Use of a Modified Continent Ileovesicostomy in Adults with Prior Enterocystoplasty

Juzar Jamnagerwalla       Ali-Reza Sharif-Afshar       Andrew Freedman
Cedars-Sinai Medical Center, Los Angeles, Calif, USA

Key Words
Bladder augmentation • Neurogenic bladder • Pediatric case • Urinary diversion

Abstract

Background/Aims: To describe our initial experience with a novel modification of the Mitrofanoff conduit technique utilizing the Yang-Monti ileovesicostomy and the serosa lined extramural tunnel of the T-pouch to create a continent catheterizable stoma in patients with a prior enterocystoplasty.

Methods: A 14 cm segment of bowel was harvested, and the distal 4 cm was divided and reconfigured utilizing the Yang-Monti technique. The remaining segment was folded into a U and secured with a serosal basting stitch. Half of the Yang-Monti tube is laid in the trough of the U-shaped segment and secured. Next, the U-shaped segment was incised along the anti-mesenteric border for the length of the tube. The newly created flaps adjacent to the tube was then laid over the tube and sutured together completing the serosa lined tunnel. The entire patch was anastomosed to a cystostomy through the previous enterocystoplasty. Finally, the proximal end of the tube was brought through the umbilicus and matured as a stoma.

Results: Two patients with prior enterocystoplasties underwent the procedure described above. At follow-up of 18 and 24 months, both patients reported excellent continence. To date, there have been no revisions or significant complications.

Conclusion: The construction of a continent catheterizable stoma in adults with prior history of enterocystoplasty presents many technical challenges. The combination of the Yang-Monti ileovesicostomy and the extramural tunnel of the T-pouch provides an effective option for creating a continent catheterizable stoma in adults with prior history of enterocystoplasty.

Introduction

Since its original description in 1980, the use of a continent catheterizable conduit (Mitrofanoff procedure) [1] has proven to be of great benefit in many children with neurogenic bladders requiring intermittent catheterization [2–4]. It provides a ready access that is pain-free and easily accessible. For many children it enables greater independence and improves compliance with catheterization schedules. Its construction has become a nearly routine component in reconstruction for neurogenic bladder dysfunction. Furthermore, the development of the Yang-Monti ileovesicostomy allowed construction of a continent catheterizable conduit in children with a small or missing appendix [5, 6].

The construction of a continent catheterizable stoma in adults whom have had a prior bladder augmentation can present a difficult challenge. The creation of a long
sub-mucosal tunnel as a flap-valve mechanism for continence can be difficult as ileum lends itself poorly to sub-mucosal dissection. The remaining bladder remnant, especially following a clam-shell enterocystoplasty, may be of poor quality or a great distance to the desired umbilical stoma site. A flap from the reconstructed anterior bladder wall has been fashioned into a imbricated tube, however such procedures may diminish bladder capacity [7].

We therefore developed a modified procedure combining elements of the Yang-Monti ileovesicostomy and the T-pouch neo-bladder [8]. This procedure creates an serosal lined extramural anti-refluxing tunnel [9] and allows addition of a catheterizable stoma to any bladder location without a reduction of capacity or need to raise a sub-mucosal tunnel, in fact increasing capacity. We present our initial experience with our original technique being applied to adults with congenital neurogenic bladders with previous bladder augmentation.

**Materials and Methods**

*Surgical Procedure*

The procedure is based on the serous lined extramural tunnel as originally described by Abol-Enein et al. [9] for uretero-ileal anastomosis and modified by Stein et al. [8] for ileal tube implantation in the T-pouch orthotopic neo-bladder. The tunnel was constructed by harvesting a 14 cm long section of distal ileum. The distal 4 cm was divided from the proximal portion for use in the tube construction. The remaining 10 cm of ileum was folded into a U and limbs anchored together with a serosal basting suture of 3-0 silk along the medial sides creating a trough (fig. 1). The Yang-Monti tube was constructed by dividing the 4 cm portion into two 2 cm rings. The rings were incised on opposite sides near the mesentery. The short ends were brought together and joined thereby positioning the mesentery in the center. The resulting rectangular patch was then tubularized along its long axis over a 12F Foley catheter. One half of the tube was then laid into the trough and secured with serosal sutures of 3-0 silk. A tunnel length of at least 4 cm is usually easily obtained using just the length of tube from one side of the mesentery. Starting at the apex of the U the bowel was divided near the basting sutures, however as the ostium of the tube was approached, the incision was directed laterally to...
the antimesenteric border of the bowel to allow for mucosal flaps to cover over the tube (fig. 2). The flaps were then brought over the top of the tube and closed using a running 3-0 PGA suture with incorporation of the underlying serosa of the tube in order to prevent withdrawal of the tube. The ostium of the tube was then matured to the mucosal flaps with interrupted sutures (fig. 3). The patch containing the serosa lined extramural tunnel was then anastomosed to a generous cystotomy with running 3-0 PGA in 2 layers. The cystotomy can be anterior or laterally based. The proximal end of the tube was brought through the umbilicus and matured with the aid of a V-flap anastomosis.

By use of the Yang-Monti tube, as opposed to unreconfigured ileum as with the T-pouch, there is no need for the tedious dissection of mesenteric windows. In addition there is no need to incorporate the mesentery into the extramural tunnel.

Data Collection

We received institutional review board approval for retrospective review of patients in our urology practice. Data was abstracted from pre-operative clinic notes, operative notes, and post-operative clinic notes.

Results

We identified 2 patients who underwent the procedure in our adult congenital urology practice.

Patient 1

The first patient was a 35-year-old male with a history of neurogenic bladder from spina bifida. He had a bladder augmentation performed as a child and managed his bladder via clean intermittent catheterization. Unfortunately he developed a urethral stricture after a cystoscopic urethral injury following lithotripsy for nephrolithiasis and underwent suprapubic tube placement with inability to catheterize per urethra. He was then referred to our practice for further evaluation.

His urodynamic evaluation showed a poorly compliant, low volume bladder. He preferred the option of a continent catheterizable urinary diversion as opposed to urethral repair and restarting clean intermittent catheterization. He subsequently underwent the procedure with no complications intra-operatively, although he developed a post-operative deep venous thrombosis requiring anti-coagulation for 6 months. Later he developed a false passage in his continent catheterizable stoma requiring endoscopic placement of a catheter performed in clinic, after 2 weeks of decompression he was able to resume catheterization; this was classified as a Clavien grade IIIa complication (requiring endoscopic intervention not under anesthesia). He also had an 8 mm bladder stone at 12 months for which he underwent cystolitholapaxy through his stoma. At 24-month follow-up he was dry and his continent catheterizable stoma remained patent and was catheterizable with a 14F catheter.

Patient 2

The second patient was a 30-year-old female also with a history of neurogenic bladder from spina bifida. She had a bladder augmentation with Mitrofanoff procedure as a child, this failed and she was managed with a suprapubic tube for 10 years. She had severe recurrent urinary tract infections with her suprapubic site eroding into a large vesicostomy. Pre-operative urodynamic evaluation was not possible given her vesicostomy.

She underwent the procedure and closure of her iatrogenic vesicostomy, with no intra-operative or post-operative complications. At 18-month follow-up she was dry and her continent catheterizable stoma remained open and was catheterizable with a 12F catheter.

Discussion

Patients with prior enterocystoplasty present a unique challenge to the later construction or revision of a continent catheterizable stoma. The augmenting ileum does not lend itself well to the development of a continence tunnel and the bladder is frequently of poor quality or a great distance from a preferred umbilical stoma site. Therefore the development of a catheterizable conduit with a self-contained continence mechanism would greatly facilitate the construction of such conduits in these patients. We describe our initial experience with a novel modification of the Mitrofanoff conduit using the serosal lined tunnel anti-reflux method of the T-pouch orthotopic neobladder and the reconfigured ileal tube in the Yang-Monti fashion.

The introduction of the Mitrofanoff technique in 1980 along with enterocystoplasty allowed the creation of a relatively simple catheterizable channel improving the quality of life for children with neurogenic bladders. The long-term success of the Mitrofanoff procedure is excellent. Snyder et al. [3] reported on 50 consecutive patients with a mean follow-up of 4.3 years, with only 1 patient developing failure intractable to revision requiring alternative reconstruction. Mitrofanoff et al. [4] reported his long-term follow-up (> 15 years) of 22 patients, with 6 patients requiring conversion to non-continent diversion. Finally, Leslie et al. [10] reported follow-up on 169 patients who underwent either the Mitrofanoff or Yang-Monti procedure, with 96% of patients having...
a functional stoma at last follow-up. Enterocystoplasty combined with a continent catheterizable has certainly stood the test of time in preserving renal function and maintaining continence.

Despite the excellent long-term results, failure of the continent catheterizable stoma carries significant morbidity. Patients tend to be older and referred to adult urologists, who may not be familiar or comfortable with the complex anatomy. While most patients are offered non-continent urinary diversions, this technique allows for creation of a new continent catheterizable stoma without reduction in bladder capacity or need to raise a sub-mucosal tunnel in previously reconfigured ileum. The serosal lined extramural tunnel has the advantage over other forms of anti-reflux nipples in that it does not require the use of staples or other non-absorbable aids to prevent loss of intussusception. In addition there is no need for mesenteric dissection. Furthermore, as opposed to the development of an anterior bladder wall tube there is no loss of bladder capacity via the ileal patch.

Kutzrock et al. [11] describe a similar procedure on a pediatric patient with a previous Mitrofanoff, however their technique utilizes tapered ileum requiring mesenteric dissection to exclude it from the tunnel. We prefer use of reconfigured ileum in the form of a Yang-Monti tube as it avoids a tedious mesenteric dissection and allows the mesentery to be excluded from the tunnel. Multiple prior studies have compared outcomes of bowel and appendix channels, with similar complication rates between the two [10, 12-15]. In our series of patients, we found no loss of tunnel length or intravesical stomal stenosis. One of our patients developed a false passage that resolved with conservative management and a small bladder stone, however both these complications are common with any continent catheterizable conduit and bladder augment and unrelated to this specific technique.

Our study has significant limitations. Due to our small number of patients and short follow-up caution should be used in reporting the success of this procedure, nonetheless based on our initial findings we feel further studies with longer follow-up and a larger patient population are certainly warranted.

**Conclusion**

The creation of a continent catheterizable stoma can be challenging in patients with a previous bladder augmentation. The novel modification of the Mitrofanoff conduit, utilizing the Yang-Monti ileovesicostomy and the serosa lined extramural tunnel of the T-pouch provides a viable and reproducible technique to aid in the management of these patients.

**References**

1. Mitrofanoff P: Trans-appendicular continent cystostomy in the management of the neurogenic bladder. Child Pediatr 1980;21:297–305.
2. Suzer O, Yates TS, Freedman AL, Smith CA, Gonzalez R: Results of the Mitrofanoff procedure in urinary tract reconstruction in children. Br J Urol 1997;79:279–282.
3. Harris CF, Cooper CS, Hutcheson JC, Snyder HM 3rd: Appendicovesicostomy: the mitrofanoff procedure: a 15-year perspective. J Urol 2000;163:1922–1926.
4. Liard A, Ségueir-Lipszyc E, Mathiot A, Mitrofanoff P: The Mitrofanoff procedure: 20 years later. J Urol 2001;165:2394–2398.
5. Yang WH: Yang needle tunneling technique in creating antireflux and continent mechanisms. J Urol 1993;150:830–834.
6. Monti PR, Lara RC, Dutra MA, de Carvalho JR: New techniques for construction of efficient conduits based on the Mitrofanoff principle. Urology 1997;49:112–115.
7. Hanna MK, Richter F, Stock JA: Salvage continent vesicostomy after enterocystoplasty in the absence of the appendix. J Urol 1999;162:826–828.
8. Stein JP, Lieskovsky G, Ginsberg DA, Bochner BH, Skinner DG: The T pouch: an orthotopic ileal neobladder incorporating a serosal lined ileal antireflux technique. J Urol 1998;159:1836–1842.
9. Abol-Enein H, Ghoneim MA: A novel uretero-ileal reimplantation technique: the serous lined extramural tunnel. A preliminary report. J Urol 1994;151:1193–1197.
10. Leslie B, Lorenzo AJ, Moore K, Farhat WA, Bigli DJ, Pippi Salle JL: Long-term followup and time to event outcome analysis of continent catheterizable channels. J Urol 2011;185:2298–2302.
11. Kurzrock E, Skinner DG, Stein JP: Hemi-T pouch modification for pediatric urinary diversion. J Urol 2003;170:949–951.
12. Castellan MA, Gosalbez R, Labbie A, Ibrahim E, Disandro M: Outcomes of continent catheterizable stomas for urinary and fecal incontinence: comparison among different tissue options. BJU Int 2005;95:1053–1057.
13. McAndrew HF, Malone PS: Continent catheterizable conduits: which stoma, which conduit and which reservoir? BJU Int 2002;89:86–89.
14. Lemelle JL, Simo AK, Schmitt M: Comparative study of the Yang–Monti channel and appendix for continent diversion in the Mitrofanoff and Malone principles. J Urol 2004;172:1907–1910.
15. Piaggio L, Myers S, Figueroa TE, Barhold JS, González R: Influence of type of conduit and site of implantation on the outcome of continent catheterizable channels. J Pediatr Urol 2007;3:230–234.