

Continent Cutaneous Diversion



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KEYWORDS

• Urinary diversion • Continent cutaneous • Bladder cancer • Indiana pouch • Right colon pouch

KEY POINTS

- Appropriate selection of patients for continent cutaneous diversion is a key factor to successful outcomes. Indications and contraindications are discussed in the context of extirpative surgery for bladder cancer.
- The 2 most common forms of urinary diversion, the Indiana Pouch and the right colon pouch with appendicumbilicostomy, are illustrated in detail.
- Components of enhanced recovery after surgery are described, including the incidence of early and late complications and tips on how to minimize them.
- Continence rates and health-related quality of life from various series are summarized.

INTRODUCTION

Continent cutaneous urinary diversion (CCUD) was introduced in the United States after Kock's report of clinical results with an ileal reservoir in a 12 patient series.¹ Rowland's description of a right colon reservoir with a reinforced ileocecal valve for continence (Indiana pouch) in 1987 further aided acceptance of CCUD as a reasonable option for urinary diversion.² The University of Southern California reported excellent outcomes using the Kock reservoir for urinary diversion in the first large American series of 531 patients from 1982 to 1988.³ CCUD provides an excellent option for patients who are not candidates for orthotopic neobladder (ONB), yet desire continence and are capable of intermittent catheterization. However, with the widespread adoption of orthotopic diversion in the 1990s (1% before 1990 and 16% between 200 and 2008), there was a significant decline in the percent of patients undergoing CCUD.⁴ Among experienced surgeons who routinely offer CCUD to appropriately selected

patients, the percent of patients choosing CCUD is as high as 20% to 30% compared with just 9% in population-based data.⁵

The principal advantages of CCUD over orthotopic diversion are excellent early daytime and nighttime continence. Some surgeons prefer CCUD over ONB in women because of the 20% to 30% risk of hypercontinence associated with ONB⁶; additionally, CCUD is well suited for patients with a diseased urethra from either benign damage or malignancy. CCUD are constructed with adherence to basic principles of continent urinary diversion, including the use of detubularized bowel in a spherical conformation for pouch creation with either ileum or the right colon. Construction of a robust and stable continent catheterizable channel remains the most critical aspect of the operation with a variety of methods and approaches largely based on individual surgeon experience and preference. Additional considerations include the use of a refluxing versus anti-refluxing techniques for the afferent limb or ureteroenteric anastomoses. Although there is no

Disclosure Statement: The authors have nothing they wish to disclose.

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Urol Clin N Am 45 (2018) 55–65

<https://doi.org/10.1016/j.ucl.2017.09.004>

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evidence for impact on renal function,⁷ the risk of reflux is balanced against a potentially higher risk of ureteral obstruction with anti-reflexing techniques.^{8,9} This article reviews the history, patient selection, preoperative evaluation, surgical technique, and outcomes of CCUD.

HISTORICAL BACKGROUND

The first description of a catheterizable reservoir for urinary diversion was by Verhoogen in 1908,¹⁰ who reported early results after creation of a cecal reservoir. Initial attempts permitted catheterization but did not provide continence. The first series describing a continent channel was from Gilchrist and Merricks¹¹ at Presbyterian Hospital in Chicago beginning in 1949.¹¹ In the 1980s, further refinements of continent diversion by Kock, Skinner, Rowland, and others led to improved functional outcomes and reduced complications through the use of detubularized bowel for the pouch and description of numerous plication and intussusception strategies for creation of a flap valve between the pouch and catheterizable channel to provide adequate continence. These techniques form the armamentarium of urologists performing urinary diversion in the current era.¹⁻³

PATIENT SELECTION AND PREOPERATIVE EVALUATION

Before counseling a patient about options for continent diversion, it is important to consider the contraindications. Absolute contraindications include significant renal insufficiency (glomerular filtration rate <50 mL/min), pelvic extension of disease, gastrointestinal disorders affecting the segment intended for urinary diversion, hepatic dysfunction, or neuromuscular disorders that could impede one's ability to self-catheterize. Most eligible patients will likely elect for continent diversion with appropriate counseling.¹² Most patients who are candidates for continent diversion tend to prefer ONB; however, there are patients who prefer CCUD. There are also many situations wherein CCUD may be encouraged as a favorable alternative to ONB, such as in patients with preexisting incontinence or malignancy at the bladder neck, prostate, or urethral margin.¹³ Women considering ONB must be counseled regarding the known risk of urinary retention and need to perform clean intermittent catheterization after orthotopic diversion.¹⁴⁻¹⁶

Assessment of past medical and surgical history must include particular attention to preexisting neurologic disease, renal dysfunction, liver disease, and prior abdominal surgery. Laboratory evaluation is performed with a focus on renal

function, electrolytes, and nutritional parameters. Colonoscopy may be considered to rule out bowel disease in clinically appropriate scenarios and computerized tomography to assess anatomy. Patients should see an ostomy nurse for selection of an optimal stoma site, typically the lower abdomen or umbilicus, and many stoma nurses will also mark the patient for an ileal conduit as a backup. The site should be in a location that is easy to conceal, locate, and manage. At the authors' institution, they use the umbilicus as the site for the vast majority of stomas given its consistency and for the aforementioned criteria.

Although enhanced recovery after surgery (ERAS) protocols for radical cystectomy and urinary diversion have improved return of bowel function and length of stay, most current data focus on patients undergoing ileal conduit or ONB.^{17,18} Elimination of a mechanical bowel preparation (MBP) is advocated by most ERAS pathways as part of a multifaceted strategy to speed return of bowel function. Most recent evidence suggests that MBP may have negative consequences on bowel motility through electrolyte and fluid imbalances, and there are no data to suggest it reduces the rate of wound infection, anastomotic leak, reoperation, or mortality.^{19,20} However, because of the frank stool load and high bacterial count in the colon, most urologists continue to use an MBP when planning a urinary diversion with colon, which is the current practice at the authors' institution. They do not recommend routine oral antibiotic bowel preparation because of the risk for selection of resistant, pathogenic bacterial strains.²¹

TECHNIQUE

This section outlines the basic aspects of CCUD creation. There are a variety of approaches to CCUD. Many technical modifications have focused on creation of continence mechanisms and anti-reflux strategies such as tunneled ureteral anastomoses, the ileocecal valve, the Kock nipple valve, or an extraserosal tunnel. These techniques are not discussed here in detail, and there is some evidence that anti-refluxing ureteroenteric anastomosis techniques may have a higher risk of late upper tract obstruction and stenosis compared with direct refluxing techniques, leading to favor for the latter currently among most urologists.^{8,9} The Indiana pouch is probably the most common approach to CCUD, which involves a right colon pouch with the tapered terminal ileum functioning as the catheterizable channel and a reinforced ileocecal valve providing continence (**Fig. 1**). Following completion of a side-to-side ileocolic bowel anastomosis, the ileal segment is tapered

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