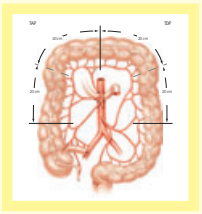
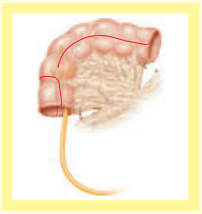
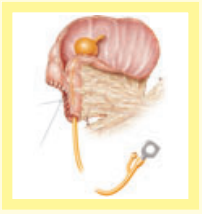
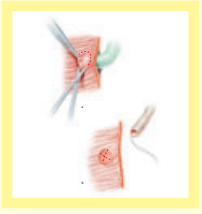
Surgery Illustrated









Surgical Atlas

Colonic pouch (Mainz-pouch III) for continent urinary diversion

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

INTRODUCTION

Urinary diversion in previously irradiated patients has proven to be a challenge which has been addressed with several different techniques. There is a high rate of early and late complications using small bowel segments and ileocaecal reservoirs. Based on the high risk of failure in reconstructive surgery in the irradiated field, and on the high complication rate after using irradiated tissue for urinary diversion, the 'avoidance' principle was adopted with unirradiated large bowel segments being used for continent urinary diversion [1–3].

Here, we describe the technique of the transverse ascending pouch (TAP) and transverse descending pouch (TDP), which was initially introduced in patients with previous pelvic irradiation therapy. The excellent results of the TAP and TDP have caused us to contemplate using these techniques not only under special circumstances but as an alternative form of urinary diversion in unirradiated patients. We also introduce a direct, refluxing uretero-intestinal anastomosis with a very low risk of ureteric obstruction and subsequent deterioration in kidney function.

Advantages of the technique are: preservation of the ileocaecal valve for limiting adverse effects related to an increased stool frequency; there is also no risk of vitamin B12 deficiency, as it is associated with the use of small bowel segments for urinary diversion [4].

INDICATIONS

Absolute or functional loss of the urinary bladder (patients with muscle-invasive bladder cancer, local tumour recurrence of gynaecological malignancies, irreparable vesical fistulae and neurogenic bladder disorders after failed conservative management). The technique can also be used in patients with complete pelvic exenteration requiring urinary diversion and colostomy.

LIMITATIONS AND RISKS

- Patients should understand the problems and risks associated with self-catheterization and should be assessed for compliance.
- Patient compliance is mandatory for regular follow-up visits, including measurement of base excess.
- Preoperative existing diarrhoea can be worsened by additional loss of large bowel for a colonic pouch.
- Dilatation of the upper urinary tract with normal kidney function is **not** a contraindication.

CONTRAINDICATIONS

- Renal insufficiency with elevated serum creatinine levels (>2 mg/dL).
- Short bowel syndrome.
- Abnormalities of the colon (diverticula disease, stenosis).
- History of colorectal cancer.
- Poor compliance.

PREOPERATIVE DIAGNOSTIC PROCEDURES

- IVU.
- Renal scintigraphy if there is upper urinary tract dilatation. Nephrectomy should be considered when the split renal function of one side is <20% of total renal function.
- A contrast-medium enema to exclude diverticular disease or stenosis of the colon. Also estimate the colon length available and decide on a TAP or TDP (the skin incision circumnavigates the umbilicus on the contralateral side).
- Bowel preparation with mechanical clean-out 1 day before surgery.

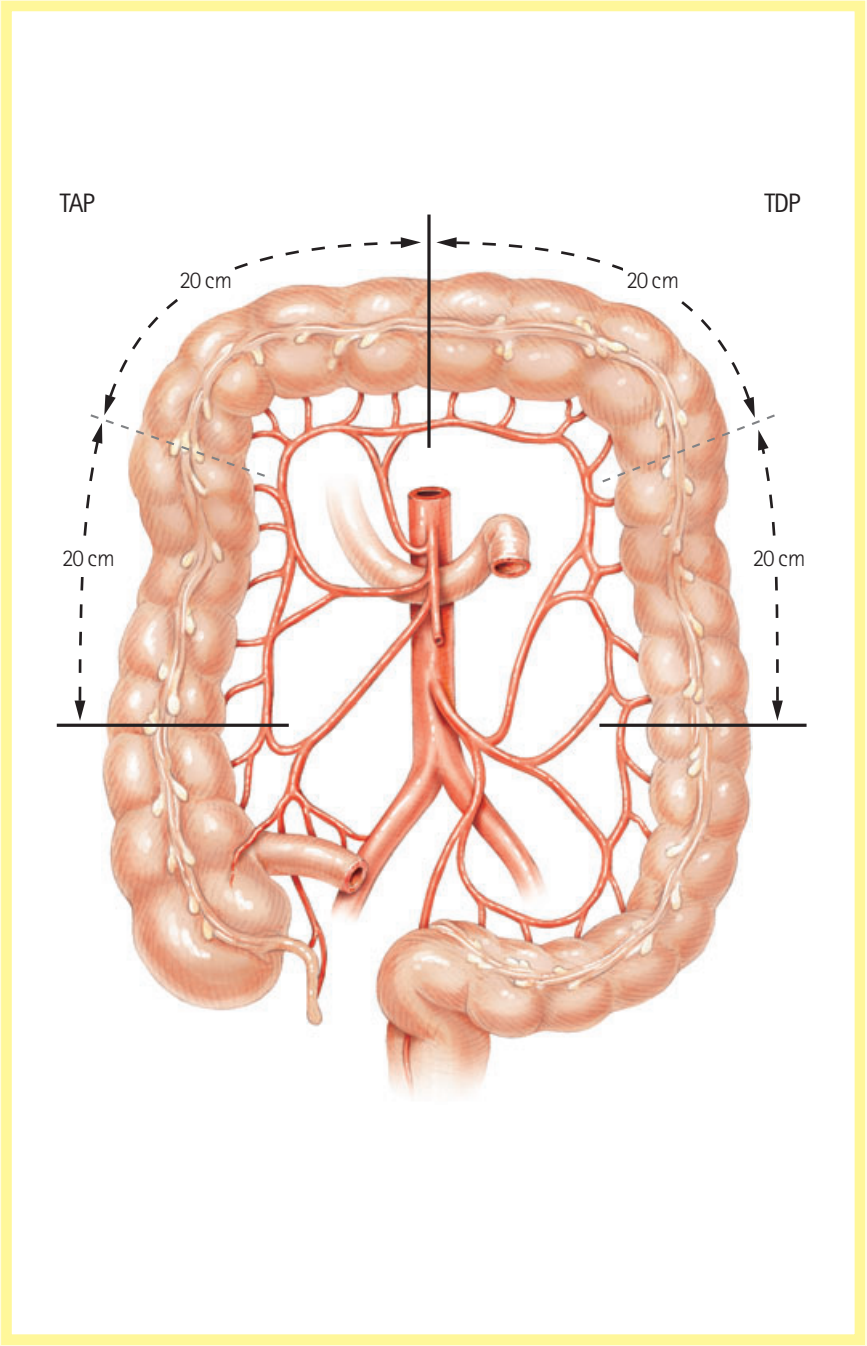
SUTURE MATERIALS

- Ureteric implantation: monofilament sutures 5 × 0 (e.g. poliglecaprone, polyglyconate);
- Pouch wall: monofilament sutures with straight needle 4 × 0 (polydioxanone);
- Fixation of stents: e.g. polyglactin rapid 4 × 0;
- Umbilical funnel: monofilament sutures 3 × 0 (e.g. poliglecaprone, polydioxanone);
- Creation of efferent segment: Monofilament absorbable sutures for mucosa (e.g. poliglecaprone 5 × 0), nonabsorbable sutures for seromuscular layer (e.g. polypropylene 3 × 0).

Figure 1

A midline laparotomy is made from the xiphoid to the pubic symphysis with circumnavigation of the umbilicus on the right side for the TDP and on the left side for the TAP. This decision is made based on the preoperative enema. In patients who have undergone previous midline laparotomies, the same skin incision should be used to avoid umbilical necrosis and to create a well-vascularized umbilical stoma.

- Small and large bowel are mobilized carefully to avoid serosal lesions and the need for bowel resections.
- Ureters are dissected out of the retroperitoneal tissue where they are often impacted and obstructed in a fibrous mass after irradiation. The ureteric stumps are shortened up to a level at which arterial capillary bleeding, spontaneous peristalsis, and urinary ejaculation are observed.
- Selection of the colon segment depends on the individual length of unirradiated bowel; 30–40 cm of transverse colon and either ascending or descending colon are required to create a pouch of adequate capacity (400–600 mL). The right or left colic flexure should be mobilized completely to gain adequate colon length for the pouch.
- Greater omentum is separated from the transverse colon from right to left in the TAP and left to right in the TDP. The blood supply of the colon, which has some anatomical variability, is identified by transillumination. The colon is then resected between stay sutures.
- Colo-colostomy is performed with interrupted seromuscular sutures (4 × 0 monofilament material).



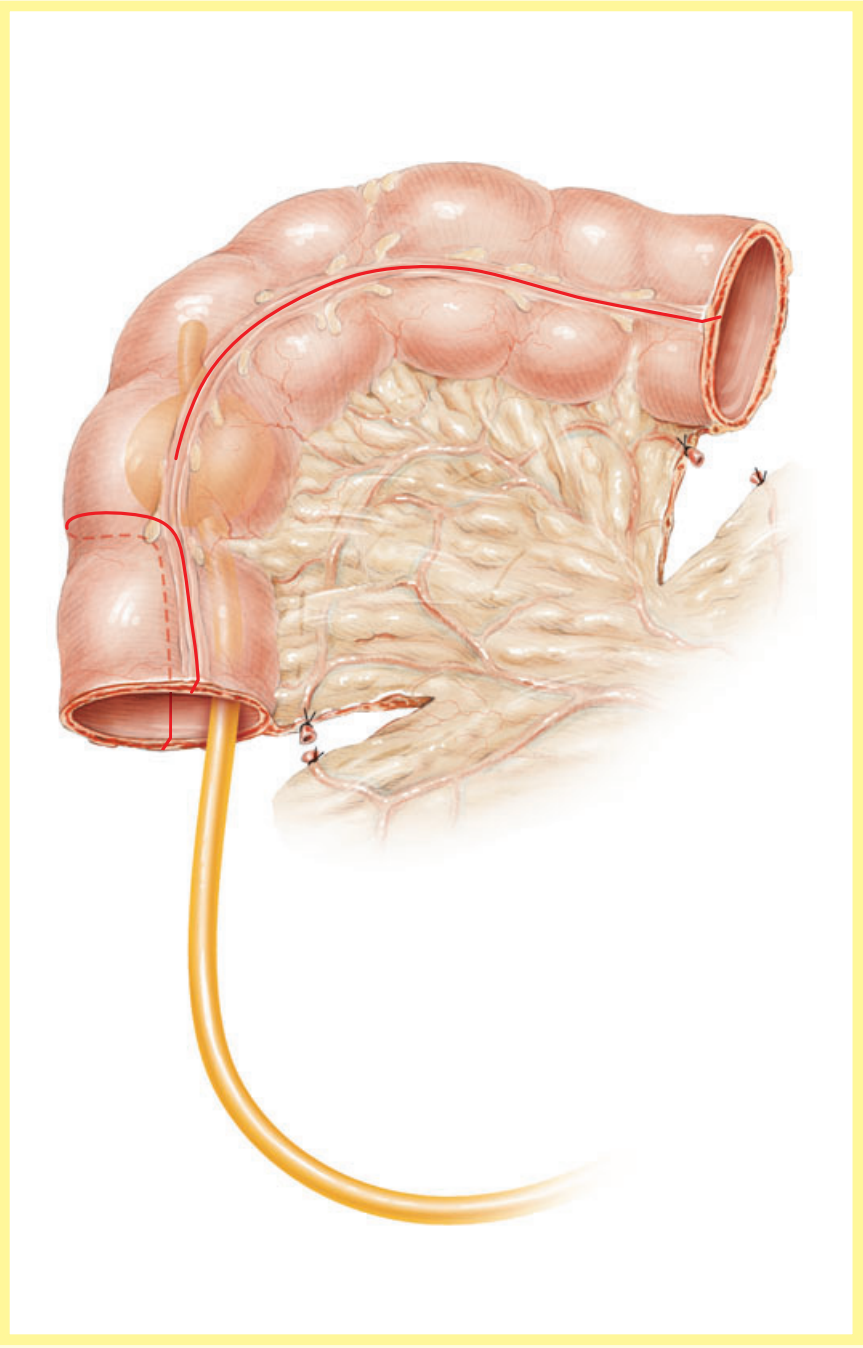
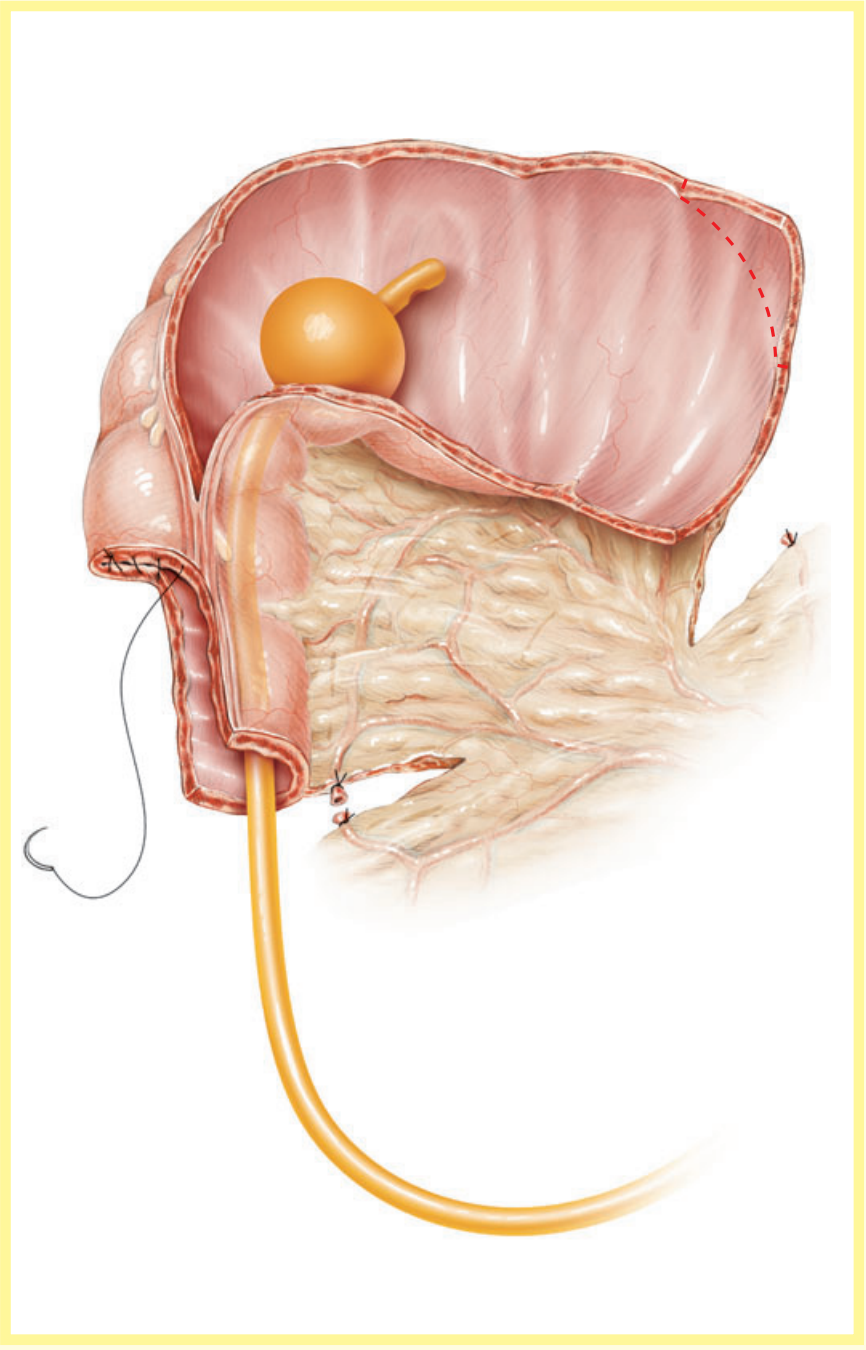


Figure 2

The colon is detubularized antimesenterically leaving 5–6 cm of the oral or aboral end intact for creating the efferent segment.

Figures 3 and 4

This segment is tapered over an 18 F silicone catheter. The mucosa is sutured with polyglycol and the seromuscular layer with a nonabsorbable running suture. A pseudo-appendix is thus created. Easy catheter gliding is important as a shrinkage rate of up to 30% can be expected.



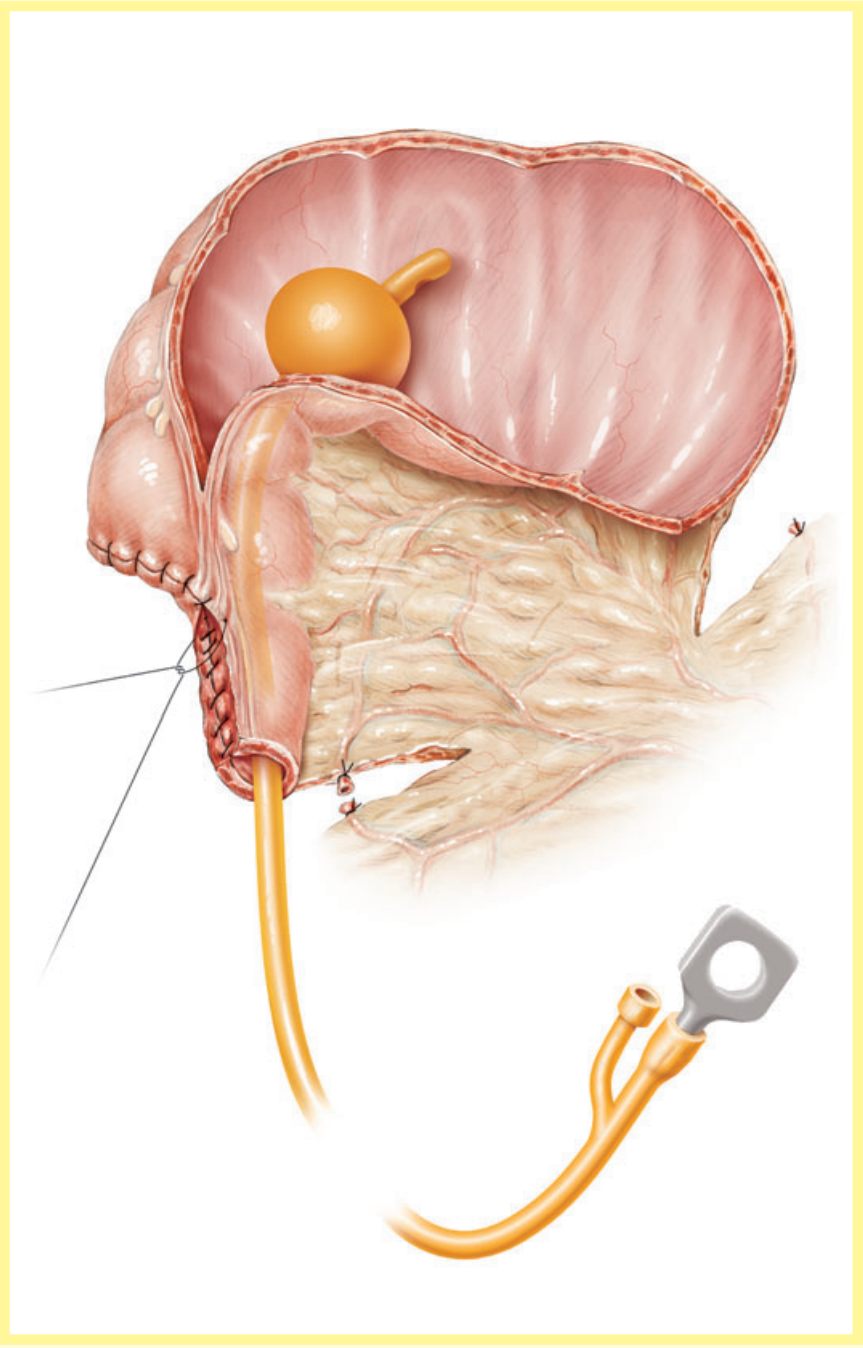
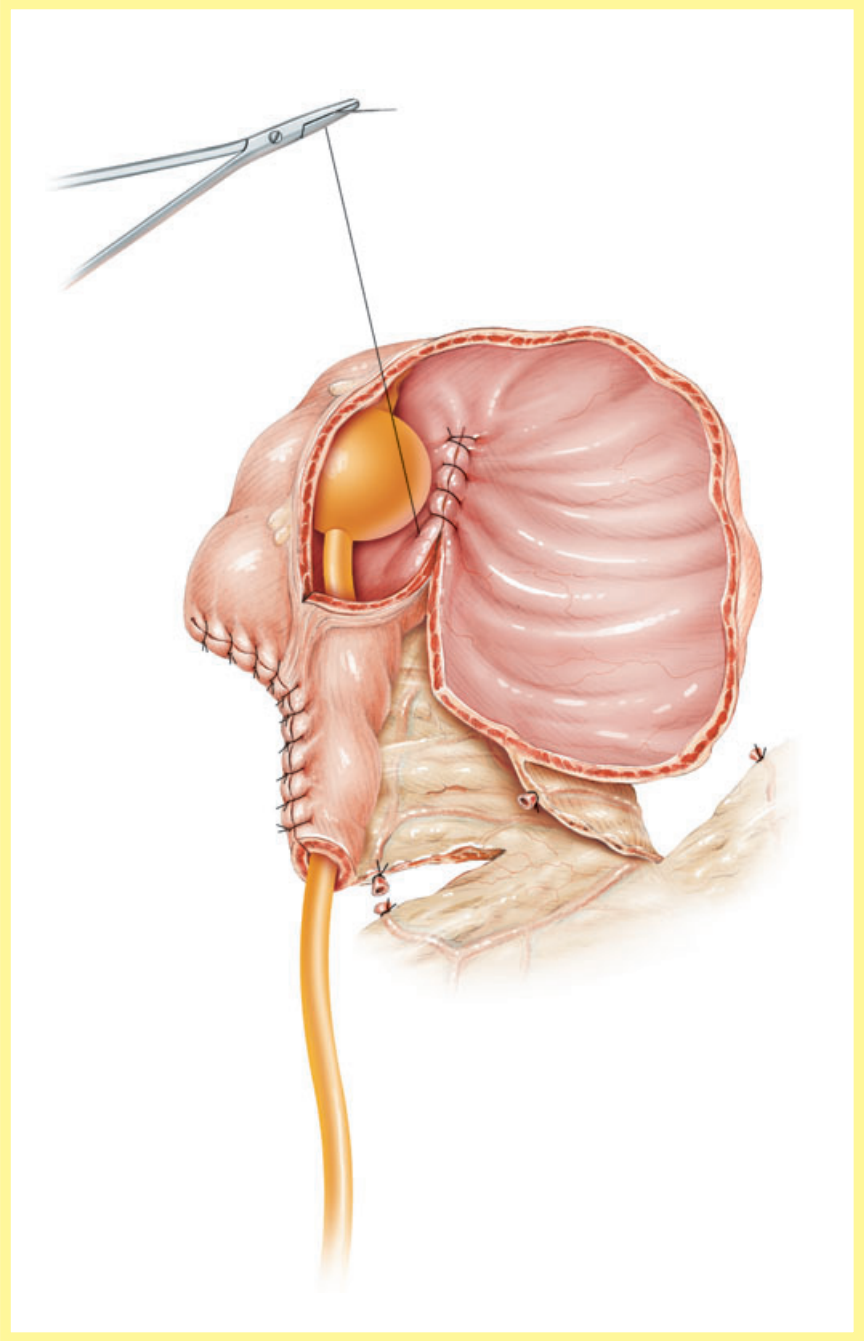


Figure 5

- A pouch plate is created using a running 4/0 monofilament polyglycol suture on a straight needle.
- The ureter can be implanted with an antirefluxing or refluxing technique.
- For the antirefluxing uretero-intestinal anastomosis: A submucosal tunnel of ≈2 cm on both sides of the suture link is created between stay sutures. The ureters are pulled through the tunnel and a neo-ostium made with 5 × 0 absorbable sutures. The ureteric adventitia is fixed at the external pouch wall with two 5 × 0 sutures [5].



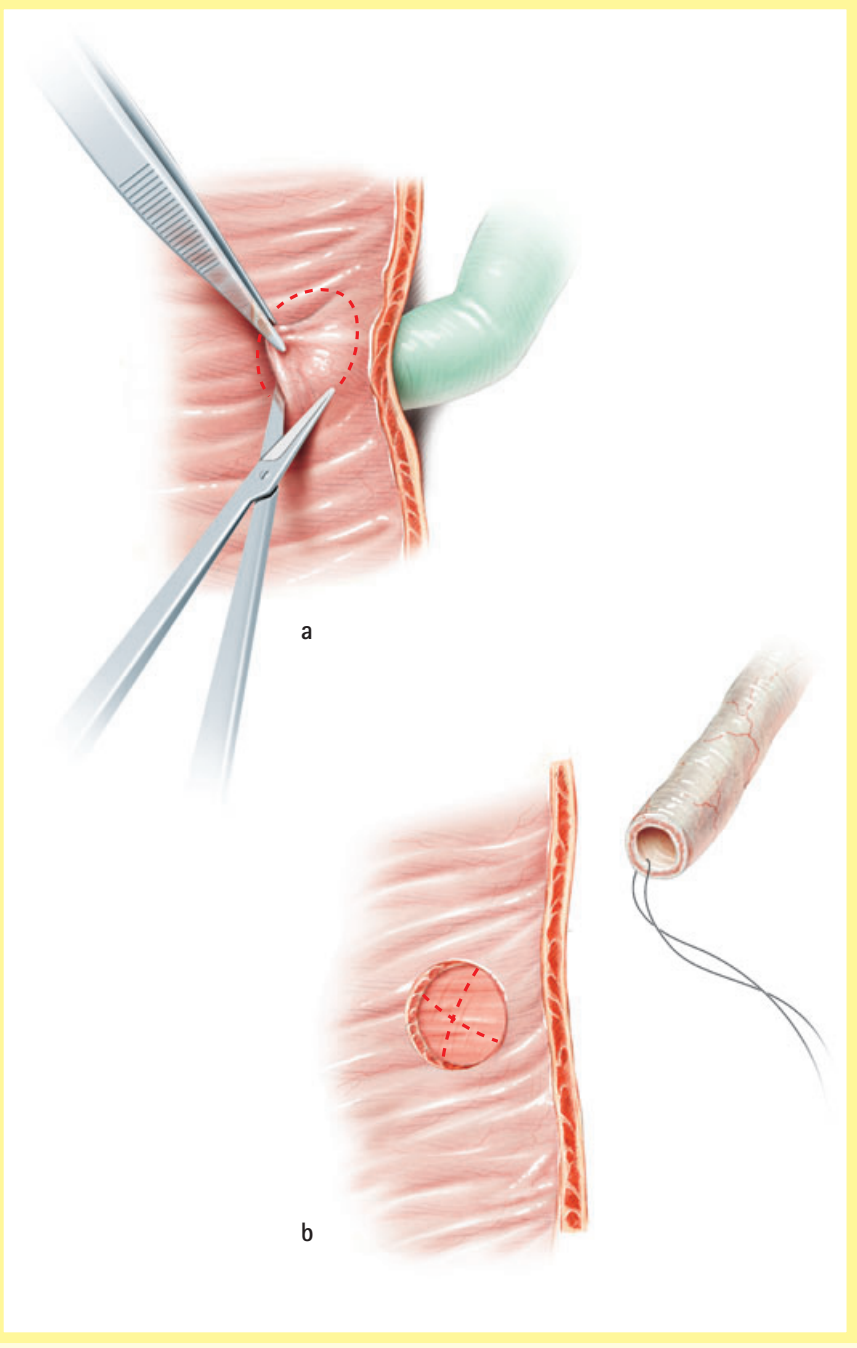
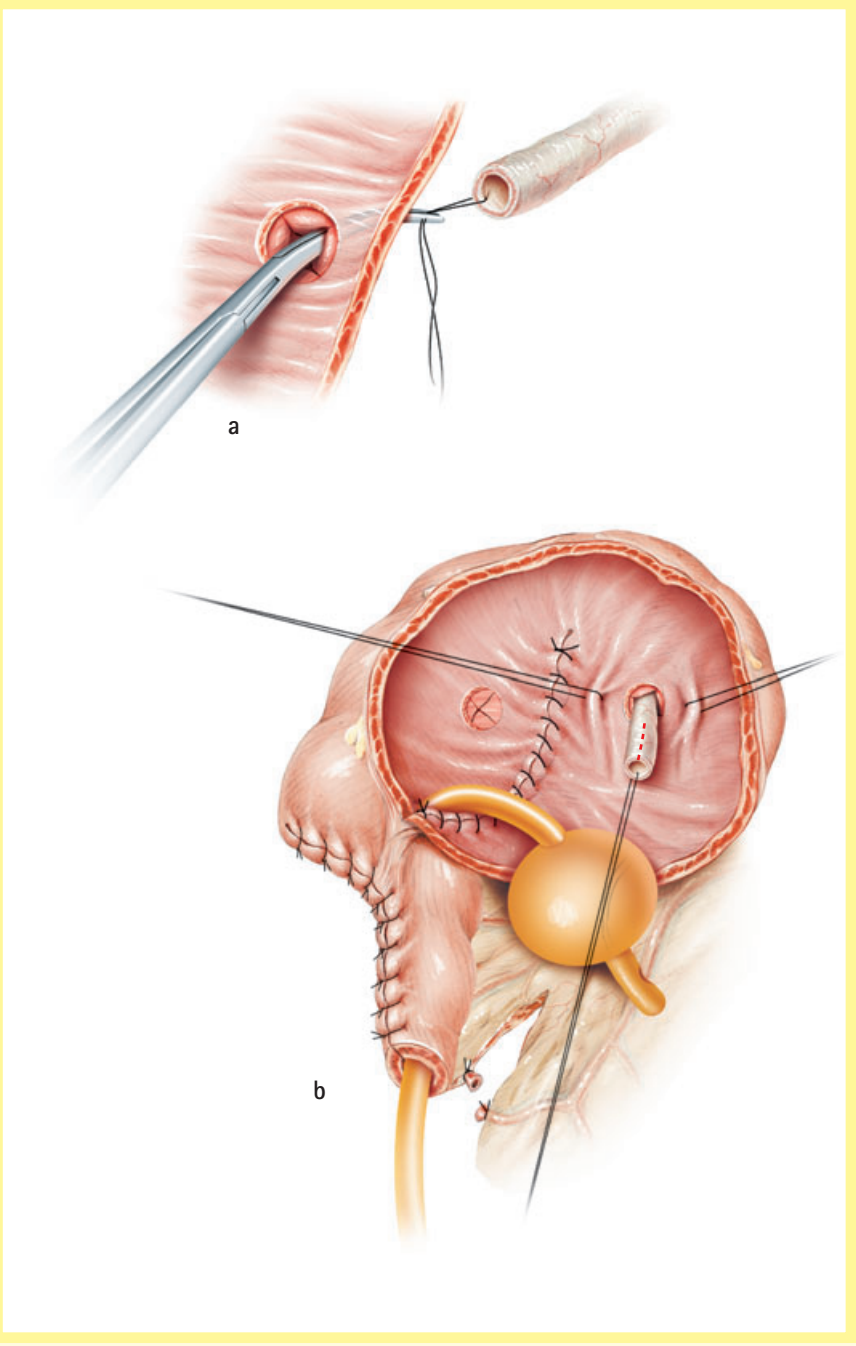


Figure 6

For the refluxing ureterointestinal anastomosis: On the rear side of the pouch plate, ≈1 cm^2 of the bowel mucosa is excised. The manoeuvre is facilitated by extending the pouch wall by a finger placed from the posterior. The seromuscular layer is then incised in the shape of a cross.

Figures 7 and 8

Care should be taken to observe spontaneous spouting of urine from the ureteric stump in each case after the pull-through manoeuvre before the ureter is anchored in the pouch at the 5 and 7 o'clock positions. This is followed by a watertight anastomosis with 5/0 sutures. The ureteric adventitia is fixed at the external pouch wall.



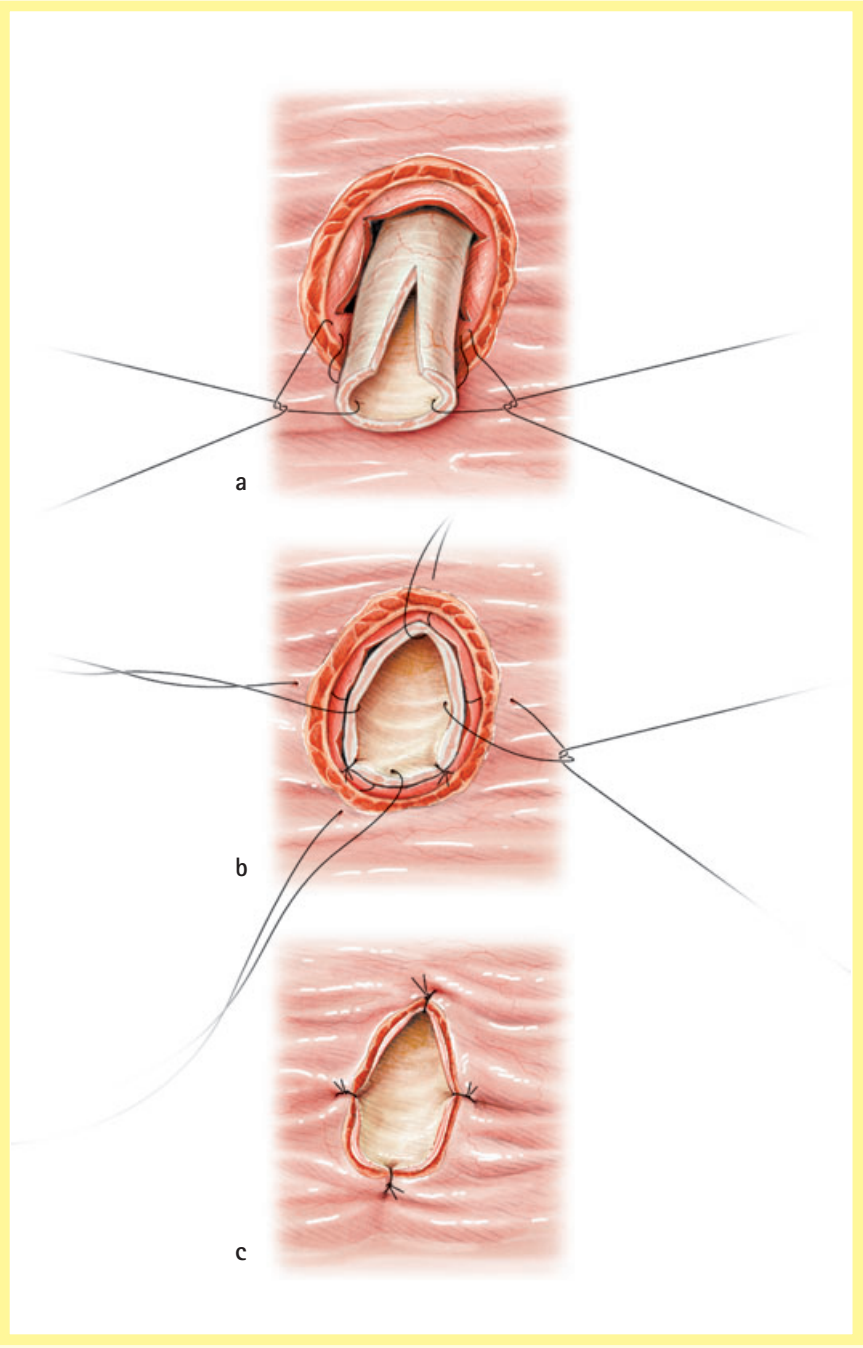
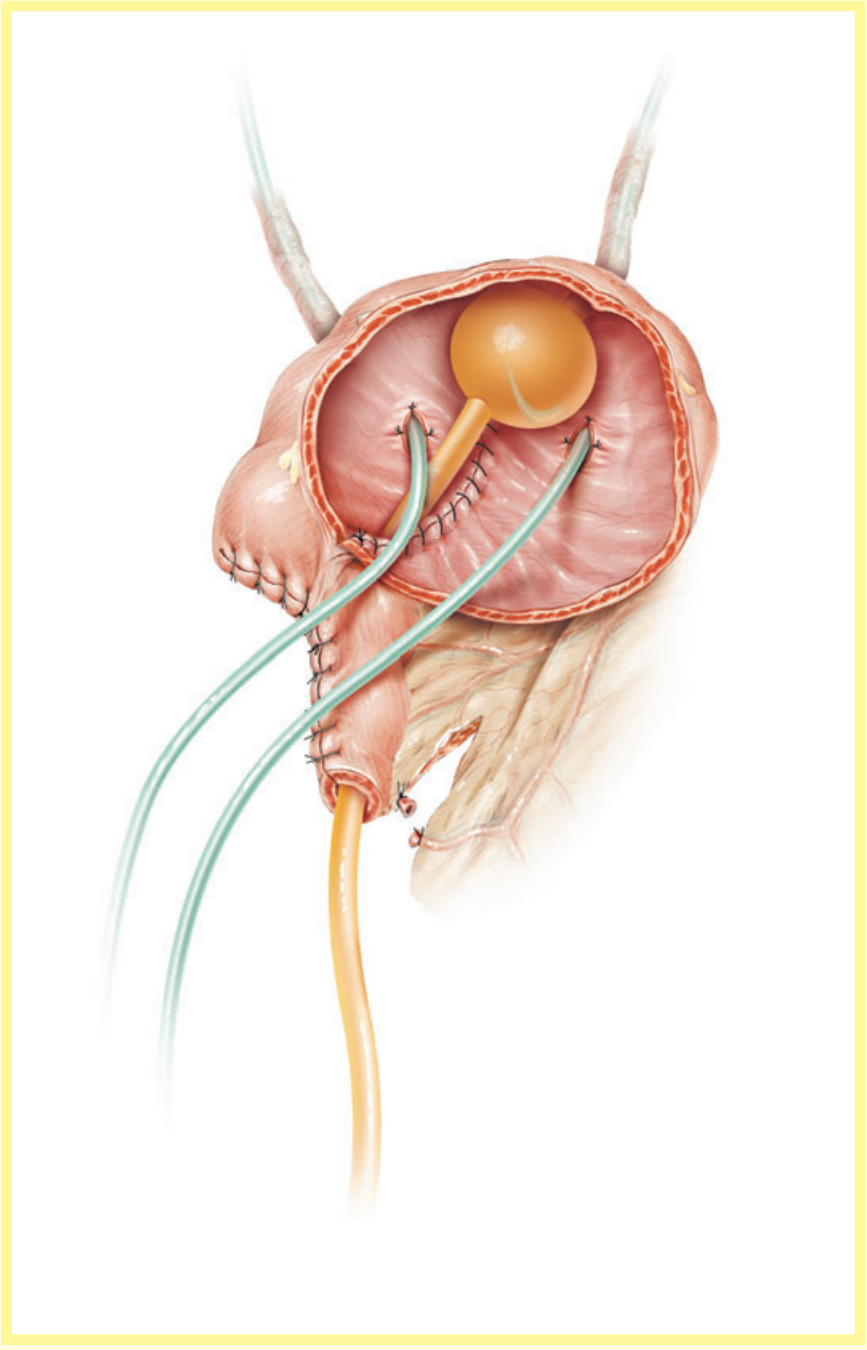


Figure 9

After anastomosing the ureter to bowel, spontaneous urine emission is used as evidence of an unobstructed and torsion-free ureteric course. The 6 or 8 F smooth ureteric stents are placed and fixed. Along with a 10 F pouchostomy, the ureteric stents are led out through the pouch and abdominal wall at separate sites.



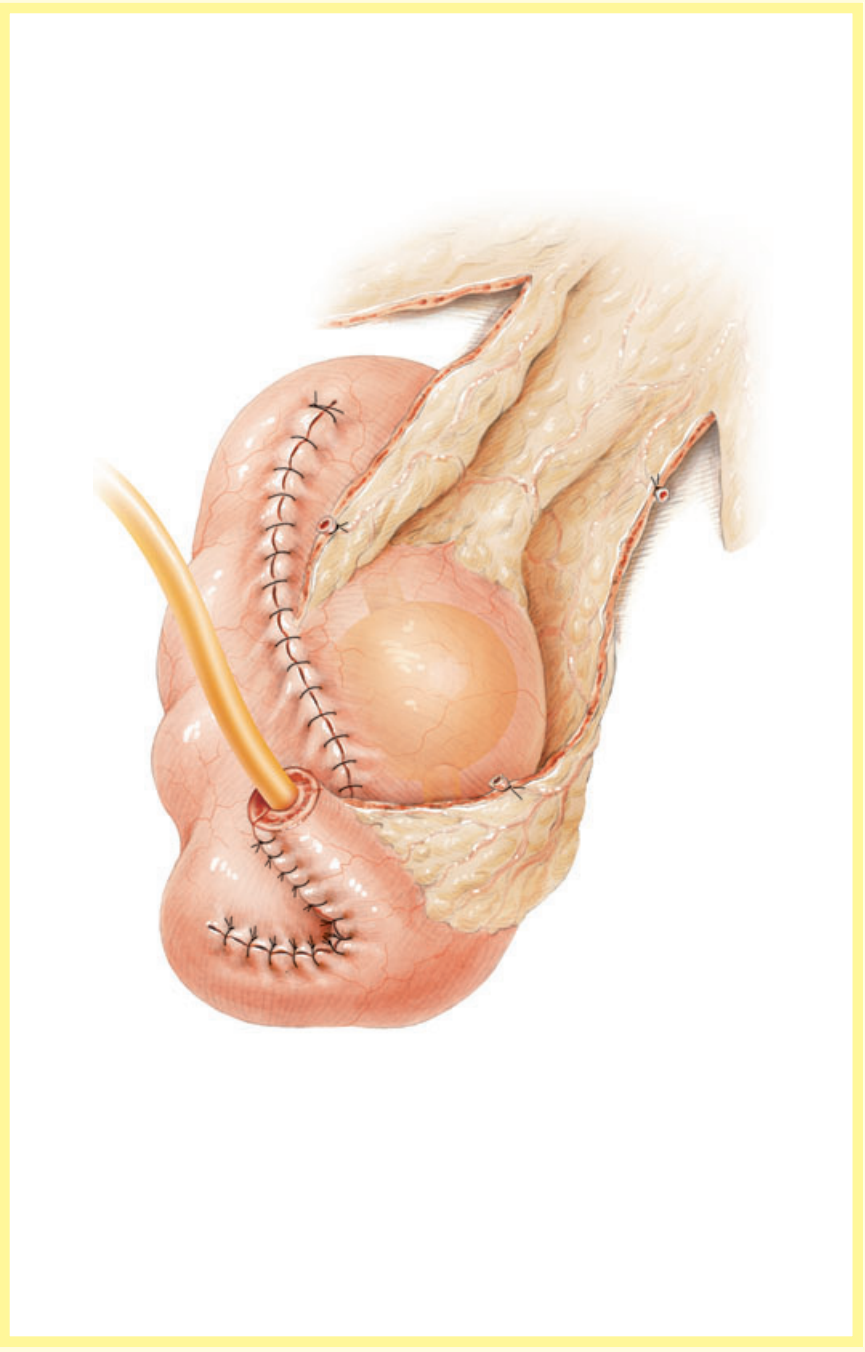
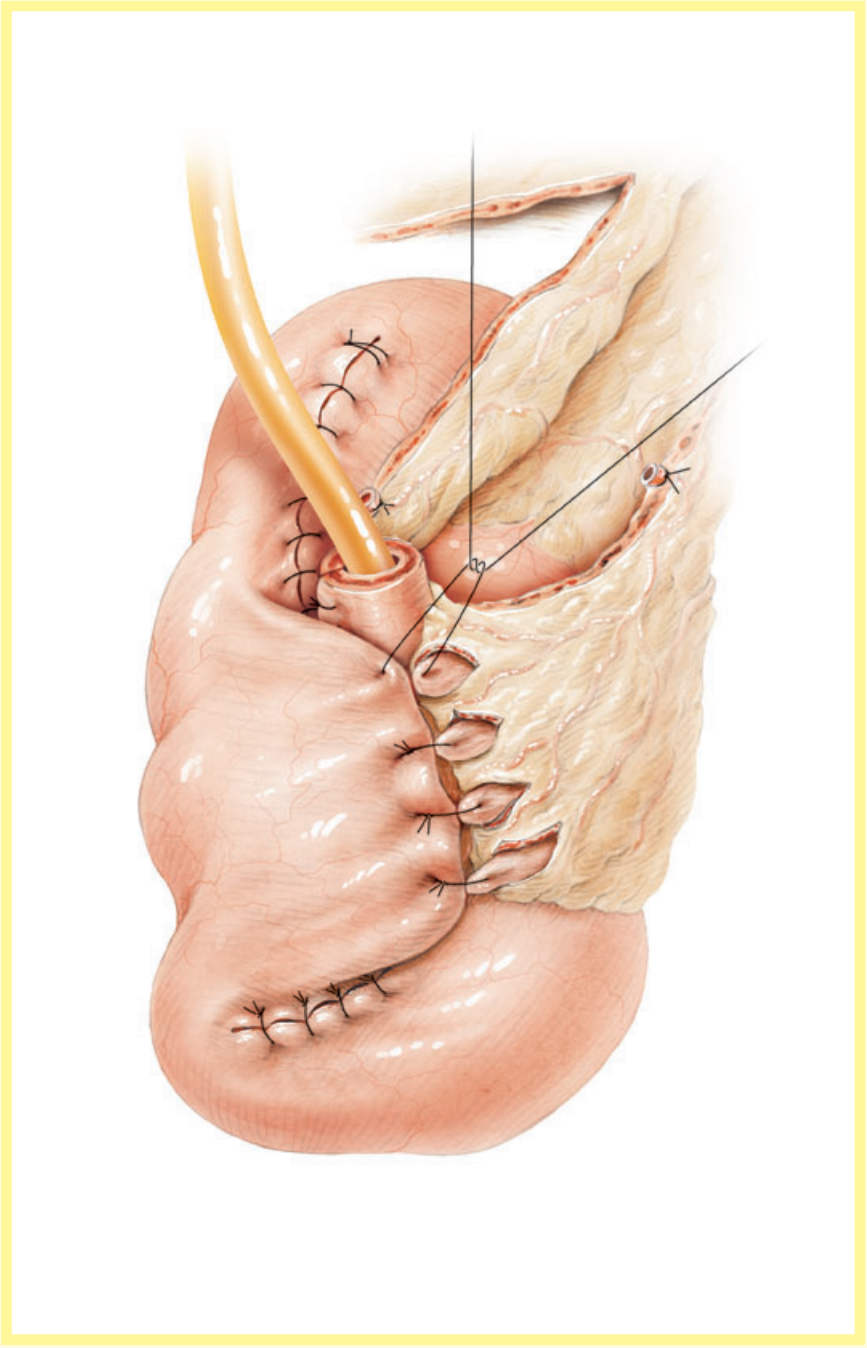


Figure 10

The pouch is closed and the efferent segment embedded in the anterior suture line of the pouch wall.

Figure 11

- Windows are dissected in the mesentery of the tapered colon between the vessels.
- The efferent segment is then placed in the suture line and the seromuscular layer of the anterior wall sutured together through the mesenteric windows using nonabsorbable sutures.
- The anastomosis between the umbilical funnel and the efferent segment is made at the level of the rectus fascia and the pouch fixed to the abdominal wall.
- The pouch is fixed at the anterior and lateral abdominal wall with interrupted sutures.
- Omentum is used as a flap to cover the pouch and the bowel.



POSTOPERATIVE CARE

- Remove the ureteric stents after 10–14 days.
- IVU after removing the stents
- Start clean intermittent catheterization after taking a pouchogram 3 weeks after surgery.

COMMENTS/SURGEON TO SURGEON

As we recently reported the advantages of a refluxing uretero-intestinal anastomosis, with almost no risk of ureteric obstruction and subsequent deterioration in kidney function, we consider this our technique of choice in adults [6]. The antirefluxing implantation technique should only be used in children.

As large bowel surgery is less common than small bowel procedures in most urological centres, the following points may be helpful for avoiding problems during and after surgery. Because of the greater mobility of the large bowel than the small bowel, only minimal separation (4–5 cm) of the mesentery is necessary. The blood supply is thus less at risk. Open resection without clamps or staplers makes capillary bleeding recognisable, which is important in irradiated bowel surgery with significant vascular damage. Macroscopically, irradiated bowel looks smaller and is contracted, less vascularized, and sometimes pale with fibrotic adhesions, and especially in the ileocaecal region, may be fixed to the abdominal wall. In addition, palpation of the wall thickness is important to identify the line of resection. A minimum safety margin of 5–7 cm should be left, so that large bowel continuity can be restored later. With 4–0 polyglycol interrupted sutures through the seromuscular layer for end-to-end-anastomosis, leakage has not occurred in the >200 cases at our institution. To feel safer, a semicircular running suture of the mucosa can also be added.

Although our experience with the efferent segment is excellent [7], other techniques for constructing a continence mechanism are available. A tapered small bowel segment outside the irradiated area may be embedded according to the technique described above. A full-thickness tube can also be used [8,9]. To take as little bowel as possible; the technique introduced by Monti *et al.* [10] may be used. The long-term results of this technique have yet to be documented.

REFERENCES

1 **Nelson JH.** *Atlas of Radical Pelvic Surgery*. New York: Appleton-Century-Crofts, 1969: 181–91
2 **Schmidt JD, Buchsbaum HJ, Nachtsheim DA.** Long-term follow-up further experience with and modifications of the transverse colon conduit in urinary diversion. *Br J Urol* 1985; **57**: 284–8
3 **Hancock KC, Copeland LJ, Gershenson DM *et al.*** Urinary conduits in gynecologic oncology. *Obstet Gynecol* 1986; **67**: 680–4
4 **Sagalowsky AI, Frenkel EP.** Cobalamin profiles in patients after urinary diversion. *J Urol* 2002; **167**: 1696–700
5 **Thüroff JW, Alken P, Riedmiller H, Engelmann U, Jacobi GH, Hohenfellner R.** The Mainz pouch (mixed augmentation ileum and cecum) for bladder augmentation and continent diversion. *J Urol* 1986; **136**: 17–26
6 **Hohenfellner R, Black P, Leissner J, Allhoff EP.** Refluxing ureterointestinal anastomosis for continent cutaneous urinary diversion. *J Urol* 2002; **168**: 1013–7
7 **Leissner J, Black P, Fisch M, Höckel M, Hohenfellner R.** Colon pouch (Mainz Pouch III) for continent urinary diversion after pelvic irradiation. *Urology* 2000; **56**: 798–802
8 **Roth S, Weining C, Hertle L.** Continent cutaneous urinary diversion using the full-thickness bowel flap tube as continence mechanism: a simplified tunneling technique. *J Urol* 1996; **156**: 1922–5
9 **Lampel A, Hohenfellner M, Schultz-Lampel D *et al.*** In situ tunneled bowel flap tubes. 2 new techniques of a continent outlet for Mainz pouch cutaneous diversion. *J Urol* 1995; **153**: 308–15
10 **Monti PR, Lara RC, Dutra MA *et al.*** New technique for construction of efferent conduits based on the Mitrofanoff principle. *Urology* 1997; **49**: 112–5

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