

Surgery Illustrated – Surgical Atlas

Robotic neobladder

N. Peter Wiklund and Vassilis Poulakis*

Department of Molecular Medicine and surgery section of Urology, Karolinska Institutet, Stockholm, Sweden

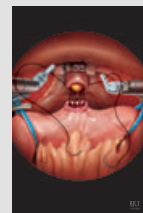
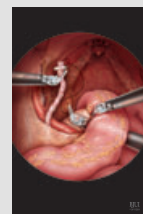
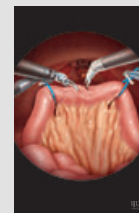
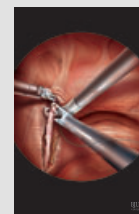
**Department of Urology, Doctors' Hospital, Athens, Greece*

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INTRODUCTION

During the past 5 years robotic radical cystectomy (RRC) with extended pelvic lymphadenectomy has developed from 'experimental surgery' to an option of 'standard care' at medical centres with installed robotic systems trying to copy the successful route of robotic radical prostatectomy as the 'preferred method' of treatment for bladder cancer [1]. At present, orthotopic reconstruction as the preferred method of urinary diversion remains the most challenging issue when reconstruction is performed laparoscopically or robotically. Despite initial enthusiasm, the laparoscopic neobladder has been abandoned because of its complexity and complications [2].

The arrival of robotic technology to assist in complex laparoscopic procedures has revolutionized minimal invasive surgery. Using the technological advantages of the da Vinci® Surgical System (Intuitive Surgical Inc., CA, USA), it is possible to perform intracorporeal ileal neobladder according to modern recommendations for construction of an orthotopic bladder substitute. Particularly the increased degrees of freedom using EndoWrist® technology, the improved depth perception with three-dimensional (3D) vision, and the ergonomic surgeon's position in a long-standing and time-consuming operation appear likely to reduce the difficulties associated with certain steps of laparoscopic reconstruction of a neobladder. Furthermore, overcoming the learning curve and using some special tips and tricks, it is possible to achieve a reasonable operative duration of 3–4 h. Under this aspect, robotic neobladder could become an attractive option and complete RRC with a robotically made neobladder, using



the entire spectrum of the potential benefits of minimal invasive surgery.

PLANNING AND PREPARATION

INDICATIONS AND CONTRAINDICATIONS

The indications for robotic neobladder are the same as those for open orthotopic bladder replacement [3,4]. Therefore, any patient who requires urinary diversion after a RRC is a candidate for this procedure.

There are certain contraindications to constructing an orthotopic bladder substitute. However, the most important factor for a successful long-term outcome is patient compliance with the indefinite follow-up. Adequate mental capacity for comprehension of the nature and function of a neobladder and basic physical dexterity are required. If these prerequisites cannot be guaranteed, an alternative form of diversion should be selected. The postoperative management of patients with an orthotopic neobladder, including continuing education by specialized medical staff, is more crucial than the actual robotic construction if satisfactory long-term functional results are to be achieved.

Given adequate robotic expertise, all patients who have undergone RRC are suitable candidates for robotic neobladder. Absolute contraindications are:

- In cases of bladder cancer, the concomitant presence of urethral cancer or preoperative paracolicular biopsies showing tumour at the future anastomotic margin.
- Poor renal function with elevated serum creatinine (>2.6 mg/dL) after relief of renal obstruction.
- Major insufficiency of liver function.
- Chronic inflammatory bowel disease (Crohn's disease, ulcerative colitis) or extended previous bowel resection or radiotherapy.
- Incontinence caused by urethral rhabdosphincter insufficiency.

PATIENT SELECTION

During early experience of robotic neobladder, proper patient selection is one of the most important factors for successful outcome to minimize complications, improve surgical dexterity and efficiency. Therefore, during the initial learning experience, robotic neobladder should be reserved for non-obese patients with probably no intra-abdominal adhesions

caused by previous operations and with organ-confined, non-bulky bladder malignant disease.

SPECIFIC PATIENT PREPARATION

Because ileum resection and anastomosis is performed intracorporeally under continuous gas flow of pneumoperitoneum, the dissemination of enteric material in the closed abdomen could be crucial. Thus, we still routinely use mechanical (with polyethylene glycol and a liquid diet of 4–5 L) and antibacterial bowel preparation the day before surgery. Fasting overnight with administration of i.v. fluids to provide good hydration is required. All patients receive a prophylactic dose of heparin (low molecular weight adjusted to the body weight of patient) the evening before surgery and every 24 h thereafter until ambulation. To prevent formation of postoperative pelvic lymphocele, s.c. prophylaxis for deep vein thrombosis should be applied in the upper body (in deltoid muscle area). Patients are shaved from the nipples to the mid-thighs just before surgery. A parenteral antibiotic prophylaxis is commenced, when the procedure begins. The antibiotic treatment is continued for 72 h.

SPECIFIC EQUIPMENT AND MATERIALS

EQUIPMENT AND MATERIAL REQUIRED FOR ROBOTIC NEOBLADDER

Robotic equipment (da Vinci)

- Three (for four-arm robotic system) or two (for conventional three-arm device) trocars (8 mm)
- 0° 3D laparoscope
- Hot Shears™ (monopolar curved scissors)
- Maryland bipolar forceps
- Two large needle drivers
- Two Cadere™ forceps

Laparoscopic equipment

- Two trocars (12 mm)
- One trocar (15 mm)
- One trocar (5 mm)
- 5-mm endoscopic long suction irrigator (45 mm)
- 5-mm endoscopic scissors
- 5-mm endoscopic hook
- 5-mm endoscopic locking grasper
- 5-mm endoscopic needle driver
- 10-mm Lapra-Ty® (Ethicon Inc., Somerville, NJ, USA) absorbable suture clip applier

- Laparoscopic staplers Endo-GIA™ Universal 12 mm with blue straight staple magazines of 60 mm in staple line length and 3 mm in open staple size (Tyco Healthcare, Norwalk, CT, USA) for anastomosing the ileum

ENERGY SOURCES/HAEMOSTATICS

- Monopolar/bipolar electrocautery
- 10 mm Hem-o-lok
- Ligasure® (Covidien, USA)

SUTURE MATERIALS

2-0 polyglycolic acid suture (without needle) at 10 cm knotted at Hem-o-lok clip using as stay suture for the ligated ureter.

3-0 monofilament synthetic absorbable sutures (Glycomer™, Biosyn™) with CV-25 needle (half-circle, 22 mm diameter) for reservoir formation. Alternatively, 3-0 poliglecaprone 25 (monofilament synthetic absorbable suture, Monocryl™, Ethicon Inc.) with SH needle (half-circle, 26 mm diameter). Four to five of these sutures are cut at 25 cm with a Lapra-Ty suture clip at the end secured by a suture double knot.

3-0 monofilament synthetic absorbable suture (Biosyn) with CV-25 needle for urethral anastomosis. Alternatively, 3-0 poliglecaprone 25 with RB-1 needle (half-circle, 17 mm diameter). Two sutures of these are knotted at 18 cm each to make a urethral-reservoir anastomosis according to the technique of van Velthoven *et al.* [5].

4-0 monofilament synthetic absorbable suture (Biosyn) with CV-25 needle for anastomosing the ureters to the afferent tubular segment. The Wallace plate of both ureters, are anastomosed to the afferent tubular segment according to the technique of van Velthoven *et al.* [5] using two sutures that are knotted at 18 cm each.

OTHER MATERIALS

- Two long mono-J ureteric stent 7 F with guided wire (Bander Ureteral Diversion Stent Set, Cook Urological, Inc., Spencer, IN, USA)
- Neobladder urethra catheter 22 F
- Nephrostomy puncture needle 18 G
- Fascia dilatation bougie 8 F
- Silicon vessel loops (Sterion® Surgical, Caledonia, MI, USA) alternative nylon tape (Ethicon Inc., USA)

Figure 1a

Specific patient positioning. Because of the possible long operative duration, the patient set-up is important to prevent compartment syndromes, neural plexus lesions and hypothermia. The patient is placed supine on the operating table. The head and shoulders are protected by anatomic pillows. Great care is taken to adequately pad and support the patient to avoid neuromuscular injury. Elastic cotton drapes are wrapped around the upper and lower extremities, and special warm-air blanket covers the patient's chest and face to avoid hypothermia. A metallic bar supported at the operation table is placed just over the patient's head and shoulders to protect the head from the robotic camera and arms, and to avoid any interference with the endotracheal tube.

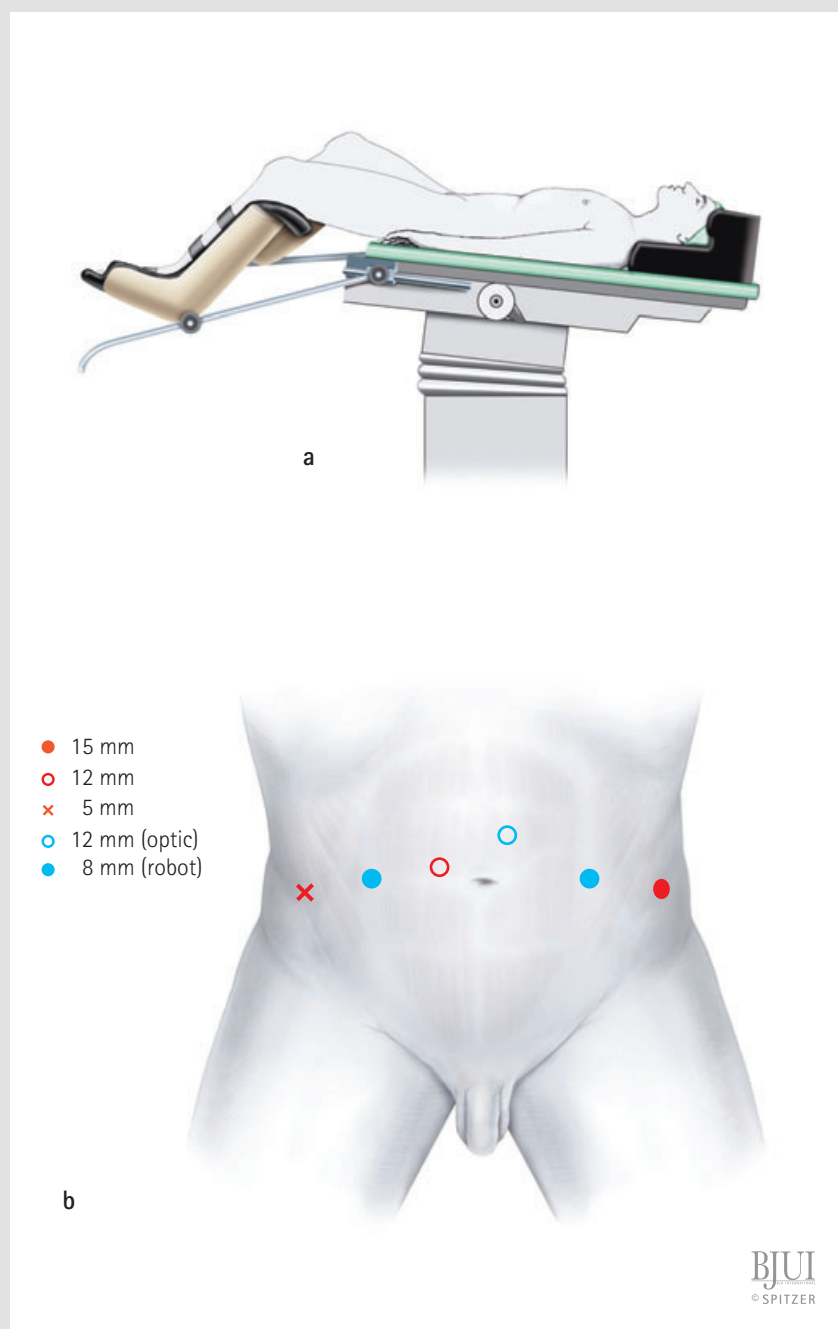
After the induction of general anaesthesia, the patient's arms are tucked at the body sides and the legs are placed in special boots. Because the robot is placed between the patient's legs, these should be positioned separately to facilitate the robot docking. The hips and knees are only slightly flexed to reduce the distance between the mesentery root and os pubis, facilitating a tension-free approximation of ileal loop to the urethra stump. Additionally, the operating table is positioned almost horizontally (0–5°), contributing to the performance of tension-free urethral-neobladder anastomosis and helping to keep the small bowel contents in the epigastrium.

The entire procedure could be performed using any da Vinci system but da Vinci-S HD system with four arms or higher is preferred, because using the new systems, the trocars may be placed higher and relatively independent from patient's somatotype. After completing RRC and lymphadenectomy, the specimens are placed separately in special retrieval bags and left in the upper abdomen until the end of robotic neobladder reconstruction.

During RRC and lymphadenectomy, the patient is placed in a steep Trendelenburg position. When commencing the robotic neobladder reconstruction, the patient is placed back in an almost horizontal position, parallel with the floor.

Figure 1b

The positions of the ports, which are placed at the beginning of the robotic procedure, are as follows:



- First, a 12-mm optic port is placed 3–5 cm above the umbilicus and 1–2 cm left of midline, depending on the length of the patient;
- at the umbilicus level two robotic 8-mm ports are placed symmetrically on the left and right pararectal line;
- in case of absence of a fourth arm, a 15-mm port is placed up from the iliac crest on the left side for insertion of a large Endo-Catch™ II (Tyco Healthcare, Norwalk, CT, USA)

device for retrieval of a cystoprostatectomy specimen and of Endo-GIA for making ileal anastomosis. If a da Vinci device with a fourth arm is used, a double cannulation for the 8-mm robotic port is performed through the 15-mm trocar;

- a 5-mm port up from the iliac crest on the right side;
- a 12-mm port at the right side between the optic and the 8-mm port, for insertion of Lapra-Ty applier.

SURGICAL PROCEDURE

Figure 2

Putting stay clip suture at the ureters after their ligation during RRC. To facilitate the handling of the ureter during the ureteroenteric anastomosis, the ureters are clipped with Hem-o-lok clips, which are knotted at their corner with a suture. This also prevents direct manipulation of the ureter with the robotic instruments, which may cause ureteric lesions.

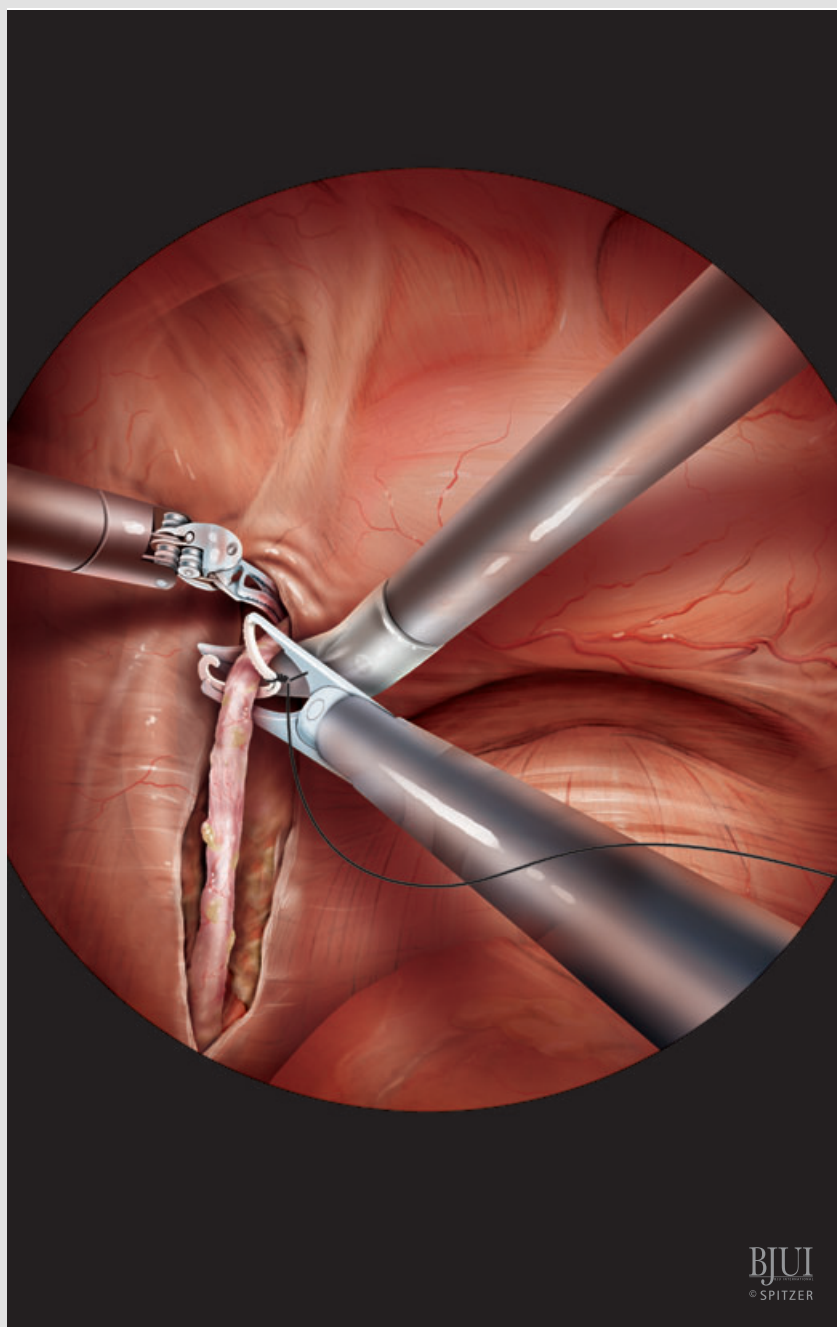
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Figure 3

Passing the left ureter to the right side under the mesosigmoid. After completion of RRC and lymphadenectomy, the presacral area under the mesosigmoid is already prepared, as the lymph nodes below the aortic bifurcation are removed at both sides. The robotic Cadieere forceps are passed under the sigmoid from the right to left side. The left ureter is held by the stay suture and brought to the right side.

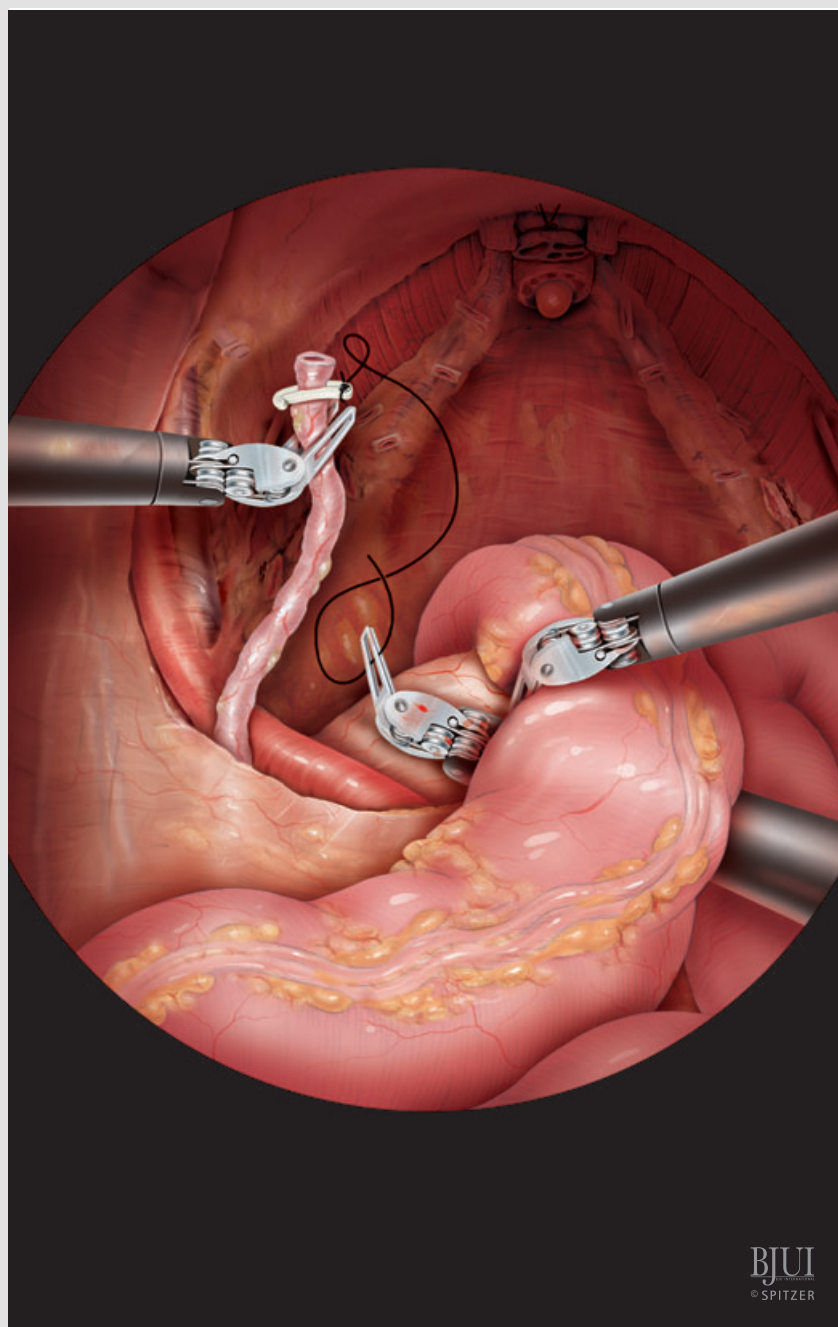
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Figure 4

Overview of the subsequent steps.

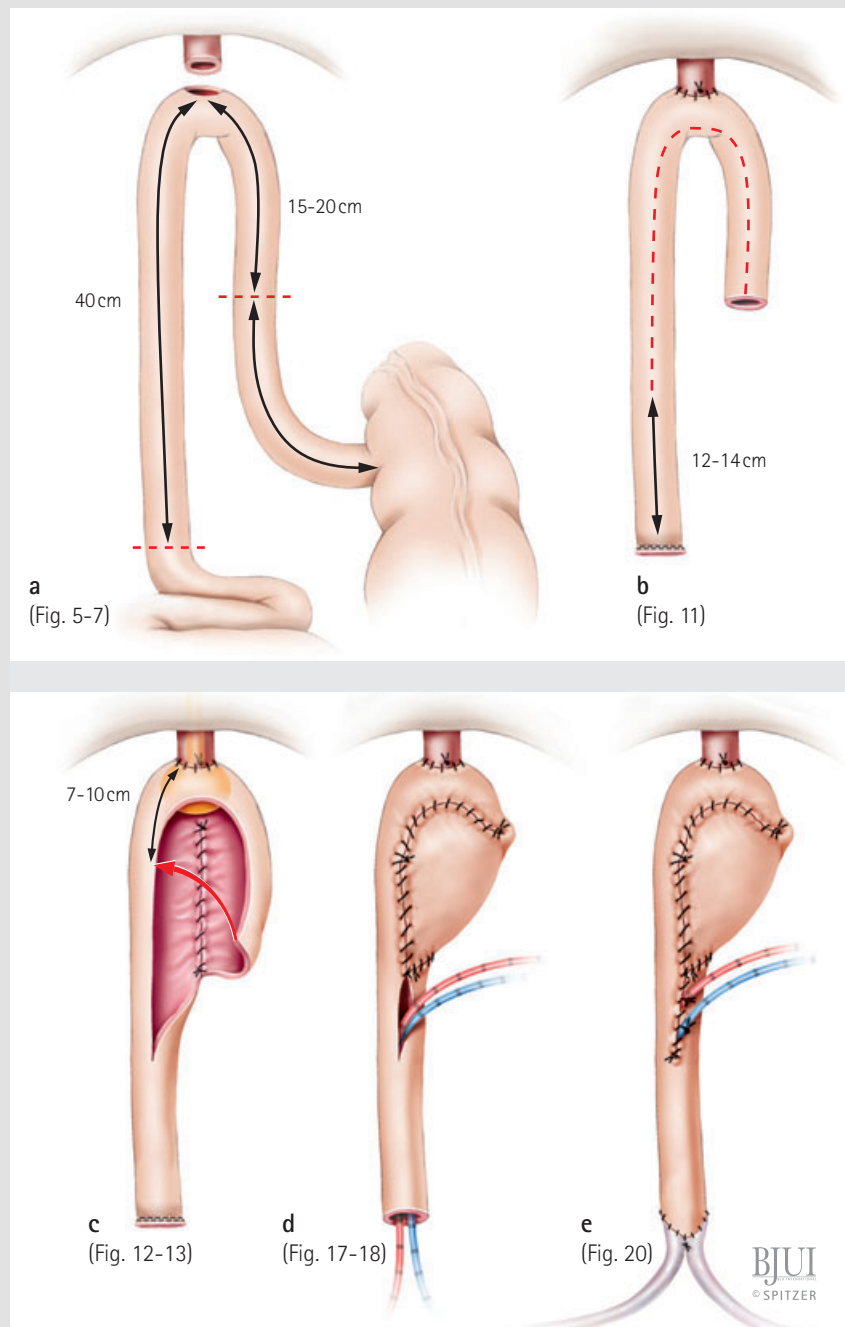


Figure 5

Isolation of terminal ileum loops.

An ileal loop with a distance of at least 35–40 cm from its tip to the caecum is selected and brought down to the urethra. Adhesions that may make the mobilization of intestine difficult must be freed using sharp or blunt dissection. To assist the retraction of ileum, two vessel loops are passed around the intestine through the mesentery with the tip of ileum loop, which will be anastomosed with the urethra in the middle between the vessel loops. These vessel loops are held by the Cadere robotic forceps. At the tip of the U-shaped ileal loop, a small incision (1.5–2 cm long) is made with the robotic scissors.

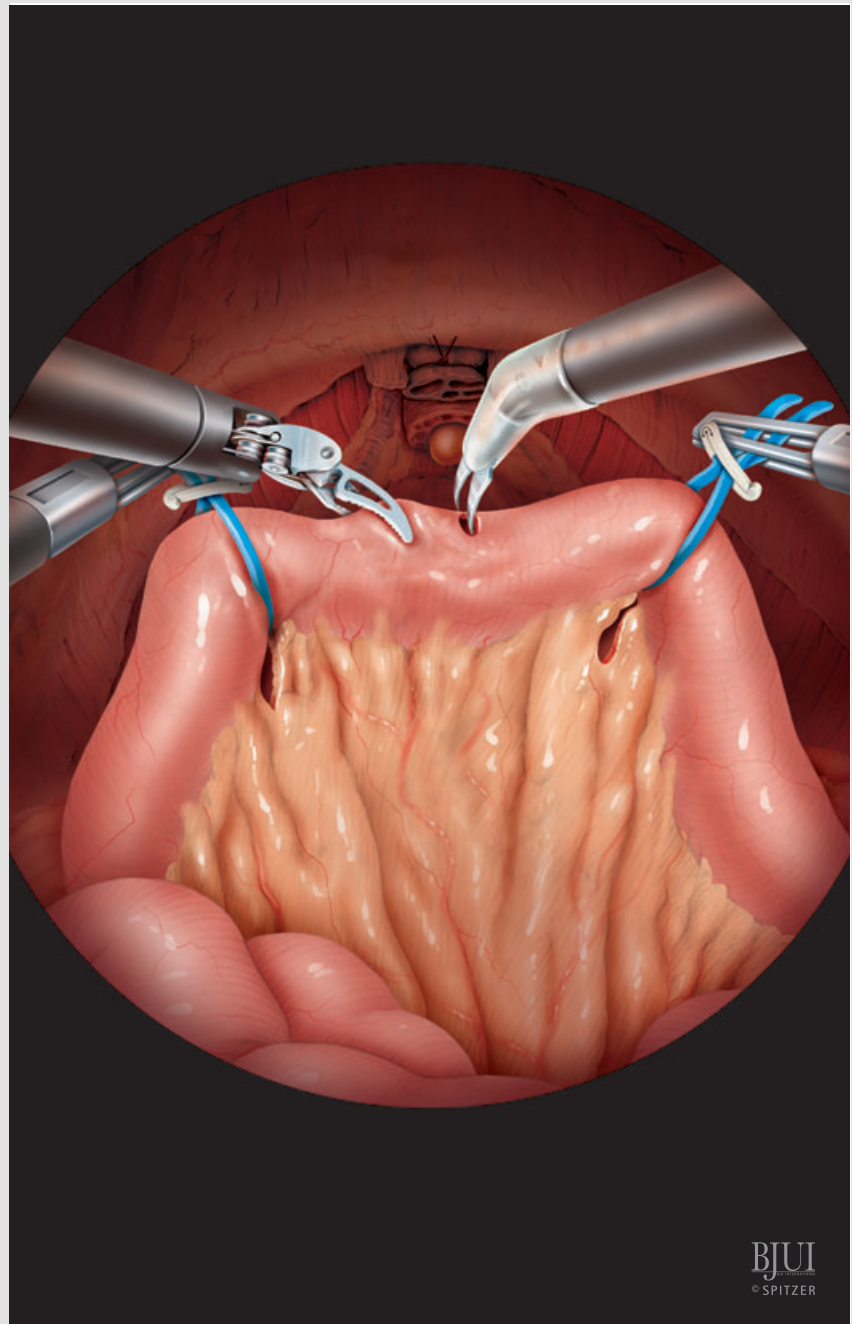
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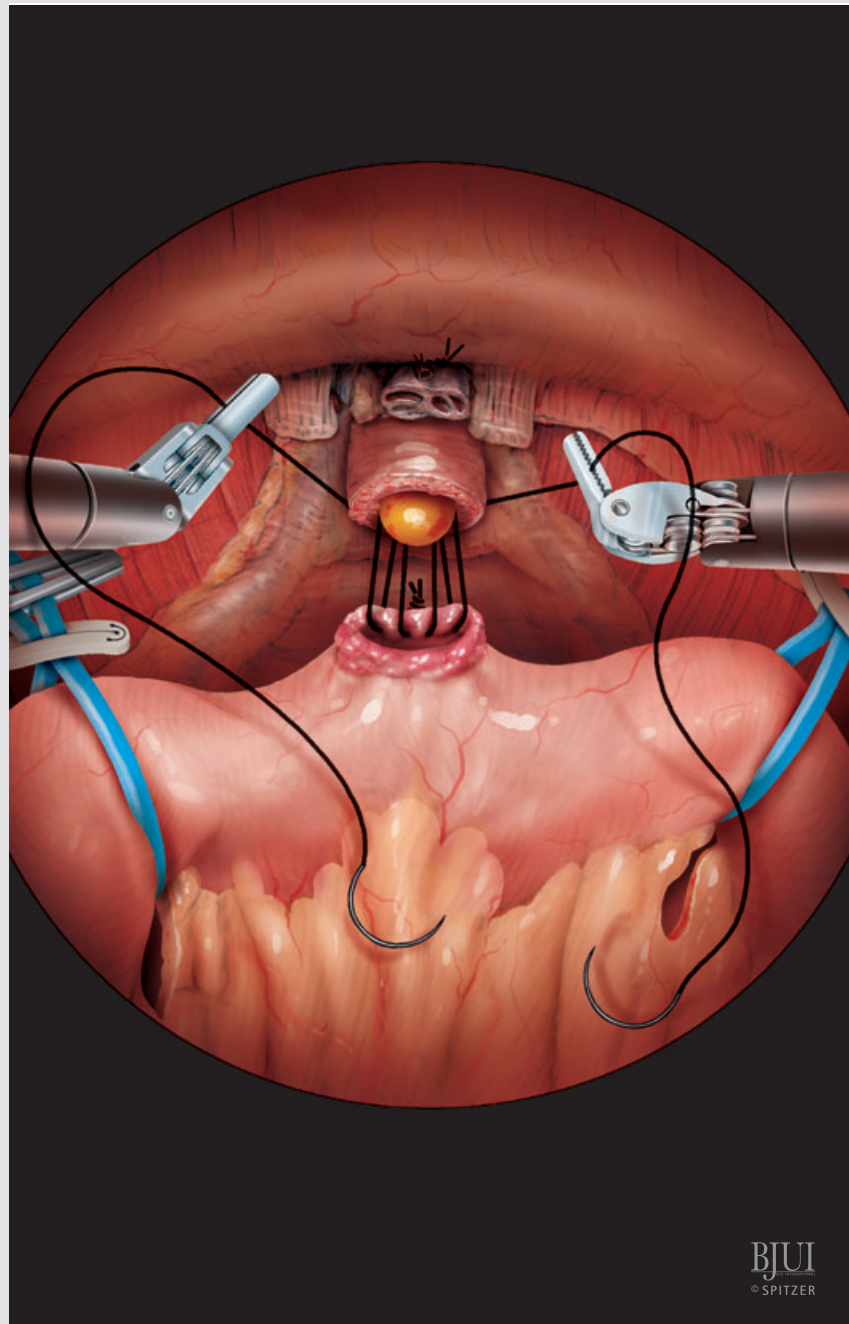
Figure 6

Making the urethral–neobladder

anastomosis. The technique of urethral–reservoir anastomosis used is a slight modification of that described by van Velthoven *et al.* [5]. The running anastomosis suture is prepared by tying two 3-0 monofilament absorbable sutures on a half-circle needle, 18 cm long, back-to-back. Doing so, a double-armed suture with a pledget of knots is made. Both sutures are dyed because, in our experience, no special identification purpose for the left and right suture is needed. A sponge stick and perineal pressure, if needed, may be applied during the initial throws of the suture.

The running suture is started by placing both needles outside–in through the intestine opening, which will act as the neobladder neck. One needle is placed at the 5:30-o'clock position and the other needle at the 6:30-o'clock position and, in doing so, the knot sits at the 6-o'clock position on the posterior neobladder neck. The urethral 'bites' are made inside–out, at the corresponding sites. After two such bites on each side, which cover the completed posterior aspect of anastomosis, the neobladder neck is brought down together with the major portion of ileal loop by tightening both sutures. Progressively tightening the sutures by the robotic needle drivers reduces the risk of suture cutting through the urethral stump. At this point, a 22 F neobladder catheter is placed into the intestinal loop.

The left suture can be locked and is then held by either the left-side assistant or the fourth arm, under gentle traction to prevent losing the posterior anastomosis lip. The right suture is run counter-clockwise back to the 1-o'clock position, passing the needle from outside–in at the neobladder neck to inside–out at the urethra side. At this point, the right suture is now held gently and we continue with suturing the left suture arm that is run clockwise from the 7-o'clock to the 11-o'clock position, keeping the same direction when passing the needle (e.g. from outside–in at the neobladder neck to inside–out at the urethra side). The bedside assistant moves the tip of the catheter in and out of the urethral stump to prevent involuntary suturing of the catheter. Both suture arms are tied to each other to complete the anastomosis. The catheter balloon is inflated to 5 mL.



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Figure 7

Completing the urethral–enteric anastomosis, the ileal U-shaped loop, which is going to be the orthotopic reservoir, is fixed deep in the pelvis, facilitating the performance of enteral resection and anastomosis. Doing so, a U-shaped ileal loop is formed that is fixed at the urethra on its tip and consisting of two ileum loops (e.g. the right one which leads to the ileocaecal valve and the left one which comes from the jejunum).

An intestine length of 20–25 cm from the ileocaecal valve and 15 cm from the urethral–enteric anastomosis is selected. The Endo-GIA stapler is inserted through the left 15-mm trocar. The selected point of ileum is caught between the jaws of the endoscopic stapler including 3–4 cm of its mesentery. To prevent sliding of the intestine during the firing of the Endo-GIA stapler, the bowel is held just opposite to the Endo-GIA and pushed against by the robotic Cadiere forceps.

For the reconstruction of afferent reservoir loop, a distance of ≈ 40 cm from the urethral–enteric anastomosis is selected on the left intestine loop. The same resection procedure is followed.

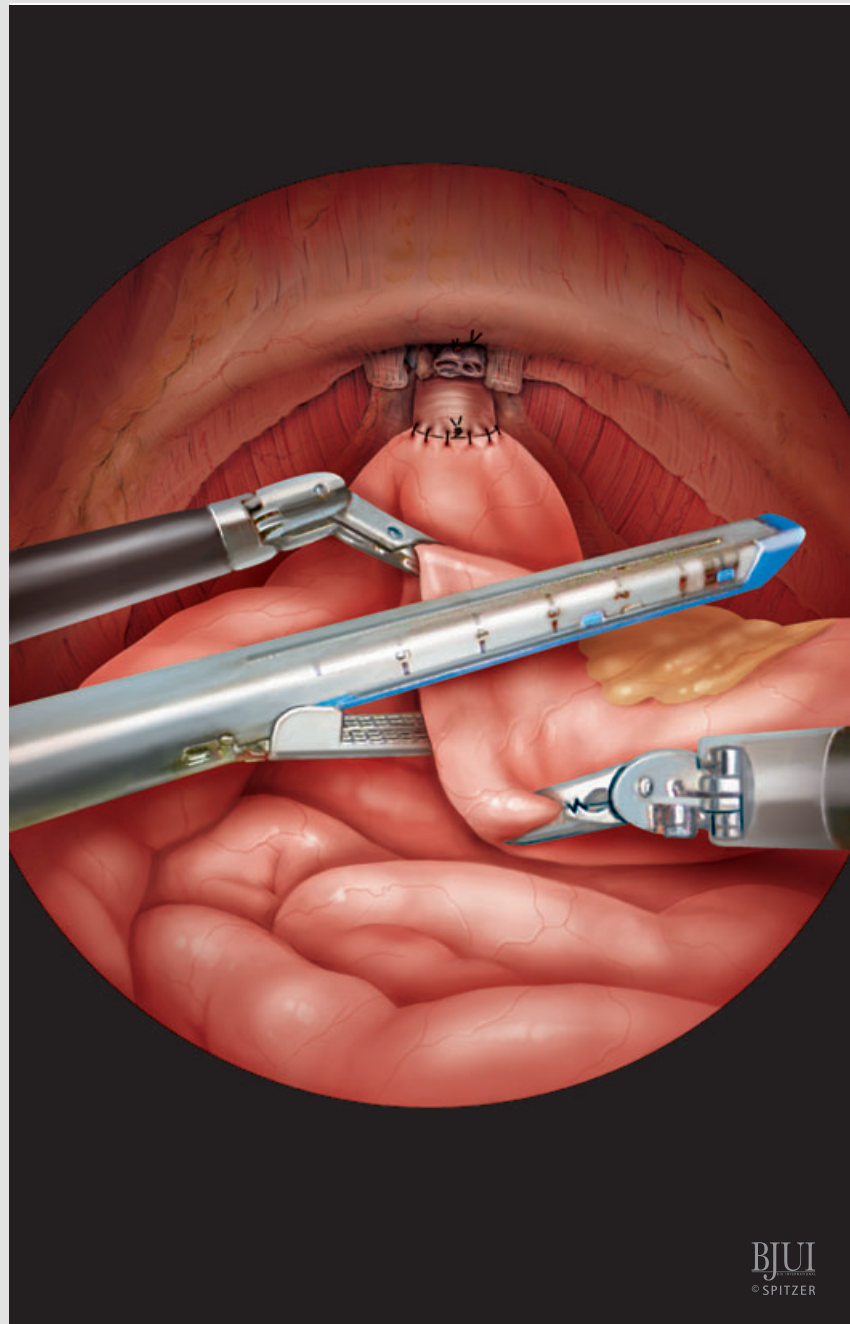
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Figure 8**Making the enteric anastomosis.**

A hole of 1 cm in diameter is made at the antimesenteric bowel border just next to the staple line by the robotic scissors.

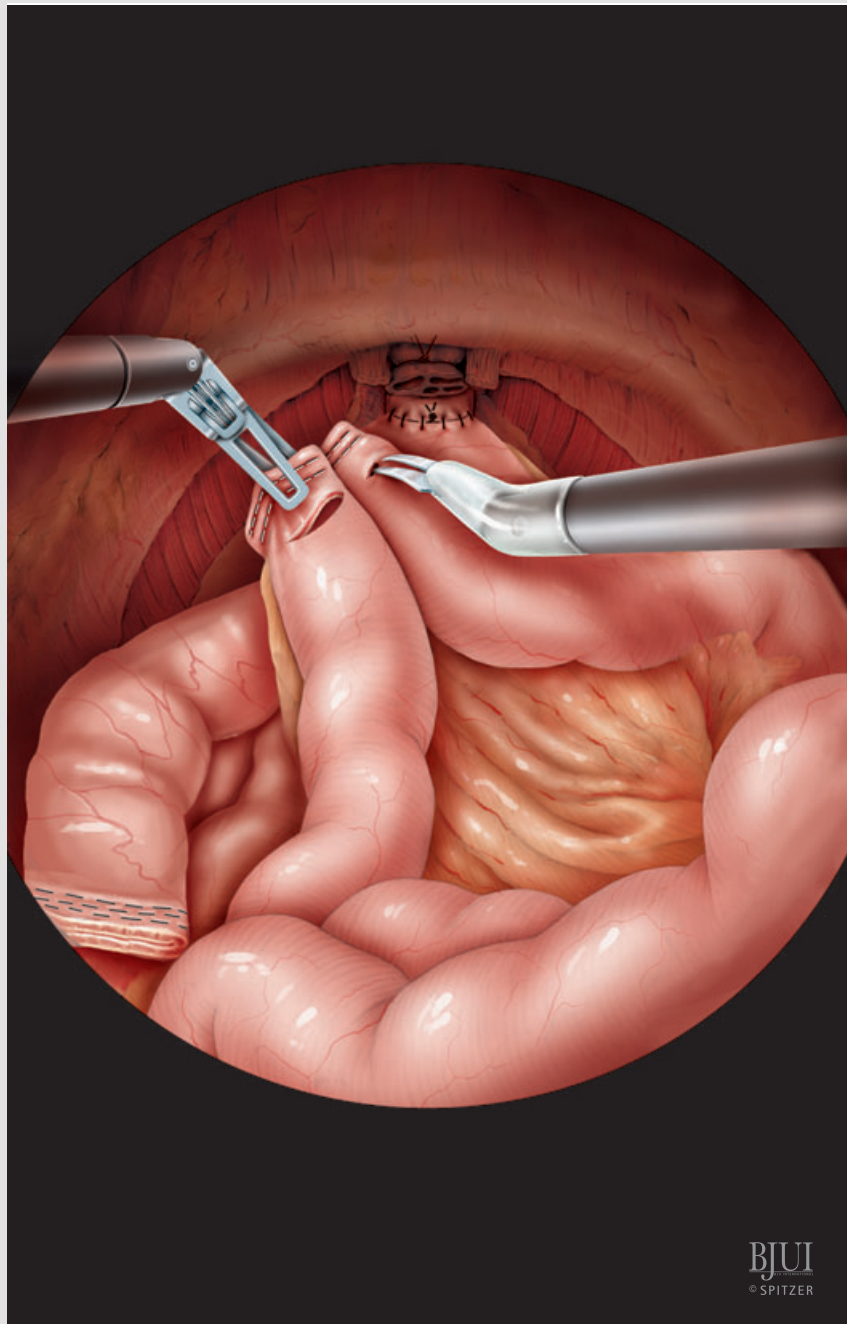


Figure 9

Through each of these two holes, the jaws of the stapler are inserted to restore the continuity of the bowel. Three points are critical when performing the stapler bowel anastomosis: (1) only the antimesenteric ileum border must be included between the jaws of stapler; (2) each jaw must be inserted completely into the ileum lumen to secure a wide intestinal anastomosis; and (3) a counter-traction must be applied to the edges of ileum by the robotic Cadieere instrument to prevent sliding of bowel during firing of the stapler.

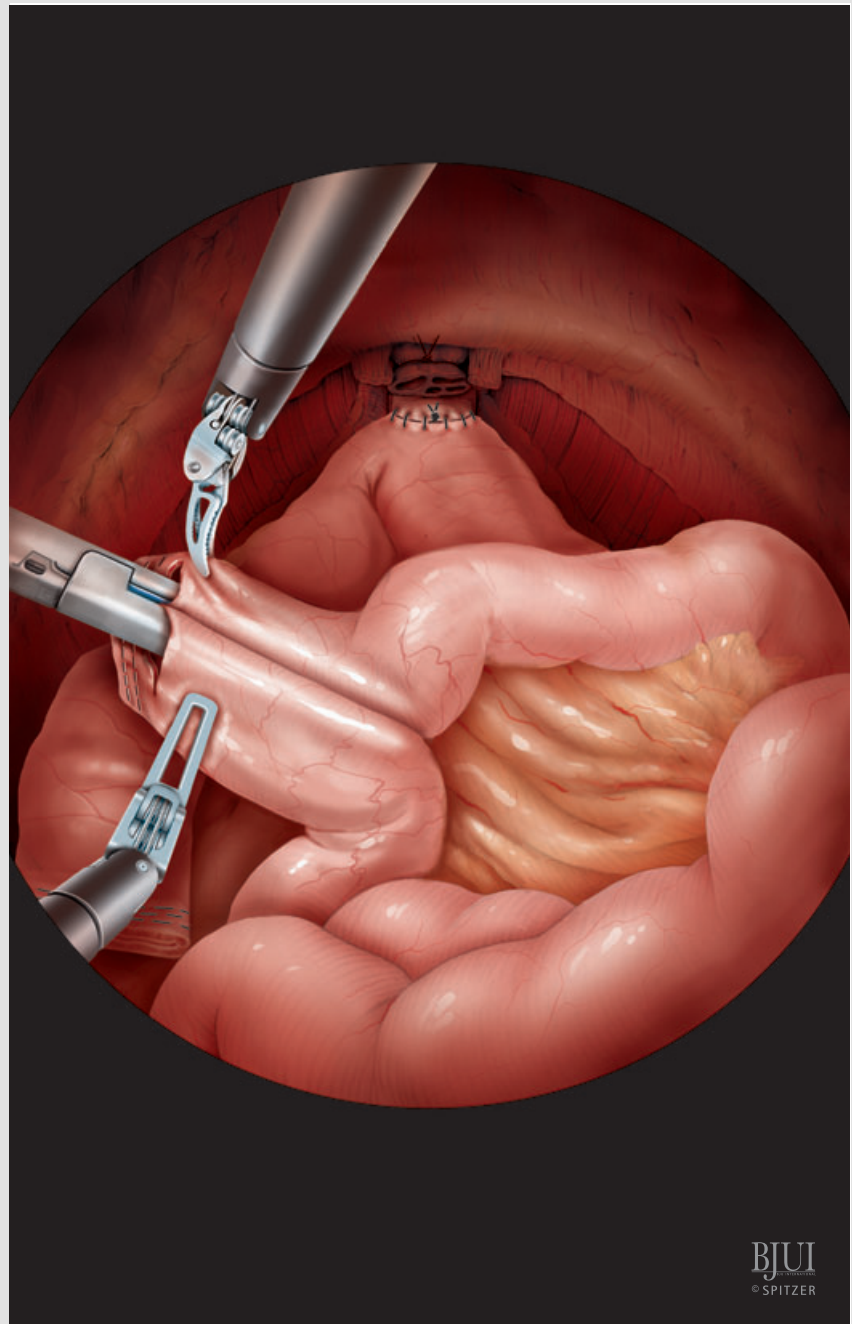
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Figure 10

Finally, the transverse opening between the two ileum segments is held up by the robotic instrument and closed by a last firing of the stapler. The completed side-to-side ileum anastomosis is checked for its wideness and integrity. The mesenterium gap between the anastomosis remains almost closed and needs no reconstruction.

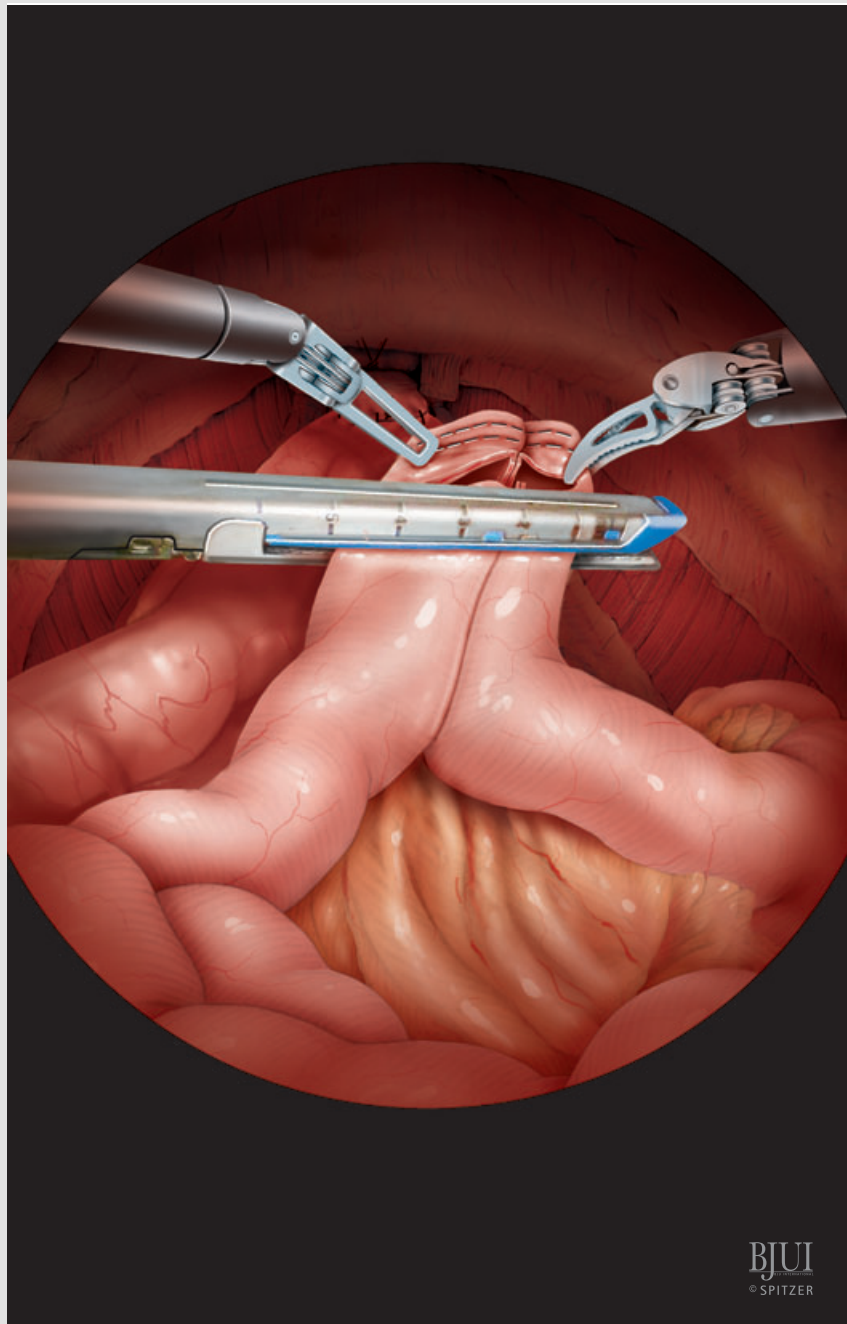


Figure 11

Opening of ileum on its antimesenteric border (detubularisation). The right intestinal loop, which is fixed on its tip at the urethra, is detubularised on the antimesenteric border. Close to urethral-enteric anastomosis the ileum is incised just next to the mesenteric border keeping a distance from the anastomosis and avoiding destroying the catheter balloon. Then, the left ileum loop is detubularised leaving intact the last 12–14 cm of the afferent bowel segment. To avoid bleeding from the incision line of bowel and to keep the operation field clear, the detubularisation is carried out using the robotic hot scissors.

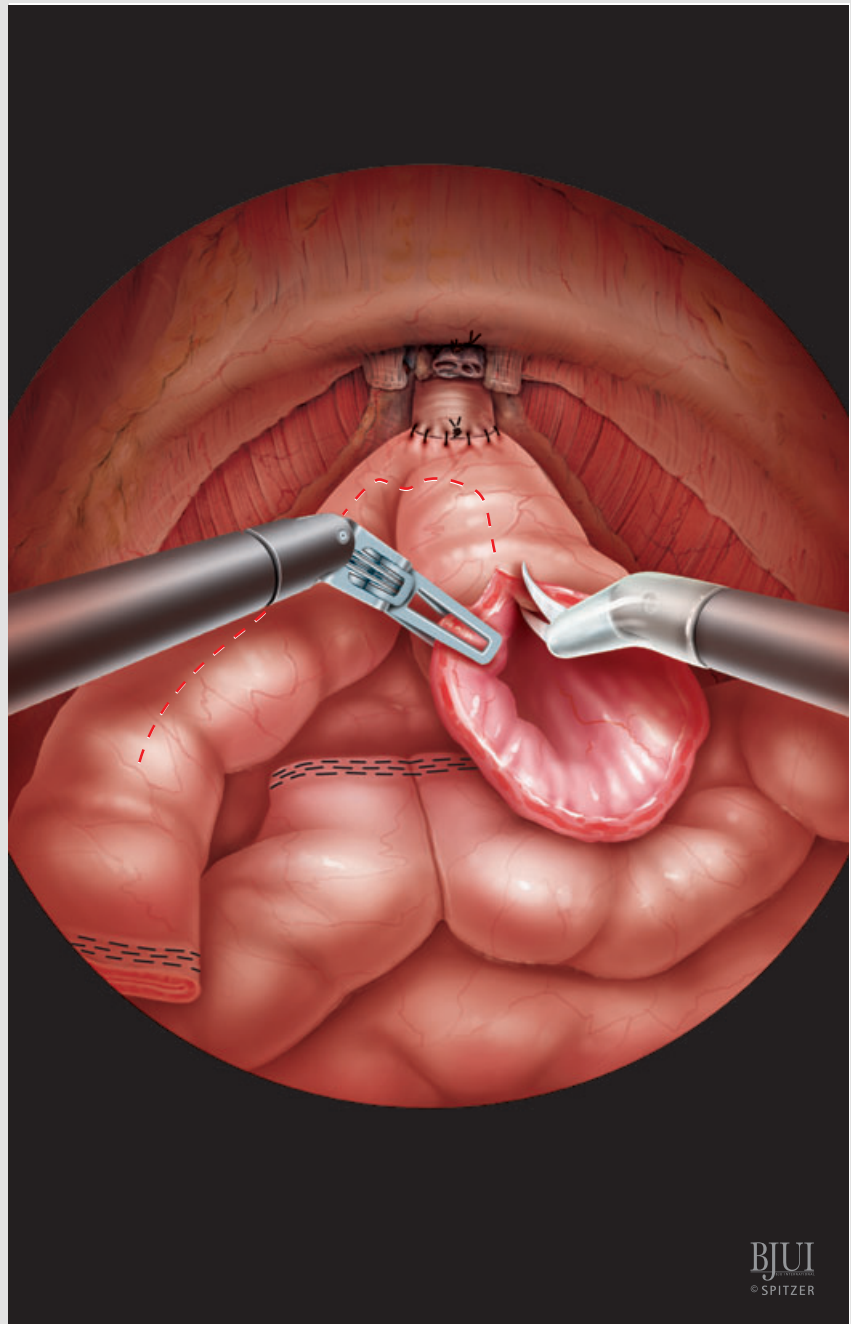
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Figure 12

Construction of the posterior wall of the reservoir. By putting traction sutures every 5–7 cm at the posterior wall of the reservoir an exact approximation of the bowel edges is achieved facilitating the robotic suturing. Special attention is paid to leaving no gap between the suture line, keeping constant distance between needle passes and to performing only serosa-muscular sutures excluding the bowel mucosa. To save time, prepared 3-0 monofilament absorbable sutures 25 cm long with a Lapra-Ty clip at the end are used. To keep the long suture in the right order intracorporeally, the assistant pulls the suture back using the laparoscopic hook instrument after each needle passage.

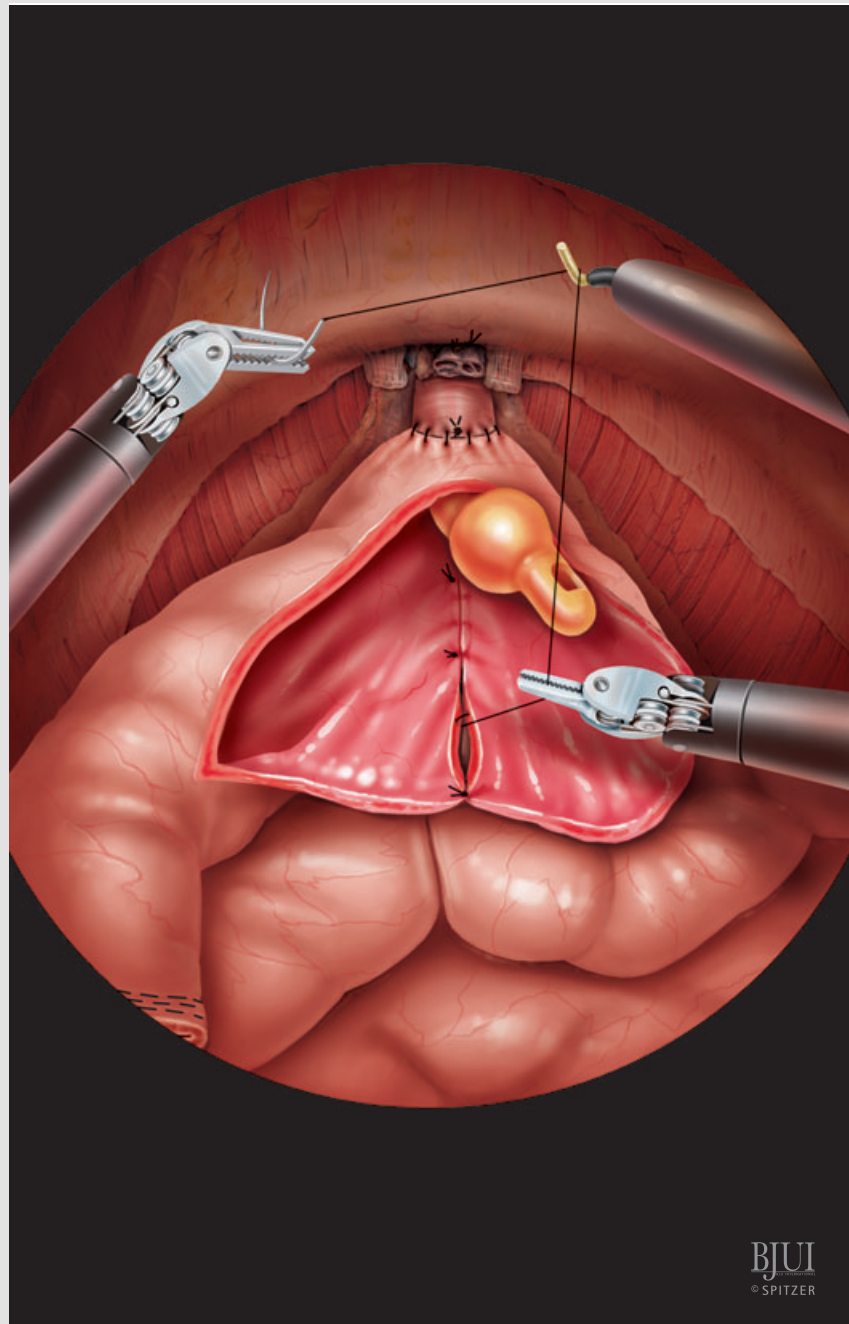


Figure 13

Folding of the anterior wall of the reservoir. After completion of the posterior wall of the reservoir, the right upper bottom of the U is folded over approximating diagonally the left limb of reservoir loop at 7–10 cm from the urethral–enteric anastomosis. Doing so results in a spherical reservoir consisting of four cross-folded ileal segments and similar to the Studer neobladder [4].

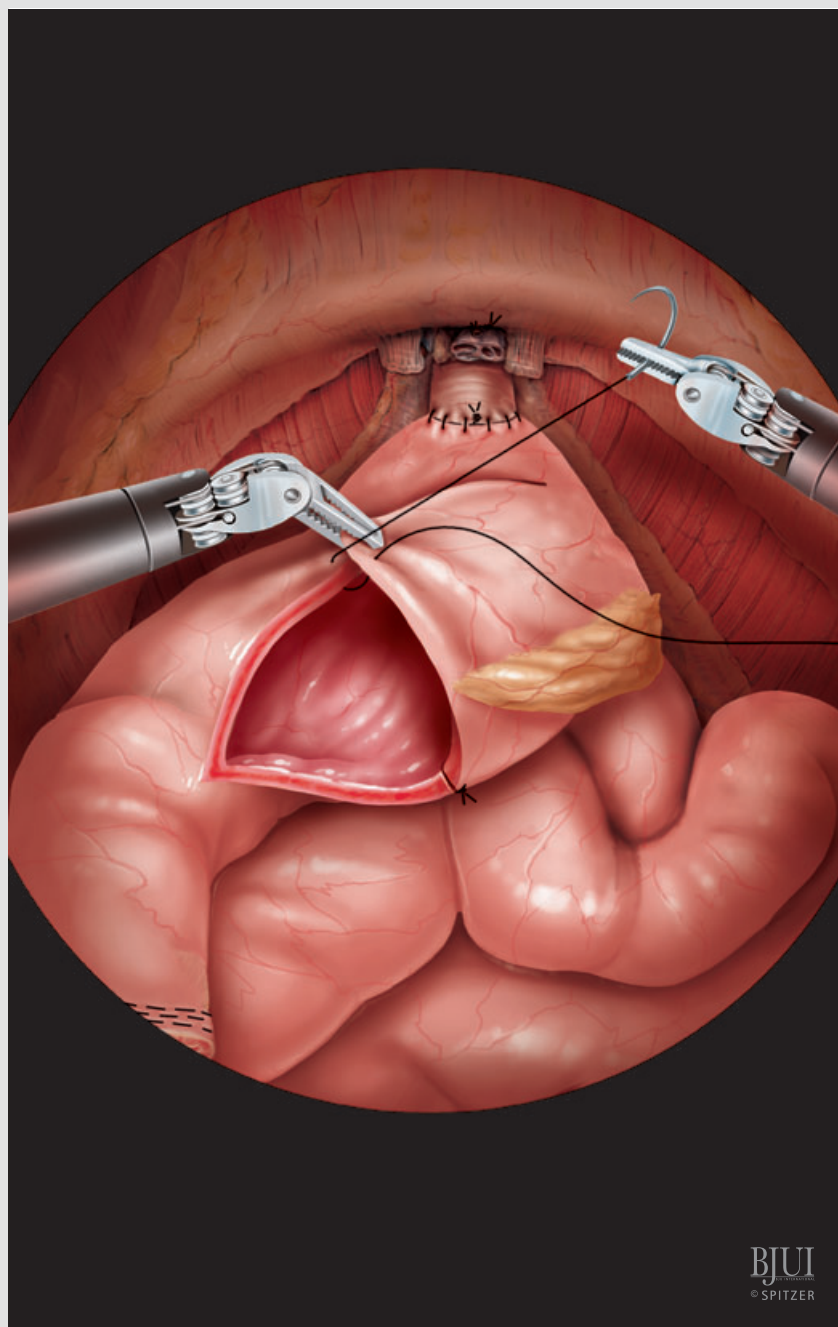
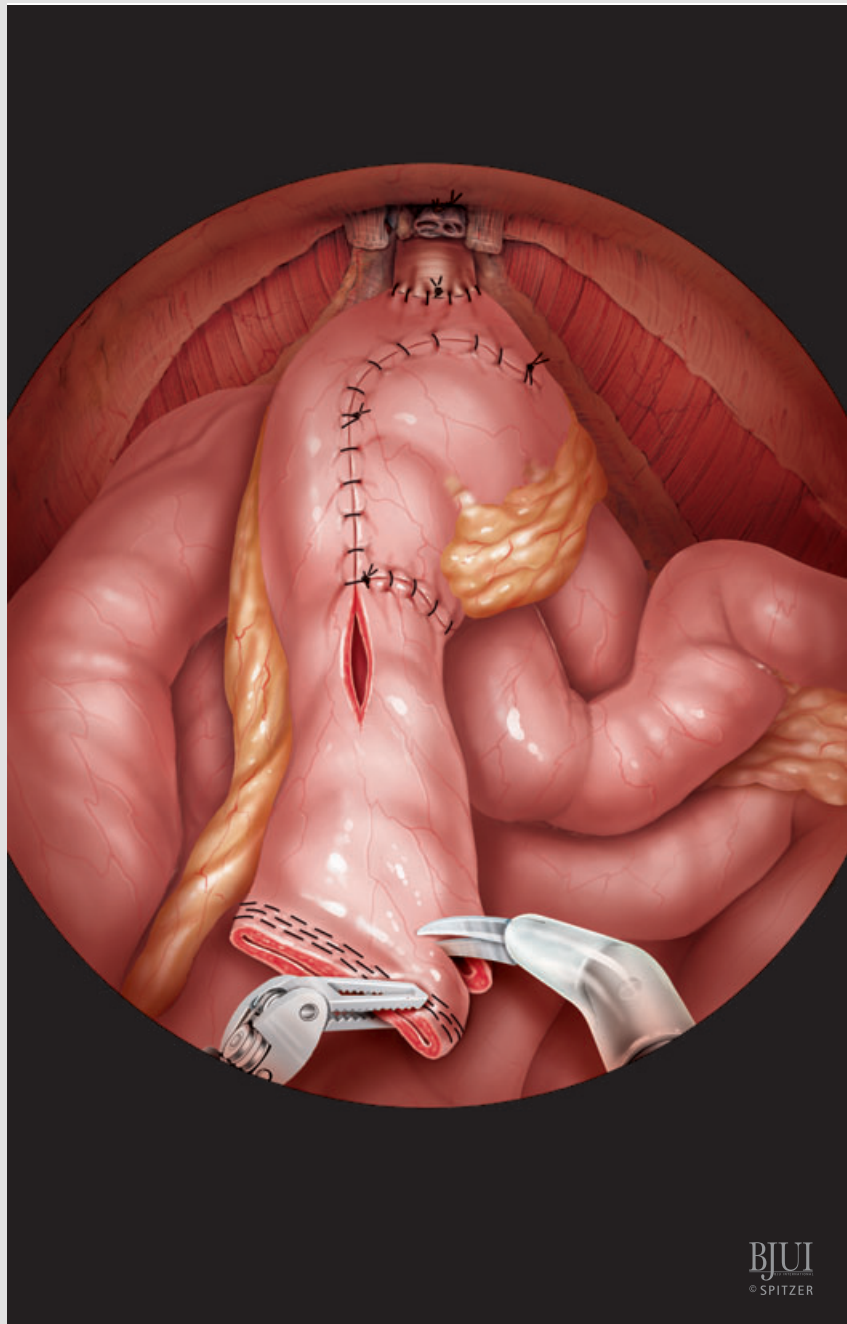


Figure 14**Construction of the anterior reservoir wall.**

The anterior reservoir wall is closed leaving the last uppermost 5 cm open. This open part of the anterior reservoir wall facilitates the passage of ureter stents through the abdominal wall. The previous described suture technique is used.

The staple line of the afferent reservoir loop is excised.

Possible mucosa residuals of intestine are excised to guarantee a full-thickness ureteroenteric anastomosis.



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Figure 15

Preparing and starting the ureteroenteric anastomosis. Both ureters are held from the stay suture by the fourth robotic arm in front of the inner orifice of the inguinal ring at the patient's right side. The ureters are spatulated to a length of 3–4 cm. Special care is taken not to cross the ureters (e.g. the right ureter is held to the right side towards the patient's feet and the left ureter to the left side toward the patient's head).

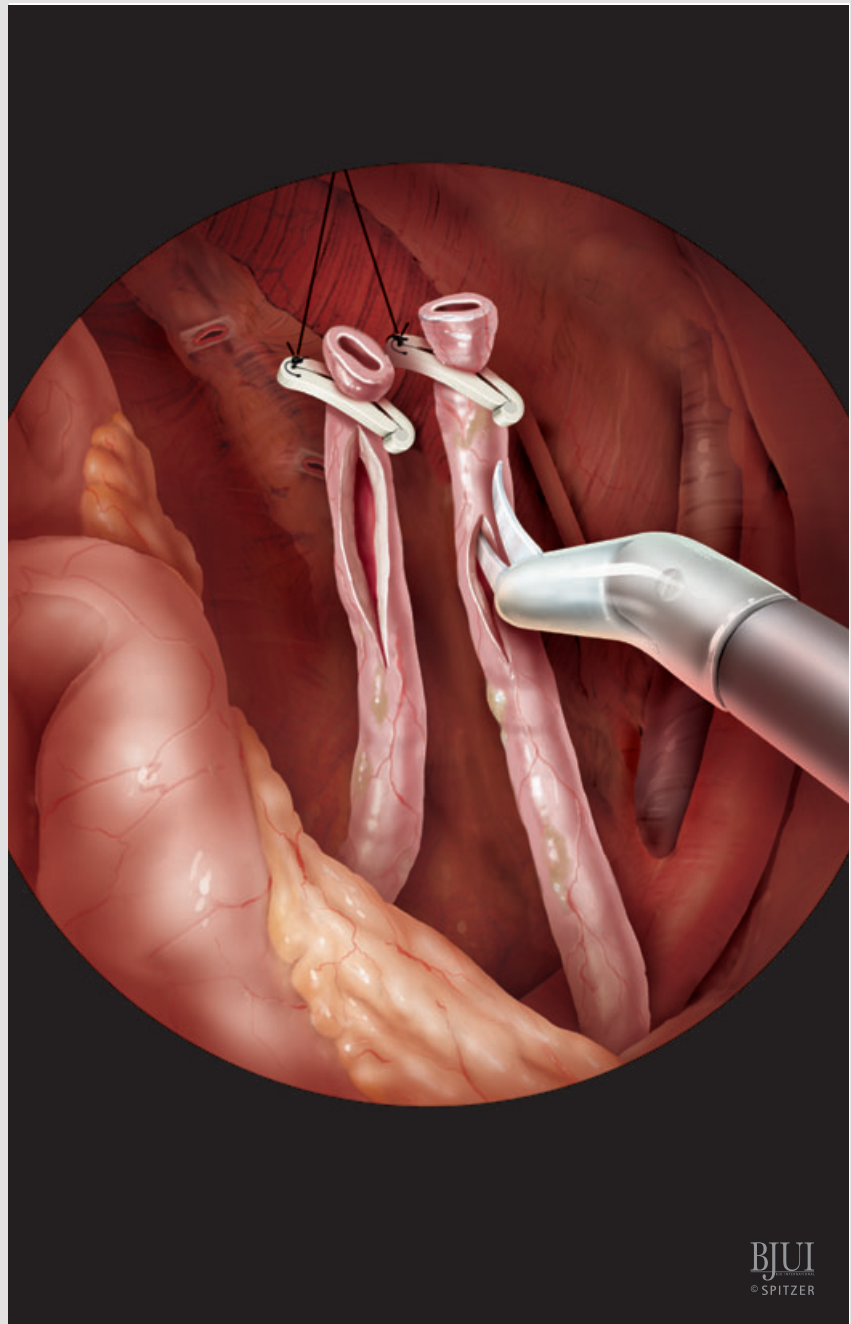


Figure 16

Construction of the ureter plate for a Wallace type II ureteroenteric anastomosis. Both ureters are sutured together completing the posterior plate for the Wallace ureteroenteric anastomosis using a running 4-0 monofilament absorbable suture. Care is taken to put the suture knot outside the ureter plate.

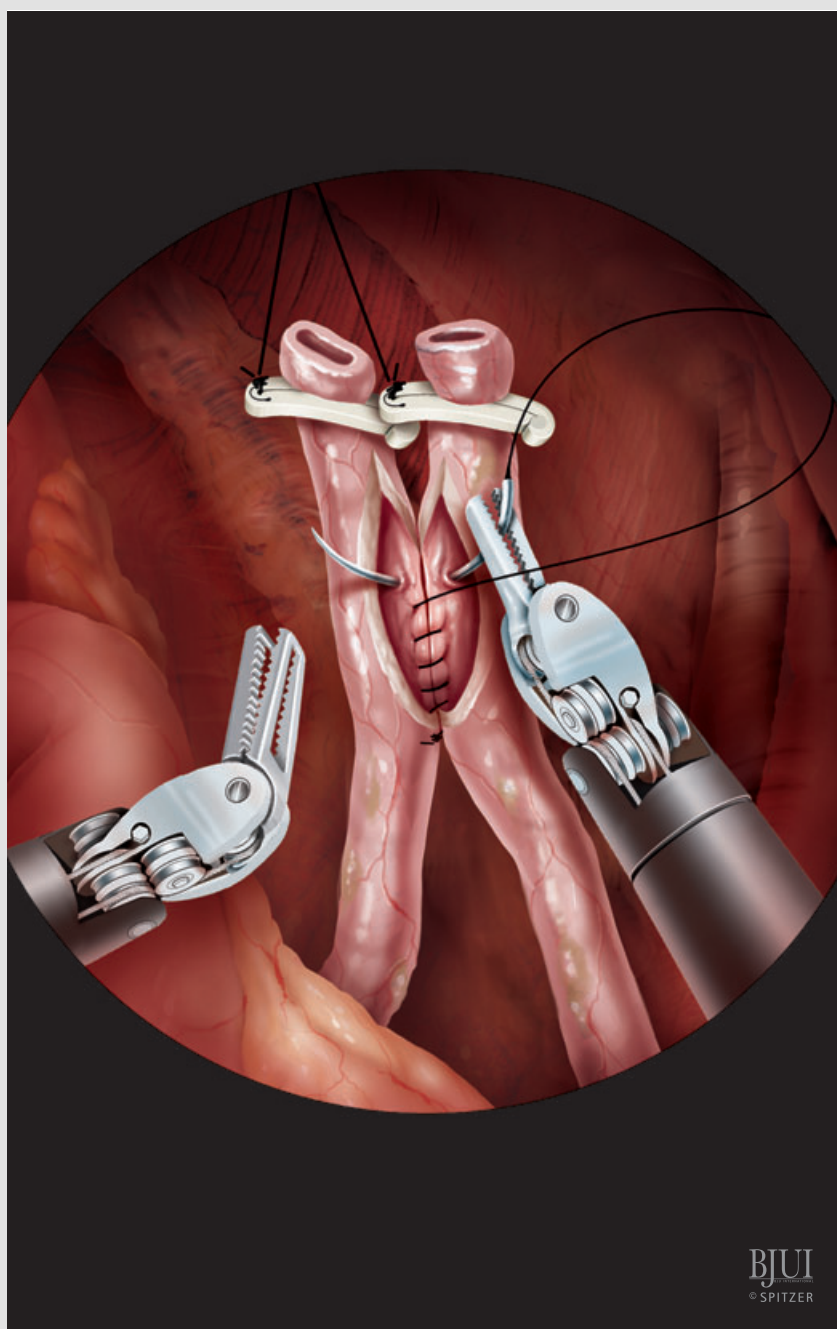


Figure 17

Insertion of mono-J ureteric stent. The Cadie re instrument of the right robotic arm is inserted through the opening of ascending loop and comes out through the remaining opening of anterior neobladder wall. The bedside assistant inserts a nephrostomy puncture needle suprapubically at the midline. Through this puncture needle a guidewire is introduced and fascia dilatation is followed to facilitate the insertion of a mono-J stent.

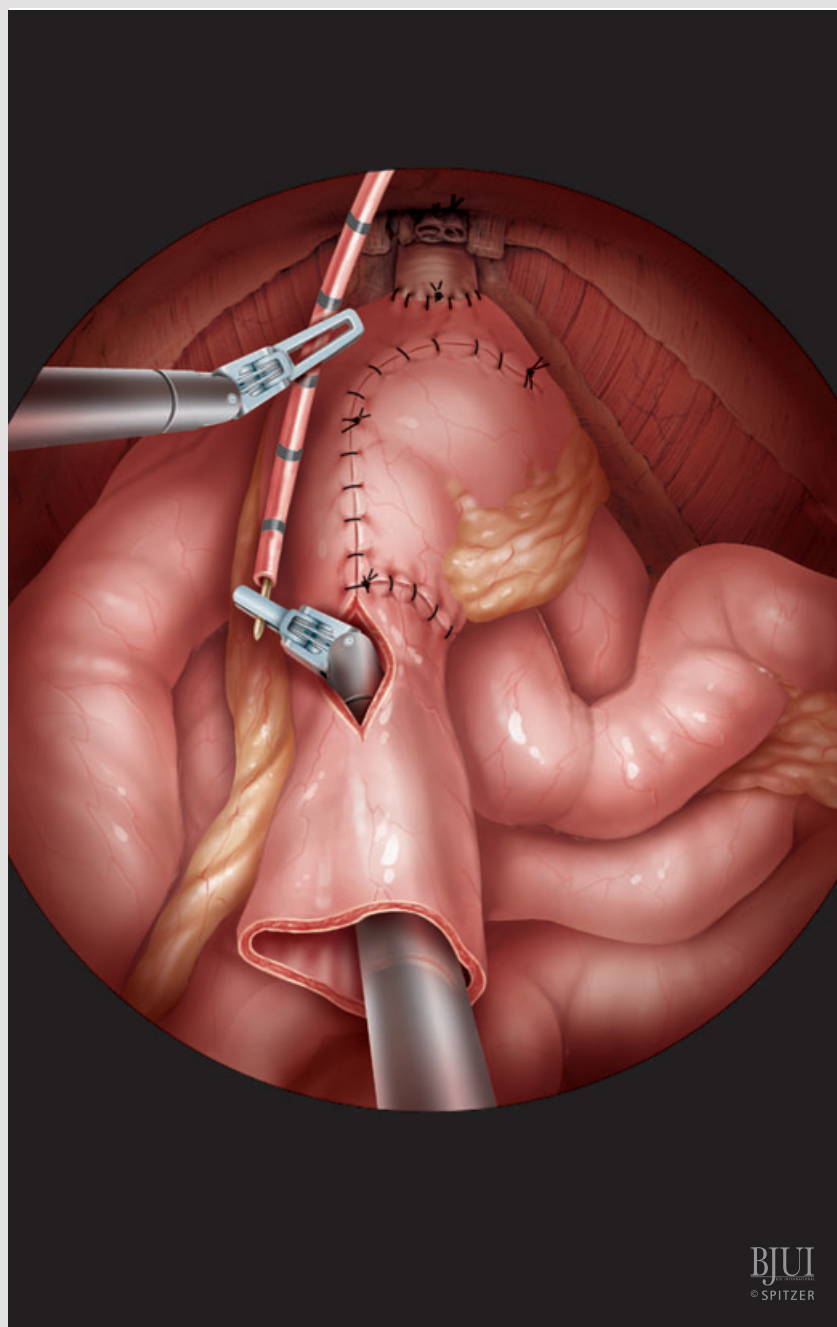
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Figure 18

The ureter stent with the guidewire is caught by the robotic instrument and is inserted into the ureter opening. The guidewire is removed after the completed insertion of the mono-J stent into the ureter, holding the stent by the Cadere forceps to prevent dislocation of the stent. The same procedure is followed for the second ureter taking care to use a different ureter stent colour for each ureter (e.g. red ureter stent for the left and blue one for the right ureter).

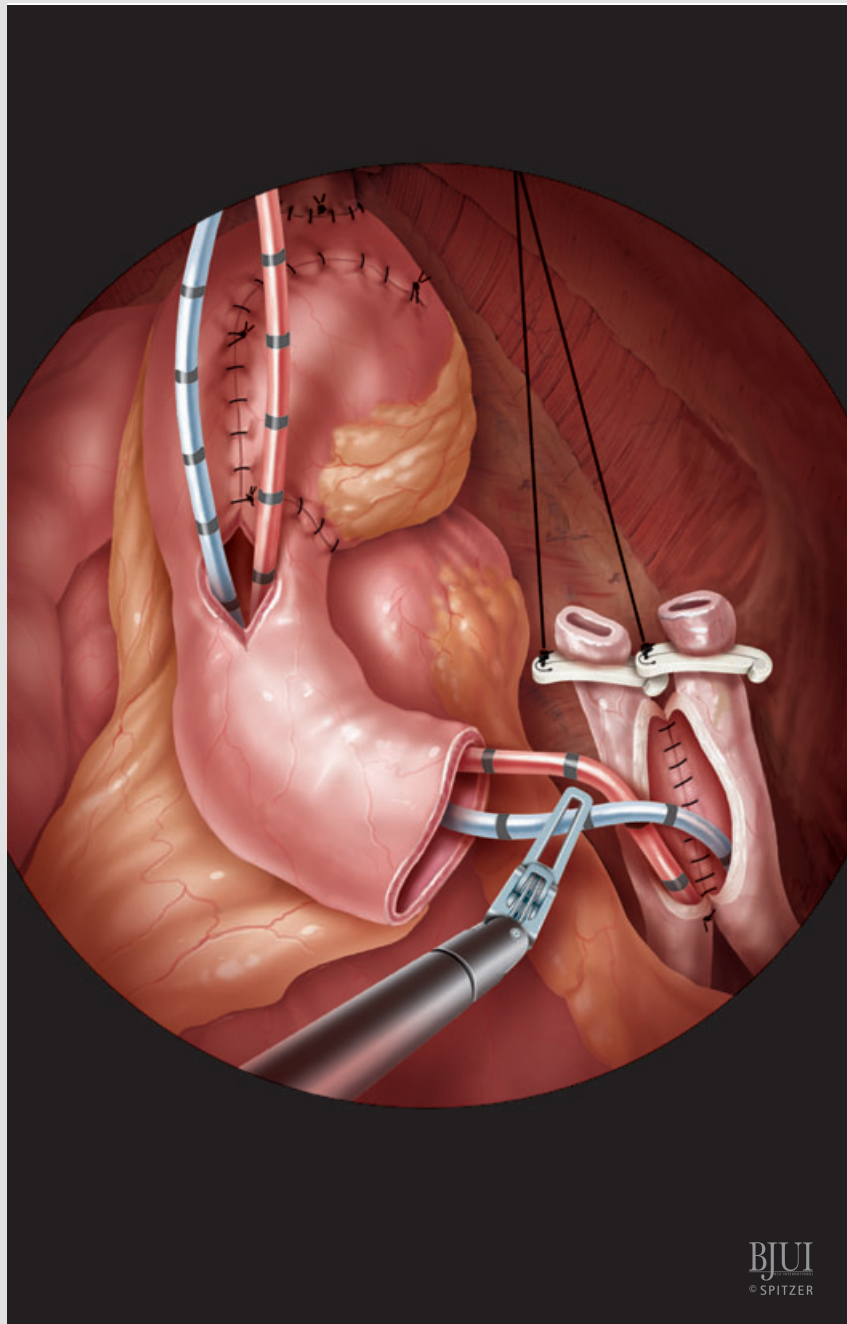
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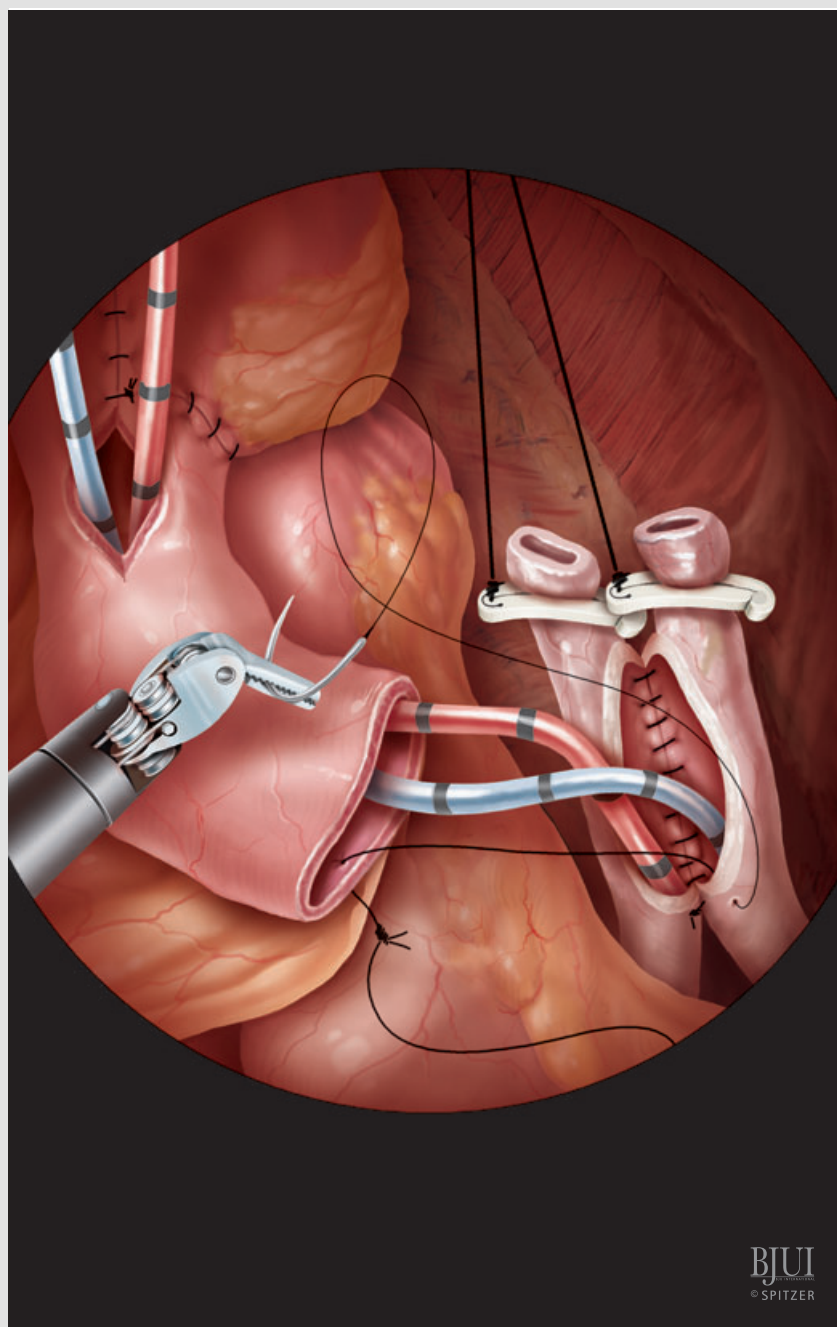
Figure 19

Anastomosis of the ureter plate with the ascending loop of the neobladder with the technique of Van Velthoven.

Similarly to urethral–intestinal anastomosis, the ureteroenteric anastomosis is made according to a modified van Velthoven *et al.* [5] technique. The suture for ureteroenteric anastomosis is prepared by tying two 4-0 monofilament absorbable sutures on a round, half-circle needle, 18 cm long, back-to-back. Thus, a double-armed suture with a pledget of knots is formed.

The row of sutures is slightly different from those used for the urethral–neobladder anastomosis. The suture is started just left of the mesenteric wall of the afferent reservoir loop at 7-o'clock position, outside-in. The ureter bite begins inside-out, at the spatulation tip of the right ureter. After three such bites, which cover a major portion of the lower aspect of ureter plate, the anastomosis edges are approximated by tightening the suture. The suture is run counter-clockwise up to the 12-o'clock position at the antimesenteric border of ascending loop. At this point, the suture can be locked and the suture is knotted under gentle traction.

The other suture arm is then run clockwise from the 7-o'clock to the 12-o'clock position. While placing the anastomotic sutures special care is taken to avoid sutures through the ureter stents. The remaining ureter tissue and the stay sutures are cut and then both arms of the suture are tied to each other to complete the ureteroenteric anastomosis.



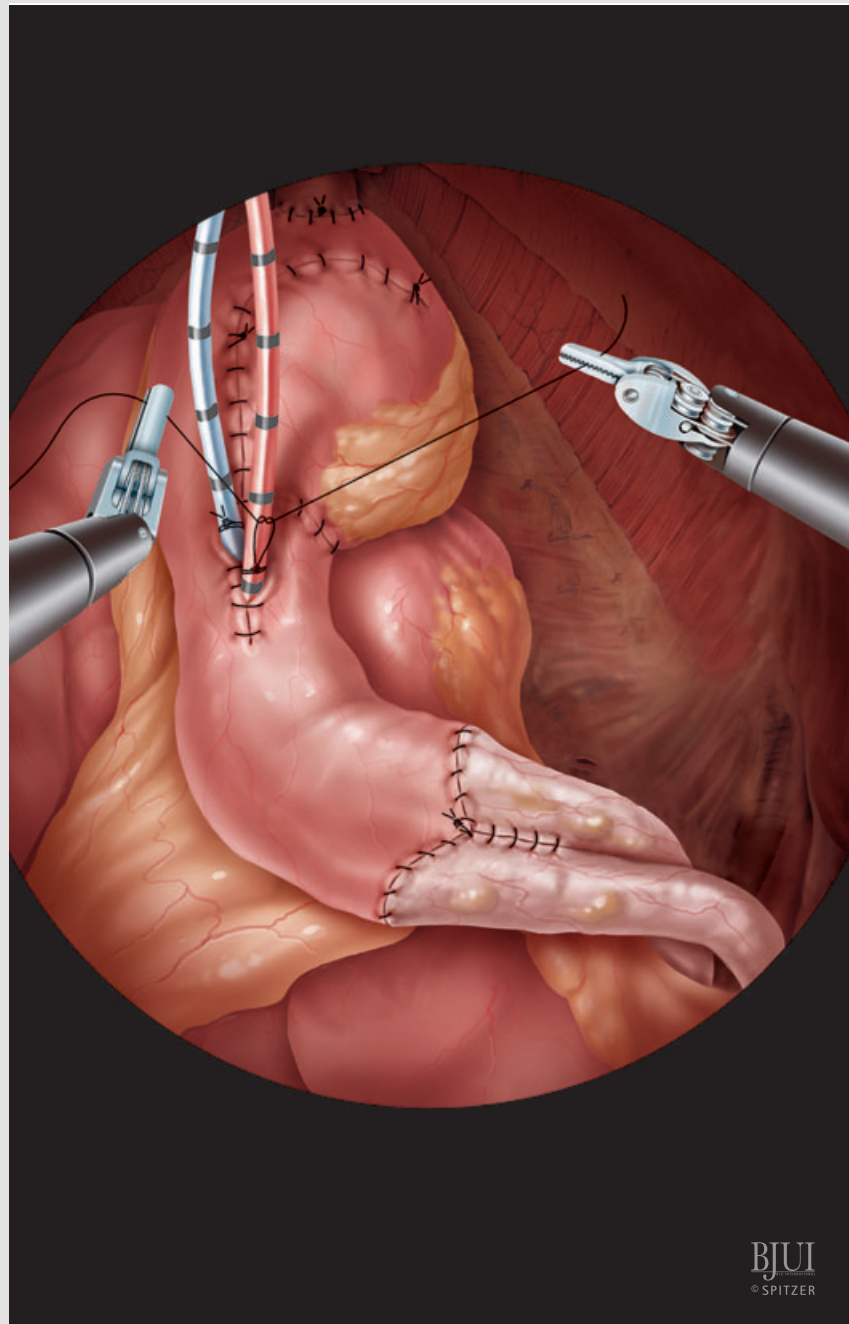
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Figure 20

Construction of the final part of the reservoir anterior wall and fixation of ureter stent on the neobladder wall. The last open part of the neobladder is closed using the same described suture technique. Both ureter stents are fixed separately using a suture around each stent to avoid dislocation.

The reservoir is flushed to remove any clots and intestinal contents. The neobladder is filled with 60 mL of saline to test the integrity of both anastomoses and reservoir. Special attention is paid to check the ureteroenteric anastomosis for leakage.

No cystostomy tube is placed. A Jackson-Pratt drain is introduced into the small pelvis through the right robotic port and is secured to the skin with a number 1 silk suture.



FINAL OPERATION STEP: SPECIMEN RETRIEVAL AND CLOSURE

The specimens of cystoprostatectomy and lymphadenectomy, which were placed within separated retrieval bags before commencing urinary diversion, are removed after enlarging the umbilical port incision as required. The fascia of the incision is then closed with two running sutures of number 1 monofilament non-absorbable loop suture. The first suture is started cephalad and the second one begins caudally. Both sutures met in the middle of the incision and are knotted together. The skin is closed by either 4-0 braided polyglactin, subcuticular sutures and sterile strips or metal clips.

POSTOPERATIVE CARE

The postoperative care of robotic neobladder is almost identical to open procedure and can be summarized in the following points:

The transurethral catheter should be irrigated with 50 mL normal saline every 12 h to prevent any catheter blockages by intestinal mucus that may lead to neobladder rupture or urine leakage. The risk of mucus blockage is highest when paralytic ileus is resolved and the transurethral catheter still remains in place.

Using the principles of fast-track postoperative care, the patient has no nasogastric tube; gradual fluid nutrition is started on first postoperative day (POD) along with early mobilization. Light medications (e.g. metoclopramide 10–20 mg three-times a day, i.v.), which accelerate peptic track motility, begin on POD 1–2 to assist the return of bowel function.

If blockage or obstruction of ureteric catheter is suspected the exteriorized tubes should be irrigated manually. The ureteric catheters can be removed sequentially on POD 7–10.

Normally the urethral catheter is removed on POD 21. A pouchogram is not mandatory before the removal of neobladder catheter to exclude urinary extravasation.

When the transurethral catheter is removed a urine culture sample is tested. Any UTI or bacteriuria must be treated. Quinolone antibiotics may be used as prophylaxis for 2–3 weeks.

After catheter removal, the patient is confronted not only with voiding problems and incontinence but also with metabolic acidosis. The base excess estimated by venous blood gas analysis or lowered plasma bicarbonate is an indicator of acidosis. It must be monitored initially and after the removal of catheter and later at greater intervals, depending on the blood gas values. Any negative base excess should be corrected. In our practice, many patients require sodium bicarbonate substitution (e.g. 2–6 g/day) gradually stopping 3–6 weeks later; although some patients will require sodium bicarbonate substitution indefinitely.

The method of voiding is important for complete emptying of the reservoir. During the initial period it is better for the patient to void in a sitting position. Voiding occurs by relaxing the pelvic floor, supported by slight abdominal straining. Applying pressure on the lower abdomen and bending forward are helpful to empty the neobladder completely. The postvoid residual urine volume is monitored by suprapubic ultrasonography of the neobladder.

The voiding intervals are crucial for gaining an adequate reservoir capacity with high compliance. The patient must void every 2 h during the day and every 3 h at night, increasing the voiding interval gradually from 2–4 h, in hourly steps. Doing so, the bladder capacity increases passively to an optimal volume of 500 mL, which is usually required for continence. Laplace's law (pressure = tension/radius) explains the development of continence; increasing neobladder radius (and as consequence the neobladder capacity) results in a decrease in the intra-reservoir pressure and urinary continence.

MODIFICATIONS TO FACILITATE THE CONSTRUCTION OF THE ROBOTIC NEOBLADDER

The robotic neobladder is reconstructed in a form similar to the Studer neobladder, having a spherical shape and keeping low intraluminary pressure during bladder filling. Advice for robotic neobladder, making its reconstruction easier and faster is as follows:

- The anastomosis between the urethra and the intestinal loop, which is going to be the lowest point of the reservoir, is made first, before the ileum resection. Thus, the bowel is

fixed deep in the pelvis, simplifying robotic reconstruction of neobladder.

- To help measure the length of ileum or the distance from caecum endoscopic devices may be used (e.g. the jaws of Endo-GIA stapler device which are 6 cm long or a distance of 10 cm from the tip of Cadere Forceps can be marked with a permanent pen on the robotic instrument).
- The intestinal resection and anastomosis is made without deeply incising the mesentery.
- Stay sutures are placed at 7–10-cm intervals and held by the fourth arm or the bedside assistant.
- Absorbable suture clips save suturing time.
- Long sutures are placed intracorporeally and the bedside assistant helps to keep them in line using the laparoscopic hook instrument.
- The robotic steps for neobladder are quite different from open surgery according to the Studer technique in order to save time and make the robotic procedure simpler (e.g. in robotic neobladder the reservoir folds from the right to the left side and not from the left to the right, as in open surgery).
- To facilitate the ureteroenteric anastomosis (Wallace type II) at the afferent loop of the reservoir, we use stay sutures at the ureter, which are knotted at the Hem-o-lok clip. In doing so, the ureters are kept close to the end of the ascending reservoir loop, facilitating the construction of a watertight anastomosis.
- The most challenging step of the robotic neobladder is the construction of a tension-free reservoir-urethra anastomosis, especially for short and obese patients with a narrow pelvis. As in these cases the mesentery of the ileum that is used for the bladder substitute is thick and short, the distance between the reservoir and the urethra can be longer than expected. To bring the ileal loop down to urethra and achieve a tension-free anastomosis, two vessel loops are placed around the intestinal loop between the point selected for the most caudal reservoir part. These vessel loops are held by the fourth arm and the bedside assistant. Additionally, before bringing the ileal loop down to the urethra, it is important to remove the small bowel loops or sigmoid colon, which may be present between the mesoileum of the reservoir and the sacral promontory. Manual pressure to the perineum with a sponge stick and straightening the patient or slightly flexing at the pelvis can further reduce the distance between the urethra and reservoir. It is also critical to have a bloodless operation field

after RRC and lymphadenectomy to achieve a quick and fluent urethral–reservoir anastomosis.

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Correspondence: Vassilis Poulakis, Department of Urology, Doctors' Hospital, Athens, Greece.
e-mail: vpoulakis@hotmail.com

Abbreviations: **RRC**, robotic radical cystectomy; **3D**, three-dimensional; **POD**, postoperative day.