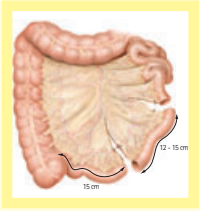
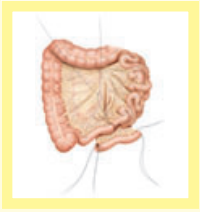
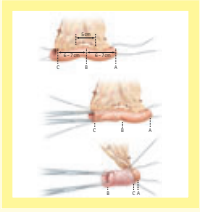
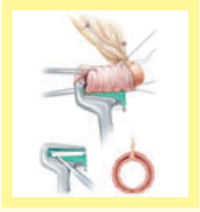
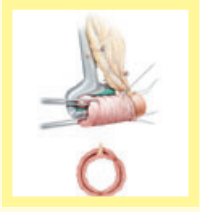
Surgery Illustrated











Surgical Atlas

Intussuscepted ileal flap valve for revisional surgery

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

INTRODUCTION

If the construction of a continent outlet for continent cutaneous urinary diversion (CCUD) is required in revisional surgery, the ileal intussusception flap valve is a straightforward and reliable solution to the problem. Construction of a continent outlet in the presence of an established intestinal urinary pouch may be required for conversion of an orthotopic bladder substitution into a CCUD or for repairing a failed continence mechanism in a CCUD. However, the surgical technique may also be used to convert any other form of urinary diversion (e.g. conduit diversion, ureterosigmoidostomy) into a CCUD.

The ileal intussusception flap valve was originally devised by Kock for both creating a continent outlet (anisoperistaltic intussusception) and as an antireflux mechanism (isoperistaltic intussusception) in the ileal Kock pouch [1]. Later it was modified to prevent nipple gliding (dessusception) and nipple prolapse, specifically during the phase when the initial small-capacity pouch was distending into a high-volume reservoir. The most significant modification is the fixation of the 'nipple valve' to the wall of the pouch [2,3]. This technique basically converted the original 'nipple valve' into a 'flap valve' [4]. A modified version of the intussuscepted flap valve has been used since the 1980s in the ileocaecal Mainz pouch for a CCUD [5,6].

PLANNING AND PREPARATION

INDICATIONS

The main indications for constructing an ileal intussusception flap valve in a surgical revision are conversion of any type of continent or incontinent urinary diversion into a CCUD, or repair of a failed continence mechanism in a CCUD. Obviously, conversion from an orthotopic bladder substitution into a CCUD or repair of a failed continence mechanism of a CCUD deal only with the construction of the continent outlet in the presence of an established intestinal urinary reservoir, while conversion from conduit or ureterosigmoidostomy into a CCUD also involves constructing an intestinal urinary reservoir and ureteric reimplantation in many cases. The latter more complex surgery requires careful preoperative planning in terms of how the intestinal segments of the existing urinary diversion can be reused and incorporated into the planned CCUD, specifically which segment of ileum may be used for constructing the continent outlet and which parts of intestine will be used for ureteric implantation and creating an antireflux mechanism. For instance, conversion from an ileal conduit into a CCUD

may be planned as follows: creation of the ileal intussusception flap valve from the existing ileal conduit and construction of an ileocaecal pouch with antirefluxive ureteric reimplantation through a submucosal tunnel for undilated ureters, or through a serosa-lined extramural tunnel for dilated ureters. However, in the case of conversion of an antirefluxive colonic conduit, ureteric reimplantation is generally not required and the colonic conduit is simply opened and incorporated into the pouch. Hence, the continence mechanism has to be constructed from an additionally resected segment of ileum.

When converting from an orthotopic bladder substitution into a CCUD, closure of the anastomosis between the neobladder and the urethra usually requires some mobilization of the bladder substitute from pelvic wall adhesions, which can be extensive and time-consuming. When urethral tumour recurrence is the indication for conversion, urethrectomy must be performed. However, also for all other indications for conversion from an orthotopic bladder substitution into a CCUD, e.g. incontinence, it is advisable to perform urethrectomy, as complete urethrectomy will be more difficult later.

The best choice of a location for the continent stoma is generally the umbilicus, for cosmetic reasons, as the stoma remains invisible at this location. The umbilicus is mostly easily reached even in conversion from an orthotopic bladder substitution to CCUD. The patient must be well instructed and motivated to use clean intermittent self-catheterization (CISC) through the continent stoma.

SPECIFIC INSTRUMENTS AND MATERIALS

- Optical loupes (× 2.5–3.5, 50 cm focal length);
- Headlight;
- Allis clamps;
- Green magazines for the TA 55 stapler with 4.8 mm titanium staples;
- 4/0 poly p-dioxanone monofilament sutures on a 1/2 needle (HR22) for anastomosis of the intussusception valve with the pouch;
- 3/0 polypropylene monofilament sutures on a 1/2 needle (RB-1) for closure of the serosa at the intussusception base;
- 2/0 polyglycolic acid braided sutures on a 5/8 needle (FR26) for fixation of the ileal outlet to the abdominal fascia;
- 3/0 polydioxanon monofilament sutures on a cutting 3/8 needle (FS-2) for cutaneous stoma formation.

The day before surgery the bowel is cleansed by administering 3 L of polyethylene glycol solution. During surgery, antibiotics (ampillicin/clavulanic acid and metronidazole) are administered and continued afterward for 5–7 days.

The patient is placed supine on the table with the legs spread out, allowing access to the urethra. If urethrectomy is planned through a perineal incision and for complete urethrectomy in females, a lithotomy position is required. For mobilising a neobladder, transection of the urethral anastomosis and closure of the substitute bladder neck, a slight Trendelenburg position is helpful.

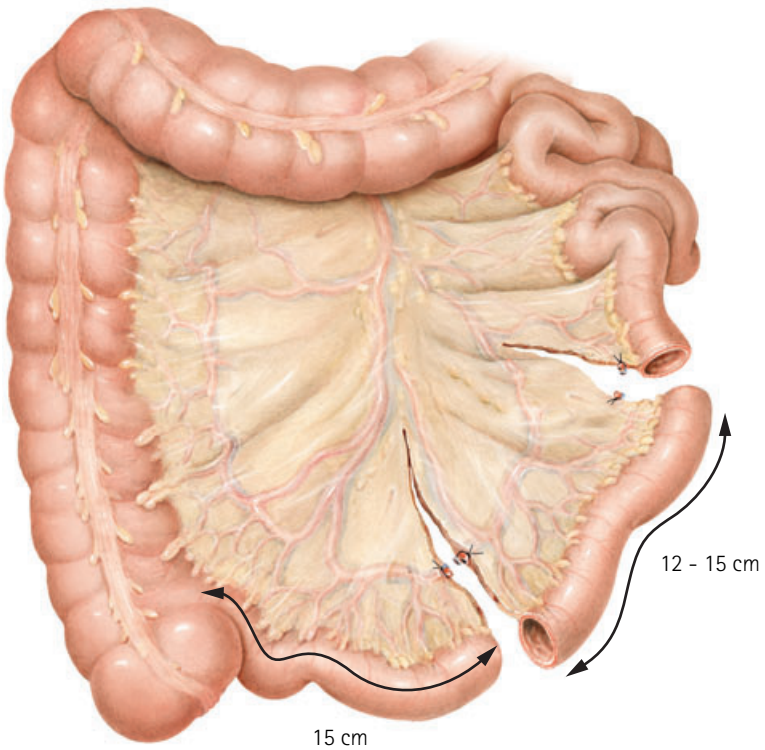
INTRAOPERATIVE DECISION MAKING

Despite careful planning, in revisional surgery final decisions about bowel segments to be used for creating the continence mechanism and (if necessary) a reservoir obviously have to be made during surgery, depending on the degree and location of intra-abdominal adhesions and additional factors such as radiation damage to exposed bowel segments. However, in general the ileal segment required for constructing the intussusception valve can be taken from the distal ileum at a location from which an ileal conduit would be resected. When ileum has already been resected for constructing an intestinal urinary reservoir, the resection of the additional ileal segment for the intussusception valve should be from the vicinity of the previously used intestinal segments.

In conversion from orthotopic bladder substitution to a CCUD the surgeon must be prepared for a lower abdominal stoma location, if in difficult cases adequate mobilization of the neobladder is impossible due to extensive adhesions and the umbilicus cannot be reached. This must be discussed with the patient beforehand and a suitable alternative stoma location should be identified and marked on the skin.

Figure 1

For constructing the intussuscepted ileal flap valve, 12–15 cm of distal ileum must be resected from the bowel continuity at a location from which an ileal conduit would be taken. As the intussusception requires ≈ 10 cm of ileum and 1 cm further of ileum is required for anastomosing the base of the intussusception to the reservoir, the remaining length of resected ileum is required for abdominal pull-through and forming the cutaneous stoma. Thus, the variation in resection length depends mostly on the size of the abdominal wall and the thickness of the ileal mesentery. When the ileal intussusception valve is used for conversion from orthotopic bladder substitution into a CCUD the ileal segment must be resected from the vicinity of the intestinal segments which were previously resected for creating the neobladder.



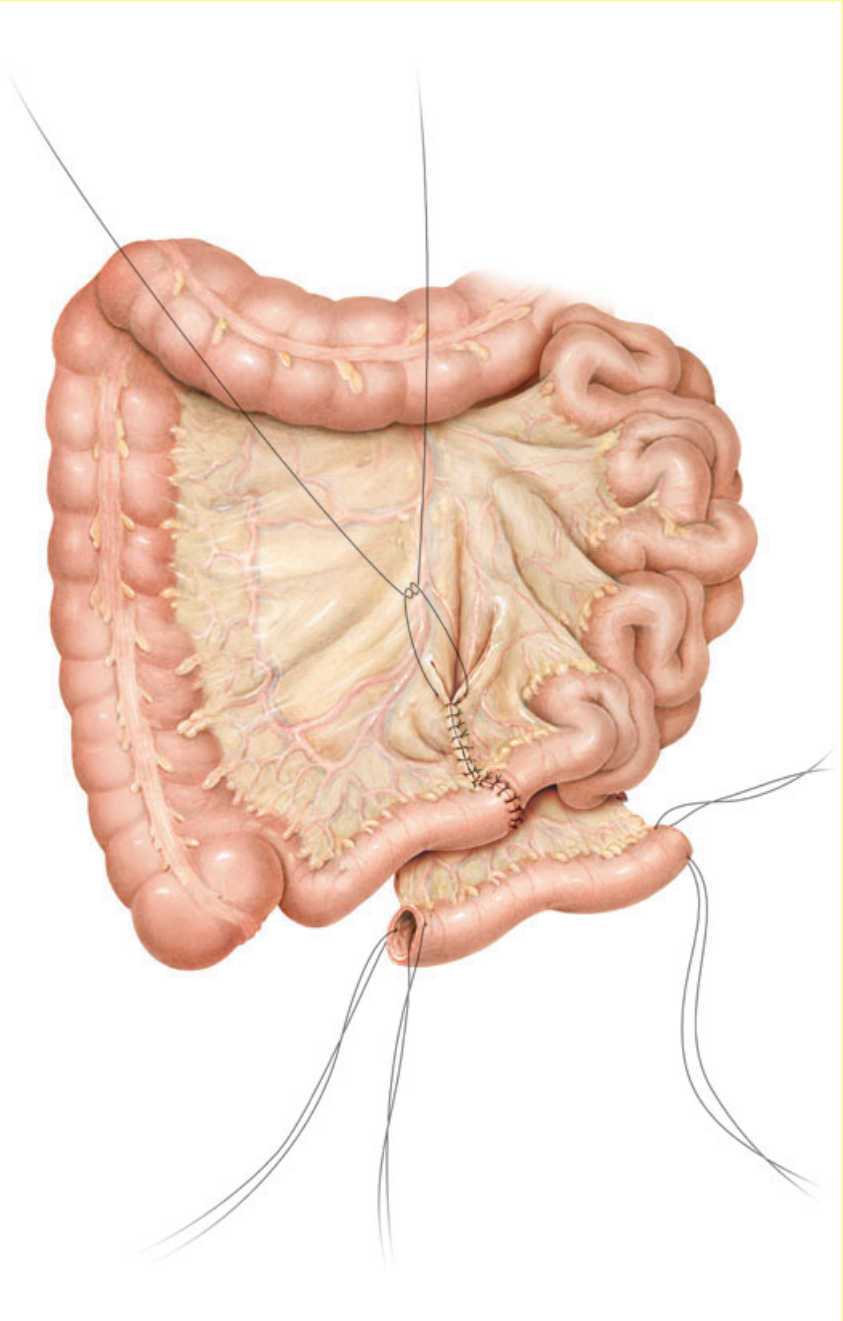
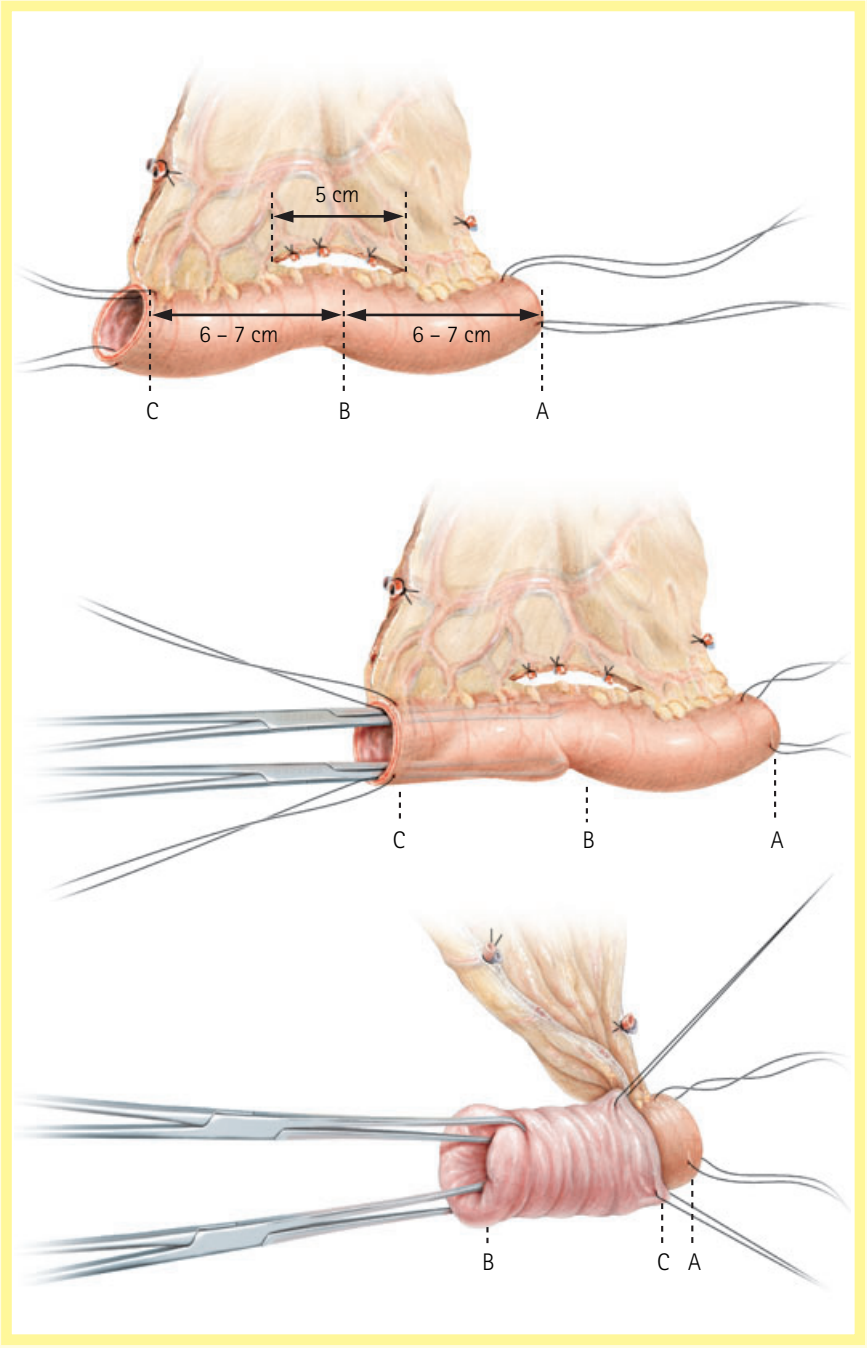


Figure 2

The intestinal continuity is restored by end-to-end anastomosis of ileum. The single-row seromuscular anastomosis is sutured with 4/0 interrupted polydioxanone monofilament sutures. Alternatively, two running sutures of the same material may be applied with specific attention not to constrict the lumen of the anastomosis.

Figure 3

For constructing the ileal intussusception, the mesentery is divided from the ileum over 5 cm in the middle of the resected segment at ≈1 cm from the ileum. As isoperistaltic intussusception is performed, the oral end (A) of the resected segment will be used to form the cutaneous stoma and the aboral end (C) for anastomosis with the reservoir. Intussusception is accomplished by inserting two Allis clamps from the aboral end (C) and grasping the ileal wall in the middle of the segment (B) from inside. With the help of stay sutures or additional Allis clamps and a wet sponge, intussusception is generally easy. A: Oral end of the resected ileum (cutaneous stoma), B: Middle of the resected segment of ileum, C: Aboral end of the resected ileum (anastomosis with the reservoir).



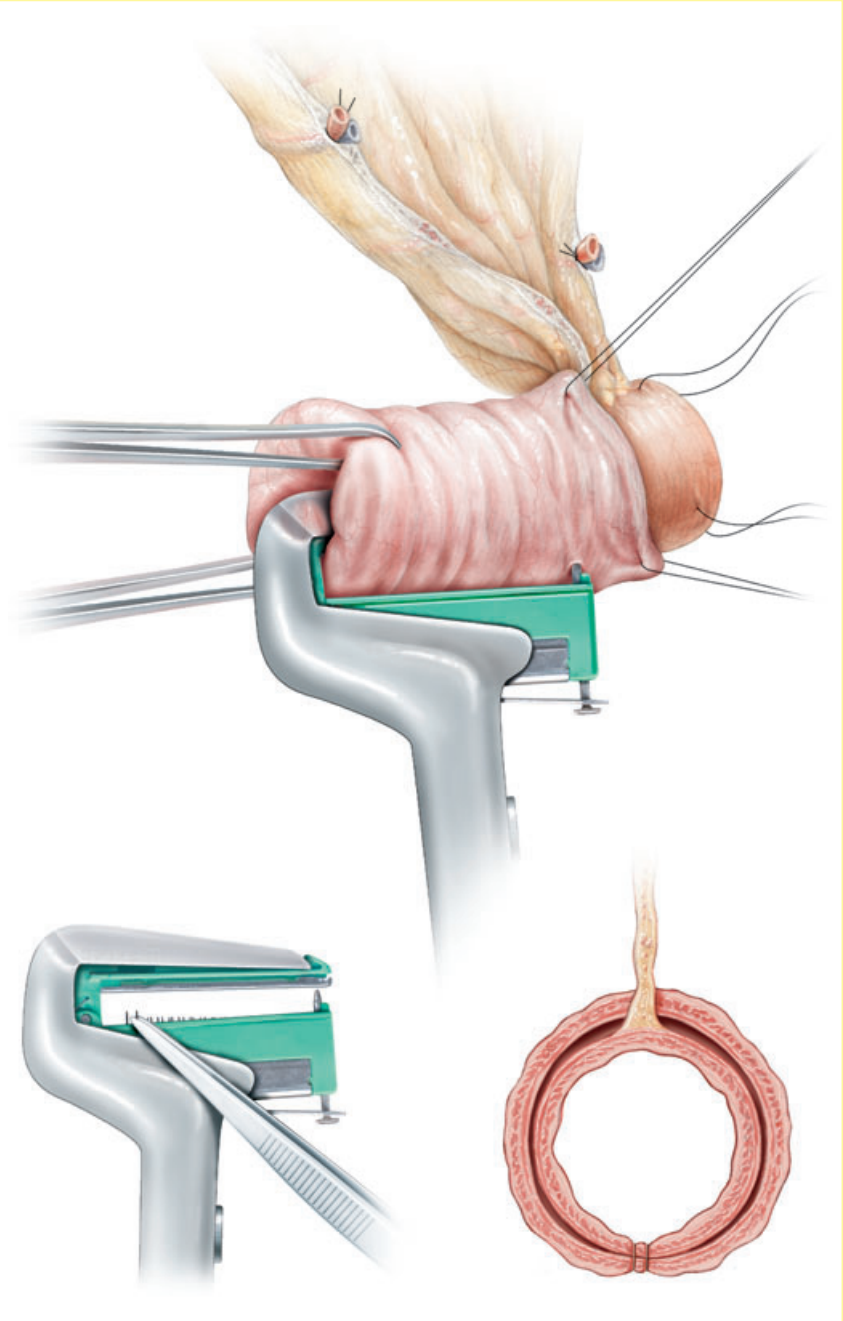


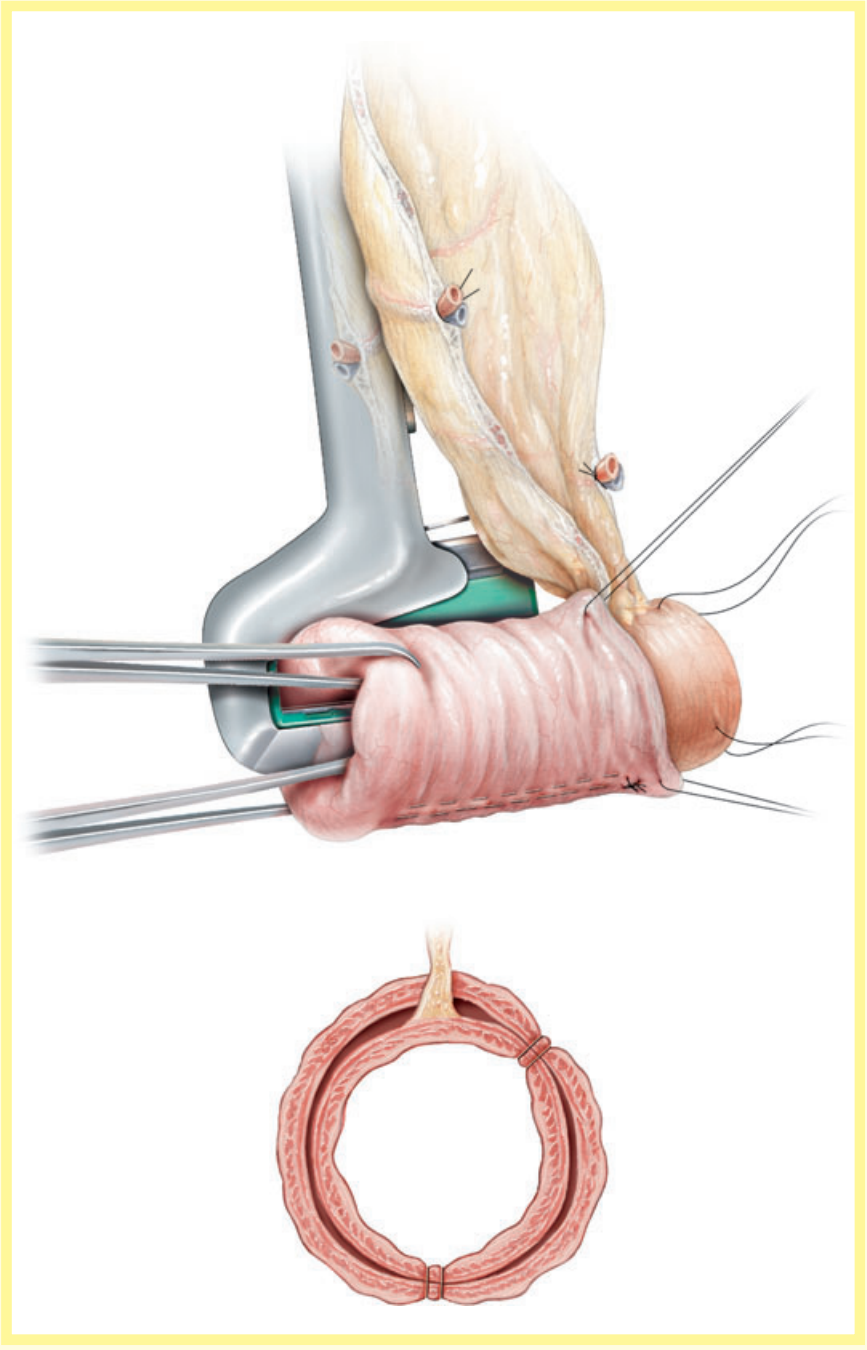
Figure 4

Stabilization of the ileal intussusception by titanium staples. The intussusception is fixed by several double-staggered rows of 4.8 mm titanium staples (green magazines). The nipple-stabilizing effect of the staples is most important at the base of the nipple. As staples at the tip of the nipple tend to be exposed at the mucosal surface to the urine in the reservoir, and thus are prone to stone formation, three or four staples are removed from the magazine at its inner end. These staples can be removed with pick-ups from the magazine after a gentle, partial and asymmetric release of the magazine. The asymmetric release is accomplished by inserting the magazine only partially into the instrument. When the stapler magazine has been prepared in the described manner, it is inserted completely into the instrument.

The loaded stapler is inserted into the intussusception nipple from its tip and closed so that ≈ 1 cm of aboral ileum remains mobile for anastomosis with the reservoir. The first row of staples is placed antimesenterically at the 6 o'clock position (cross-section viewed from the oral side of the ileal segment = stoma side). The bowel segments are aligned with Allis clamps and stay sutures, and must be carefully checked before closing the instrument and releasing the staples. After closing the instrument it is released in a second step, during which the metal staples are placed. During this manoeuvre, the pin at the tip of the magazine produces a pinhole through both walls of the nipple, which must be closed immediately after opening the magazine and removing the pin, as it may be difficult to find the pinhole later. Closure is accomplished by a z-stitch with 4/0 polydioxanone.

Figure 5

The second row of staples is placed in the same manner as described in Fig. 4 at the 2 o'clock position (cross-section viewed from the oral side of the ileal segment = stoma side).



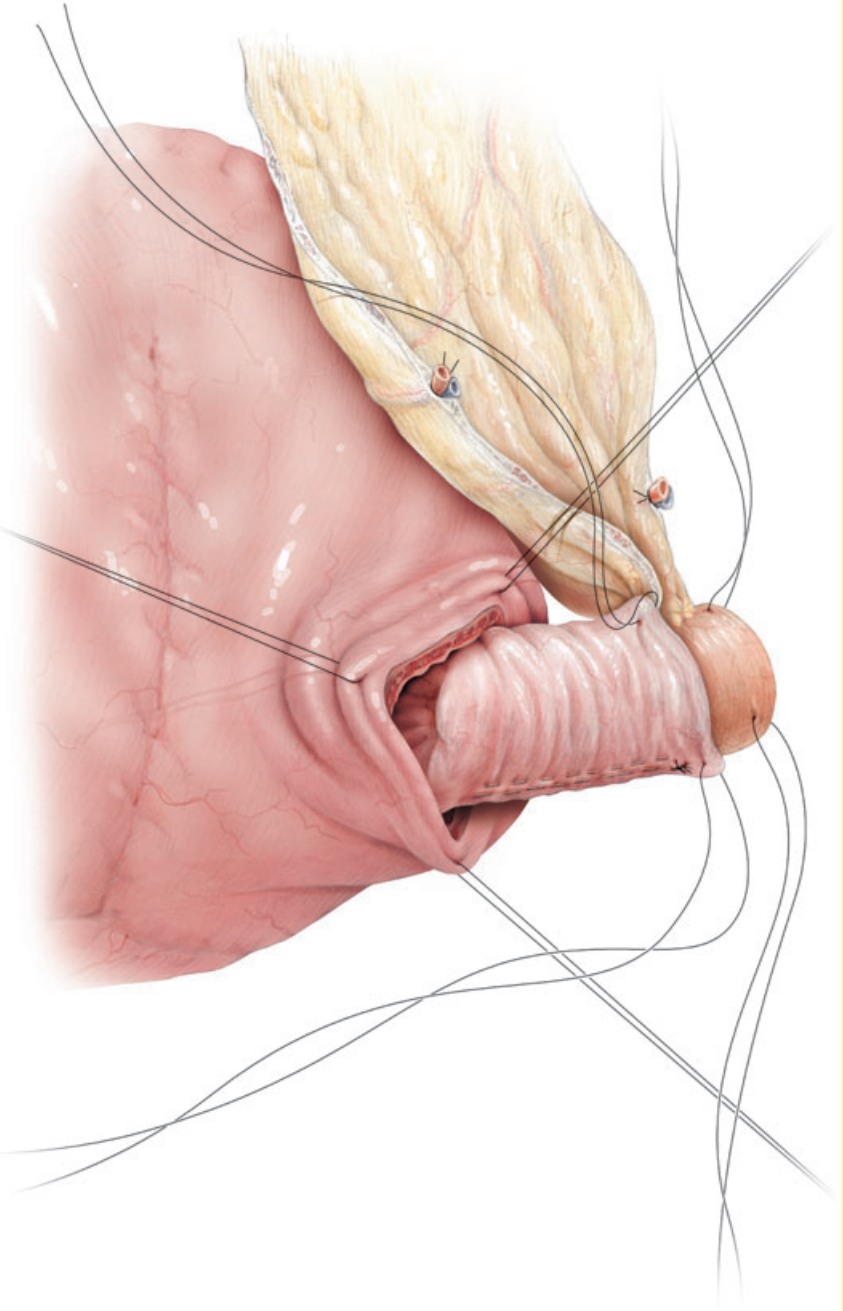
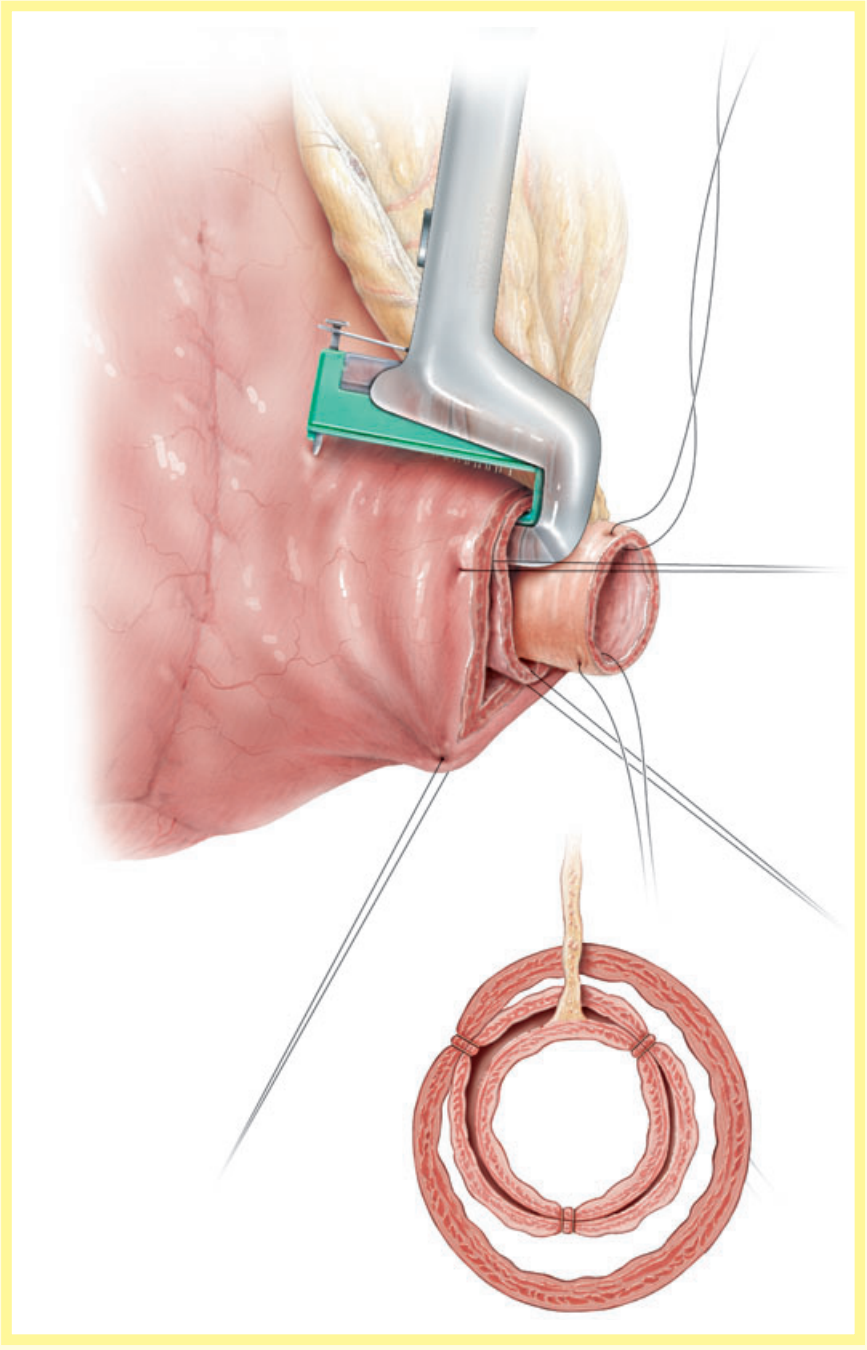


Figure 6

Anastomosis of the intussusception with the reservoir. At this stage, the intussuscepted ileal nipple is inserted through a corresponding opening of adequate size into the reservoir.

Figure 7

Fixation of the ileal intussusception to the anterior wall of the reservoir. The most important step for preventing nipple prolapse is staple-fixation of the nipple to the wall of the reservoir. Again, the magazine of the stapler has been prepared as described in Fig. 4, by removing three or four staples from the inner end of the magazine. In contrast to the previous stapler applications, the stapler is inserted for this step of the procedure from the oral end into the serosa-lined space between the inner and outer walls of the nipple. As a result, the outer wall of the nipple only will be stapled to the wall of the reservoir at the 10 o'clock position (cross-section viewed from the oral side of the ileal segment = stoma side). Again, the pinhole at the tip of the magazine must be closed by a 4/0 polydioxanone z-stitch. The result of fixing the ileal intussusception is a flap valve configuration of the ileal nipple.



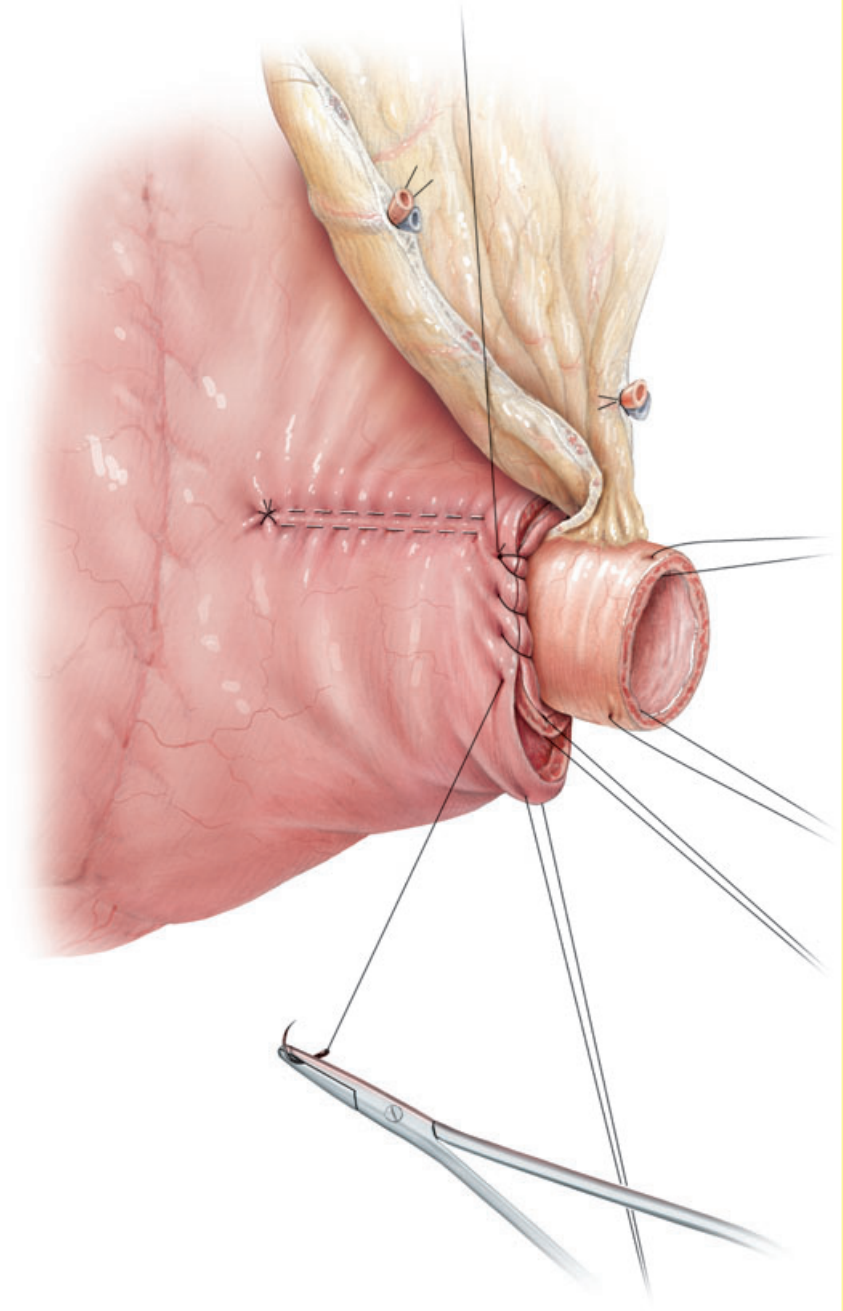
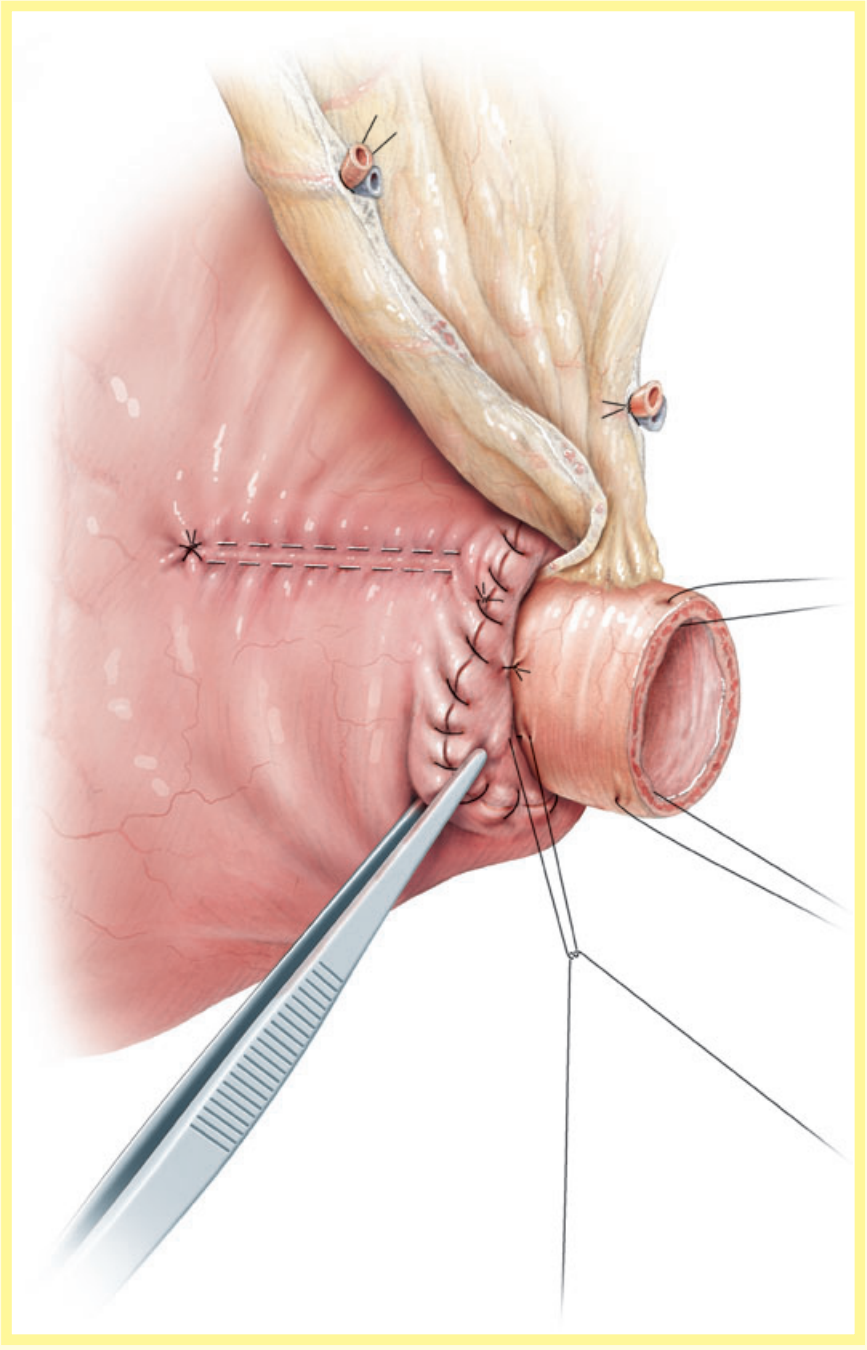


Figure 8

Circumferential anastomosis of the basis of the ileal nipple and closure of the reservoir is accomplished with several running 4/0 polydioxanone monofilament sutures. Lifting the mesentery of the ileal intussusception with a vessel loop or an eyelid hook helps in anastomosing the ileal nipple at this site and in securely closing the reservoir.

Figure 9

The serosa-lined slit between the inner and outer wall of the ileal intussusception is closed by a row of nonabsorbable 3/0 polypropylene monofilament sutures.



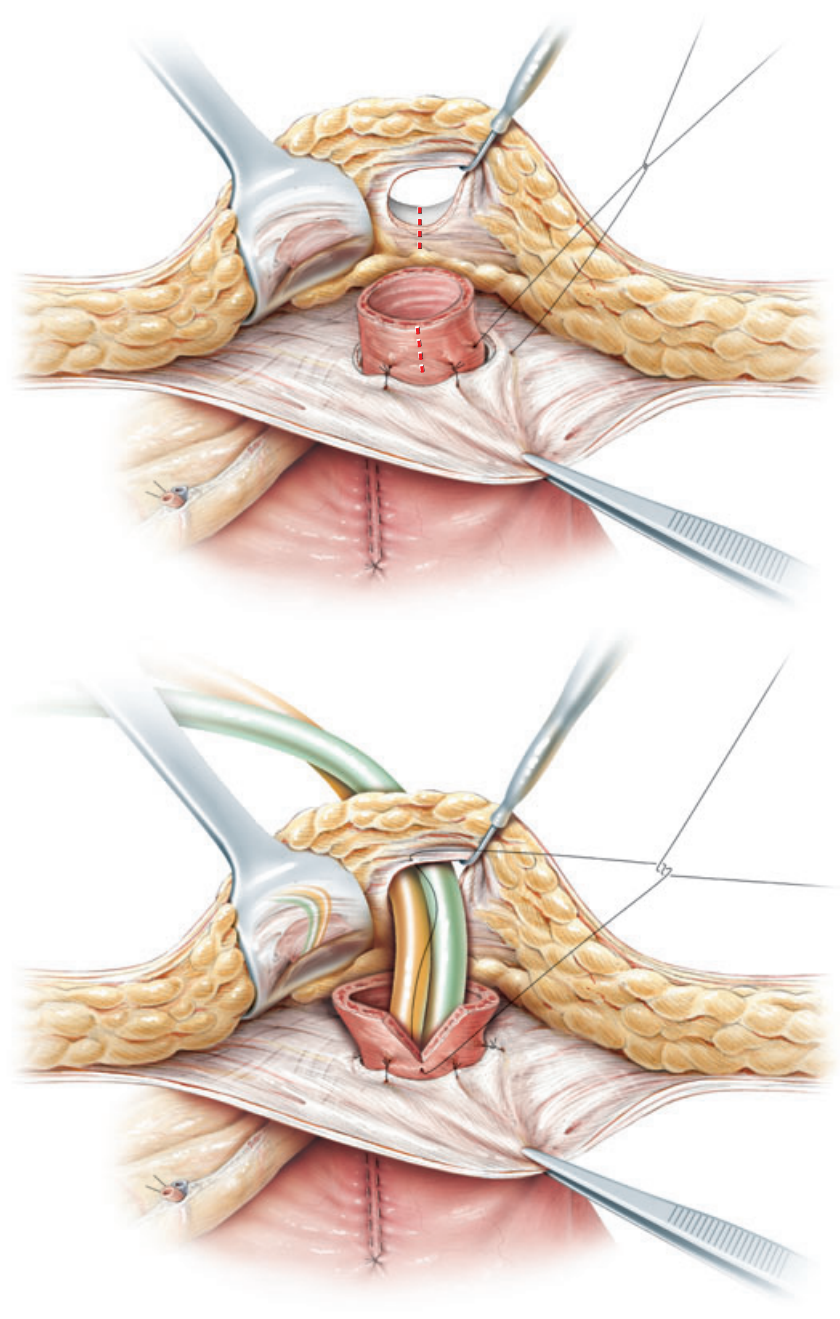


Figure 10

The umbilical stoma is created by separating the skin funnel of the umbilicus from the abdominal fascia and excising its button. This is easily accomplished by preparing from the side of the abdominal incision. After crosswise incision of the abdominal fascia and the peritoneum, the oral end of the ileal outlet is pulled through the abdominal wall and secured to the abdominal fascia with several 2/0 polyglycolic acid sutures. Inside the abdomen, the reservoir is sutured around the outlet against the adjacent peritoneum with several 4/0 polydioxanone sutures. Both, the umbilicus and the ileal outlet are spatulated at opposite sides and anastomosed with 3/0 polydioxanone sutures on a cutting needle. The posterior (= lateral) wall of the skin anastomosis is completed first, followed by the anterior (= medial) part of the anastomosis, which is more easily accessible from the abdominal incision. A 10 F pigtail catheter and a 16 F Foley balloon catheter are inserted through the umbilical stoma into the reservoir for both, irrigation and drainage of the pouch.

POSTOPERATIVE CARE

Medication. Antibiotics (ampillicin/clavulanic acid and metronidazole) are started before surgery and continued for 5–7 days afterwards. For postoperative drainage of the stomach, we prefer intraoperative insertion of a 12 F balloon gastrostomy catheter rather than a nasogastric tube. Patients are mobilized as early as the first day after surgery.

Drains are only used in the small pelvis if an orthotopic bladder substitute is converted into a CCUD. The gravity drains are removed as soon as the drainage is <50 mL/24 h. Before discharge from the hospital, the pigtail pouch catheter is removed from the umbilical stoma. However, the Foley catheter is left indwelling on continuous drainage for 3 weeks, after which the indwelling catheter is removed and CISC of the pouch is initiated.

SURGEON TO SURGEON

The procedure described is usually straightforward and can be done through a rather limited midline abdominal incision around the umbilicus, if the indication is repair of a failed continence mechanism of a previous CCUD. Difficulties may relate only to the extent of abdominal adhesions. However, for conversion of an orthotopic bladder substitution into a CCUD, a generous abdominal midline incision down to the symphysis is required, to allow mobilization of the neobladder, transection of the urethral anastomosis, closure of the substitute bladder neck and mobilization of the reservoir to reach the umbilicus. If extensive and scarred adhesions of a neobladder with the pelvic walls render adequate mobilization difficult or even impossible, it may be preferable to choose a lower abdominal site for stoma formation. The required ileal segment for the intussusception valve can be taken (if possible) from the site of the previous ileal anastomosis from resection of the segments for neobladder formation, so the patient would not have two ileal anastomoses in sequence.

By contrast with a newly established Mitrofanoff type of continence mechanism, such as a transversally reconfigured ileal tube (Yang/Monti), catheter insertion into the intussuscepted ileal flap valve is easy and must not be done before the pouch is closed and pulled through the abdominal wall. Similarly, postoperative loss of a stomal catheter is not a problem, as reinsertion of a Foley balloon catheter remains easy and straightforward.

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