

ILEAL LOOP CONDUIT DIVERSION AND BOWEL REANASTOMOSIS

11

SELECTION OF ILEAL SEGMENT AND ITS MESENTERY

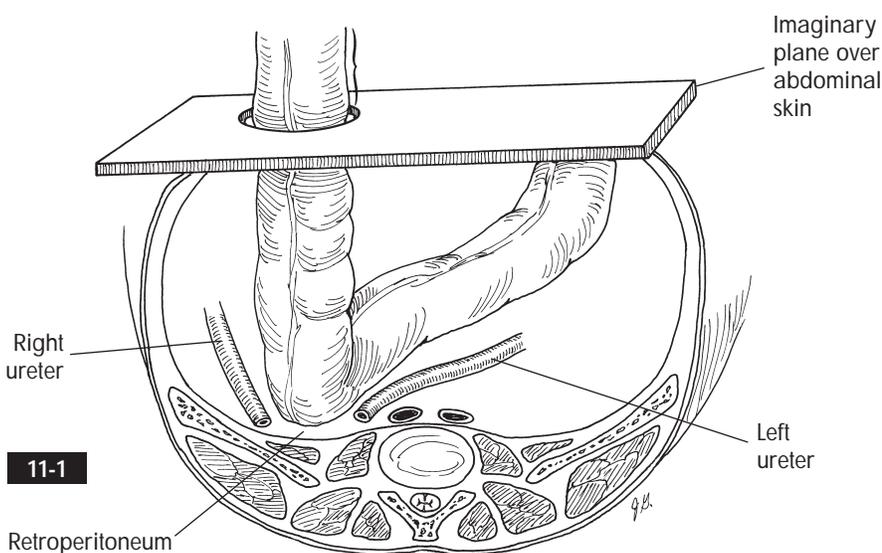
At 10 cm from the ileocecal valve, the selected segment of ileum should be short enough to act as a conduit (generally 10 to 15 cm long). In determining the length of the ileal segment, the surgeon must consider the following three factors:

- 1 Position of the ureters, especially the possible tension of the left ureterointestinal anastomosis
- 2 Individual variation of fat and muscle depth between the abdominal skin and the peritoneal cavity
- 3 Creation of a good nipple stoma that prevents urine leakage from the conduit bag.

FIG. 11-1. The surgeon first approximates the stomal end of the conduit, selects a point 3 to 4 cm above the horizontal plane of the abdominal skin, and then estimates the length of ileum needed proximally to meet the ureters at the level of the retroperitoneum posteriorly. There should be no tension in approximating the ureter to the ileal segment (especially the left ureter).

The selected length of the ileum can be marked with silk stitches, and the surgeon checks for proper mesentery vascularity and the lines of division. The easiest method is to transilluminate with a light source behind the mesentery in a darkened room. The surgeon can visualize the entire mesenteric

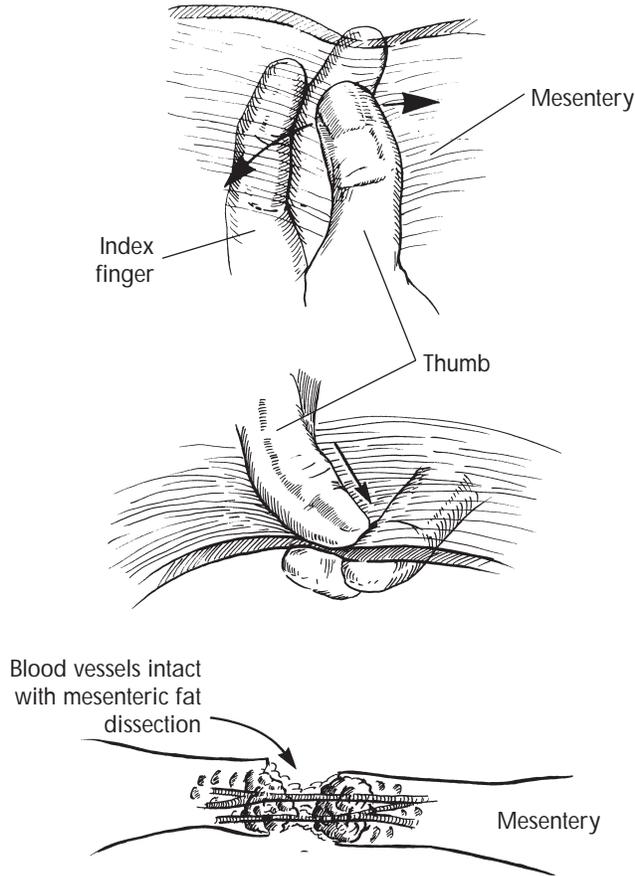
Estimation of Ileal Segment Necessary for Conduit
(Cross-sectional View)



11-1

vasculature from the opposite side. The mesentery division of the stomal end is longer than the mesentery division for the proximal end of the conduit.

Three-Finger Pinching Maneuver



11-2

For creation of a good stoma, it is important for the surgeon first to select a segment of the mesentery that is flexible and pliable (not fixed) and then to divide the mesentery so that it is long enough that when the open end of the loop is pulled through the fascia and skin for fixation there is no tension.¹

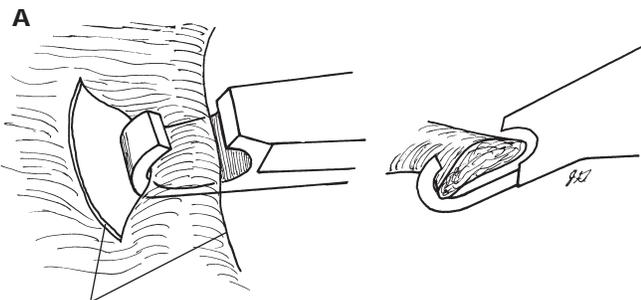
DIVISION OF MESENTERY

FIG. 11-2. After the superficial layers of the mesentery have been divided with the knife, we have found that by finger-pinching the fatty mesentery, the mesenteric tissue is compressed and bluntly divided while the residual blood vessels are easily visualized and tied.

FIG. 11-3. The gas-powered LDS stapler (Autosuture, U.S. Surgical, Norwalk, Conn.) can also be used to divide the mesentery (A). If the tissues are thin, it is not necessary for the LDS stapler to loop around two mesenteric openings before firing. We have placed the LDS stapler into one opening and discharged the staples effectively over the tissues without mechanical problems (B).

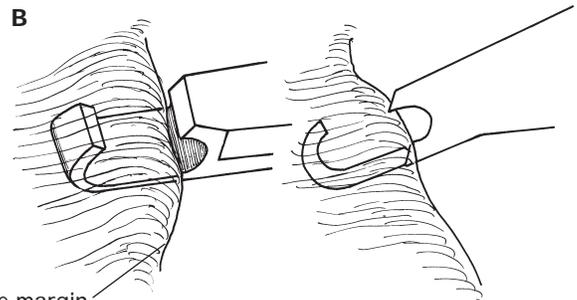
The surgeon must be careful not to injure the root of the mesentery vasculature when stapling.

Traditional Method of LDS Stapling



Two free margins

One-Margin Method of LDS Stapling



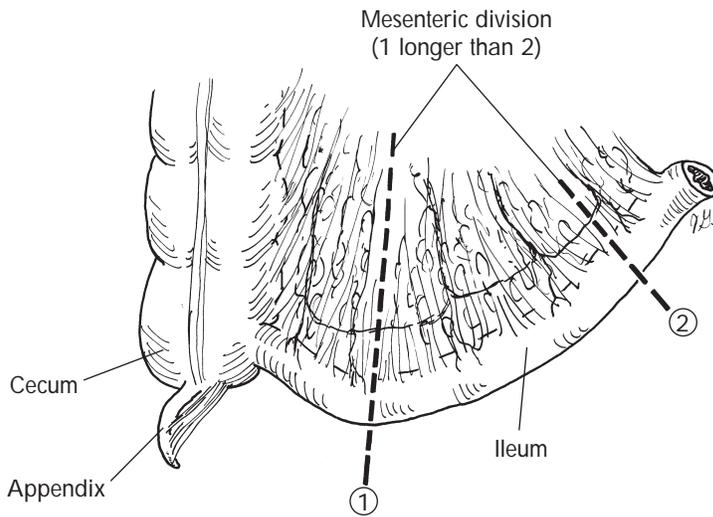
One free margin

11-3

GIA STAPLING TECHNIQUE FOR BOWEL REANASTOMOSIS

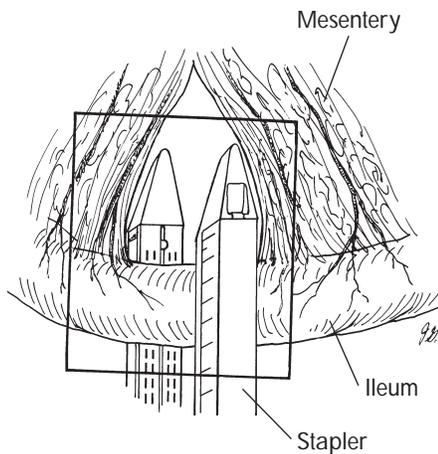
FIG. 11-4. For bowel division, the surgeon can either use the GIA 60 stapler or perform traditional bowel division with clamps. If using the GIA stapler, the surgeon can simply apply the stapler at a right angle to the selected ileal segment.

FIGS. 11-5 AND 11-6. After a segment of the ileum has been divided for the conduit using the GIA 60 stapler and placed posteriorly behind the two bowel segments to be reanastomosed, a small opening is made at the antimesenteric border on the two stapled butt ends of the bowel. The GIA 60 stapler is placed inside the bowel lumen in a side-to-side configuration, engaged, and then discharged.

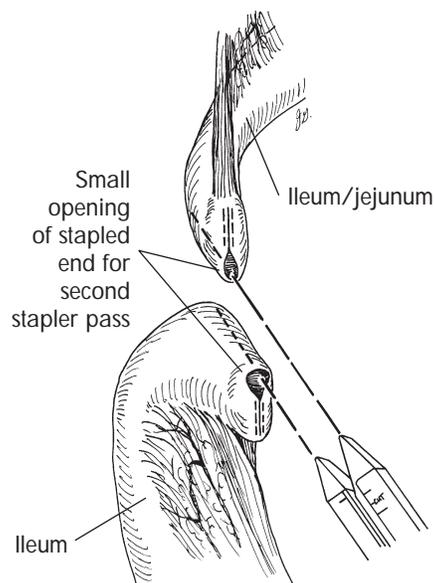


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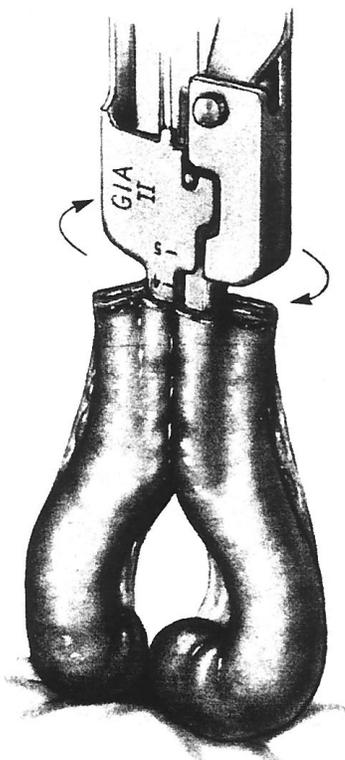
Reanastomosis of Ileum



11-5

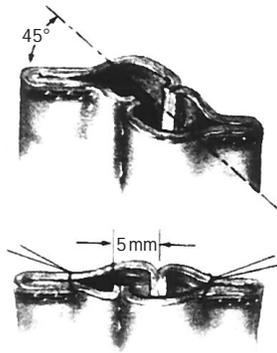


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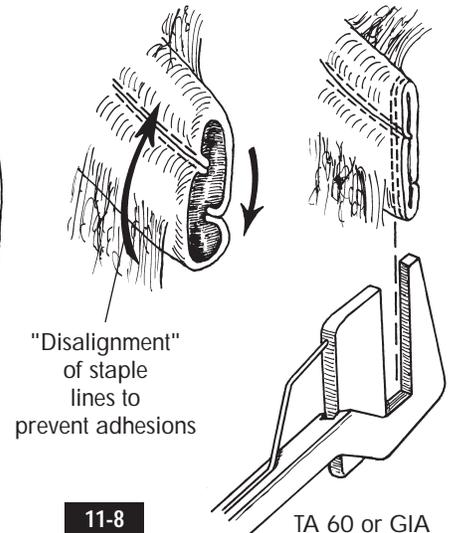
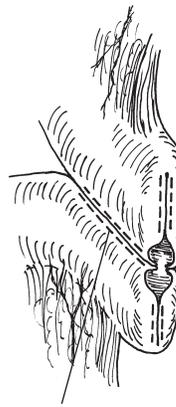


From Steichen PM, Ravitch MM: Mechanical sutures in operations on the small intestine. In Nelson RL, Ravitch MM, editors: *Surgery of the small intestine*, Norwalk, Conn, 1987, Appleton & Lange.

11-7



Second stapling for side-to-side anastomosis



"Disalignment" of staple lines to prevent adhesions

11-8

TA 60 or GIA stapler application (third stapling)

FIGS. 11-7 AND 11-8. To prevent cross synechial adhesions of the two staple lines, which can lead to obstruction, the surgeon can perform one of two maneuvers:

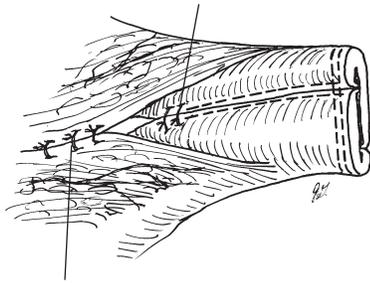
- 1 The stapler is rotated before engagement, thus causing the two staple lines to be off-set (Fig. 11-7).^{2,3} We have not always found this method effective and therefore use a more definitive maneuver.
- 2 After creating the wide side-to-side anastomosis, we cut the butt-end staples out and rotate the bowel so that the two lines of stapling do not oppose each other. Then we place Babcock clamps over the new configuration of the butt end. The surgeon can

use the GIA 60 or 80 stapler or the TA 60 stapler for the closure (Fig. 11-8).

FIGS. 11-9 AND 11-10. The crotch end of the side-to-side anastomosis is reinforced with a few stitches. Compared to an end-to-end anastomosis, the side-to-side anastomosis clearly has the advantage of creating a larger anastomotic lumen. The mesentery is reapproximated to prevent any herniation of bowel segments. The reapproximation should not be so tight that it compromises the vasculature to the ileal loop segment.

Side-to-Side Bowel Anastomosis

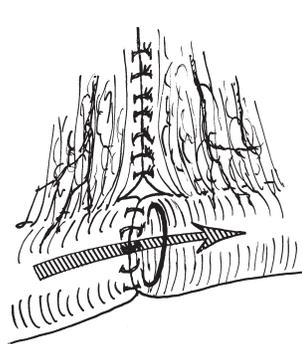
Reinforcing stitches at crotch



Mesenteric reapproximation

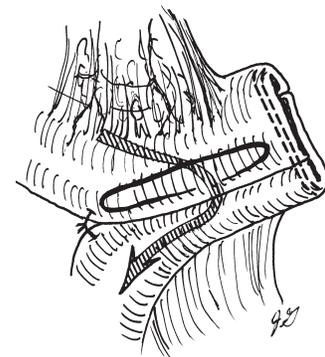
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Intestinal Luminal Enlargement with Side-to-Side Anastomosis

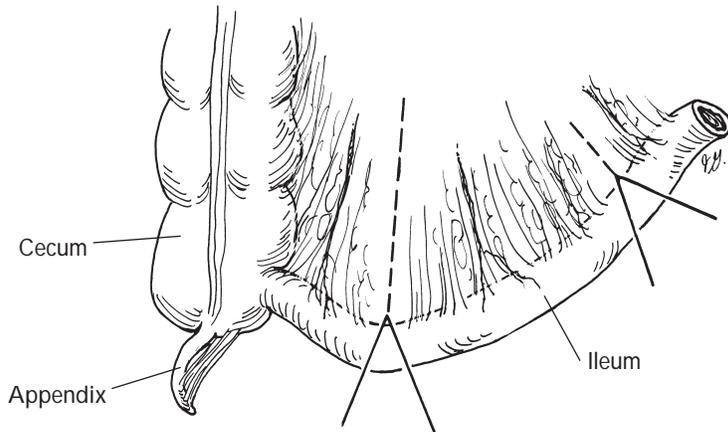


End-to-end anastomosis

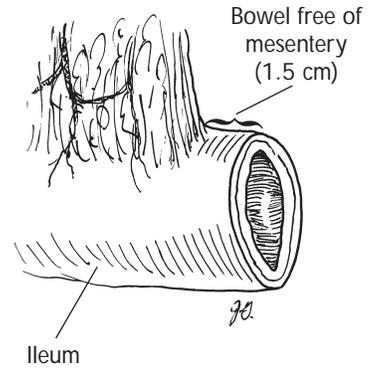
11-10



Side-to-side anastomosis

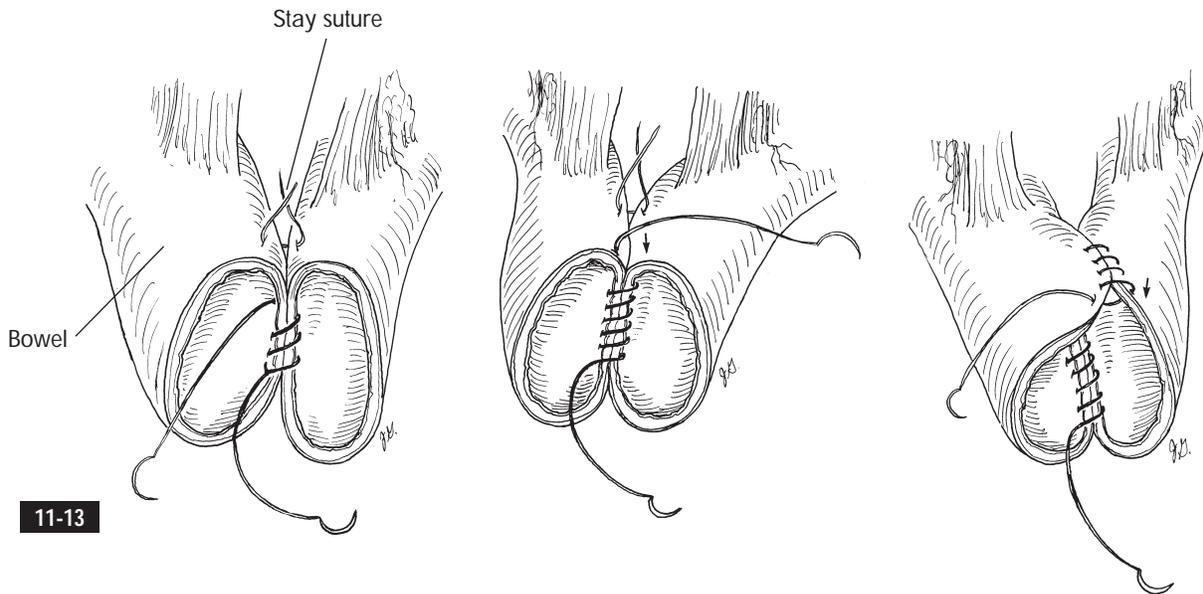


11-11



11-12

Continuous Stitch



11-13

END-TO-END TRADITIONAL STITCHING METHOD FOR BOWEL ANASTOMOSIS

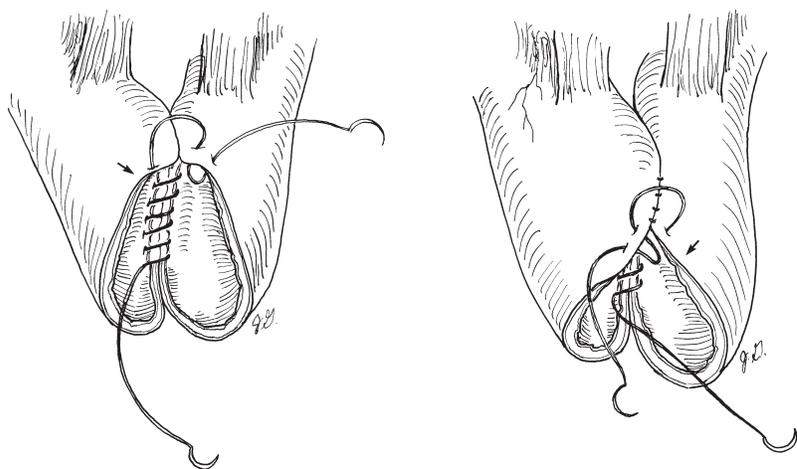
FIG. 11-11. Unlike the technique of applying the GIA 60 at right angles to the bowel, the surgeon must apply the clamps at a slight angle to avoid bowel ischemia.

The bowel is clamped in a wedge configuration and then divided.

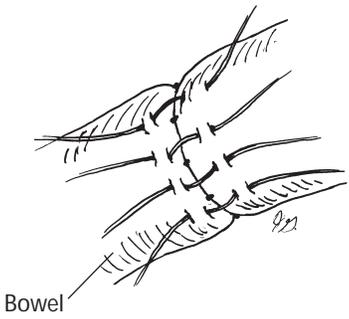
FIG. 11-12. A free margin of bowel measuring 1.5 cm should be cleared of the mesentery for the reanastomosis.

FIGS. 11-13 AND 11-14. A simple continuous suture all the way around or a combined continuous and anterior Connell suture can be used for the first layer of closure. The arrows point to the placement of the next suture.

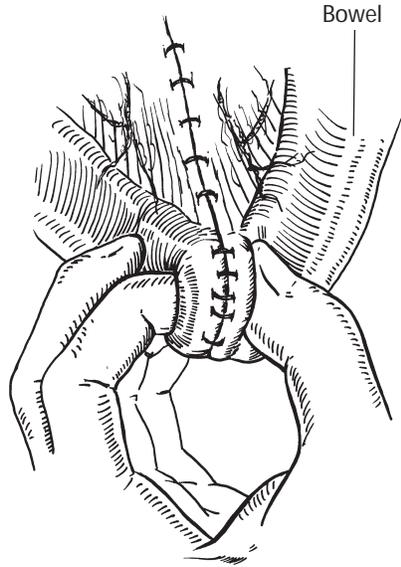
Anterior Connell Stitch



11-14



11-15



11-16

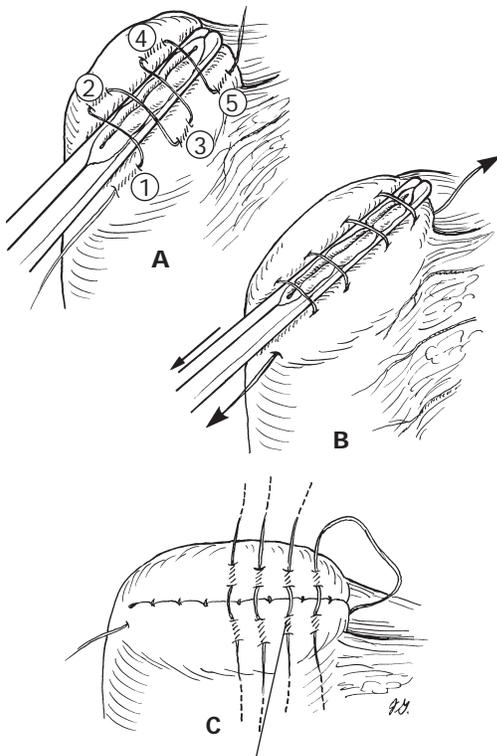
FIG. 11-15. A second layer of a horizontal mattress silk stitch can be used to reinforce the anastomosis.

FIG. 11-16. After the anastomosis, the surgeon should always check for luminal patency by pushing the index finger across the anastomosis against the thumb as illustrated.

PARKER-KERR STITCH AT PROXIMAL END OF CONDUIT

FIG. 11-17. The ileal loop segment is opened and irrigated clear of mucous contents. A bowel clamp is placed over the proximal end first. This end of the ileum is closed using a Parker-Kerr stitch (A and B) and then a running horizontal mattress stitch (C). Both layers of suture invaginate the bowel. This closure can be performed with one or two stitches.

Parker-Kerr Stitch for Ileal Conduit



Second layer of continuous mattress stitch

11-17

LEFT URETERAL MOBILIZATION AND PARIETAL PERITONEAL TUNNEL

While making the initial incision lateral to the right or left colon, the surgeon should continue the right lateral incision so that it sweeps around the cecum and up the mesenteric root. This incision actually facilitates the mobilization of the left ureter to the right side by decreasing the width of the parietal peritoneal tunnel.

After making the left lateral incision along the line of Toldt, the surgeon immediately uses the left fingers to bluntly dissect a plane between the parietal peritoneum and the retroperitoneal structures to create the tunnel for the left ureteral transposition, as similarly described for transureteroureterostomy (see p. 65). A wide tunnel, allowing three fingers to pass through, is adequate. The inferior mesenteric artery should not be in the way of the tunnel.

The left ureter is freed to the level of the lower pole of its kidney before it is passed through the tunnel.

URETEROILEAL ANASTOMOSIS

If the ureters were clipped after their division earlier in the operation, by this time there should be a hydronephrotic dilated ureter, which will facilitate the ureteral intestinal anastomosis.

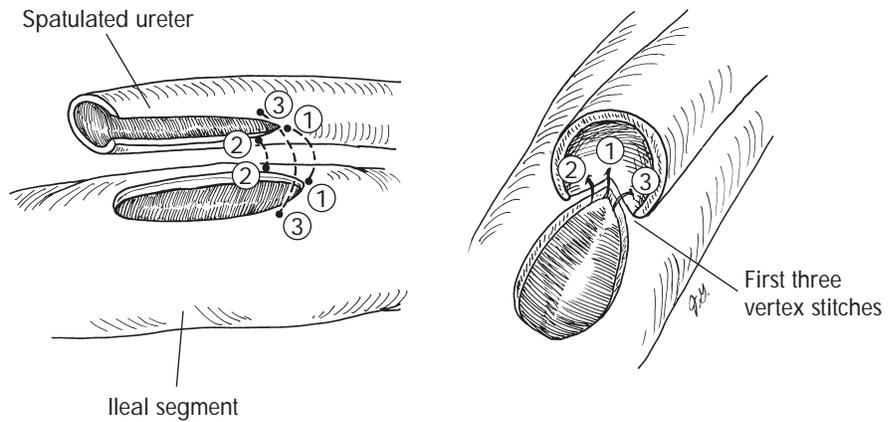
FIG. 11-18. Proper spatulation (3 to 4 mm) of the ureter is imperative to ensure an adequate anastomotic lumen. The first three stitches at the vertex are the most important in any type of ureteral bowel anastomosis.

As in all anastomoses, the apposition of mucosa or epithelium to each other is vital to prevent strictures. There must be contact between ileal mucosa and the ureteral urothelial epithelium in the anastomosis.

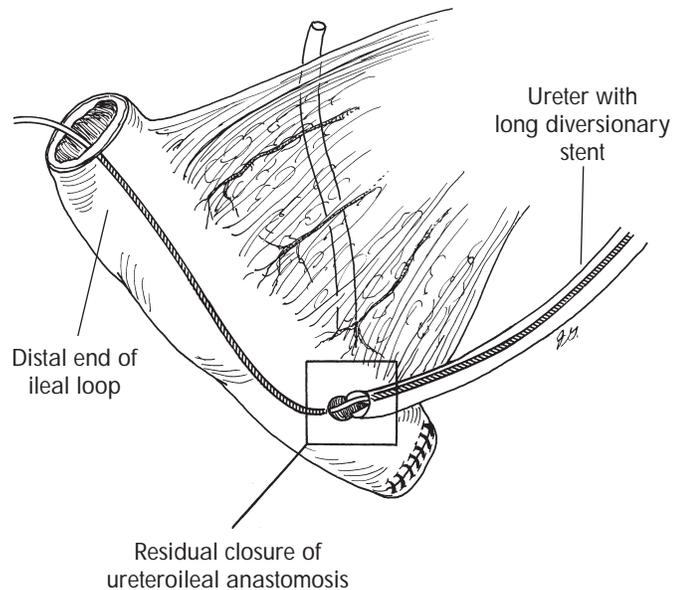
FIG. 11-19. Before complete closure of the anastomosis, a ureteral self-retaining diversionary stent (Bard 8 Fr) is placed up to the kidney. The self-retaining stent will not slip out during subsequent surgical maneuvers. The stent is brought out through the distal ileal end and fixed in place with a stitch (4-0 chromic), which is later removed. The end of the stent draining the right side is cut at a right angle to the tubing, and the end of the stent draining the left side is cut at an oblique angle.

STOMA CREATION

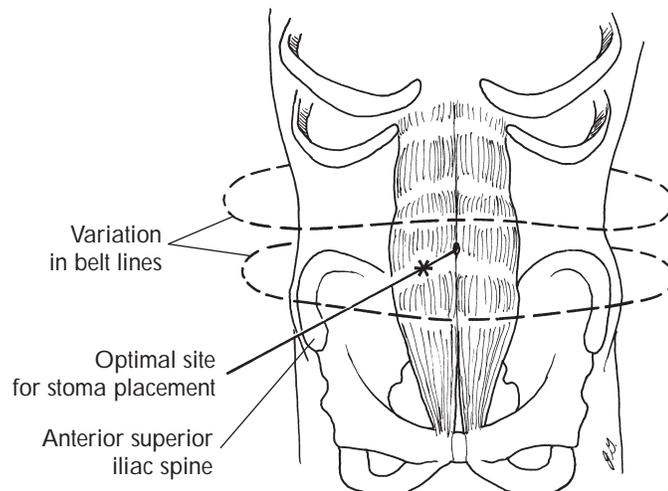
FIG. 11-20. The stoma should be placed at a location that will be away from the waistline, beltline, and skin folds when the patient is in either the standing or sitting position. An experienced stomal therapist and/or the surgeon should choose the stomal location 1 or 2 days before surgery so the patient can test the stoma ad-



11-18

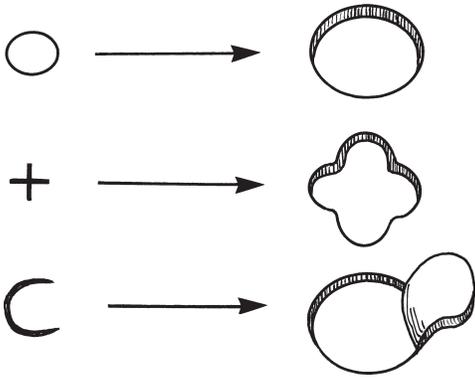


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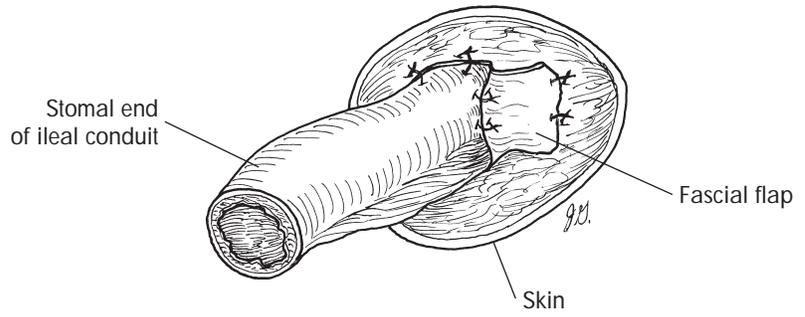


11-20

Variation in Stomal Skin Incisions



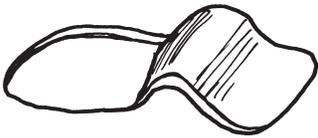
11-21



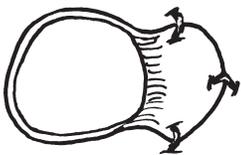
11-22

Anterior Rectus Fascia Flap with Fixation

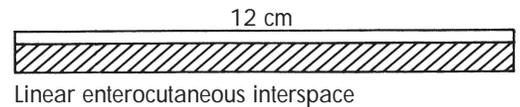
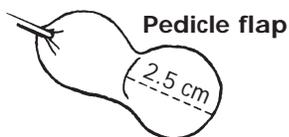
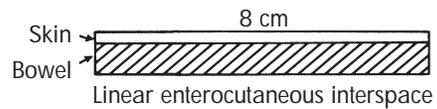
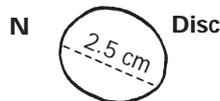
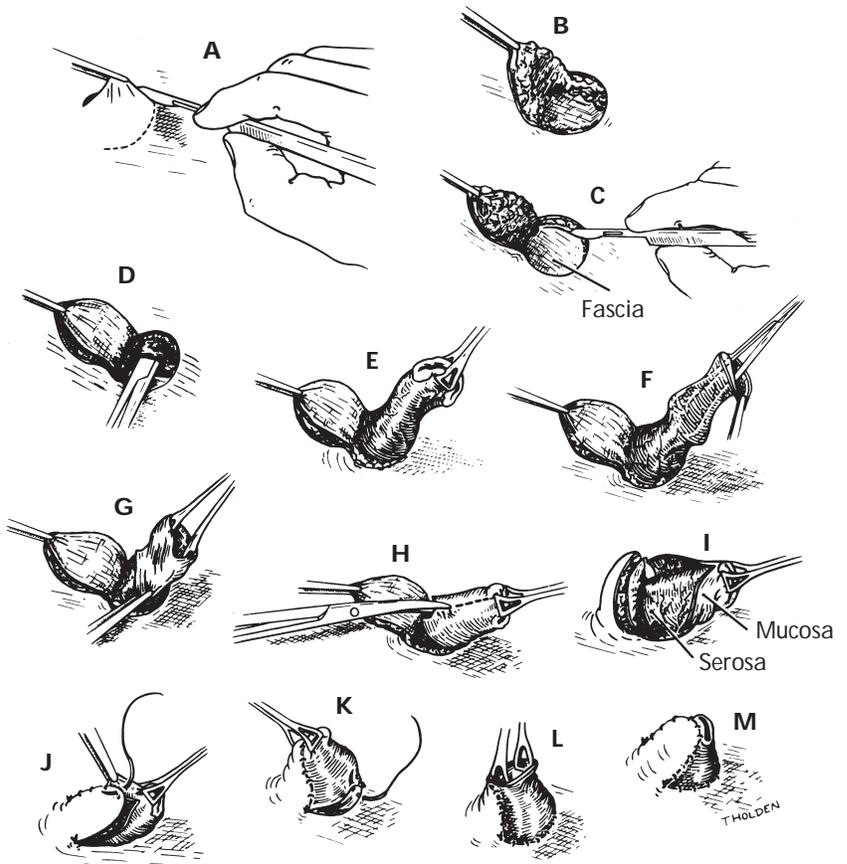
Lateral View



Top View



11-23



From Mahoney EM, Harrison JH: *J Urol* 123:475, 1980.

11-24

hesive ring for proper positioning and comfort.

The rectus fascia and rectus abdominis muscle should be used as a support and backing for the stoma.^{4,5}

FIG. 11-21. The inexperienced surgeon invariably makes the circular stomal skin incision too large. The surgeon must keep in mind that a circular skin incision 7 mm in diameter can easily be enlarged to double its original size to 14 to 16 mm if necessary. Alternative incisions with a cross or a horseshoe configuration also have been successfully used.

FIGS. 11-22 AND 11-23. Below the skin incision, the surgeon can simply make an incision of the anterior and posterior fascia or make a horseshoe flap of the rectus fascia and fix it laterally to prevent fascial contractions.^{6,7}

FIG. 11-24. Patients with previous irradiation or poor nutritional status are at risk for the development of skin and fascial contractures. In this situation, a horseshoe incision of the skin and/or rectus fascia can be used instead of a circular incision.

The technique is performed as follows.⁶ Via a subcutaneous horseshoe incision (**A** and **B**), a pedicled fascial flap is elevated (**C**). The underlying rectus abdominis muscle is incised at a 90-degree angle to the muscle fibers (**D**), thus obviating the noose effect when the ileum is brought through for stoma construction (**E**). A stan-

dard turned-back ileal stoma is constructed by grasping the ileal wall intraluminally with a Babcock clamp 4 cm from the cut edge (**F**) and turning the distal 4 cm of the ileum back on itself (**G**). Beginning at the distal turned-back edge of the ileum, the surgeon incises through the full thickness of the turned-back ileal segment to the apex, avoiding the mesenteric attachment (**H**). The pedicled skin flap is then stitched to the cut edges of the ileum using circumferential interrupted sutures (**I** and **J**), with care taken to include not only the skin and ileal edges but also the serosa of the inner ileum in the suture bites. These stitches ensure that the stoma will remain protruding (**K**). Sutures are placed intraperitoneally between the mesentery and peritoneum to ensure closure at this site, which is at risk for hernia. However, sutures are placed only at the cutaneous and peritoneal levels; the muscle and fascia are left free and are not sutured to the ileum. The surgeon evaluates the lumen for narrowing, constriction, or torsion (**L**). The final result is a stoma that protrudes 3 to 4 cm above the skin and is protected by the pedicled flap from trauma (**M**).

The pedicled flap created with the horseshoe incision prevents significant contracture and has greater linear enterocutaneous interspace, which means improved vascularity (**N**).

STOMAL NIPPLE CREATION

The patient's lifestyle and comfort will depend on the creation of a proper stomal nipple by evagination of a segment of ileal conduit. For a good evaginating nipple, the surgeon needs to accomplish the following:

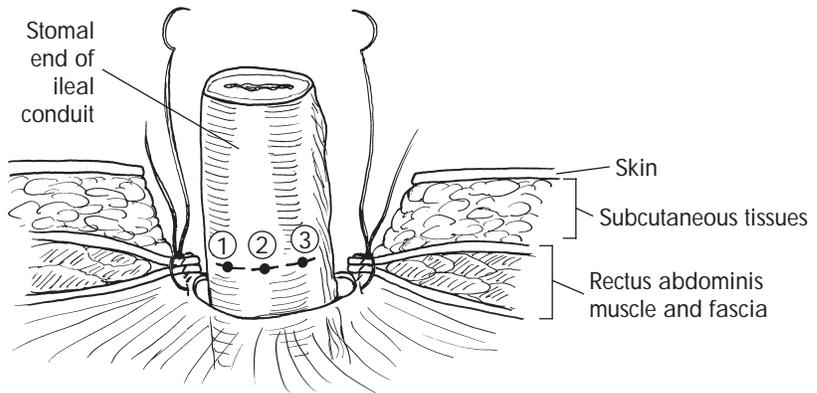
- 1 A 3 to 4 cm ileal segment above the skin level.
- 2 Sufficient length of division of the bowel mesentery to avoid retractile tension of the distal ileal conduit segment. Any retractile tension will either pull the loop back into the peritoneum or create an uneven nipple.

- 3 Fixation of the ileum at the level of the fascia circumferentially, avoiding the fixation stitch at the mesentery.

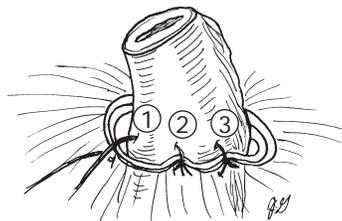
FIG. 11-25. By first sewing the anterior and posterior rectus fasciae together and then fixing them to the ileum circumferentially (avoiding the mesentery), the surgeon can avoid retraction of the entire conduit.

FIG. 11-26. A second set of stitches evaginates the ileum while fixing it to the skin subepithelium. No stitches are placed on the mesentery.

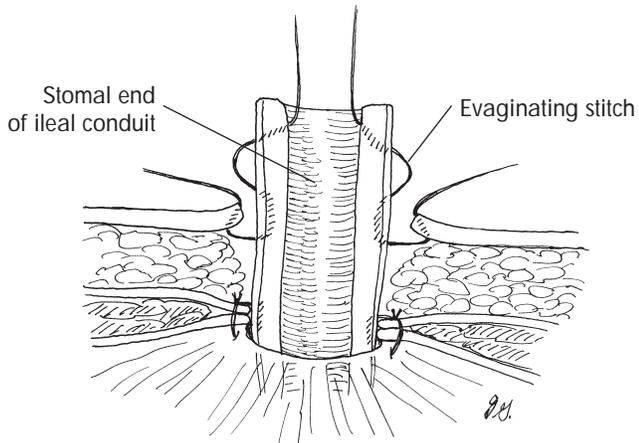
FIG. 11-27. The ureteral stents are fixed to the skin.



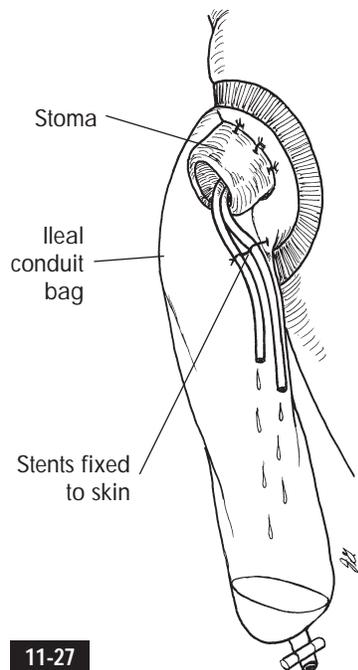
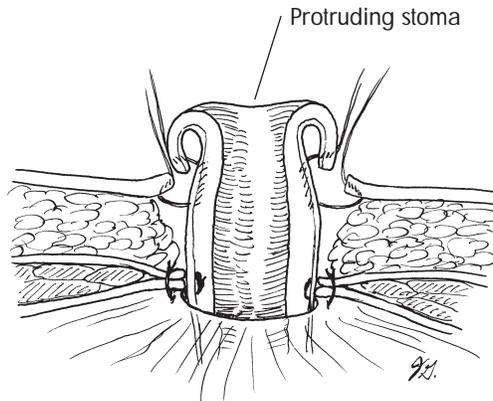
First Level of Ileofascial Fixation



Second Level of Ileal Evagination



11-26

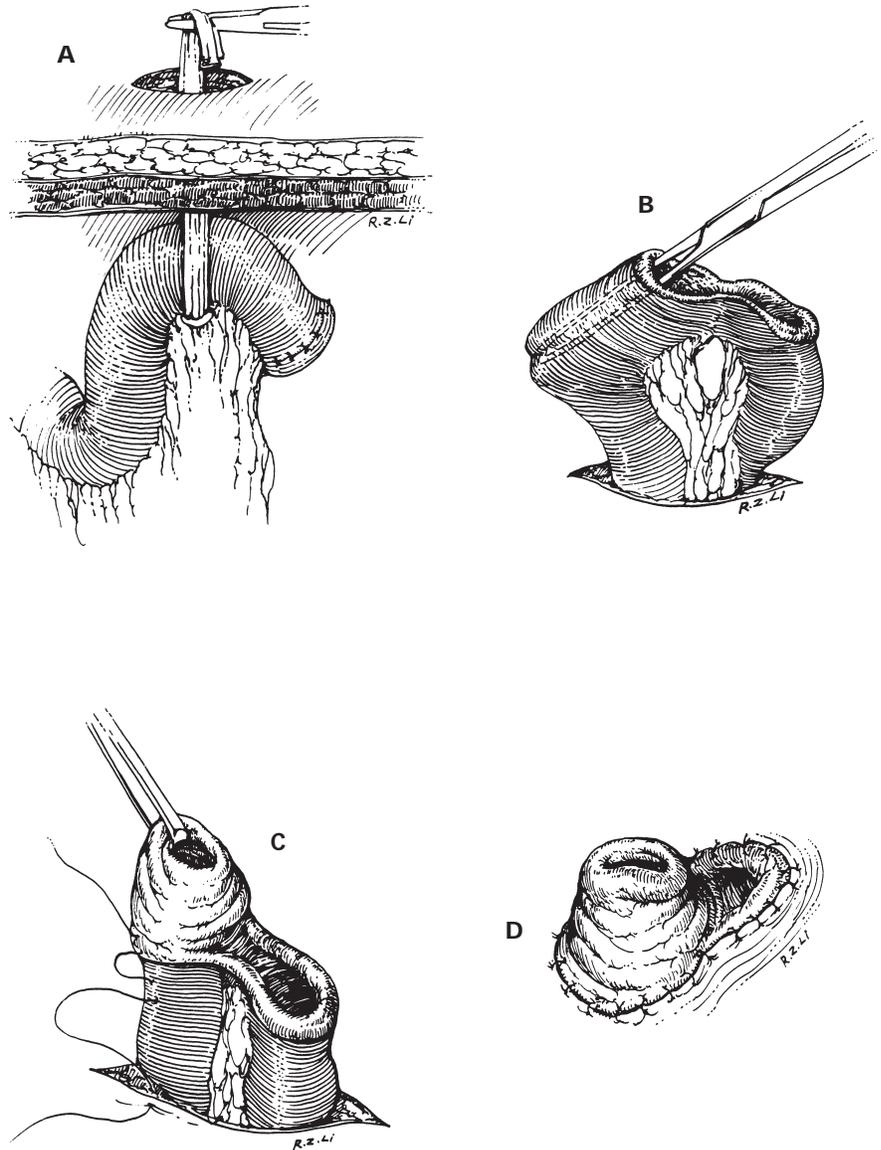


11-27

TURNBULL STOMA

FIG. 11-28. If the patient is excessively obese, it may be impossible to perform a traditional stomal procedure. In this situation a Turnbull stoma can be created.⁸ The Turnbull stoma is similar to a loop ileostomy or colostomy. The

distal end is closed and a loop of the ileal segment is brought out to the skin surface for fixation. Once the anterior rectus fascia is fixed to the ileum, the surgeon opens the exposed ileum and fixes the divided edge of the bowel to the skin.



From Fowler JE Jr: *Manual of urologic surgery*, Boston, 1990, Little, Brown.

KEY POINTS

ILEAL CONDUIT

- The proper length of ileum to be used for the conduit with no tension at the ureteroileal anastomosis and with enough ileum for good stomal nipple creation is estimated.
- The mesentery is divided so that it is long at the stomal end and short at the blunt end.
- Bowel reanastomosis anterior to the ileal loop is performed.
- A Parker-Kerr stitch and a horizontal mattress stitch are used to close the proximal end.
- Careful attention is given to the ureteral spatulation and the first three vertex stitches of the anastomosis, which are the most critical.
- The stent is placed and fixed in position.
- The creation of a good stomal nipple requires circumferential fixation of the rectus fascia to the ileum with a second set of circumferential stitches to create the ileal evagination and nipple formation.
- Self-retaining stents should be fixed to the skin.

TRADITIONAL BOWEL REANASTOMOSIS

- Clamps are applied at an angle to avoid bowel ischemia.
- Two-layer closure is performed using either continuous stitch or a combination of a continuous and an anterior Connell stitch for the first layer and a horizontal mattress silk stitch for the second layer of closure with subsequent mesentery closure.
- Luminal patency is verified by finger palpation.

POTENTIAL PROBLEMS

ILEAL CONDUIT

- *Entire ileal conduit segment is dusky or ischemic:* Select another segment and start over
- *Ileal loop was placed anterior instead of posterior to reanastomosis of ileum:* Take down the mesentery and pass the ileal conduit segment posteriorly
- *Difficult left ureteral mobilization:* Check adequacy of the parietal peritoneal tunnel if the left ureter is free from adjacent tissue such as the gonadal vessels → make sure the inferior mesenteric artery is not obstructing the left ureteral transposition
- *Both ureters are short:* The ileal conduit segment must be made longer to accommodate this discrepancy
- *Stent accidentally falls out:* Replace the stent by opening the ureteral ileoanastomosis at the end opposite the vertex stitches
- *Ileal conduit nipple is too flat:* Check to see if primary stitches at the fascial level can be revised
- *Patient is obese and stomal nipple cannot be created:* Consider creating a Turnbull stoma

TRADITIONAL BOWEL REANASTOMOSIS

- *Bowel ischemia of two open ends:* Resect this area until good tissue is established → perform the anastomosis
- *Small luminal opening of end-to-end anastomosis:* Take down the anastomosis and perform a side-to-side anastomosis
- *Hematoma of mesentery:* Ligate the bleeding vessels or area with attention to preservation of the main vasculature

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