Total Bladder and Posterior Urethral Reconstruction: Salvage Technique for Defunctionalized Bladder with Recalcitrant Posterior Urethral Stenosis

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Purpose: Recalcitrant posterior urethral stenosis is a challenging disease. When combined with a defunctionalized bladder, cutaneous urinary diversion is the most common surgical option. We present a novel technique of total lower urinary tract reconstruction, combining salvage cystectomy, ileal neobladder formation and urethral pull-through, as an orthotopic alternative in patients with a defunctionalized bladder and recalcitrant posterior urethral stenosis.

Materials and Methods: We completed a retrospective review of 8 patients who underwent salvage cystectomy, orthotopic ileal neobladder formation and urethral pull-through. Artificial urinary sphincter placement was performed in a staged fashion. Six patients received prostate cancer treatment including radiation therapy, 1 had urethral disruption after robotic radical prostatectomy, and 1 experienced bladder rupture and urethral distraction injury during a motorcycle accident. Patient demographics, operative variables and postoperative outcomes were examined.

Results: No high grade complications were observed after salvage cystectomy, orthotopic neobladder formation and urethral pull-through. After staged artificial urinary sphincter placement, a median of 2 revision surgeries (range 0 to 4) was required to establish social continence. All patients maintained functional urinary storage, urethral patency and social continence at a median followup of 58 months. No patient had complications related to orthotopic neobladder formation, including ureteroileal anastomotic stricture or pyelonephritis, and no patient required cutaneous diversion.

Conclusions: Total lower urinary tract reconstruction with cystectomy, ileal neobladder formation and urethral pull-through offers an orthotopic alternative for patients with recalcitrant posterior urethral stenosis and defunctionalized bladders. Although it requires staged placement of an artificial urinary sphincter, this approach can offer functional urinary storage, durable urethral patency and avoidance of cutaneous urinary diversion.

Key Words: urinary diversion; radiation; cystitis; urethral stricture; urinary sphincter, artificial

Abbreviations and Acronyms

AUS = artificial urinary sphincter

RRP = radical retropubic prostatectomy

UPT = urethral pull-through

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THE management of recalcitrant posterior urethral stenosis is particularly challenging in the setting of trauma or prostate cancer therapy. The incidence of posterior urethral stenosis after prostate cancer treatment ranges from 1% to 29% in reported series and varies considerably

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based on etiology.[1] Posterior urethral stenosis may be located at the bladder neck, vesicourethral anastomosis, or the prostatic, membranous and bulbomembranous urethra. Often strictures or stenoses span multiple areas and may be associated with obliteration of the urethral lumen. Despite described endourological and open surgical management approaches, recalcitrant urethral stenosis remains a reconstructive dilemma.

Radiation and trauma can also cause bladder dysfunction, including problems with storage, voiding and hematuria, resulting in significant morbidity.[2] When bladder defunctionalization is present along with posterior urethral stenosis, surgical options primarily include cutaneous urinary diversion. While many patients may accept this option, some are highly motivated to undergo orthotopic reconstruction. We present a novel technique combining salvage cystectomy/cystoprostatectomy, ileal neobladder formation and UPT as an orthotopic alternative for the unique group of patients with a defunctionalized bladder and recalcitrant posterior urethral stenosis. This technique of total lower urinary tract reconstruction requires staged AUS placement for the restoration of continence.

MATERIALS AND METHODS

Patient Population

Investigational review board approval was acquired for retrospective data collection. Between February 2007 and May 2014 we identified 8 patients with recurrent, treatment refractory posterior urethral stenosis and defunctionalized bladder who underwent cystectomy, neobladder formation and UPT.

After referral, each patient was evaluated by a single surgeon, including history and physical, laboratory testing (creatinine and urinalysis), evaluation of post-void residual urine, cystourethroscopy (to define the posterior urethral injury) and cystometry. A defunctionalized bladder was defined as one with severe radiation cystitis, refractory hematuria and/or recurrent bladder neck stenosis, in addition to a cystometric capacity of 200 ml or less. After extensive counseling on surgical options including endoscopic and medical management and cutaneous urinary diversion, patients elected to proceed with total bladder and posterior urethral reconstruction.

Procedure Details

A preoperative bowel preparation and 24 hours of perioperative antibiotics are administered. With the patient in the low lithotomy position, the procedure is performed with 2 teams of surgeons through a combined abdominoperineal approach. One team performs salvage cystectomy/cystoprostatectomy and orthotopic ileal neobladder reconstruction, while a second team uses a perineal approach. After reflection of the bulbospongiosus muscle posteriorly, the urethra is mobilized from the penoscrotal junction to the point of obstruction in the urogenital diaphragm. The urethra is transected at the point of the stenosis. The area of posterior urethral obliteration is excised and dilated sequentially to 14 Hegar. After resection to healthy tissue, the proximal urethra is then spatulated and temporarily affixed to a suture for manipulation. The urethra is advanced proximally (urethral pull-through) through the urogenital diaphragm into the pelvis. Anastomosis of the neobladder to the pull-through urethra is performed with interrupted 2-zero monocryl (see figure). An open suction drain is left near the neobladder-urethral anastomosis and a 24Fr 2-way Foley catheter is placed per urethra into the neobladder. The reflected bulbospongiosus is then interposed proximally toward the anastomosis and a closed suction drain is placed in the perineum. A single surgeon (SDB) performed each UPT and all AUS surgeries.

Patient Followup and Statistical Analysis

The urethral catheter was removed 4 to 6 weeks postoperatively. In the initial 5 patients a decommissioned AUS cuff was left around the pulled-through urethra to facilitate staged implantation of the definitive AUS. However, this procedure was eventually abandoned due to associated complications. AUS implantation, performed at a minimum of 6 weeks after reconstruction, required carefully selected components for initial placement. This included conservative cuff measurement and a low pressure (51 to 60 cm H_2O) balloon. AUS activation occurred 8 to 10 weeks after implantation. Serial cystourethroscopy was performed at 1, 3 and 6 months postoperatively, with surveillance (laboratory testing, cystoscopy and abdominopelvic imaging) performed every 6 to 12 months thereafter.

Success of the procedure was defined by use of a functional neobladder and AUS, maintenance of a patent posterior urethra without surgical intervention and avoidance of cutaneous diversion. Patency, voiding status and continence were evaluated by clinical history and cystoscopic findings. Social continence was defined as a requirement of 2 pads or less per 24-hour period. Associated complications and subsequent AUS surgeries were also recorded. Descriptive statistics were used to describe the study population, and perioperative, followup and complication data.

RESULTS

Mean patient age at surgery was 65.5 years (range 54 to 78). One patient was in a motorcycle accident, and had bladder rupture and a urethral distraction injury. Immediate embolization of bilateral internal iliac arteries was required for hemodynamic stabilization. An attempted repair included suprapubic tube placement, cystorrhaphy with bladder neck reconstruction to establish urethral continuity and bilateral nephrostomy drainage. This occurred 8 months before referral to our institution.

There were 7 patients who received prostate cancer therapy at a mean age of 62 years. Of these patients 6 were treated with radiation. One patient