

The Use of The Appendix or Tapered Ileal Segment as a Continent Catheterizable Efferent Limb of Urinary Reservoir

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Background and Purpose: We report our functional results of ileal continent reservoir, which utilized the modified Mitrofanoff procedure as the continence mechanism in 5 invasive bladder cancer patients post radical cystectomy. **Methods:** Five invasive bladder cancer patients accepted radical cystectomy with ileal continent reservoir formation and follow-up ranged from 28 to 99 months (mean 53). Three patients accepted modified appendix and two accepted the ileal segment tapering as the continent catheterizable efferent limb. One patient died of metastatic bladder cancer 28 months postoperatively. **Results:** During the mean follow-up of 53 months, all the 5 patients were satisfied with the ease of performing self-catheterization through the umbilical stoma. Urodynamic evaluations revealed low pressure reservoir and stable sphincter tone without urine leakage. None of patients had stoma stenosis or appendix perforation, catheterization interval increased from 3 to 5 hours as reservoir capacity developed. **Conclusion:** The appendix or tapered ileal segment seem to be the satisfactory structure for the creation of a continent catheterizable conduit and the placement of stoma in the umbilicus proves to be advantageous in enhancing the patient's body image and quality of life. (*FJMJ* 2005; 3 (2) : 69-74)

Key words: continent urinary diversion, ileum, appendix, radical cystectomy

INTRODUCTION

In 1980, Mitrofanoff described a method of achieving continent urinary diversion by surgically closing the bladder neck and creating a continent catheterizable stoma from the appendix^{xq}. The principles behind the procedure are use of a narrow, supple conduit, which, when brought out to the skin as a catheterizable stoma, will provide continence by acting as a flap-valve and attachment of the

conduit to a low-pressure urine storage reservoir by an antireflux mechanism. Early experience in the pediatric population focused on use of the appendix as the efferent limb, while bladder served as the reservoir^{xq}. Further developments have demonstrated that any segment of bowel can be tapered and implanted to achieve continence^{xz}. Recently, the Mitrofanoff procedure was applied in those bladder cancer patients who undergoing radical cystectomy and continent urinary diversion

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formation, and the use of the umbilicus as a stomal site preserves normal body image and thus does not interfere with quality of life¹⁰. We report our functional results of continent urinary diversion made by ileum, and using the modified Mitrofanoff procedure for the continence mechanism in 5 invasive bladder cancer patients post radical cystectomy.

METHODS

Five invasive bladder cancer patients accepted radical cystectomy with ileal continent reservoir formation and follow-up ranged from 28 to 99 months (mean 53). Three patients accepted modified appendix and two accepted the ileal segment tapering as the continent catheterizable efferent limb. One patient died of metastatic bladder cancer 28 months postoperatively (Table 1).

A Brief Introduction Of The Continent Catheterizable Conduit Formation:

After achieving a low-pressure ileal reservoir, the ureter-bladder anastomosis was performed using Le Duc-Camey antireflux method. When the continent catheterizable conduit was constructed by using appendix, the mesoappendix was excised from the distal 2.5-3 cm to allow the fashioning of an adequate submucosal tunnel(Fig 1), and the distal 1 cm was tailored also to allow the formation of a 0.5 cm nipple valve(Fig 2). Antirefluxing connection between the conduit and the reservoir were performed by burying the nipple valve into the lumen of the reservoir with six to eight simple extracorporeal knots(Fig 3), and then the limb was correctly positioned and embedded under the seromucosal layer with a 14Fr. catheter in situ to avoid kinking(Fig 4).The appendico-umbilical stoma was created as an oval anastomosis using a V-shaped flap of the umbilical funnel(Fig 5). To construct the continent catheterizable conduit by

Table 1. Basic data, bowel segment used and stoma site in the 5 patients

Pt No	Gender	Age (y/o)	Duration (months)	Pathology	Bowel used	Stomal site	Cystoplasty
1	M	68	99	T.C.C. Gr.III CIS	Appendix	Umbilicus	Ileum
2*	M	62	28	T.C.C. Gr.III m.i.	Tapered terminal ileum	Umbilicus	Ileum
3	M	78	60	T.C.C. Gr.IV m.i.	Tapered terminal ileum	Umbilicus	Ileum
4	F	76	45	T.C.C. Gr.IV m.i.	Appendix	Umbilicus	Ileum
5	M	68	31	T.C.C. Gr.III m.i.	Appendix	Umbilicus	Ileum

CIS, carcinoma in situ; m.i., muscle invasion

Patient 2*: The patient died of metastatic bladder cancer 28 months postoperatively.

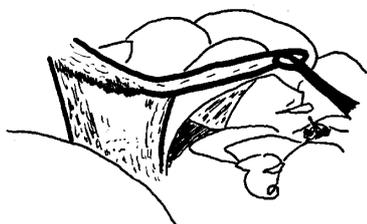


Fig 1. The mesoappendix was excised from the distal 2.5-3 cm to allow the fashioning of an adequate submucosal tunnel.



Fig 2. The distal 1 cm appendix was tailored to allow the formation of a 0.5 cm nipple valve.

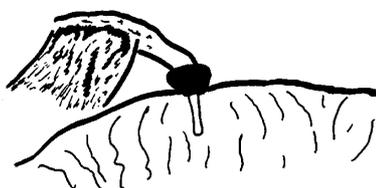


Fig 3. Antirefluxing connection between the conduit and the reservoir were performed by burying the nipple valve into the lumen of the reservoir with six to eight simple extracorporeal knots.

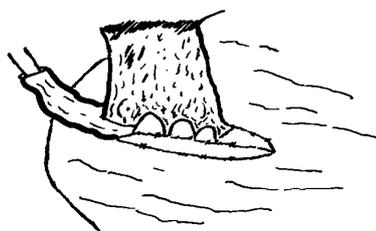


Fig 4. The limb was correctly positioned and embedded under the seromucosal layer with a 14Fr. catheter in situ to avoid kinking.



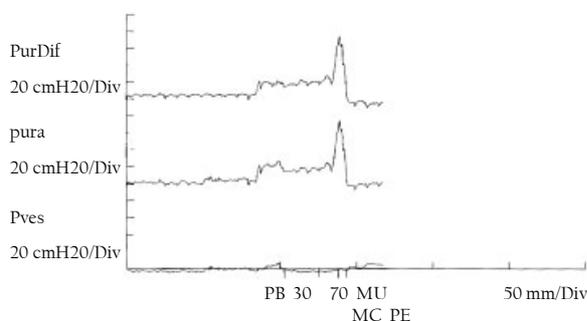
Fig 5. The appendico-umbilical stoma was created as an oval anastomosis using a V-shaped flap of the umbilical funnel.

using tapered ileum segment, a 10-12 cm ileum segment that just distal to the 70 cm ileum segment used for reservoir formation was isolated and tapered to 14 Fr. in diameter. The mesentery was excised from the distal 2.5-3 cm to allow the fashioning of an adequate submucosal tunnel, and the distal 1 cm was tailored also to allow the formation of a 0.5 cm nipple valve. Antirefluxing connection between the conduit and the reservoir were performed by burying the nipple valve into the lumen of the reservoir with six to eight simple extracorporeal knots, and then the limb was correctly positioned and embedded under the seromucosal layer with a 14Fr. catheter in situ to avoid kinking. The conduit-umbilical stoma was created as an oval anastomosis using a V-shaped flap of the umbilical funnel.

RESULTS

During the mean follow-up of 53 months, 1 patient died of metastatic bladder cancer, but all the 5 patients were satisfied with the ease of performing self-catheterization through the umbilical stoma. Urodynamic evaluations revealed low pressure

reservoir with capacity 550-650 c.c. and stable sphincter tone without urine leakage, the representative urodynamic data is shown in Fig 6 with the maximum closure pressure of 77cmH2O in pressure profiles. None of patients had stoma stenosis or appendix perforation, catheterization interval increased from 3 to 5 hours as reservoir capacity developed. None of patients had suffered from ureterovesicle(UV) junction stenosis or UV reflux on follow-up image studies. The patient No 5 who had impaired renal function(serum creatinine:3.2mg/dl) preoperatively suffered from hypokalemia and progressive renal function impairment(serum creatinine elevated to 4.3mg/dl) during the postoperative OPD follow-up even no evidences of urine retention or incomplete reservoir empty, and these physiological disorders settled down after regular oral potassium supplement.



RESULTS

Max Urethral Pressure	cmH2O	76
Max Closure Pressure	cmH2O	77
Closure Pressure at 30%	cmH2O	16
Closure Pressure at 70%	cmH2O	19
Functional Lenth	mm	58
Length of Continence Zone	mm	53
Continence Area	mm*cmH2O	1180
Volume at Profile Begin	ml	N.A.

Fig 6. The representative urodynamic data showed the maximum closure pressure of 77cmH2O in pressure profiles.

DISCUSSION

Our study reports a continence rate of 100% by using the modified appendix or tapered ileal segment to create continent catheterizable conduits, with the same satisfactory results as reported by Dr. Bissada¹² in 1993, and the easy clean intermittent catheterization to be achieved in all patients.

The appendix remains the tissue of choice to fashion catheterizable channels, and the shortcomings derived from its small caliber require using small catheters to empty the reconstructed bladder¹³. We uniquely used 14 Fr. catheter to drain the bladder urine, and it always worked smoothly. Poor bladder emptying and the pooling of mucus may result in an increased incidence of bladder stone formation. Fortunately, there was no bladder stone formation in our patients after long-term follow-up, it maybe due to the careful patient selection before operation, and they had highly motivation and intelligence to deal with the strict regimen of clean intermittent catheterization so as not to jeopardize the entire procedure. Other tubular structures such as tapered small bowel segments have been reported as alternatives when the appendix is unavailable¹⁴. Tapered bowel segments have good mobility but the distal portion has poor vascularity. In addition, long bowel segments (between 10 and 12 cm) are needed¹⁵. Its thick mesentery must be excised from the distal 2.5-3 cm to allow the fashioning of an adequate submucosal tunnel, and invariably part of this segment becomes ischemic, shortening the tunnel and potentially leading to a stricture. The incidence of difficult catheterization, presumably due to the presence of transverse mucosal folds, as well as stomal stenosis, is also higher with this technique¹⁶. In our two patients using tapered ileal segments to fashion catheterizable conduits, there were no above complications noticed at present, and it may

need further follow-up. Stenosis seems to be the weak point of the appendico-umbilical stoma, and it is reported to be avoided by creation of an oval anastomosis using a V-shaped flap of the umbilical funnel instead of the original circular anastomosis^{8,9}. We used oval anastomosis to deal with the appendico-umbilical stoma, and no stenosis was detected.

With rising pressure in the urinary reservoir, compression of the nipple valve mechanism increases, resulting in a higher resistance to leakage¹⁰. The appendicular pressure profile of our patients showed the abdominal wall closing the neosphincter pertinently with the patient supine and providing a completely continent, easily catheterized stoma.

The conventional approach to Mitrofanoff appendicovesicostomy with continent urinary stoma to the umbilicus is open surgery. In recent years, several investigators have successfully incorporated laparoscopy into the reconstructive procedure to minimize postoperative patient morbidity and improve cosmesis^{11,12}. With the advent of Laparoscopic surgery, appendix preservation and using appendix as the continent stoma laparoscopically will be unsolicited. Of course, the experience of the surgeon with laparoscopic techniques and the anatomy of the patient need to be carefully considered before using the described technique.

In conclusion, the appendix or tapered ileal segment seem to be the satisfactory structure for the creation of a continent catheterizable conduit and the placement of stoma in the umbilicus proves to be advantageous in enhancing the patient's body image and quality of life.

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應用盲腸或縮窄的迴腸段來做為 可禁式儲尿囊之自我導尿肢

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背景與目的：5 位患有膀胱肌肉層侵犯之膀胱癌病患在接受全膀胱摘除手術之後以迴腸來重建代用膀胱，並應用改良式的 Mitrofanoff 步驟來建立禁尿機制。我們報告這 5 位病患對代用膀胱禁尿機制的使用滿意度及功能評估結果。**方法：**上述 5 位病患之術後追蹤期從 28 至 99 個月不等（平均 53 個月）。3 位病患使用修飾後的盲腸，而另兩位使用縮窄的迴腸段來建構可禁尿的自我導尿肢。1 位病患在術後 28 個月死於膀胱癌遠處轉移。**結果：**在 53 個月的平均追蹤期中，5 位病患皆滿意並能夠輕易地從肚臍造瘻口執行自我導尿，尿路動力學評估顯示低壓的代用膀胱和穩定的擴約肌張力，而且沒有漏尿現象。5 位病患皆無造瘻口狹窄或導尿肢穿孔的現象，隨著代用膀胱容積之逐漸增加，導尿間距從 3 小時延長至 5 小時。追蹤期中從影像學檢查上並無病患有輸尿管膀胱交接處狹窄或尿液逆流之現象發生。**結論：**就建構一個可禁尿的自我導尿肢而言，盲腸或縮窄的迴腸段似乎是令人滿意的構造，而且將造瘻口安置於肚臍上具有增加美觀及增進病患生活品質之益處。(輔仁醫學期刊 2005；3(2)：69-74)

關鍵詞：用禁式尿液分流，迴腸，盲腸，全膀胱摘除術

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