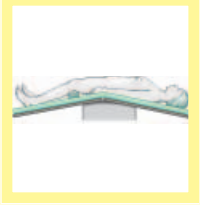
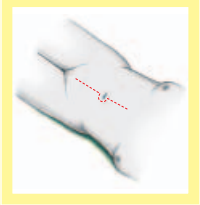
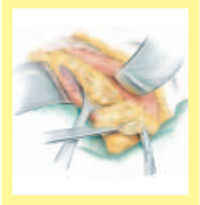
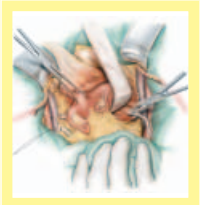
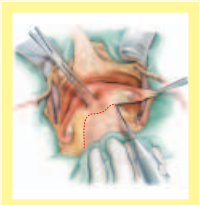
Surgery Illustrated











## Surgical Atlas

# Orthotopic bladder substitution in women after cystectomy for bladder cancer

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

## SUMMARY

Orthotopic bladder substitution after cystectomy in women is feasible. The rate of continence is comparable to that in men who have been similarly treated. Over continence (which is common) is caused by posterior and caudal displacement of the neobladder. Prevention of this descent can reduce the incidence of this complication. Further follow-up is needed to evaluate the oncological outcome.

## INTRODUCTION

As a result of the development of low-pressure reservoirs derived from various segments of the intestines [1] orthotopic bladder substitution is now feasible. The procedure has gained an increasing popularity in men for whom cystectomy is indicated [2–5] but the use of such procedures in women is less common as total urethrectomy was considered an integral part of the radical operation. Furthermore, the chances of continence in a female in whom the bladder neck was removed during cystectomy was highly questionable. The first clinical attempt was reported by Tscholl et al. in 1987 [6]. Although their one female patient became continent, the authors were skeptical and stated that 'from this case, one should not infer that the proximal urethra can ensure continence on its own'.

Three studies had provided the scientific basis and paved the way for orthotopic substitution in selected women. The functional study of Hubner *et al.* [7], outlined that in the dog, the continuity of bladder and urethra is not required for the function of the urethral closure mechanism. The anatomical study of Colleselli *et al.* [8] showed that preserving the musculature of the lower two thirds of urethra, together with its nerve supply are important for urinary continence in women. Finally, the pathological studies of Stenzl *et al.* [9] identified the subpopulation of patients in whom the urethra may be preserved with no increased risk of local tumour recurrences.

As a result, more clinical experience with orthotopic bladder substitution in women were reported by several groups with uniformly good functional results [3,10]. Our first case was carried out late in 1994. Since then, the procedure has been used for a further 92 patients.

## PATIENT SELECTION AND EVALUATION

Pelvic and bimanual examination provide the basis for clinical staging of the disease.

Endoscopy and biopsy are carried out to establish the histological diagnosis and determine the grade of the tumour. The tumour should not involve or extend into the trigone. Cold punch biopsies are taken from this region to ensure the absence of tumour involvement and to exclude the presence of premalignant lesions. We consider cases with diffuse carcinoma *in situ* and/or multifocal tumours are considered as a contraindication for orthotopic substitution. Metastatic evaluation should include CT of pelvis, abdomen and chest regions, and a bone scan. If the case is judged to be suitable for orthotopic substitution, a urethral pressure profile is measured to assess the integrity of the urethral closure mechanisms.

Because of the extent and length of surgery, all patients deserve a careful medical evaluation and anaesthetic consultation.

As we use the small bowel for reconstruction, a simple bowel preparation is required over one day before surgery. Oral neomycin and a low residue diet are all that is needed. Intravenous fluids are administered the night before surgery to maintain hydration.

## INITIAL EXPOSURE

Full relaxation of the abdominal muscles by an appropriate anaesthetic is necessary throughout the entire procedure. Hypotensive anaesthesia would provide an additional advantage during the cystectomy phase of the operation.

## THE CYSTECTOMY PHASE

The scope of the operation is to excise the bladder with its perivesical fat, peritoneal covering, the uterus, upper half of the vagina as well as the ovaries and adnexia. In young (premenopausal) females, one of the ovaries can be spared to preserve its hormonal functions. In addition, the distal common iliac, external iliac, obturator and internal iliac lymph nodes are dissected and removed.

Initially, the abdominal and pelvic cavities are explored. The growth is palpated, its degree of mobility determined and its relation to the adjacent structures assessed. The endopelvic and the aortic lymph nodes are palpated and frozen sections are taken if necessary. If it is now decided to proceed with the radical operation, the intestines are packed out of the pelvis. The peritoneal incision is extended posterolaterally on either side along the lateral border of the external iliac then the common iliac vessels up to the aortic bifurcation.

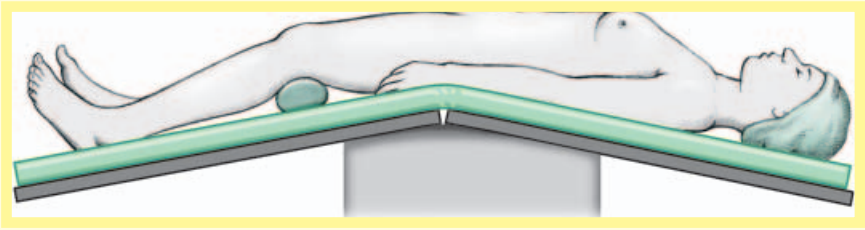


**Figure 1**

The patient is placed supine with a Trendelenberg tilt. Slight bending of the knees would further help in the relaxation of the abdominal muscles, facilitate retraction and provide a wider exposure.

The surgical area to be sterilized and draped extends from the vulval cleft to the lower chest. A simple Nelaton catheter is passed into the bladder for its evacuation throughout the cystectomy phase of the operation. This keeps the bladder empty and improves the working space within the pelvic cavity.

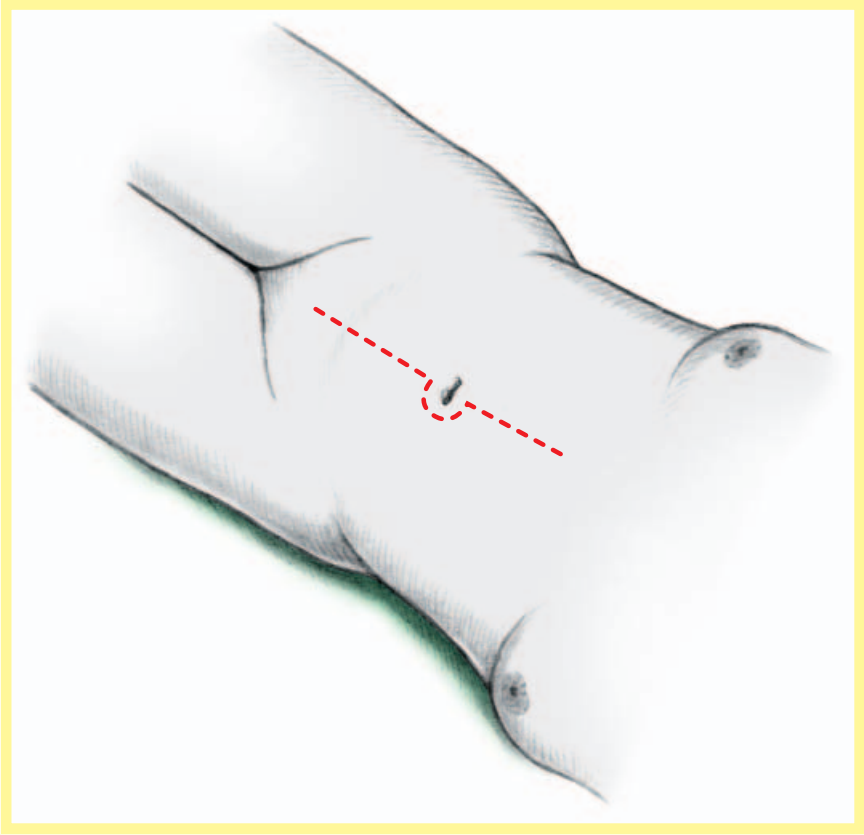


**Figure 2**

A long vertical right paramedian incision extending from the symphysis pubis inferiorely to a point halfway between the umbilicus and xephi-sternum superiorely is generally used. Alternatively a midline incision encircling the umbilicus can be used. For obese patients, a lower abdominal muscle cutting transverse incision is preferred. It provides a wide and direct exposure of the pelvis under such circumstances.

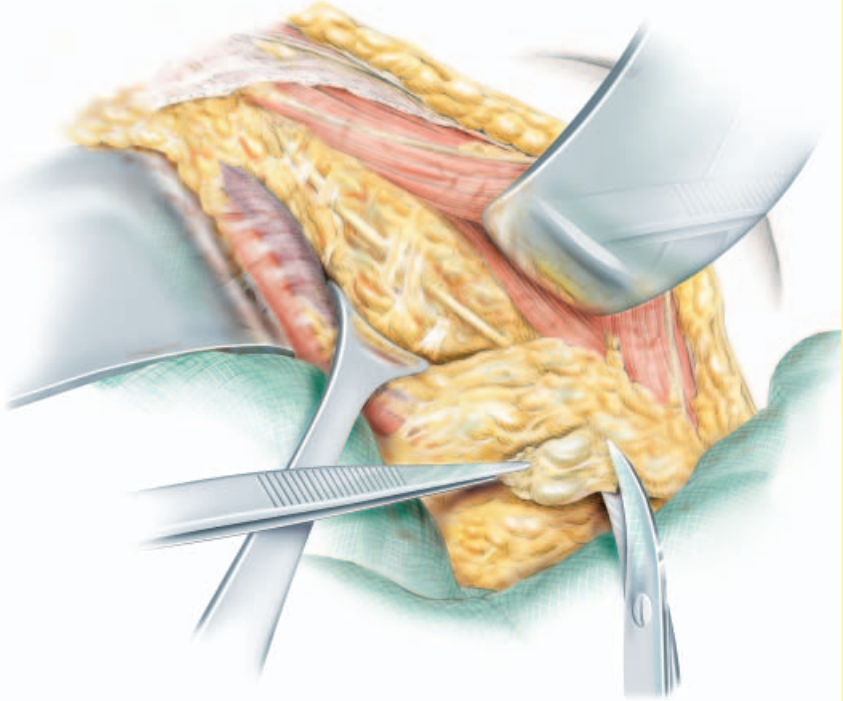
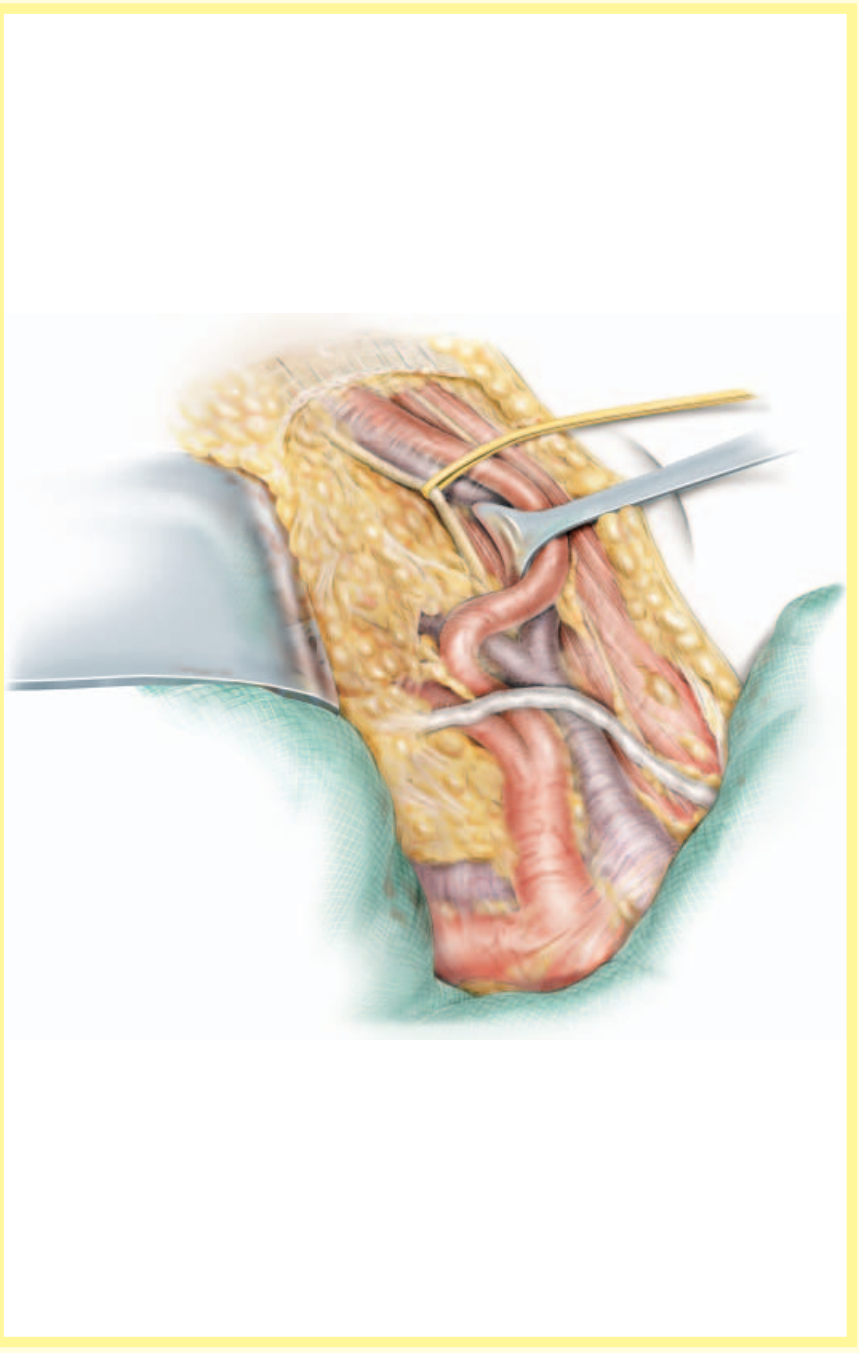


**Figure 3**

The round ligament is identified, cut and ligated leaving a long stump. The ovarian vessels are secured and cut as they cross the iliac vessels. The fascia on the iliopsoas is incised and reflected medially. The triangle of Marceille is exposed by retracting the common and external iliac arteries medially, and dissecting the space between these vessels and the medial border of the psoas muscle. The cleaning of the fibrolymphatic tissues in this space will expose the obturator nerve as it emerges from the medial border of the psoas muscle. The fibrofascial sheath covering the distal half of the common iliac and external iliac vessels is then opened and stripped medially to remove the perivascular lymphatics and lymph nodes. The vessels are then gently retracted laterally. Below and medial to the now cleaned external iliac vein, the obturator space is entered. By working right on the psoas and obturator muscles, all the pelvic fascia is stripped medially without difficulty. The obturator neurovascular bundle is included in the stripped mass. The obturator nerve is identified and separated from the vessels which are divided and ligated as they leave the pelvis through the obturator foramen. Dissection is facilitated and the operating time reduced by the use of electrocoagulation to control lymphatic and small blood vessels throughout the lymphadenectomy.

**Figure 4**

The fibrolymphatic mass is now reflected medially. The internal iliac artery is dissected free and its anterior division divided and ligated.



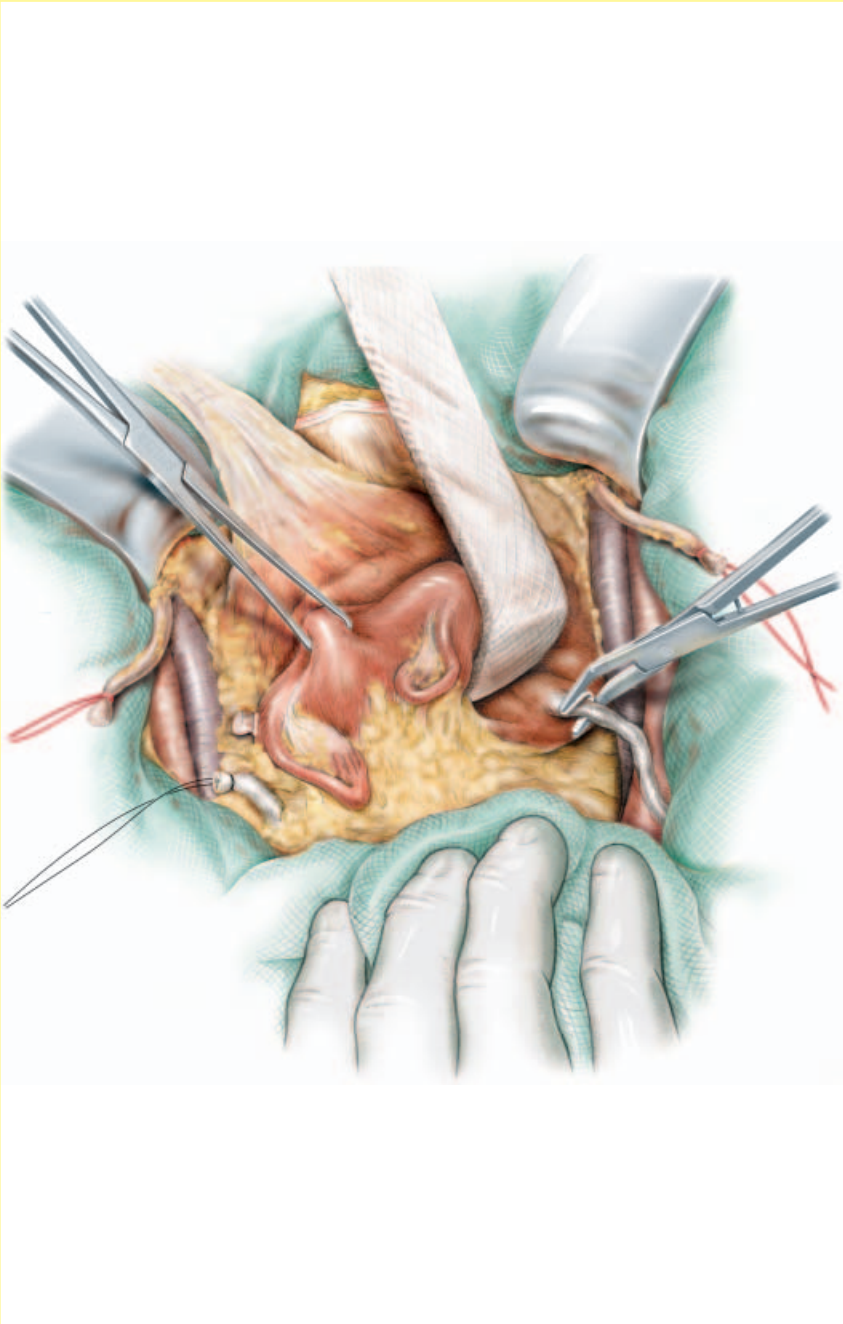
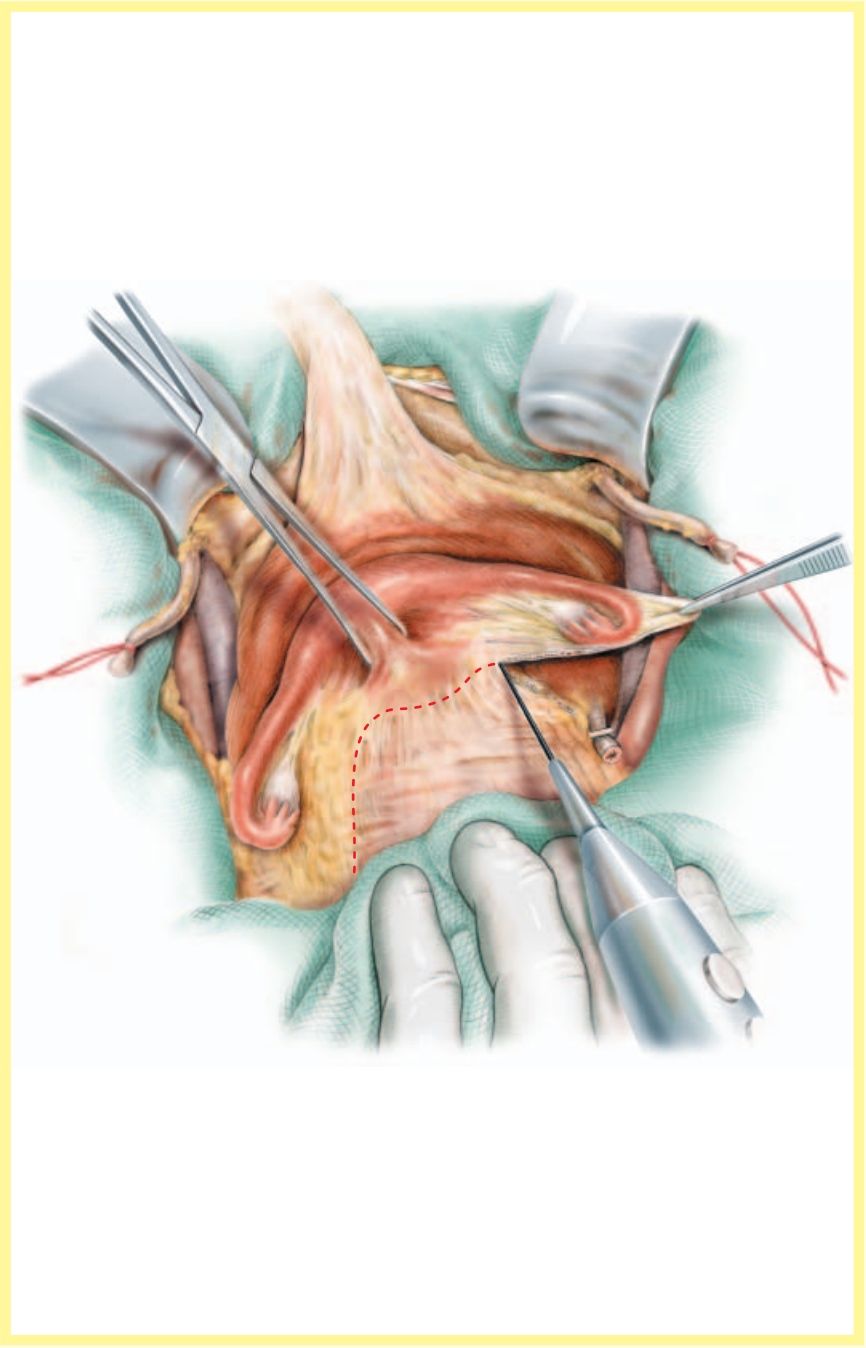


**Figure 5**

The ureter is identified as it crosses the common iliac bifurcation, dissected free for 3–4 cm, divided and its distal end ligated. The same dissection is carried out on the other side of the pelvis. This completes the lymphadenectomy and we are left with a central mass formed of the bladder, uterus and adnexial tissue.

**Figure 6**

The uterus is held by an Allis clamp and retracted ventrally. The peritoneum at the floor of the Douglas pouch is incised by diathermy.



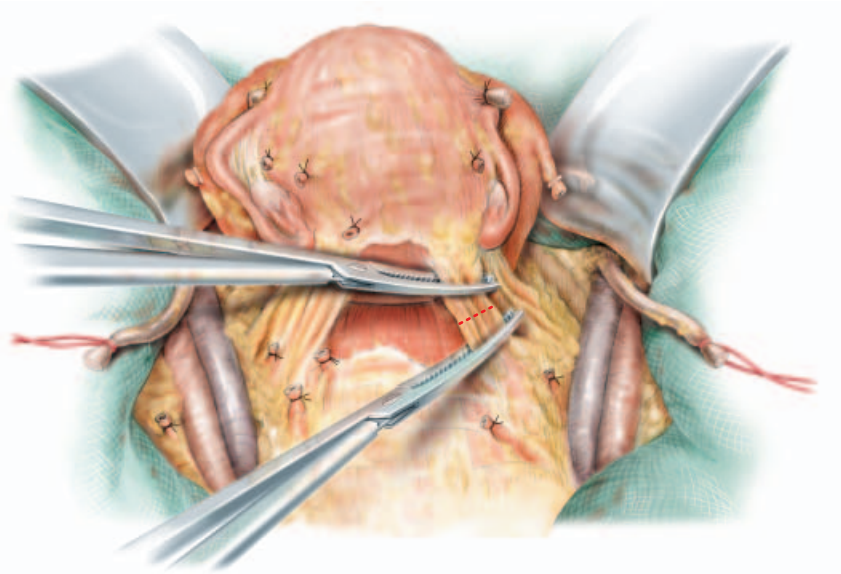
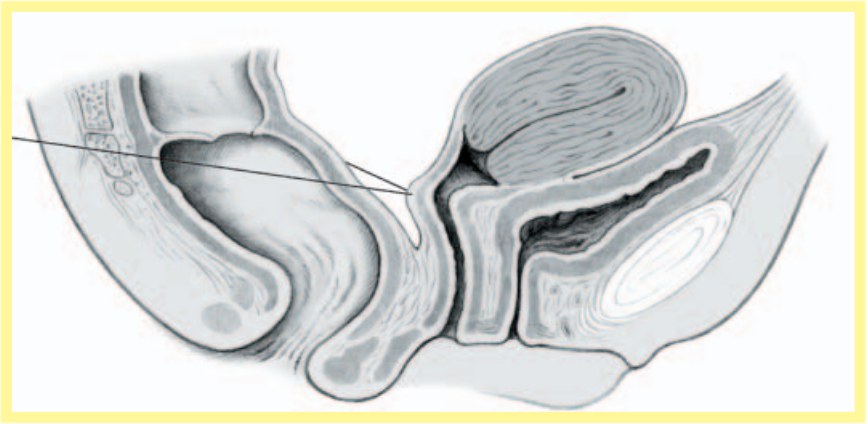


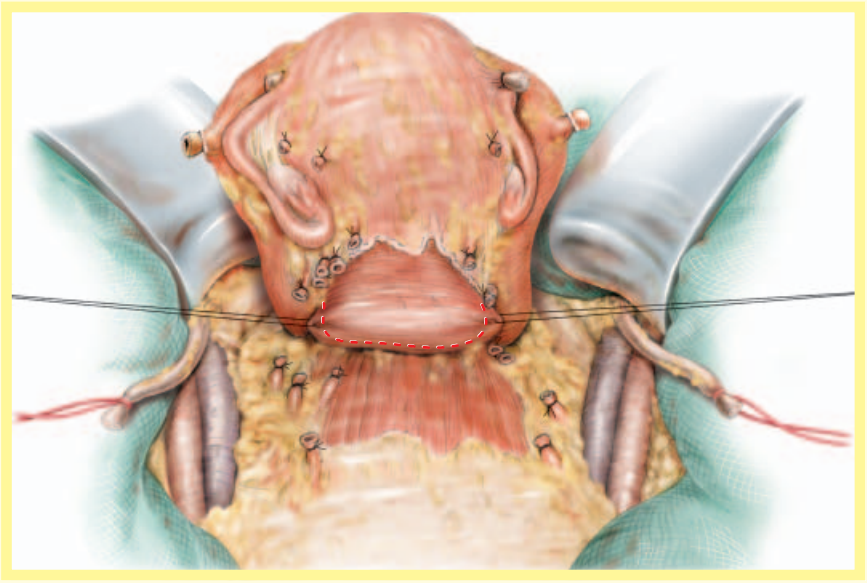
**Figure 7**

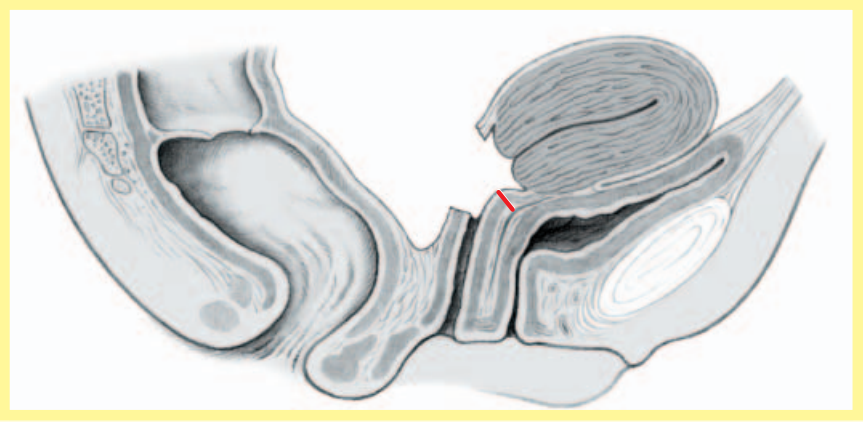
The rectum is then separated from the vagina by blunt dissection. As a result, two broad fascial sheets now appear on either side. These connect the bladder, uterus and vagina anteriorly with the side wall of the rectum posteriorly. These ligaments are cut piecemeal between clamps which are underrun by 2/0 polyglactin acid sutures with no attempt at nerve preservation.

**Figure 8**

Two suture ligatures are applied on either side of the lateral vaginal wall. These serve to control any bleeding and can be used later for the closure of the vaginal stump.







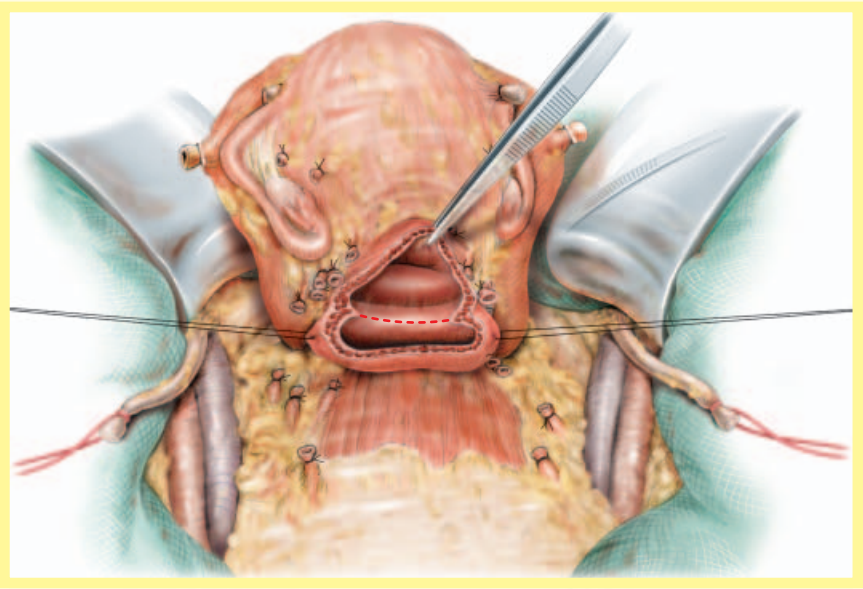


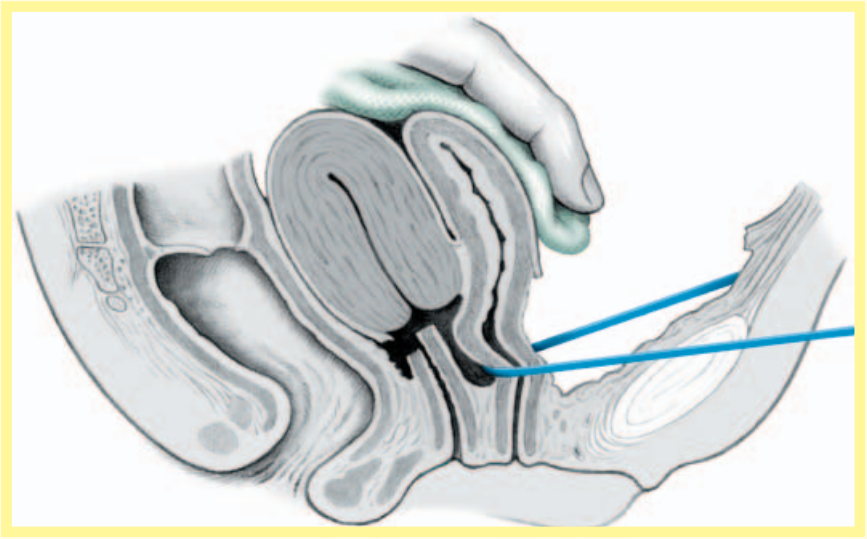
**Figure 9**

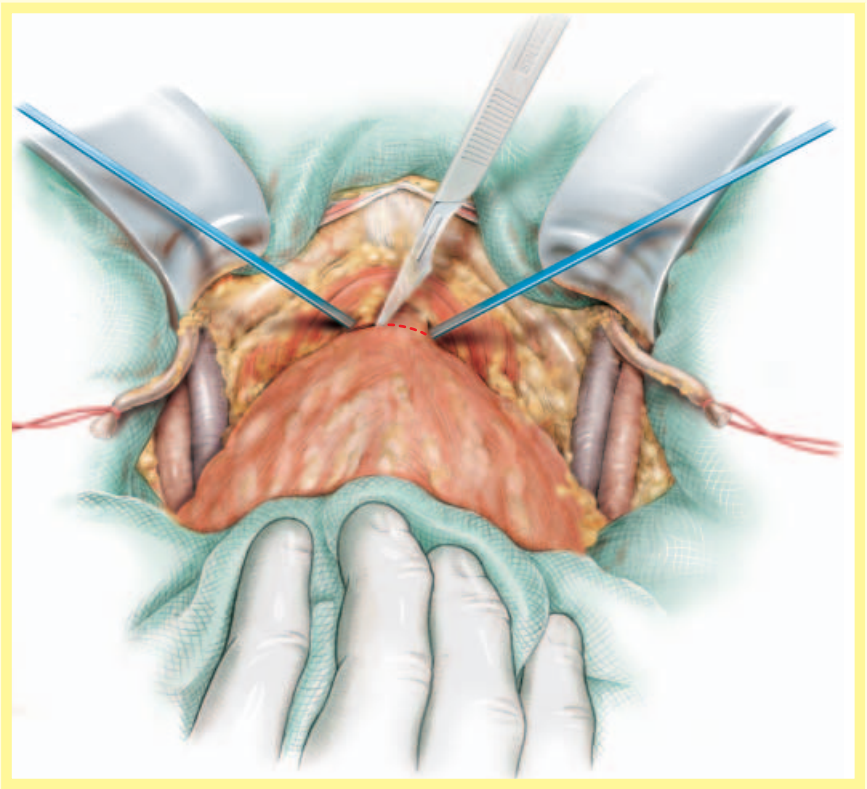
The posterior vaginal wall is incised transversely with a diathermy knife 2.5 cm below the posterior fornix. The incision is extended laterally on both sides. This will expose the anterior vaginal wall, which is similarly incised but at a slightly higher level. Accordingly, the anterior vaginal flap is a little longer than the posterior one. When the vaginal stump is later closed, the suture line will be facing posteriorly away from the urethroileal anastomosis. The anterior vaginal wall is now held by an Allis clamp and the plane between the anterior vaginal wall and the posterior aspect of the bladder and proximal urethra is developed by the tip of a blunt pair of long dissecting scissors.

**Figure 10**

Now the mass is left to drop back into the pelvis and the anterior dissection is performed. The retropubic space is entered and opened. The dorsal vein of the clitoris with the surrounding fascia are underrun with 3/0 polyglactin suture ligature. The urethra is thus exposed and dissected on all sides.

The anterior wall of the proximal part of the urethra is incised transversely with a long scalpel and the urethral catheter is withdrawn. At this point, three stay sutures of 4/0 polyglactin acid are placed through the urethra at the 3, 9 and 12 o'clock positions, incorporating the mucosa as well as the periurethral musculature. These prevent retraction of the urethra following its complete transaction and can be used later for the urethroileal anastomosis. The posterior urethral wall is then incised and the specimen removed.





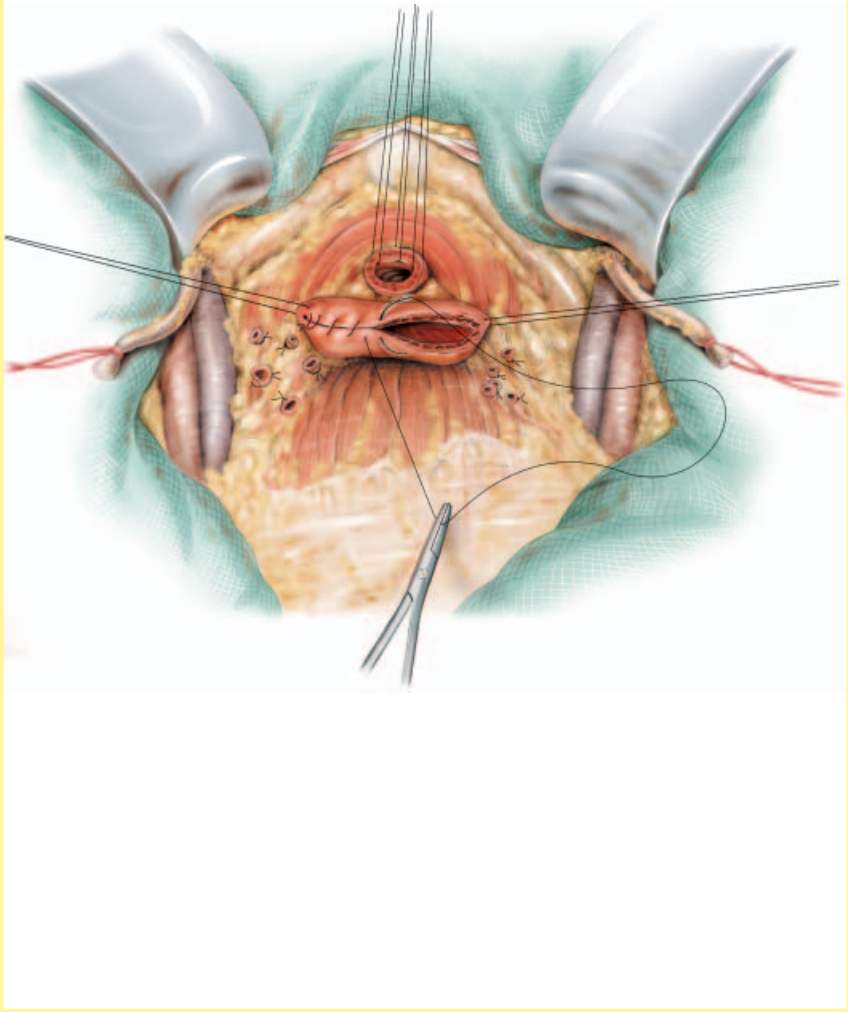
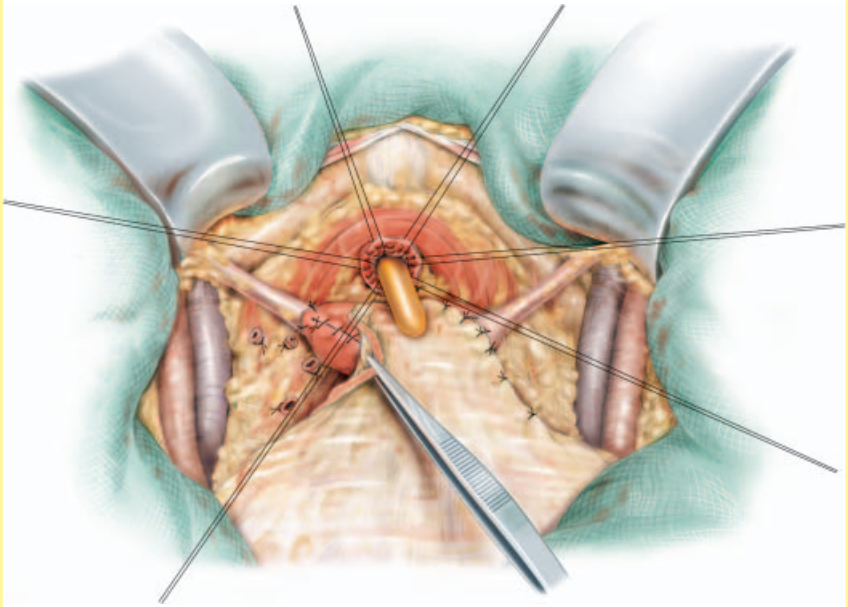


**Figure 11**

The vaginal stump is carefully closed embedding the mucosa using 2/0 polyglactin sutures. Haemostasis is revised and perfected and a 22°F silicon balloon catheter inserted in the urethra.

**Figure 12**

Two surgical manoeuvres are now carried out to prevent any tendency for caudal displacement and prolapse of the vaginal stump. The medial end of the round ligament is sutured to the corresponding angle of the vaginal stump on either side. Furthermore, the edge of the incised peritoneum at the floor of the Douglas pouch is sutured to the anterior wall of the vaginal stump.



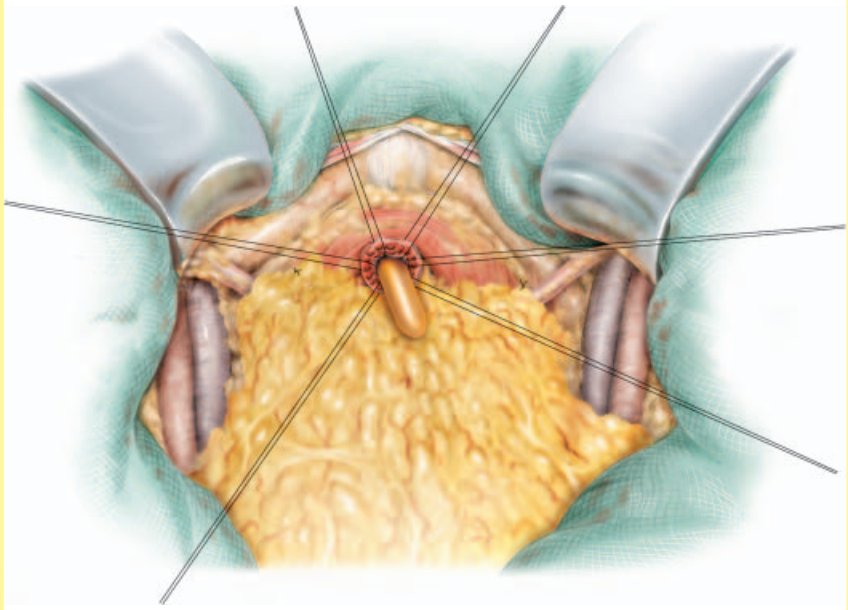
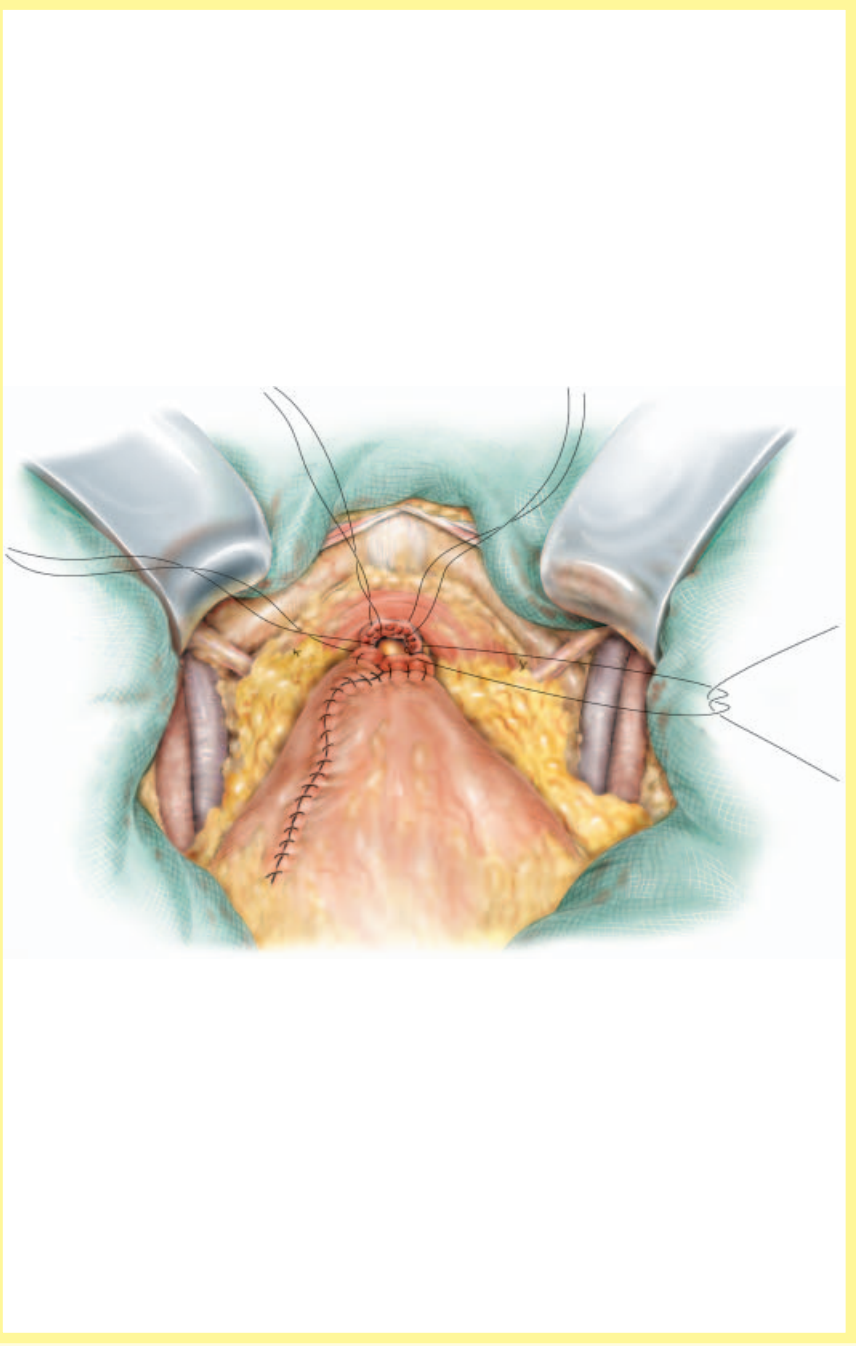


**Figure 13**

A generous pedicled omental flap is fashioned based on the left gastroepiploic artery. Beginning from the right side, the omentum is dissected off the anterior wall of the transverse colon, and its attachments to the greater curvature are clamped, cut and ligated. Dissection is continued towards the left side until the splenic flexure is reached. This usually results in a long broad omental flap that can be brought down to the pelvic cavity with ease. The graft serves to fill the dead space resulting from removing the bladder and uterus. In this manner, a back support to the neobladder is provided, preventing its posterior displacement and angulation of the urethroileal junction. Furthermore, the omentum is sutured to the anterior vaginal wall, providing an interposing sheet between the vaginal stump and the urethroileal suture line, thus the likelihood of a fistula formation is reduced.

**Figure 14**

An isolated segment from the distal ileum is generally preferred by us for creating of the neobladder. Two models are readily available: the hemi-Kock's pouch or the ileal W-bladder with a serous-lined tunnel. The hemi-Kock's pouch is indicated if the ureters are grossly dilated or had to be cut short because of the presence of an associated pathology at their distal ends. Otherwise, the ileal-W-bladder is routinely used for its technical simplicity and as stapling material is not required. The technical details of these two procedures have been the subject of several publications [2,11–13]. In both procedures, the suture line of the most dependent part of the pouch close to the urethral stump is reopened for 2 cm. The security of the suture line is maintained by two interrupted sutures at both ends of the aperture. The urethral stump is anastomosed to the hole thus created using the already inserted stay sutures holding the urethral stump. A 22°F silicone Foley catheter is then inserted to drain the neobladder.



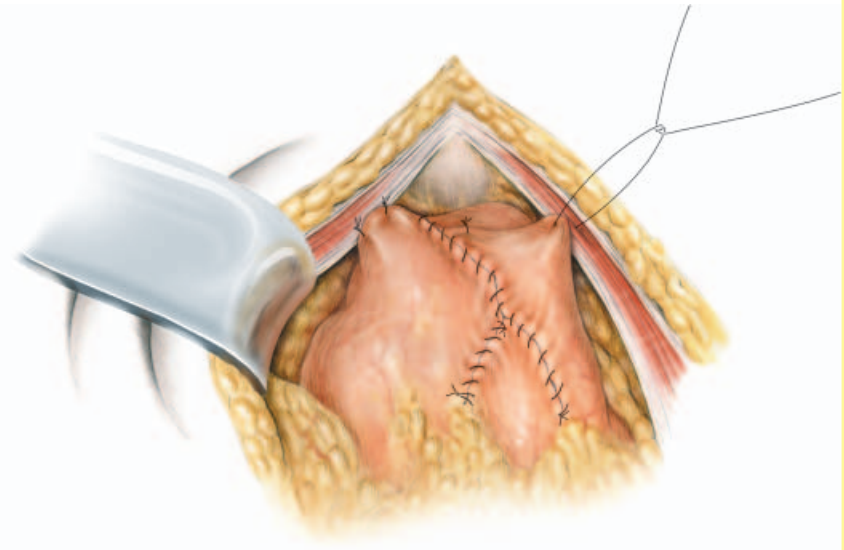


**Figure 15**

At the end of the procedure, the anterior wall of the neobladder near its dome is fixed to the back of the rectus muscle by 2–3 sutures of 3/0 polyglactin. This would prevent caudal descent and/or axial rotation of the reservoir.

## POST-OPERATIVE CARE AND FOLLOW-UP

The pelvic cavity is drained by two tubes brought out through separate incisions in the abdominal wall. Gravity drainage only is used. Intravenous alimentation is maintained until normal bowel function resumes. Prophylactic antibiotics are administered routinely. Active and passive chest and leg exercises are used. The drains are removed once fluid drainage has ceased and the ureteric stents are removed after 10 days. The urethral catheter is kept for 3 weeks.

Patients are instructed that after removing the urethral catheter they may suffer from urinary incontinence for a few days. They are encouraged to carry out pelvic floor exercises and not to wear a protective pad.

Patients are seen again in 3 months, and enquiries made about day-time continence, enuresis and voiding frequency. IVU is used to evaluate the configuration of the upper tract with ascending and voiding studies to assess the capacity of the pouch, the efficiency of the reflux-preventing system and the presence of residual urine.

## COMPLICATIONS

We recently reported our experience with 60 cases [14]. Early postoperative complications included a fatal pulmonary embolism in one patient, deep vein thrombosis in two, and prolonged ileus, which was managed conservatively in one. A urinary leak from the vaginal stump was encountered in three patients. These required surgical correction through a vaginal approach 3 months after the initial procedure. The anterior vaginal wall was incised, and the fistulous tract encircled. The vaginal flaps were raised and the fistulous communication was excised. The edges of the neobladder were paired and sutured together by interrupted 3/0 polyglactin acid sutures. The vaginal flaps were joined by interrupted 2/0 sutures of the same material. A silicone urethral catheter was kept indwelling for 2 weeks. Despite the technical simplicity of the repair, care must be taken during the initial surgery to avoid this complication. The urethro-ileal anastomosis must be made carefully and the vaginal stump closed meticulously. The interposition of an omental graft reduces the incidence of such morbidity.

## ONCOLOGICAL OUTCOME

During the observation period (1–4 years), seven patients had a treatment failure in the form of local recurrence and/or distant metastasis. One of these had an isolated urethral recurrence. For this patient, a wide local excision and conversion to a continent cutaneous diversion were carried out.

## FUNCTIONAL OUTCOME

In all, 32 patients are continent day and night. They have large capacity reservoirs with no instability and a good urethral continence mechanism, and empty the pouch spontaneously with no significant residual urine. Symptoms of grade 1 stress incontinence in two patients were confirmed on urodynamics, which showed negative urethral pressure transmission during stress. Both patients empty the pouch spontaneously with no significant residual urine. As the symptoms were mild and tolerable they did not seek further treatment. Six patients had episodes of bed-wetting, including three with occasional enuresis who used one or two protective pads at night twice weekly. The remaining three patients had nocturnal incontinence three or more times a week and required three or more pads. Urodynamic and fluoroscopic evaluations revealed an incompetent continence mechanism in two patients, pouch hyperactivity in three and marked residual urine in one. All of these patients were treated with 25 mg imipramine hydrochloride at bedtime, which resulted in significant improvement in three. The patient with marked residual urine also used intermitted self-catheterization. Six patients (14%) had significant residual urine of ≥150 mL (mean 230, SD 60) during the first 6 months after surgery. Voiding studies under fluoroscopy showed a large pouch capacity, posterior sagging of the pouch as a result of increased intra-abdominal pressure, and increased angulation of the junction between the urethra and neobladder. The three patients who had significant overflow incontinence and/or upper tract deterioration had open surgical reduction of the pouch and ventral fixation of the neobladder to the anterior abdominal wall which were successful.

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