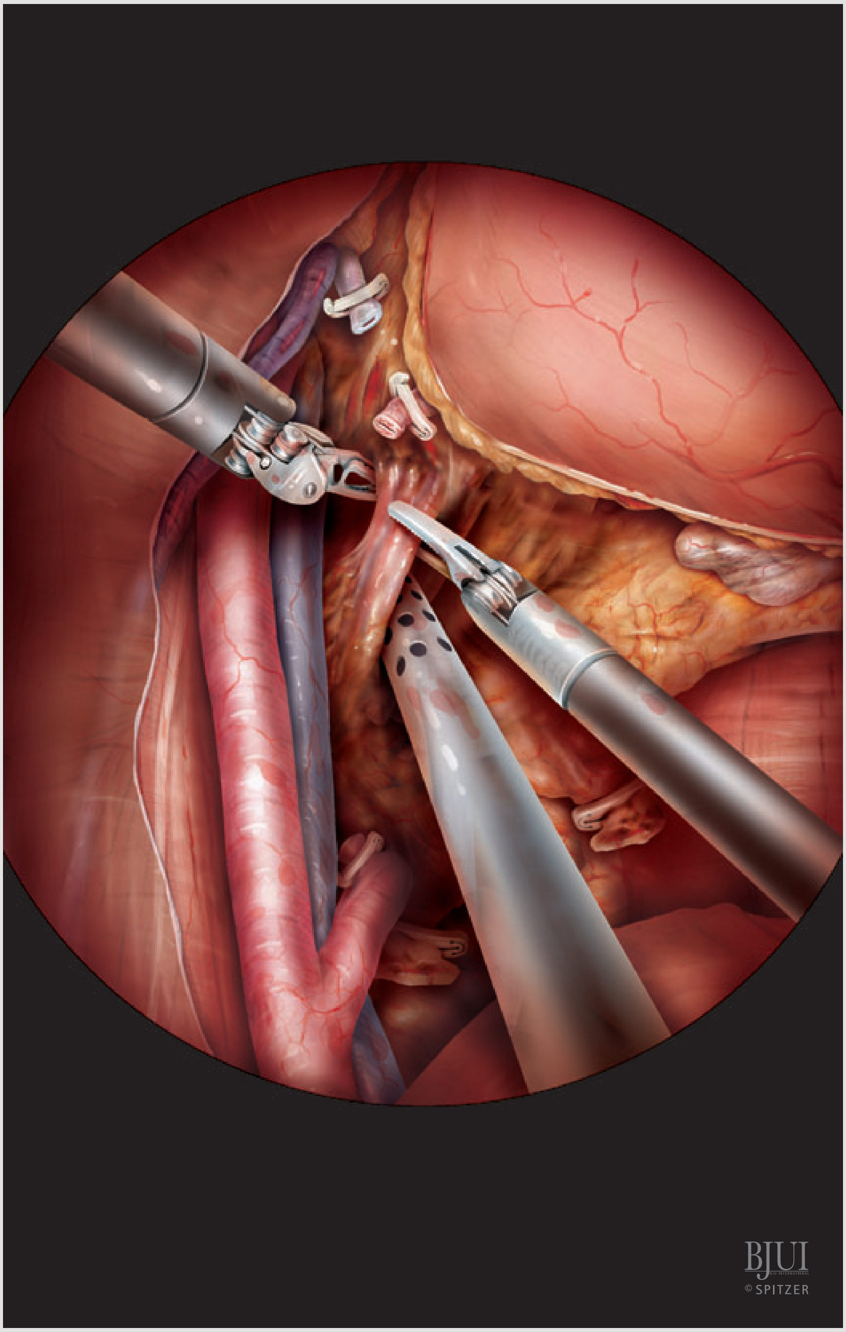
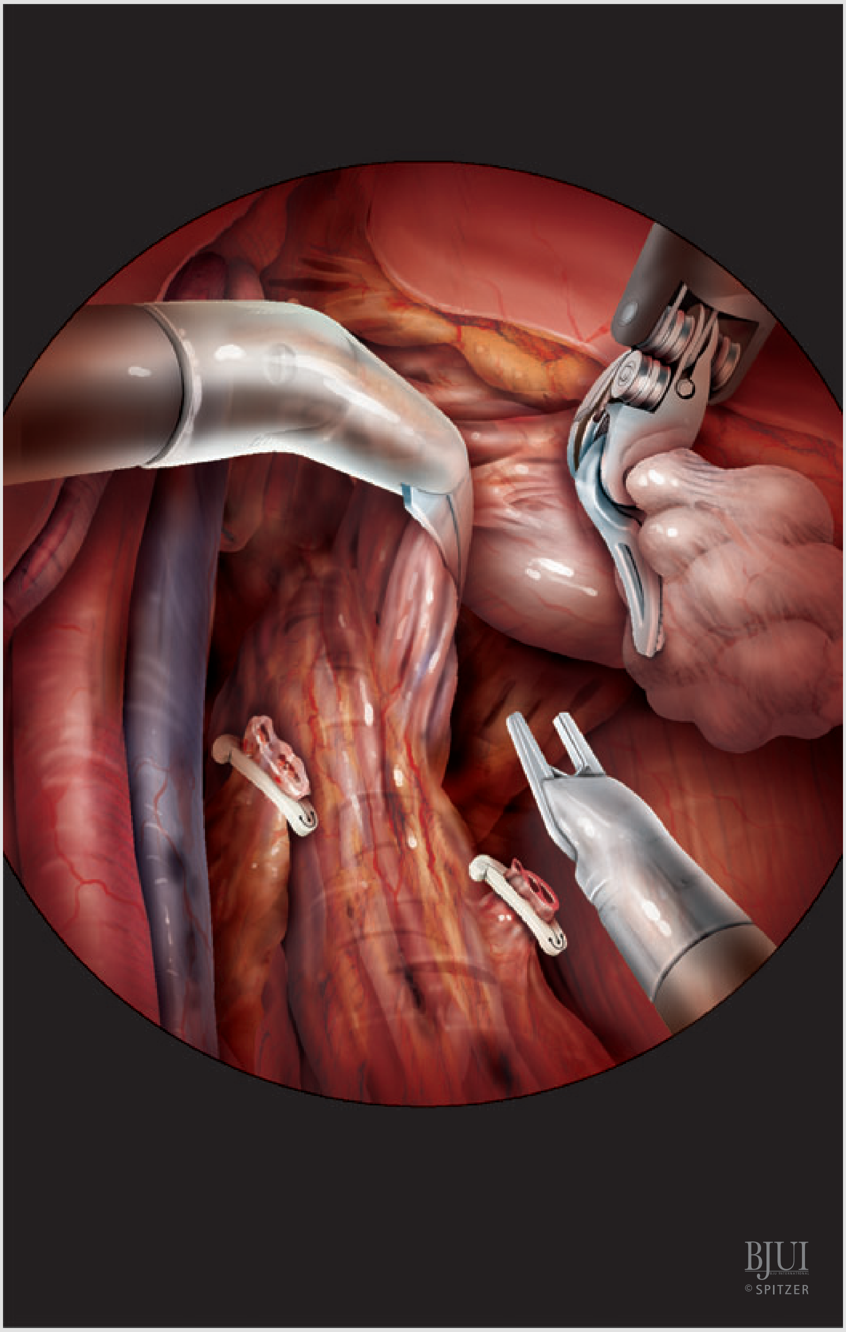


Figure 12

In a nerve-sparing procedure, the dissection is continued up to the tip of the seminal vesicles. The tissue lateral to the vesicles and bladder neck is preserved. Care is taken to avoid thermal energy, and therefore, cold dissection is used with clipping of the vessels using the Hem-o-lok and the 5 mm metallic clips.



ANTERIOR DISSECTION

Figure 13

The aim of this dissection is to drop the bladder posteriorly, as is done in da Vinci prostatectomy, to gain access to the space of Retzius. The peritoneum is incised anteriorly through the medial umbilical ligaments and the urachus, just below the umbilicus. The bladder is dropped, as is done in da Vinci prostatectomy.

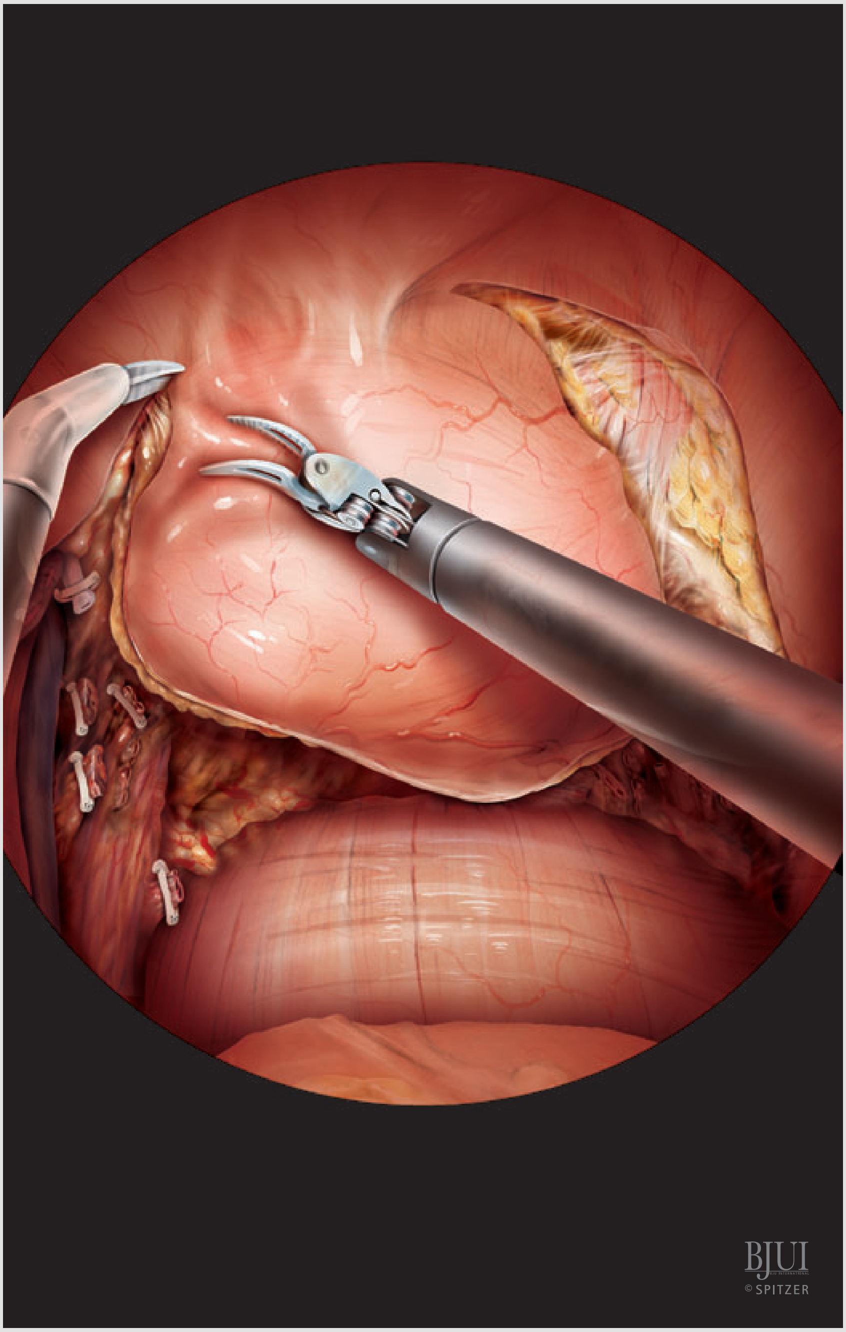
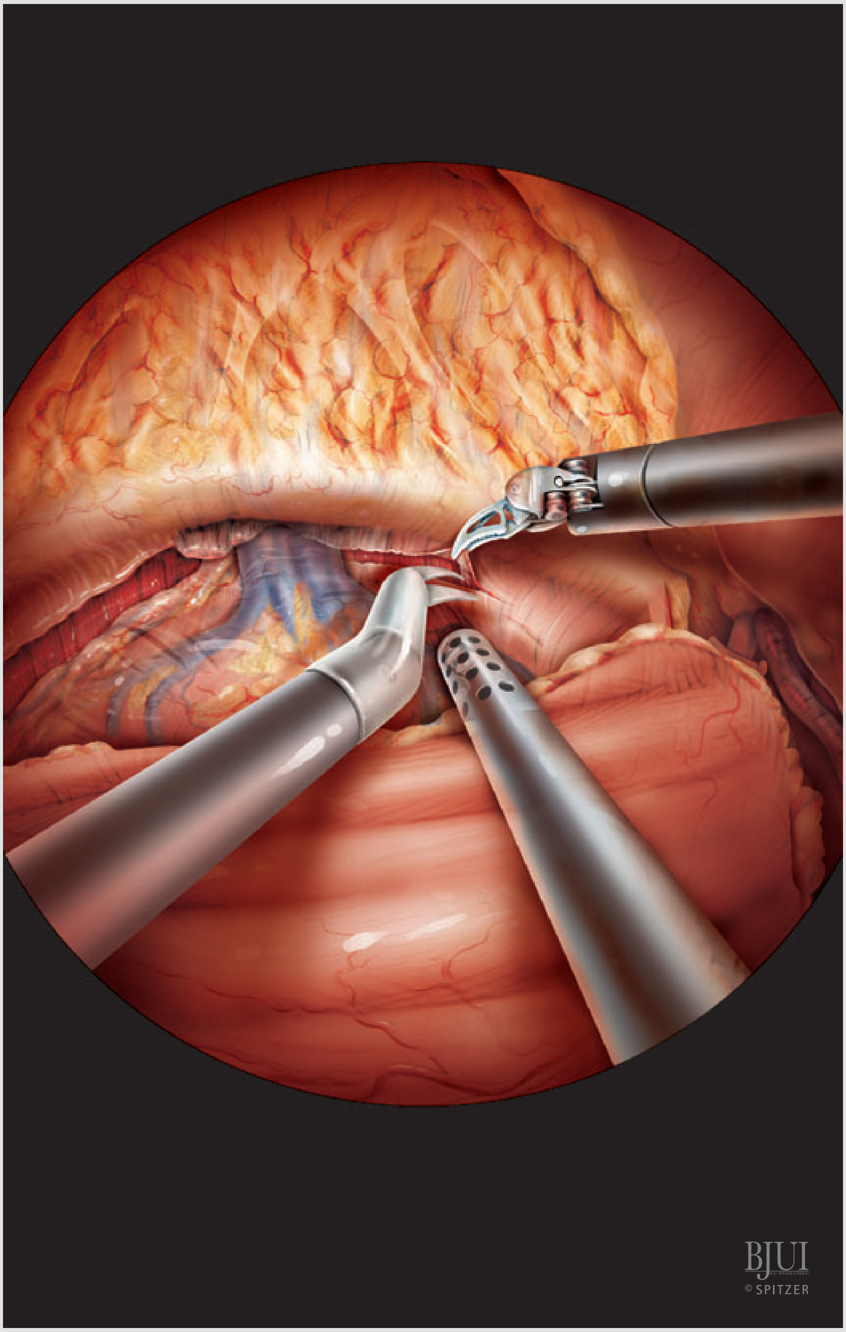


Figure 14

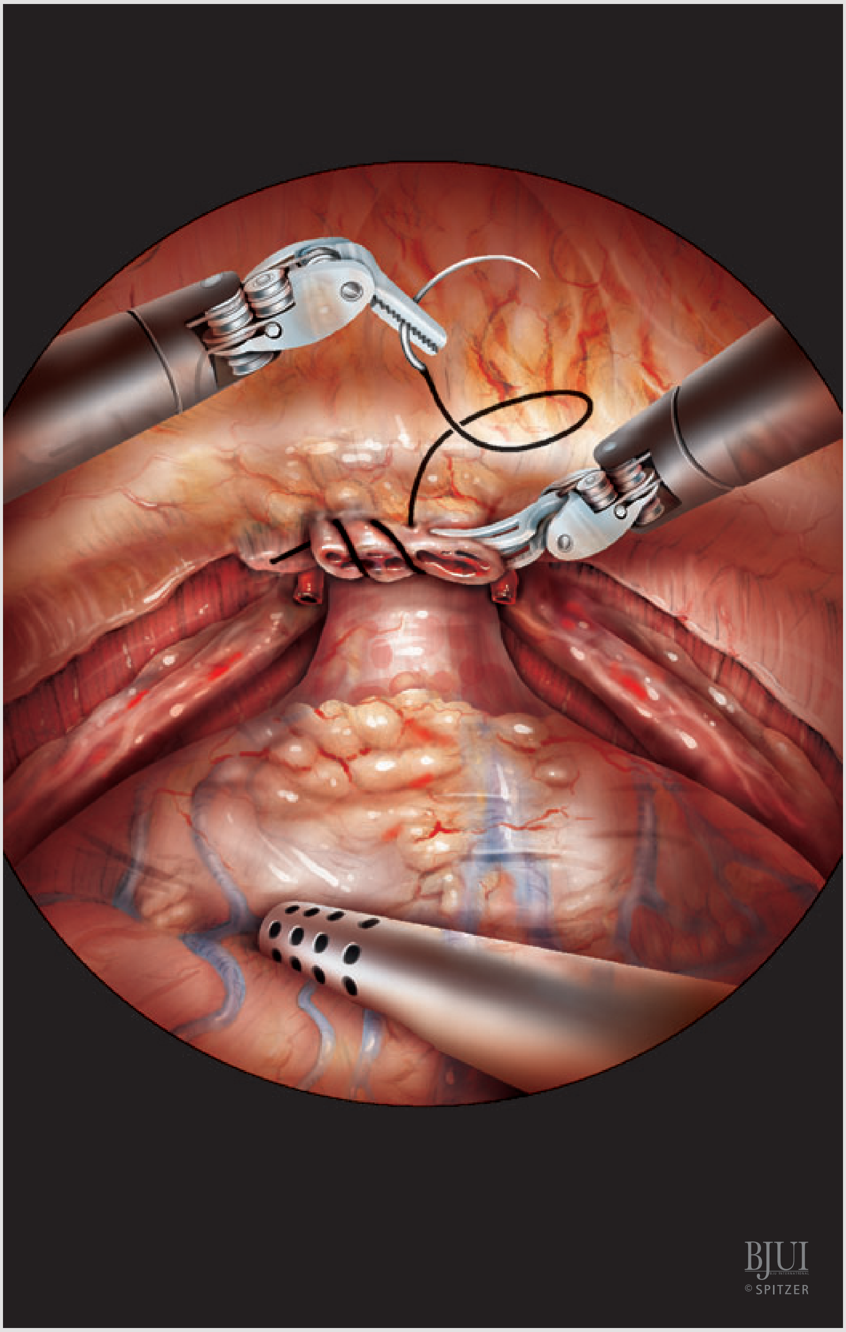
The endopelvic fascia is identified and incised bilaterally. The levator muscle fibres are gently pushed away from the lateral side of the bladder.



DORSAL VENOUS COMPLEX (DVC) AND APICAL DISSECTION

Figure 15

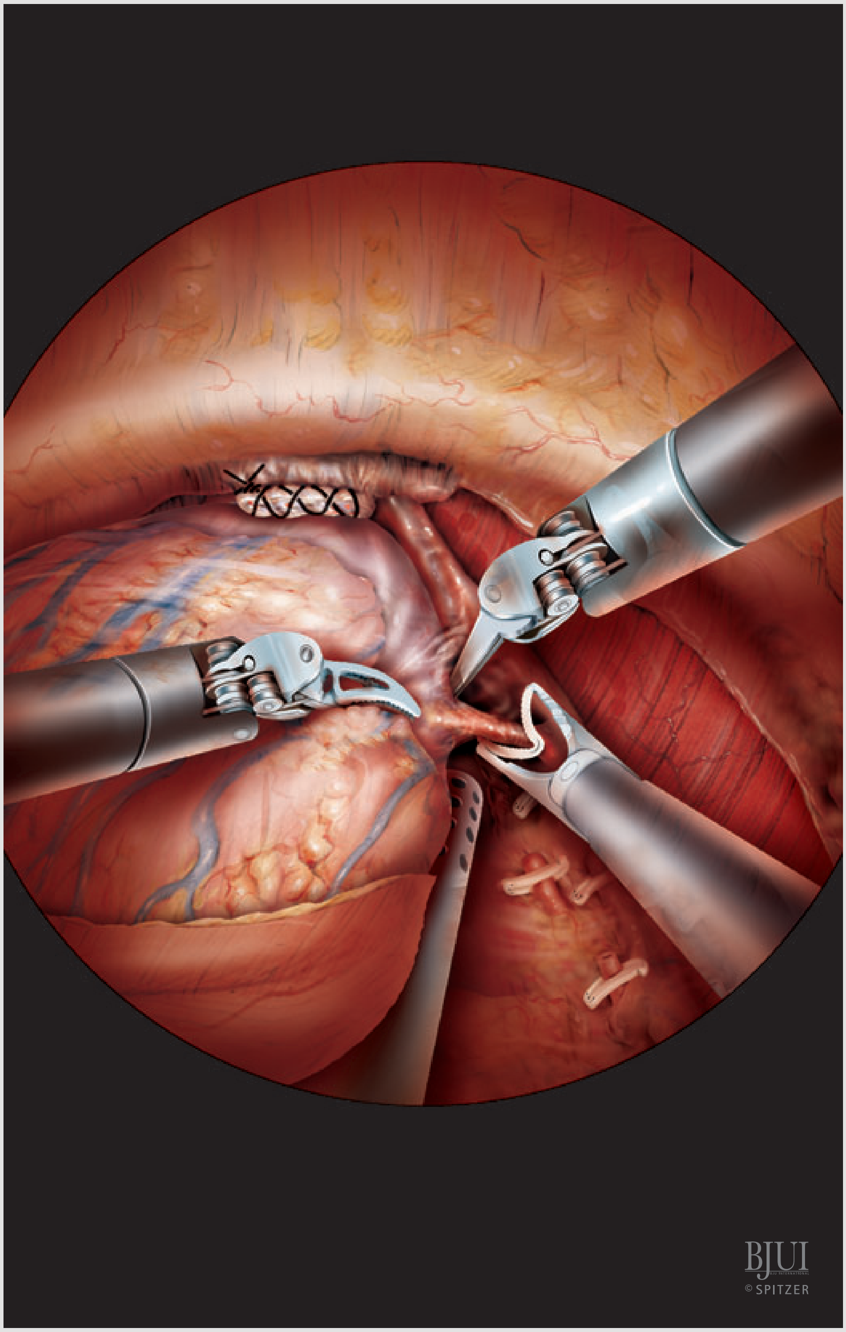
The DVC is incised cold; to avoid venous bleeding, the intra-abdominal pressure is brought to 20 mmHg and the assistant is forbidden to aspirate. During incision of the DVC, two arteries are mostly encountered that are secured with monopolar coagulation. The anterior contour of the prostate is followed until the apex is reached. All periurethral tissue is cut to gain as much urethral length as possible. The DVC is now secured with a running suture of poliglecaprone 25 2/0 and the intra-abdominal pressure is lowered again.



THERMAL BILATERAL NERVE-SPARING TECHNIQUE

Figure 16

Nerve-sparing in da Vinci RRC is done in the same way as in the da Vinci prostatectomy. Care must be taken to avoid thermal energy and traction injury to the neurovascular bundles. The prostate and bladder are retracted laterally and superiorly to expose the contralateral prostatic pedicle. The pedicle is secured with clips and sharply divided with cold scissors. The contralateral pedicle is secured and nerve preservation is performed in a similar manner. The periprostatic tissue is preserved (Veil of Aphrodite).

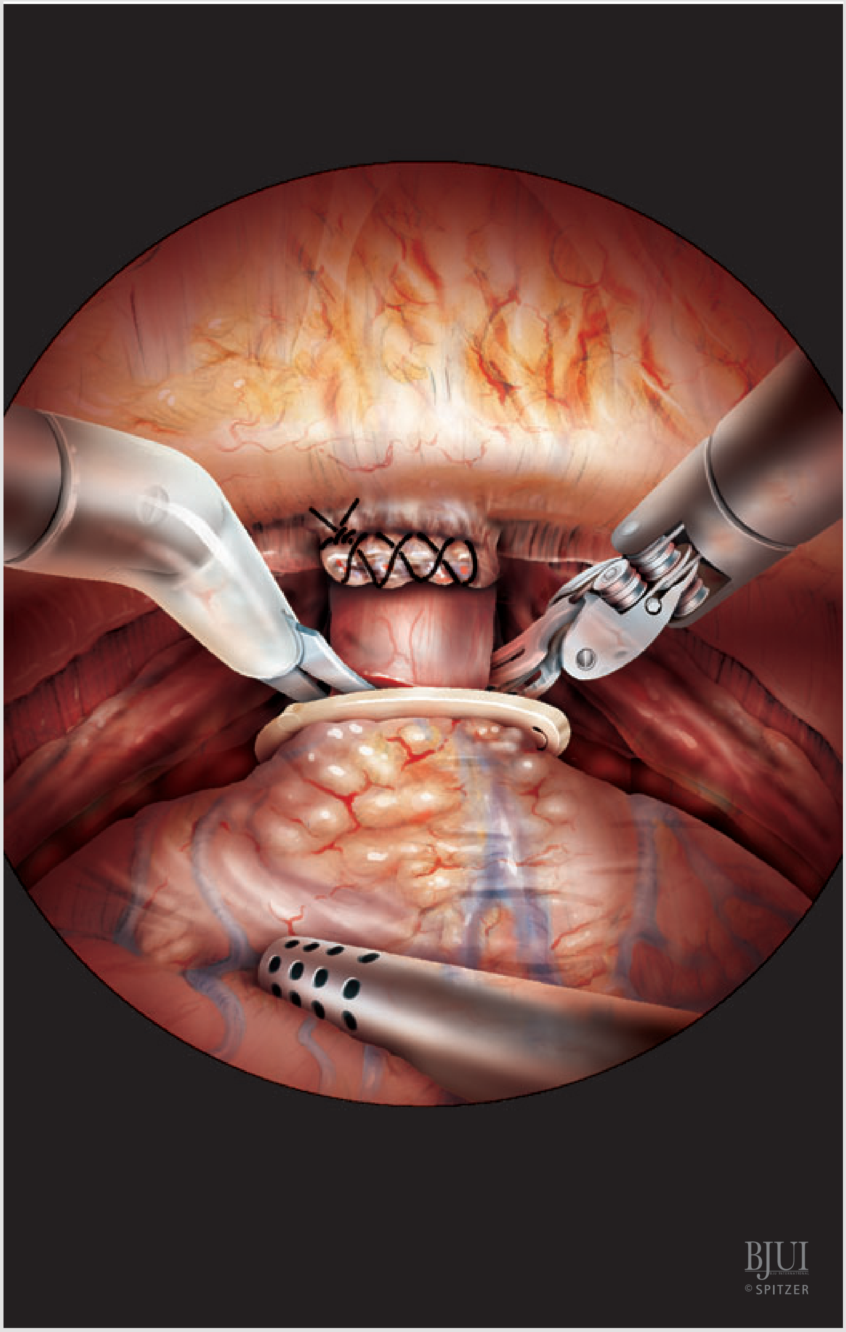


TRANSECTION OF THE URETHRA

Figure 17

The membranous urethra is now completely isolated. The catheter is withdrawn and a large Hem-o-lok clip is placed on the urethra just next to the apex of the prostate, to avoid possible urinary spillage that could be contaminated with tumour cells. The urethra is then cut. The specimen is put in a large Endocatch bag coming from the enlarged opening of the right lateral assistant port opening. The bag is closed and pushed in the upper abdomen until the end of the operation. It is then retrieved through a midline supra-umbilical incision.

Urinary diversion can then be performed intra- or extracorporeally. Two drains are placed in the pelvis.



POSTOPERATIVE CARE

After completing the procedure, all patients undergo routine care according to our RC care pathway. During the first 24 h patients receive paracetamol 1 g per 4 i.v., ketorolac 30 mg per 3 i.v. and piritamide 20 mg per 4 i.m. for pain control. Subsequently, during the first 5 days the pain is controlled with paracetamol 1 g per 4 i.v. The nasogastric tube is removed when flatus starts. Parenteral nutrition is commenced from the first day after RRC for 4–5 days. The patient can then begin solid nutrition. The drains are normally removed after 3 days, when the drainage id <100 mL. On the eighth day the ureteric catheters are removed. Patients are discharged once they are fully ambulant and tolerate oral nutrition. Serum creatinine and electrolytes are measured before hospital discharge.

FROM SURGEON TO SURGEON

There are not too many urological contraindications for this kind of surgery. However, proper patient selection is vital. It is not safe to use RRC in patients with advanced bladder cancer (>T2), or in those with gross lymphadenopathies on the preoperative radiological examination. The oncological result with this kind of pathology remains unclear, but there is the theoretical risk of early recurrence or port metastasis due to the pneumoperitoneum whenever there is direct tumour contact.

Obesity can make the procedure more difficult because of the increased resistance on the robotic arms.

In our most difficult case the patient had chronic cystitis due to previous prostatic radiotherapy. In this case all tissue was very fibrotic and the planes were difficult to detect.

Correct port positioning and robot docking are crucial to the successful outcome of this procedure. To avoid robotic arm collision, they should be ≥8 cm from the camera port. The fourth arm with the Pro-grasp device is very helpful and simplifies the procedure by allowing us to obtain precise traction. The use of Pk Gyrus and Hem-o-lock clips is important to obtain a good haemostasis, especially on the vesical pedicles.

We also consider it very important to have a surgeon with advanced laparoscopic skills at the surgical table for the correct detection of the right dissection plans and the usage of all instruments needed during the procedure.

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Abbreviations: **(R)RC**, (robotic) radical cystectomy; **DVC**, dorsal venous complex.