

Male Neobladder



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KEYWORDS

• Urinary diversion • Radical cystectomy • Neobladder • Bladder Cancer

KEY POINTS

- The goals for urinary diversion are to store urine at low pressure, protect renal function, allow for complete volitional emptying, and provide socially acceptable continence.
- The diversion should have minimal absorption of excreted urinary metabolites to avoid major metabolic abnormalities and also have acceptable rates of early and late complications.
- Finding a suitable replacement for the native bladder is one of the great challenges after radical cystectomy.

BACKGROUND

Finding a suitable replacement for the native bladder is one of the great challenges after radical cystectomy. The goals for urinary diversion are to store urine at low pressure, protect renal function, allow for complete volitional emptying, and provide socially acceptable continence. The diversion should have minimal absorption of excreted urinary metabolites to avoid major metabolic abnormalities and also have acceptable rates of early and late complications. Recapitulating many of the intrinsic properties of the native bladder and understanding the impact of the choice of bowel segments are paramount to successfully reconstructing the urinary tract. This article reviews the principles, surgical technique, perioperative management, and long-term issues associated with orthotopic continent urinary diversion in male patients.

SURGICAL PRINCIPLES

Development of a Low-Pressure System

The fundamental principle behind any form of continent urinary diversion is the creation of a low-pressure reservoir that protects the upper tracts, optimizes continence, and allows for volitional voiding. Low-pressure storage is achieved

by detubularization of the bowel segment and cross-folding into a spheroid shape to maximize reservoir capacity. Detubularization disrupts rhythmic peristaltic bowel contractions, thereby protecting the upper and lower urinary tracts from intermittent increases in pressure.¹ The spherical configuration maximizes the radius of the reservoir, which according to Laplace's law (pressure = tension/radius), translates into lower filling and storage pressures. The spherical configuration also minimizes the surface area that is in contact with urine, thus reducing reabsorption and metabolic complications. Furthermore, continence is best with a low-pressure reservoir.

Because reconfiguration into a spheroid shape maximizes capacity, the overall length of bowel required for the diversion is not excessively long. Although capacity of the reservoir is limited immediately after surgery, it increases over time as the viscoelastic properties of bowel wall allows stretch.² The temptation to use too long an ileal segment for the neobladder must be avoided because this can result in an excessively large, flaccid reservoir with high postvoid residual urine volumes requiring intermittent self-catheterization to empty. Large reservoirs also place patients at higher risk for metabolic disorders and infections

Disclosure: E.J. Pietzak, T.F. Donahue, and B.H. Bochner have nothing they wish to disclose.

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Urol Clin N Am 45 (2018) 37–48

<https://doi.org/10.1016/j.ucl.2017.09.003>

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from chronic colonization and bacteriuria. If this occurs, patients are usually managed with medical therapy and possible long-term intermittent or chronic catheterization.

Maintenance of Intrinsic Continence Mechanism

Central to the successful outcome after orthotopic reconstruction is the ability to maintain urinary continence. The continence of an orthotopic neobladder is dependent on an anatomically and neurologically intact native urethra and sphincter. The distal external sphincter is composed of an omega-shaped striated rhabdosphincter at the level of the membranous urethra in men and is under voluntary control by the somatic nervous system. Meticulous apical dissection during cystoprostatectomy is required to ensure the sphincter is not damaged and maximal functional urethral length is maintained. To help achieve these aims, complete control of the dorsal venous complex is paramount to obtain a bloodless field that allows the contours of the prostatic apex to be properly visualized, thus minimizing the risk of excessive distal dissection or damage to the muscular or neural components.

Additionally, nerve-sparing cystectomy can result in preserved sexual function and may improve continence outcomes in men. Attempted nerve sparing in men has been shown to improve nighttime continence rates compared with those whom nerve sparing was not attempted.³ Nerving sparing is thought to preserve the somatic efferent innervation to the pelvic floor and external urethral sphincter as well as the autonomic innervation to the smooth muscle component of the sphincter complex.⁴ Urethral sensation may also be preserved by nerve sparing, which may contribute to improved continence in orthotopic diversions.⁵ Although nerve sparing can potentially improve continence rates and preserve sexual function, this should never be performed at the expense of the oncological objective.³ Careful patient selection in nerve sparing is paramount to reduce the risk of positive surgical margins.

Some investigators advocate for sparing of the prostatic apex, prostatic capsule, and/or seminal vesicles during the extirpative part of radical cystectomy.⁶ Although these efforts are intended to preserve sexual function and continence, these modifications have not been shown to improve continence rates and may have worse oncological outcomes.⁶ Thus, the authors do not support these techniques in routine practice and advocate for a more radical resection, particularly in patients with invasive disease or high-risk histologic subtypes.

Refluxing Versus Antirefluxing Upper Tract Systems

A long-standing controversy in urinary diversions is whether the upper urinary tracts need protection against the effects of reflux to prevent long-term renal deterioration. Similar to the function of the vesicoureteral junction of the native bladder, the principle behind constructing antirefluxing ureteral anastomoses is to protect the kidneys and upper tracts from sustained increases in pressures during voiding and to prevent ascending bacteriuria. Although this was particularly relevant for patients undergoing ureterosigmoidostomy, which diverts the urine into a high-pressure chronically infected system, ureteral reflux may be less of a concern with the development of lower pressure, high-capacity orthotopic reservoirs. Yet, proponents of antireflux mechanisms in orthotopic diversions argue that there are high rates of bacteria colonization, and intraluminal pressures can substantially increase during voiding.⁷ There are several different antireflux techniques described, including extramural and transmural tunneling, as well as creating nipple valve mechanisms with ileum or the ureter directly.^{8–10} Randomized controlled trials comparing refluxing and nonrefluxing anastomoses have not demonstrated a benefit for nonrefluxing anastomosis but have found them associated with an increased risk of ureteral strictures and complications.^{11,12} Not only are ureteral strictures seen, but the antireflux mechanism itself is at risk for stricture and can result in obstruction as demonstrated in the long term follow-up for the Kock valve, Ghoneim subserosal tunneling system, and T-pouch reconstructions.^{8,10,12} A randomized trial demonstrated a reoperative rate for the T-pouch antireflux mechanism was 22% at 3 years compared with 13% for refluxing ureteral anastomoses.¹² There seems a greater risk of gradual renal deterioration from ureterointestinal anastomotic strictures than from reflux of urine into the upper tracts. Refluxing anastomosis into an isoperistaltic tubular afferent limb of the orthotopic reservoir has demonstrated excellent long-term protection against renal deterioration.¹³ Hautmann and colleagues¹⁴ reported a 20.6% ureteroileal stricture rate at 10 years with the Le Duc antirefluxing technique, which was reduced to 7.0% when they switched to refluxing Wallace anastomoses. Because refluxing anastomoses are technically simpler to complete and have not been associated with significant rates of upper tract deterioration in patients undergoing orthotopic reconstruction, they are a widely accepted design.^{15–19}

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