

The Use of Bowel in Urologic Reconstructive Surgery



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KEYWORDS

- Urinary diversion • Bladder substitution • Neobladder • Ileal ureter
- Bladder augmentation • Appendicovesicostomy • Metabolic changes

KEY POINTS

- Urologists routinely use intestinal segments for reconstructive procedures and surgeons often encounter such reconstructions of the urinary tract.
- Surgeons should have a clear understanding of the most common urinary reconstructions using intestinal segments.
- Urinary tract reconstructions using intestinal segments can result in a variety of metabolic and electrolyte abnormalities.

Intestinal surgery involves an operative space shared by both general surgeons and urologists and is a border region where these 2 surgical disciplines often intersect. Urologists routinely use both small and large bowel for reconstructive procedures and surgeons often encounter such reconstructions of the urinary tract. It is therefore essential for surgeons to have a clear understanding of the urologic indications for using intestinal segments for reconstructive procedures, the variety of such reconstructions, the anatomic landmarks and potential pitfalls that should be considered when intraoperatively encountering such reconstructions, and the potential metabolic consequences associated with the incorporation of bowel segments into the urinary collecting system.

URINARY DIVERSION

Urinary diversion involves the separation of the ureters from the bladder and the development of an alternate route of urinary evacuation. The goal of urinary diversion is to provide a convenient and reliable drainage system when the native bladder is

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no longer able to serve this function. Common indications for urinary diversion include:

- Bladder or other pelvic malignancies requiring removal of the bladder
- Congenital anomalies of bladder development
- Intractable urinary incontinence
- Intractable bladder hemorrhage

Although a full description of all variants of urinary reconstruction involving intestinal segments is beyond the scope of this article, it is informative to understand the historical evolution of these procedures, the anatomic principles fundamental to each procedure, and the most common variations that surgeons can expect to encounter.

URETEROSIGMOIDOSTOMY

In 1852, Simon¹ described the first urinary diversion after performing a ureterosigmoidostomy on a patient with congenital bladder exstrophy. Ureterosigmoidostomy involves the implantation of the ureters into the tenia of the sigmoid colon, resulting in a combined evacuation of urine and feces per rectum. This procedure remained the most common form of urinary diversion for nearly a century. However, with longer-term follow-up it became clear that ureterosigmoidostomy often led to significant complications, to include:

- Chronic diarrhea and consequent electrolyte abnormalities
- Upper urinary tract obstruction
- Chronic pyelonephritis, renal scarring, and renal insufficiency
- Secondary malignant neoplasms occurring at the ureterocolonic implantation site²

This realization led to further investigations in which the ureters were implanted into a variety of other bowel segments that were separated from the fecal stream.

CONDUIT URINARY DIVERSIONS

In 1950, Bricker³ ushered in a new era in urinary diversion with his description of the intestinal conduit urinary diversion with cutaneous drainage. Although conduit urinary diversion had conceptually been described earlier by Zaayer⁴ in 1911, it was Bricker's³ simple and straightforward description of the ileal conduit diversion that popularized this procedure.

ILEAL CONDUIT

The ileal conduit remains the most common form of urinary diversion in the world and it is therefore often encountered by surgeons. It is generally constructed from a ~20-cm segment of ileum with its distal end ~20 cm proximal to the ileocecal junction (**Fig. 1**). In general, when urologists harvest a segment of small bowel for reconstructive purposes the remaining bowel is brought cephalad to it and continuity is reestablished. Ileal conduits are most often placed in the right lower quadrant of the abdomen rather than the left because of limitations of the length of the distal ileal mesentery. The ureteroileal anastomosis may be performed in the following 2 ways:

- The Bricker³ technique, in which the ureters are reimplemented individually in an end-to-side fashion to the proximal end of the ileal conduit (**Fig. 2**).

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