

Original article

Modified orthotopic spiral ileal bladder substitution: Surgical technique and long-term results[☆]

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Abstract

Objectives: The objectives of this study are to introduce the surgical technique of a modified spiral orthotopic ileal neobladder and to assess the long-term outcomes.

Patients and methods: Between January 1998 and January 2006, 44 male and 7 female patients with bladder cancer received radical cystectomy (RC) and pelvic lymphadenectomy. An ileal segment 40 cm to 45 cm long was isolated to create a spiral orthotopic ileal neobladder, and the ureters were implanted into the reservoir using a non-refluxing split-cuff nipple technique. Preoperative, perioperative, and postoperative data were collected. Complications were classified as early (less than 3 months after surgery) or late (more than 3 months after surgery). Continence incidence and urodynamic studies were evaluated 5 years after surgery. Duration of follow-up was an average of 95 months (range 60–156 months).

Results: There were no perioperative deaths. The mean operative time was 315 ± 34 minutes. The mean blood loss was 783 ± 316 ml. There were 31 early complications in 21 patients (41%) and 42 late complications in 30 patients (59%). Urodynamic studies showed the maximum neobladder capacity to be 500 ± 71 ml, maximum flow rate to be 16 ± 5 ml/s and post-voiding residual (PVR) to be 50 ± 44 ml. Postoperative continence was excellent with a daytime continence rate of 90% and a nocturnal continence rate of 78% 5 years after surgery.

Conclusions: The modified spiral neobladder is easy to perform and allows for excellent long-term results with regard to complications and continence. © 2013 Elsevier Inc. All rights reserved.

Keywords: Bladder cancer; Bladder substitution; Complications; Ileum; Urinary diversion; Cystectomy

1. Introduction

Radical cystectomy (RC) is considered to be the standard treatment for muscle-invasive bladder cancer. In recent decades, bladder substitution (or neobladder) has become the most common method of urinary diversion after RC with 50%–90% of patients with muscle-invasive bladder cancer receiving this surgery [1–3]. Bladder substitution is performed so frequently because it can provide a better quality

of life among patients after RC [4,5]. Furthermore, it was suggested that bladder substitution might motivate younger patients to accept RC earlier in the disease process, and thereby result in a better rate of survival [6].

However, construction of a neobladder following RC is still a procedure associated with a high degree of morbidity, even in the most experienced hands. Early complications after neobladder construction surgery include infections, ileus, and anastomotic bowel leakage, which occurred in 58% of patients in a large study conducted by Hautmann et al. [7]. Late complications were reported by 48%–59% of patients, and included structure of the uretero-intestinal anastomosis, renal function impairment, metabolic acidosis, neobladder rupture, and incontinence [8,9]. Most complications were not related to RC, but rather to the urinary diversion [7,9]. Thus, surgical techniques and the method of

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bladder substitution may play an important role in the development of postoperative complications.

In this study, we introduced new surgical techniques of a modified spiral orthotopic ileal neobladder using the split-cuff nipple and presented the long-term results after surgery; this surgical technique uses 40 cm to 45 cm of the ileum and requires implantation of the ureters into the new reservoir.

2. Materials and methods

2.1. Patients

This study was approved by the institutional review board (IRB) of the Affiliated Hospital of Huzhou Teachers' College. Between January 1998 and January 2006, 132 patients with bladder cancer underwent RC. Of these patients, 51 patients (44 men and 7 women) underwent a modified spiral ileal neobladder surgery. Before surgery, all patients provided written informed consent and received clinical and laboratory evaluations. An RC with standard pelvic lymphadenectomy was performed in all patients. Subsequently, selected patients received an orthotopic ileal neobladder. Patients with the following conditions were excluded: urinary stress incontinence; damaged rhabdosphincter or incompetent urethra or urethral stricture; tumor infiltration of the distal prostatic urethra in men or bladder neck in women; impaired renal function (serum creatinine >150 mmol/l); severely impaired liver function; severe intestinal diseases (e.g., Crohn's disease) or history of previous major bowel resection, especially in the ileocecal area; inadequate intellectual capacity, dexterity, and mobility; noncompliant patients for active postoperative re-education and regular follow-up; and age >75 years. **Table 1** summarizes clinical and pathologic characteristics at the time of surgery for the 51 patients receiving bladder substitution. All operations were performed by a single surgeon (W.G.W.).

2.2. Surgical techniques

An RC with pelvic lymphadenectomy was performed in all patients. The area of lymphadenectomy consisted of bilateral internal iliac, external iliac, and obturator fossa lymph nodes up to the bifurcation of the common iliac vessels. RC was performed taking special care to spare the urethra in patients who were to receive orthotopic bladder substitution. Neobladder construction was then performed regardless of whether or not the cancer had metastasized to the lymph nodes.

For constructing the reservoir, an ileal segment 40 to 45 cm long was isolated 25 cm proximal to the ileocecal valve. Bowel continuity was restored with a 4-0 vicryl single-layer running suture. After irrigation with povidone iodine (PVP-

Table 1

Clinical and pathologic characteristics at the time of surgery for patients receiving bladder substitution

Characteristic	Bladder substitution n = 51
Median age, year (range)	63 (43–74)
Male, no. (%)	44 (86)
Female, no. (%)	7 (14)
Pathologic category, no. (%)	
Transitional cell carcinoma	45 (88)
Squamous carcinoma	4 (8)
Adenocarcinoma	2 (4)
Pathologic TMN stage, no. (%)	
pT1N0M0	6 (12)
pT2N0M0	17 (33)
pT3N0M0	15 (30)
pT3N1M0	2 (4)
pT4N0M0	5 (10)
pT4N1M0	4 (8)
pT4N2M1	2 (4)
Grade (transitional cell carcinoma, n = 45), no. (%)	
i	0 (0)
ii	26 (58)
iii	19 (42)

I), the ileal segment was opened anti-mesenterically. To construct the reservoir, the treated ileal segment was closed in a “spiral-shaped” fashion using 2-0 vicryl running suture until a 2 finger wide opening was left (**Fig. 1**). The end of ureter was split 1 cm and everted in a “sleeve shape,” then was anastomosed to the reservoir with 4-0 vicryl sutures using the split-cuff nipple nonrefluxing technique (**Fig. 2**). Ureteral stents were extended from the renal pelvis across the ureteroenteric anastomosis, and then were brought out through the reservoir and the anterior abdominal wall. The surgeon's fingers were introduced through the remaining opening to determine the lowest part of the reservoir. A hole 10 mm in diameter was cut out at the bottom of the pouch. The outlet should be flat to the pelvic floor and not funnel-shaped. A 20F urethral catheter was inserted before tying 4 sutures, beginning with the ventral sutures at the 5 and 7 o'clock positions, followed by the sutures at the 2 and 10 o'clock positions (**Fig. 3**). After a suprapubic catheter was placed into the reservoir through the fat of the mesoileum, the pouch was closed completely, resulting in a spherical reservoir (**Fig. 4**). Then, the reservoir was flushed with saline to remove any clots and to check for leakage.

Two tube drains were placed in the pelvic cavity posterior to the neobladder and exiting through separate locations lateral to the incision; these drains usually were removed 3–5 days after surgery when fluid drainage ceased. The urethral catheter was irrigated every 4 hours to prevent blockage by mucus or clots. Ureteral stents were removed 7–10 days after surgery. At 2 weeks after surgery, a cystography was taken to ensure that the bladder substitution was watertight, after which the suprapubic catheter was removed, followed by the urethral catheter 2 days later.

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