Surgical Complications of Urinary Diversion

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KEYWORDS

• Urinary diversion • Ileal conduit • Orthotopic neobladder • Continent catheterizable pouch
• Complication

KEY POINTS

- Complications are common after urinary diversion.
- Patients are at risk for early and late complications after urinary diversion, and the risk increases over time.
- Patients with urinary diversions require long-term surveillance for anatomic, infectious, and metabolic complications.

INTRODUCTION

Urinary diversion (UD) is most commonly performed after radical cystectomy (RC), but can also be used in patients with nonmalignant conditions.[1–3] Most diversions are performed using ileum, although ileocecal and colonic segments are also used in some patients. Regardless of the surgical indication, bowel segment used, or type of diversion constructed, UDs are associated with significant risks of short- and long-term complications. Because most studies using contemporary reporting criteria of complications in patients with UD are in the setting of RC, these are the primary sources for this review. Still, RC and UD for noncancerous indications likely have a similar morbidity profile.[3,4]

RC with UD is generally performed on elderly patients with extensive comorbidities, requires operating times of 4 to 7 hours, and a hospital stay of 4 to 17 days.[5–15] Given the length and complexity of the procedure and the overall health and age of the patient, most patients experience early postoperative complications and up to 10% suffer mortality within 90 days of surgery.[5–8,10–26] It is estimated that at least 60% of complications after RC occur as a result of the UD and, importantly, the risk of UD-related complications increases over time.[27,28]

The fidelity of reporting postoperative complications in recent years has improved. There are now several criteria to assess the quality of reporting for surgical complications, such as whether the report captured outpatient information, described the mortality and morbidity rates, and defined and graded all complications.[29,30] Using contemporary reporting methodology and stratification of complications by organ system, one is better able to standardize and compare postoperative complication rates across institutions.[31] Institutional series that use modern reporting methods are able to describe postoperative complications more accurately than less granular population-level studies, and this increases the number of complications described.[7,11,20,21]

Postoperative complications after UD are classified as early (less than 90 days) or late, and the types and frequencies of complications that occur during time periods differ. Any physician that performs UD or follows these patients postoperatively must understand the prevalence, presentation,

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and timing of complications after UD. This article reviews the complications partially or completely attributable to UD that are either associated with surgical technique or require surgical intervention to treat.

EARLY COMPLICATIONS

Prevalence and Risk Factors

Up to two-thirds of patients experience at least one complication within the first 90 days after surgery (**Table 1**).[5,7,10,14,15] Approximately half of these complications occur within the first few weeks after initial hospital discharge, but nearly 20% occur after 30 days.[7,32] Most postoperative complications are minor (Clavien grade I-II); however, up to 20% of patients experience a major complication (Clavien grade III-V) (see **Table 1**). Complications can lead to additional interventions, a longer hospital length of stay (LOS), added morbidity, and higher costs.[6,7,10,14]

There are several risk factors for postoperative complications, including patient comorbidity, age, frailty, longer operating room time, female gender, higher tumor stage, worse mental health, more intraoperative blood loss, and a higher body mass index (BMI).[5,7,14,15,20–22,33,34] It is reasonable to suspect that patients with a continent diversion have more postoperative complications because of the longer segment of bowel and higher complexity procedure, although data on this are mixed.[7,10,11,14,35] Higher surgeon and hospital volume are protective against postoperative morbidity and mortality.[6,20,36,37] There is no evidence that neoadjuvant chemotherapy in properly selected patients impacts risk of perioperative complications.[38,39]

Table 1
Early complication rates after radical cystectomy and urinary diversion based on several large contemporary institutional cohorts

Complication	Percent
Overall	49–64
Minor[a]	34–51
Major[a]	13–22
By organ system	
Gastrointestinal	15–29
Infectious	7–30
Wound	5–21
Genitourinary	7–17
Cardiac	<1–11
Pulmonary	1–9
Bleeding	<1–16
Thromboembolic	<1–8
Neurologic	2–5
Miscellaneous	1–9
Surgical	0–1
Secondary procedure	7–14
Mortality	2–5

[a] Minor complications are Clavien grades I-II. Major complications are Clavien grades III-V.
Data from Refs.[5,7,10,14,15]

Early Complications by Organ System

Recent high-quality institutional series that use modern reporting criteria group early postoperative complications into 1 of 11 organ-systems (see **Table 1**): gastrointestinal, infectious, wound, genitourinary, cardiac, pulmonary, bleeding, thromboembolic, neurologic, miscellaneous, and surgical. Although this discussion does not comprehensively cover all possible postoperative complications, we highlight select organ systems whose complications may be more attributable to UD rather than RC.

Gastrointestinal

Because of the use of bowel for UDs, gastrointestinal complications are common after RC and UD, seen in up to 30% of patients (see **Table 1**). The most common gastrointestinal complication is paralytic ileus, although patients are at risk for a variety of other complications, such as bowel obstruction, anastomotic leak, gastrointestinal bleeding, and *Clostridium difficile* colitis (CDC).

Ileus is caused by the temporary of impairment of small bowel peristalsis causing a functional bowel obstruction. Although somewhat variable, the definition of an ileus is the absence of bowel function by postoperative day 5; need for nasogastric tube; or conversion to NPO status because of nausea, vomiting, or abdominal distention.[5,7] Depending on the definition used, nearly one-quarter of patients with RC experience postoperative ileus and it is the most common cause of prolonged LOS following RC.[5,7,14,15,40] Paralytic ileus is likely caused by an insult to small bowel innervation secondary to irritation, inflammation, or medication effects. There are several proposed inciting factors including intraoperative bowel manipulation; medications, such as opioids and anticholinergics; and metabolic abnormalities including hypokalemia, hypocalcemia, hypomagnesemia, and hyponatremia.[41]

Patients who develop an ileus are best treated supportively with hydration, nasogastric tubes, treatment of electrolyte imbalances, and cessation of offending medications. Prokinetics, such as