CASE REPORT

Laparoscopically Assisted Ureterocystoplasty on a Solitary Functioning Kidney: A Novel Technique for Urinary Bladder Augmentation

Kurt Roland A. Asperas, MD; Jose Benito Abraham, MD, FPUA and Ernesto L. Gerial Jr., MD, FPUA

Department of Urology National Kidney and Transplant Institute

Augmentation intestinal cystoplasty is usually the preferred method. However, this is complicated by mucus production, recurrent infection and cystolithiasis. In this report, the authors present a unique case of laparoscopically-assisted ureterocystoplasty and describe the operative technique and its advantages.

A 68-year-old female with a contracted urinary bladder and a solitary functioning kidney was diverted with a percutaneous nephrostomy tube for the past ten years. She consulted for a possible reconstructive procedure.

After a comprehensive preoperative evaluation, she underwent laparoscopically-assisted ureterocystoplasty. The operative time was 265 minutes with minimal blood loss. She had an unremarkable postoperative course. On follow-up, a voiding diary revealed urine volume of around 300 milliliters at 3 hour intervals, preservation of renal function, and no evidence of urinary infection.

Ureterocystoplasty was done using a combination of minimally invasive and open techniques. This procedure spared the patient a lifelong diversion with a nephrostomy tube and provided a better quality of life.

Key words: Ureterocystoplasty, percutaneous nephrostomy, vesical augmentation

Introduction

Genitourinary tuberculosis (GUTB) remains as a common form of extrapulmonary tuberculosis, particularly in a country like the Philippines. Despite the effective antibiotic therapy, the aftermath of the infection is associated with complications related to gross distortion and dysfunctional anatomy of the urinary system.

Changes associated to urinary bladder tuberculosis results from the granulomatous inflammation, caseation necrosis and contracture formation from final healing of the urothelium from the *Mycobacterium tuberculosis* infection.[1] In severe cases, the urinary bladder contracts significantly diminishing its capacity as a compliant, low-pressure reservoir.

Multiple techniques can be performed for vesical augmentation. Established techniques are associated with a variety of potential complications such as decline in renal function, urinary tract infections, nephrolithiasis formation and metabolic disturbances. The nature and severity of complications are due to the constant contact of urine to the utilized bowel segments.

An ideal surgical procedure is goaled towards enlarging the volume of the bladder, restoring low bladder filling pressures, and preventing infections

and reflux uropathy that may jeopardize renal function.

The Case

Patient Information

The patient is a 68-year old female diagnosed with genitourinary tuberculosis via urinary bladder biopsy in 2011 who initially presented as recurrent urinary tract infection, hematuria, urinary frequency and urgency, and intermittent left flank pain. Imaging at the time of GUTB diagnosis showed atrophic right kidney, normal sized left kidney with moderate hydronephrosis, dilated and tortuous left ureter up to its insertion into the small, thick-walled urinary bladder.

Patient completed the 6-month anti-tuberculosis medications while being maintained on an indwelling foley catheter to relieve the reflux uropathy arising from the increased intravesical pressure within the contracted urinary bladder. Despite maximal drainage, the patient still reported recurrent episodes of pyelonephritis. An acute episode of sepsis and acute kidney injury from pyohydronephrosis in 2012 prompted insertion of a percutaneous tube into her left kidney for source control.

For the succeeding 10 years, the patient opted to maintain her nephrostomy tube despite its detrimental effects on her quality of life. Ileocystoplasty had been offered by several urologists but she did not consent for the procedure due to the foreseen metabolic and infectious complications of the procedure. Nonetheless, the patient was highly motivated and did not want to live with the nephrostomy tube permanently.

An antegrade pyelogram (Figure 1A) was done to assess for potential reconstructive procedures. It showed a severely dilated left upper collecting system and tortuous redundant ureter draining to a small contracted urinary bladder. This finding prompted the inquest if the ureter can be used to augment the urinary bladder capacity of the patient.

Clinical Findings

Patient is a case of solitary left kidney with reflux uropathy from contracted urinary bladder secondary to GUTB. She reported a nephrostomy drain of 1-2 liters and minimal urine output per urethra in 24 hours. Urine culture showed growth of *Klebsiella spp*. that was treated adequately with appropriate antibiotics prior to the surgery. She was classified preoperatively as ASA Physical Status II.

Diagnostic Assessment

Non-contrast Computed Tomography of the abdomen of the patient showed a small right kidney and a normal sized left kidney (10.7cm in length) with normal parenchymal thickness. Left collecting system was severely hydronephrotic up to its ureteral insertion to the contracted urinary bladder. The patient's nuclear renal function on admission was measured at 0 and 35.4 ml/min/1.73m^2 for her right and left kidney, respectively.

Therapeutic Intervention

The procedure can be divided into three parts: 1) Intraoperative imaging, 2) Laparoscopic renal decensus with ureteral mobilization, and 3) Augmentation cystoureteroplasty.

1. Intraoperative Imaging

   Patient was placed on a lithotomy position under general endotracheal anesthesia. Cystoscopy was performed that documented a small contracted bladder, golf hole-like left ureteral ureteral orifice, and smooth urinary bladder mucosa. The right ureteral opening was not identified. Subsequent cystogram showed a noncompliant urinary bladder with a volume of 30mL. Retrograde Pyelography showed a dilated and redundant tortuous left ureter with severe dilatation of the left collecting system (Figure 1B).

   Serving as a baseline reference, intraoperative imaging of the collecting system also enabled the surgeon to visualize the length and assess the adequacy of the ureteral segment to be used for augmentation.

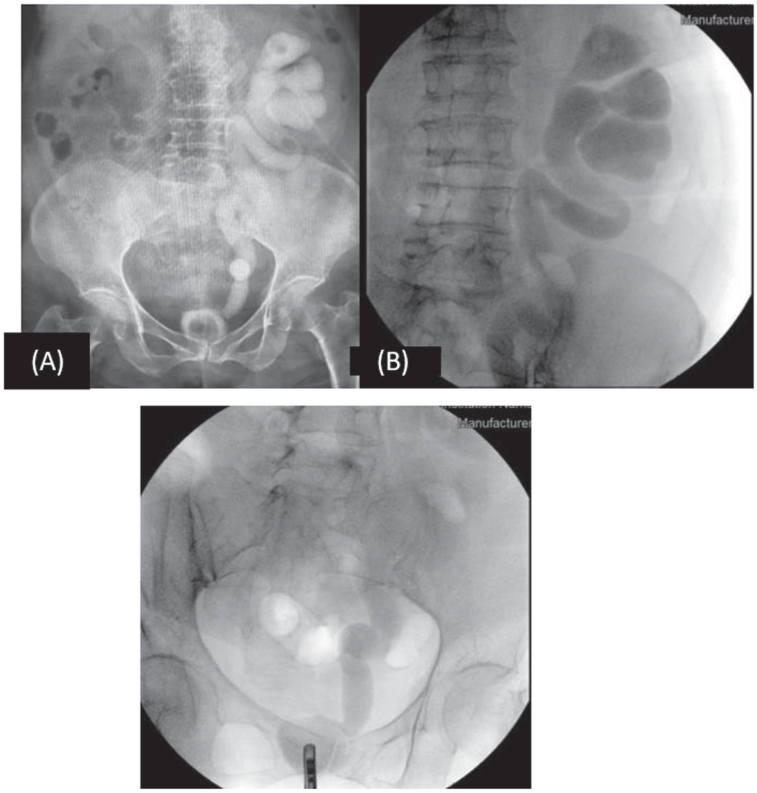

Figure 1. (A) Preoperative Antegrade Nephrostogram (B) Cystogram and Retrograde Pyelography of the left kidney showing a small bladder (~30mL:); severely dilated, redundant, and tortuous left ureter, and severely hydronephrotic left kidney.

2. Laparoscopic Renal Decensus with Ureteral Mobilization

The patient was repositioned to a right flank position for the Laparoscopic renal decensus to approximate the kidney closer to the urinary bladder, thereby extending the length of the ureteral segment available for ureterocystoplasty. A three-port laparoscopic technique as illustrated in Figure 2 was used to the detach the left kidney from all of its attachments. The entire length of the ureter was dissected to completely tubularize the redudant ureter from its proximal to distal ends.

3. Augmentation Ureterocystoplasty

The patient was again repositioned to supine position. A midline infraumbilical incision was done to identify the urinary bladder. The anterior bladder was opened transversely up to level of the left ureteral orifice (Figure 3). Approximately 12cm of the distal ureter was detubularized by cutting it medially (Figure 4). Edges of the detubularized ureters were then opposed via continuous suturing using absorbable braided sutures (Figure 5). A JJ stent was inserted intraoperatively before connecting the created ureteral flap to the edges of the urinary bladder.

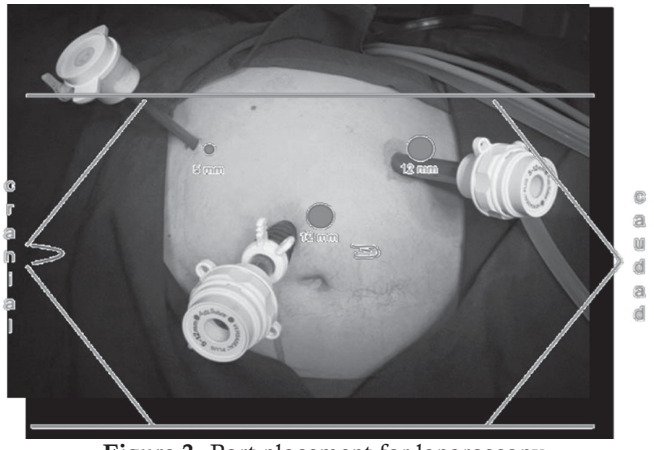

Figure 2. Port placement for laparoscopy.

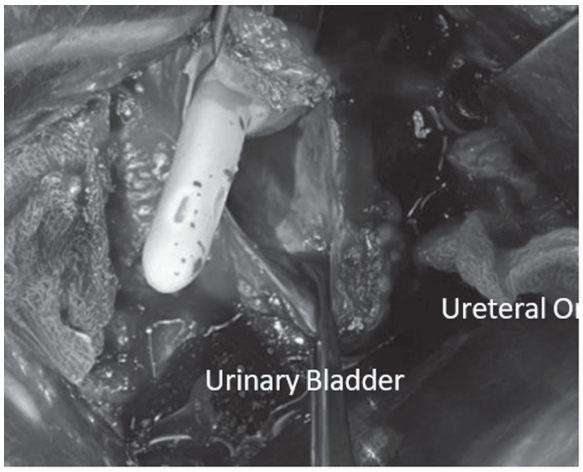

Figure 3. Intraoperative assessment of the contracted urinary bladder.

Intraoperative instillation of saline via a large bore foley catheter showed leak-free suture lines, and an approximated volume of 100mL. The entire operation was concluded after 4 hours and 15 minutes incurring an estimated blood loss of 800 mL. The patient was hemodynamically stable throughout the procedure. She was discharged with a foley catheter on her 5th postoperative day with no reported complications. Her eGFR was computed at 26.27 ml/min/1.73m^2.

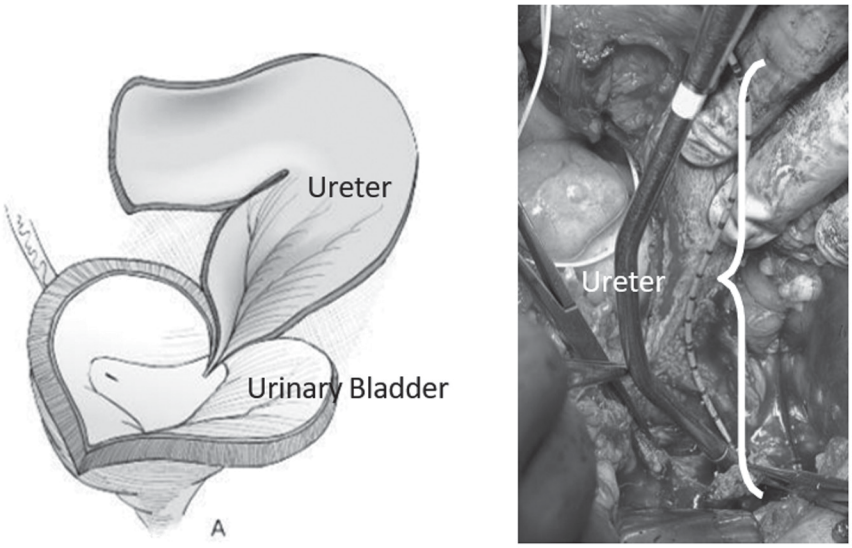

Figure 4. Urinary Bladder opened transversely. Ureter detubulartized.

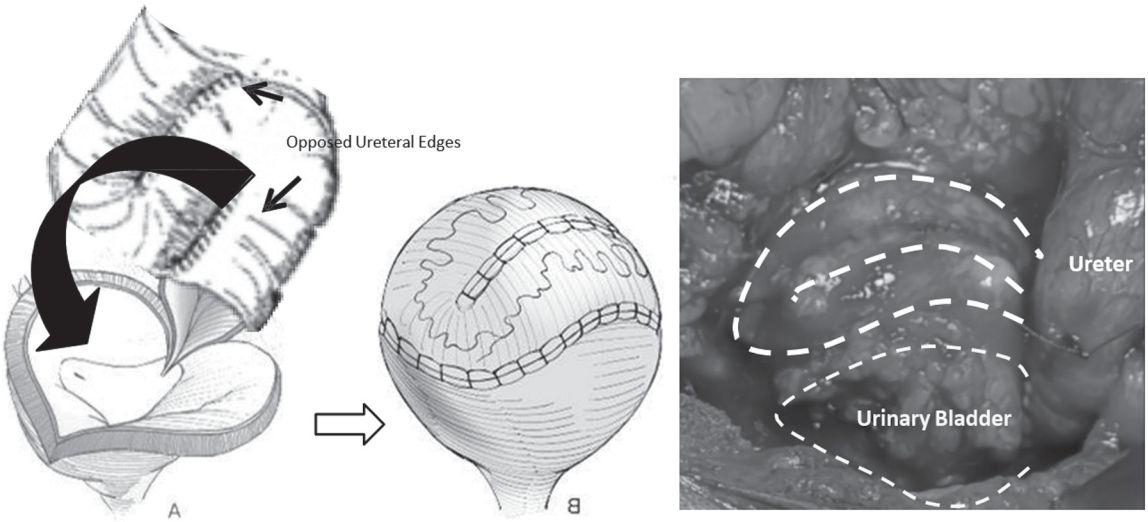

Figure 5. Opposing the detubularized edges of the ureter. The created flap was then connescted to the urinary bladder.

Follow-up and Outcomes

Three months after the operation, the patient's Frequency-Volume Charts revealed voided volumes of 100-200milliliters at 2-3 hour intervals. She reported urinary continence with no associated lower urinary tract storage-related symptom and urinary tract infection. Her computed eGFR was maintained at 27.01 ml/min/1.73m^2 six-months postoperatively. Overall, the patient was satisfied with the intervention for the removal of her nephrostomy tube positively affected her quality of life. She was advised to undergo serial urodynamic and radiologic evaluations to monitor her urinary bladder status, but she opted to do active surveillance instead should pertinent signs and symptoms occur.

Discussion

A material deemed ideal for urinary bladder augmentation should be easily shaped, capable of distention at low pressure, not absorbing urinary constituents, not secreting mucus, and poses no risk for malignant transformation. Although deemed as the gold standard technique for bladder augmentation, these parameters are sparingly fulfilled by conventional enterocystoplasty that employs the use of detubularized segments of small or large bowel.[2]

The advantages of using urothelium lined flaps of the ureter are already demonstrated in pediatric patients with a low-capacity, poorly compliant bladder.[3] The histologic layers of the urothelium are metabolically neutral making it as a rational alternative to bowel segments.[4]

Adequacy of ureteral segments can be a limiting factor for adult patients for a bigger bladder volume may be necessary to achieve the goals of reconstruction. This concern was addressed by performing Laparoscopic Renal Decensus that lengthens the ureter procurable for ureterocystoplasty.

Conclusion

The described sugery is a viable option for vesical augmentation of adult patients. This procedure offers increase in bladder volume capacity without the anticipated metabolic and infective complications observed in other techniques.

References

1. Gupta NP, Kumar A & Sharma S. Reconstructive bladder surgery in genitourinary tuberculosis. Indian J Urol 2008; 24(3): 382–7. https://doi.org/10.4103/0970-1591.42622
2. Duel BP, Gonzalez R & Barthold JS. Alternative techniques for augmentation cystoplasty. J Urol 1998; 159(3): 998–1005.
3. Özdemir T & Arıkan A. Ureterocystoplasty in pediatric patients with unilateral nonfunctioning kidney. Turkish J Urol 2013; 39(4): 232–6. https://doi.org/10.5152/tud.2013.059
4. Fisang C, Hauser S & Müller SC. Ureterocystoplasty: an ideal method for vesical augmentation in children. Aktuelle Urologie 2010; 41 (Suppl 1): S50–S2.