Intracorporeal Studer Pouch Formation with Balbay's Technique Following Robotic Radical Cystectomy for Bladder Cancer: Experience with 22 Cases with Oncologic and Functional Outcomes

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Abstract

Aim: Robot-assisted radical cystectomy (RARC) with intracorporeal Studer pouch formation (ICSPF) is increasingly being performed. Balbay's technique of ICSPF replicates the open approach with the additional advantages of inserting internal Double-J stents.

Materials and Methods: Between June 2011 and April 2019, 22 patients with muscle-invasive bladder cancer were included who underwent RARC and ICSPF with Balbay's technique. Mean follow-up was 35.7 months. Operative, postoperative, and pathological measures, complications, and oncologic and functional outcomes were evaluated.

Results: Mean operation time, estimated blood loss, mean lymph node yield, and mean duration of hospital stay were 9.2 hours, 361.4 mL, 38.6, and 10.5 days, respectively. Surgical margins were positive in 3 (9.1%) patients. Postoperative pT stages included pT0 ($n=4$), pTis ($n=4$), pT1 ($n=2$), pT2 ($n=1$), pT3a ($n=3$), pT3b ($n=5$), and pT4a ($n=3$). Daytime continence outcomes were (patients with ≥ 1 -year follow-up, $n=17$) as follows: 10 (58.8%) fully continent, 4 (23.5%) mild, and 3 (17.7%) moderate incontinence. Two-year cancer-specific survival, overall survival, and recurrence-free survival were 68.6%, 66.0%, and 69.7%, respectively. The retrospective nature of the study was the main limitation. Complications (modified Clavien–Dindo classification, $n=32$) included 23 minor and 2 major during the perioperative (0–30 days) period and 3 minor and 4 major during the postoperative (31–90 days) period. Ileus developed in 3 patients (9.3%). Readmission rates were 3 (13.6%) and 8 (36.4%) in perioperative and postoperative periods, respectively.

Conclusions: RARC and ICSPF by Balbay's technique have acceptable morbidity, excellent surgical and pathological outcomes, and satisfactory oncologic and functional results with additional advantages of exclusion of external stents, exact replication of the open approach, and fewer gastrointestinal complications.

Keywords: bladder cancer, robotic cystectomy, intracorporeal urinary diversion, Studer pouch

Introduction

THE GOLD STANDARD TREATMENT for muscle-invasive and also highest risk, nonmuscle-invasive bladder cancer (BC) is open radical cystectomy (RC) and urinary diversion.^{1–3} Robot-assisted radical cystectomy (RARC) is increasingly being performed in the world.⁴ Although it is a technically

difficult and time-consuming procedure to create a robotic intracorporeal pouch following RARC, this approach is increasingly being performed in the world as a minimally invasive surgical approach for more than 15 years.^{5–8}

Herein, we present surgical, pathological, and functional outcomes of our modified technique (Balbay's technique) for RARC and intracorporeal Studer pouch formation (ICSPF).

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Video of the surgical procedure was accepted for presentation at the 37th World Congress of Endourology (WCE) that was held from October 29 to November 2, 2019, in Abu Dhabi, UAE. (A video demonstrating this technique is available online.)

Materials and Methods

Between June 2011 and April 2019, a total of 22 muscle-invasive BC patients who underwent RARC, robot assisted-intracorporeal orthotopic urinary diversion, and bilateral extended pelvic lymph node dissection (ePLND) with Balbay's technique were included. Patient demographics and precystectomy pathology are presented in Table 1. Patient demographics, operative and postoperative parameters, pathological outcomes, complications, and functional and oncologic outcomes were evaluated. A video demonstrating this technique is given in Supplementary Video S1.

Two-year overall survival (OS), cancer-specific survival (CSS), and recurrence-free survival rates (RFS) as assessed by local and/or metastatic recurrence with histological or radiologic findings were calculated.

Complications identified during the 0- to 30-day period and within 31 to 90 days of surgery were recorded and classified according to the modified Clavien–Dindo system.

Preoperative work-up and preparation

Radiological evaluations for staging were done by contrast-enhanced thoracoabdominal CT or positron emission tomography-CT.

All patients were hospitalized 1 day before the surgery for a light bowel preparation. Ceftriaxone, 1 g×2, and ornida-

zole, 500 mg×3, were given intravenously on the day of the surgery as antibiotic prophylaxis.

Surgical technique

With the patient placed in a 30° Trendelenburg position, the abdominal cavity is entered using a Veress needle or the open entry method 5 cm above the umbilicus and insufflated to 12 to 15 cm H₂O. A total of five trocars are placed (Fig. 1). Two robotic arms are controlled with the left hand. Our RARC and bilateral ePLND techniques were described previously.^{9–11}

The limits of ePLND included:

Lateral border: genitofemoral nerve, psoas muscle, and ureters.

Medial border: cut edge of the endopelvic fascia over the neurovascular bundles (NVBs) and internal iliac vessels.

Superior border: inferior mesenteric artery, accompanying vena cava.

Inferior border: Cloquet lymph node (LN) and circumflex iliac vein.

For ileal neobladder construction, the patient is placed in nearly supine (<10° Trendelenburg) position to reduce the gravity and help intestines move freely down to the deepest part of the pelvis.

First, the ileocecal junction is identified using a premeasured tape. The ileum is divided across the zero point, leaving the most distal 20-cm segment of the ileum attached to the cecum. Starting from the zero point (distal cut end of the ileum), using a premeasured tape (Figs. 2 and 3), stay sutures are placed at every 10 cm on each side of the anti-mesenteric edge until the 40th cm. Forty and 55 cm points of the ileal segment are marked with stay sutures placed at the antimesenteric midline. The 10 cm point of the segment is brought down freely and reaches to the urethral stump without stretching. A 1-cm incision is made on the anti-mesenteric edge at this point (10 cm), which is the site for urethral anastomosis. A urethrointestinal anastomosis with a 3/0 absorbable running suture over a Foley catheter is done using a 0° telescope (Fig. 4). The ileum is divided with the second intestinal stapler at the 55th cm. Rest of the surgery is completed using a 30° down telescope.

TABLE 1. DEMOGRAPHICS OF PATIENTS

Demographics	n (%)
Number of patients	22
Gender, male/female ratio	18/4
Mean patient age (±SD) (range) (years)	61.6±9.4 (31–80)
Mean BMI (±SD) (range) (kg/m ²)	27.5±1.8 (22–35)
Patients with previous intravesical BCG therapy	2 (9.1)
Patients with previous intravesical chemotherapy	None
Patients with previous bladder perforation during TURBT	None
Precystectomy pathology	
pT1	5 (22.7)
pT2	17 (77.3)
ASA score	
I	5 (22.7)
II	8 (36.4)
III	8 (36.4)
IV	1 (4.5)
Previous pelvic radiation history	2 (9.1)
Neoadjuvant chemotherapy	1 (4.5)
Smoking history	
≥10 packs/year	19 (86.4)
None	3 (13.6)
Median creatinine level (±SD) (range) (mg/dL)	1.15± (0.6–1.94)
≥1.4 mg/dL	6 (27.3)
<1.4 mg/dL	16 (72.7)
Presence of additional malignancy	0

ASA=American Society of Anesthesiologists; BCG=bacillus Calmette–Guérin; BMI=body mass index; pT=pathologic; SD=standard deviation; TURBT=transurethral resection of bladder tumor.

FIG. 1. Port sites.

FIG. 2. Measuring the ileal segments to be used with a 20-cm-long vascular tape.

An incision is made on the entire antimesenteric border except the most proximal 15 cm, which is going to be the chimney part of the pouch. The intestine is folded on its own at the midpoint of the spared intestinal segment (at the 20th cm). With the help of stay sutures previously placed, the 30 cm and 10 cm points as well as 40th and zero points are brought down together and suture tied with 2/0 Vicryl sutures. The posterior plate is formed with continuous suturing using 30-cm-long 3/0 absorbable barbed sutures. Due to previous urethrointestinal anastomosis, the midpoint of the posterior suture line is pulled downward, which therefore assumes the shape of a V. Having completed the posterior plate, a 50-cm-long heavy silk thread (0/0) is tied at the tip of the Foley catheter inside, which is then pulled out through the urethra. The Foley catheter is changed with a 50-cm-long 12F nasogastric tube (NGT) with the help of the silk thread tied at its tip. The lumen of the NGT easily accommodates two 6F Double-J stents and a guidewire loosely, all of which will be passed through its lumen at the time of ureteroileal anastomosis. Stapler lines at both ends are removed and the NGT is brought out at the level of the open end of the chimney.

FIG. 4. Urethro-ileal anastomosis.

The anterior suture line of the pouch is completed by bringing the 20 cm point to 0/40 cm points with a 2/0 Vicryl stay suture. Corresponding edges of the intestinal segment are closed by running 3/0 absorbable barbed sutures. When completed, a vertical, anterior suture line will be formed with the afferent loop shifted toward the right.

Both ends of the distal ureters are trimmed and spatulated to form a Wallace-type ureteroureteric anastomosis as medial spatulated edges of both ureters are sutured together with a running 3/0 absorbable barbed suture. The lateral spatulated edge of the left ureter is anastomosed to the posterior wall of the proximal chimney opening with a similar suture. Halfway through the ureteral-ileal anastomosis, two 6F Double-J stents and a guidewire were inserted from the urethral end of the NGT, one by one, all of which exit out at the level of the ureteral-ileal anastomosis site (Fig. 5). A robotic grasper holds and directs Double-J stents into both ureters up to the renal pelvis. The NGT is withdrawn as the free end of the guidewire is grasped. Over this guidewire, a Foley catheter is inserted through the external urethral meatus into the neobladder lumen. Its balloon is inflated in the pouch and the remaining anterior opening between the common ureteral

FIG. 3. Side-to-side ileo-ileal anastomosis.

FIG. 5. Internal Double-J stenting.

FIG. 6. Distended Studer pouch.

duct and anterior wall of the proximal chimney opening is closed with the same suture. When all suture lines are closed, the intestinal neobladder is filled with 150 mL of saline (Fig. 6). Should any leakage be noted, additional sutures are placed to achieve a watertight anastomosis.

Postoperative management

We applied the enhanced recovery after surgery protocol for the patients included in our series, which included early mobilization on postoperative day 1, withdrawal of the NGT on day 1, and starting of oral feeding at postoperative 24 hours, comprising 10 mL of water and 10 mL of a complete balanced nutrition drink enriched with protein and calories (Ensure®, Abbott) every 1 hour, which is increased to 20 mL of water and 20 mL of a complete balanced nutrition drink enriched with protein and calories (Ensure, Abbott) every 1 hour on day 2 if tolerated well and if no nausea and vomiting occur. Thereafter, oral feeding is proceeded with soft and regular diets as tolerated.

TABLE 2. OPERATIVE AND POSTOPERATIVE PARAMETERS

Parameters and complications	n (%)
Surgery type	
a. Bilateral NVB sparing	21 (95.5)
b. Unilateral NVB sparing	1 (4.5)
c. Bilateral extended LN dissection	22 (100)
Mean operative time (±SD) (range) (hours)	9.2 ± 1.7 (6.5–11.5)
Mean EBL (±SD) (range) (mL)	361.4 ± 208.5 (100–800)
Mean time to liquid diet (±SD) (range) (days)	2.5 ± 1.22 (1–8)
Mean time to regular diet (±SD) (range) (days)	5.1 (3–11)
Mean time to ambulation (±SD) (range) (days)	2.4 ± 0.88 (1–5)
Mean lodge drain removal time (±SD) (range) (days)	8 ± 4.4 (3–30)
Median length of hospital stay (±SD) (range) (days)	10.5 ± 6.8 (5–30)

EBL=estimated blood loss; LN=lymph node; NVB=neurovascular bundle.

TABLE 3. POSTOPERATIVE PATHOLOGICAL OUTCOMES

pT stage	n (%)
Organ-confined disease	11 (50)
pT0	4 (18.2)
Primary CIS	4 (18.2)
pT1	2 (9.1)
pT2	1 (4.5)
Local extravesical disease	11 (50)
pT3a	3 (13.6)
pT3b	5 (22.8)
pT4a	3 (13.6)
Staging and LN yield	
pN0	14 (63.7)
pN1	1 (4.5)
pN2	6 (27.3)
pN3	1 (4.5)
Mean LN yield (±SD)	38.6 ± 11.5
LN yield range	24–60
LN involvement stratified by pT stage	n = 8
pT1 or less	0
pT2	0
pT3	5 (62.5)
pT4	3 (100)
Positive soft tissue surgical margins (PSM)	3 (13.6)
Incidental prostate adenocarcinoma	5 (27.8)
Gleason score 3 + 3	3 (16.7)
Gleason score 3 + 4	2 (11.1)

CIS=carcinoma in situ.

Functional evaluation

Daytime urinary incontinence (UI) was measured as described by Lantz et al.,¹² whereas nighttime UI was measured as described by Kulkarni et al.¹³

Daytime UI: None (0–1 security pad/day), mild (1–2 pads/day), moderate (3 pads/day), and severe (>3 pads/day). **Nighttime UI:** Good (dry with no protection), fair (dry with one awakening), and poor (wet, leakage, and UI during sleep).

Erectile function was assessed by using the International Index of Erectile Function (IIEF) scores described by Rosen et al.¹⁴

IIEF scoring: Severe erectile dysfunction (ED) (IIEF scores <7), moderate ED (IIEF scores 7–12), mild–moderate ED (IIEF scores 13–18), mild ED (IIEF scores 19–24), and no ED (IIEF scores >25)

All patients with preoperative erectile function were suggested to use oral phosphodiesterase type 5 (PDE-5) inhibitors after the urethral catheter is removed.

Statistical analysis

Data are descriptively reported using mean, median, and range. The 2-year OS, CSS, and RFS were assessed using the Kaplan–Meier estimator.

Results

Data are prospectively collected and recorded. Overall, there were 18 male and 4 female patients. Mean operative

TABLE 4. COMPLICATIONS OF PATIENTS FROM 0 TO 30 DAYS AND FROM 31 TO 90 DAYS

	0–30 Days (perioperative), n	31–90 Days (postoperative), n
I. Gastro-urinary		
1. Prolonged lymphatic drainage from the drain	3 (Clavien 2)	0
2. Ureteral anastomosis stricture	0	2 (Clavien 3a)
3. Acute hepatitis ^a	1 (Clavien 2)	0
4. Nausea	1 (Clavien 1)	1 (Clavien 1)
5. Vomiting	1 (Clavien 1)	0
II. Infectious diseases		
1. Urinary tract infection	6 (Clavien 2)	2 (Clavien 2)
2. Surgical site infection	1 (Clavien 2)	0
3. Septicemia	1 (Clavien 4b)	0
III. Gastrointestinal		
Ileus	2 (Clavien 2)	1 (Clavien 3b)
IV. Cardiac		
Acute myocardial infarction ^b	1 (Clavien 4a)	0
V. Bleeding		
Transfusion	3 (Clavien 2)	0
VI. Thromboembolic		
Deep venous thrombosis	1 (Clavien 2)	0
VII. Uremia	2 (Clavien 2)	1 (Clavien 4a)
VIII. Pulmonary		
Atelectasia	2 (Clavien 1)	0
<i>Grade of complication according to the modified Clavien system</i>	<i>Overall: n=25</i>	<i>Overall: n=7</i>
1	4	1
2	19	2
3a	0	2
3b	0	1
4a	1	1
4b	1	0
5	0	0
Minor complication (Grades 1 and 2)	23	3
Major complication (Grade 3–5)	2	4
Readmission rate due to minor complications	3	5
Readmission rate due to major complications	0	3

^aThis patient developed hepatitis with elevated liver enzymes during perioperative follow-up, which resolved with conservative measures. During follow-up, metastatic lesions in the liver were identified and the patient died in the postoperative 7th month.

^bFollowing acute myocardial infarction during the perioperative period, this patient developed ischemic brain injury and renal failure with prolonged lymphatic drainage and died >90 days after surgery.

time was 9.2 hours and mean estimated blood loss (EBL) was 361.4 mL. Mean duration of hospital stay was 10.5 days. Operative, postoperative, and pathological parameters and complications are shown in Tables 2 to 4. Functional outcomes, including urinary daytime and nighttime continence and erectile function, are presented in Tables 5 and 6.

Incidental prostate cancer was identified in 5 (27.8%) patients. Positive surgical margin (SM) was identified in 3 (9.1%) patients. Mean LN yield was 38.6. Two patients received neoadjuvant chemotherapy and four patients received adjuvant chemotherapy. Mean follow-up was 35.7 months.

Patients developed 23 minor and 2 major complications during the perioperative (0–30 days) period and 3 minor and 4 major complications during the postoperative (31–90 days) period. One patient had acute myocardial infarction and developed hypoxic brain injury and kidney failure and then died >90 days after surgery. One patient developed septicemia and was treated with antibiotics in the intensive care unit. Three patients developed ileus and required readmission. Two were treated with conservative measures and with NGT insertion. One required surgical exploration with no abnormal findings and ileus resolved spontaneously. Three patients required transfusion (1 U of red blood cells) due to a slight decrease in hematocrit levels.

Two patients had stricture formation at the ureteroileal anastomosis site. One of them developed postrenal kidney failure and required readmission and bilateral percutaneous nephrostomy (PCN) insertion. During follow-up, bilateral PCN tubes were removed consecutively, and this patient has a slightly elevated serum creatinine level and does not require any dialysis. This patient is being followed up for chronic kidney disease without PCN tubes. The second patient also required bilateral PCN insertion and was lost to follow-up. One patient developed acute hepatitis, which resolved spontaneously with conservative treatment. This patient developed liver metastases and died of it in 7 months. Readmission rates were 3 (13.6%) (minor) and 8 (36.4%) (5 minor and 3 major) in perioperative and postoperative periods, respectively (Table 4).

For patients with ≥1-year follow-up ($n=17$), daytime continence outcomes were as follows: 10 (58.8%) fully continent, 4 (23.5%) mild, and 3 (17.7%) moderate incontinence. None had severe incontinence (Table 5). Erectile function outcomes are presented in Table 6.

Two-year CSS, OS, and RFS were 68.6%, 66.0%, and 69.7%, respectively.

During follow-up, seven patients died. Of those, one was due to myocardial infarction and subsequent complications at 120 days after surgery. Six patients died due to disease progression and metastasis.

Discussion

We have been performing RARC with intracorporeal urinary diversion (ICUD) almost for a decade. Before applying the current technique, we have had experience on and performed considerable numbers of open/RARC with intracorporeal Studer pouch/ileal conduit procedures in addition to >500 robot-assisted radical prostatectomy (RARP) cases. Therefore, the current series includes procedures beyond the learning curve of the surgeons as the authors previously published their initial technique of RARC and ICUD outcomes elsewhere.^{9–11}

TABLE 5. POSTOPERATIVE URINARY CONTINENCE OUTCOMES OF MALE AND FEMALE PATIENTS WHO HAVE COMPLETED POSTOPERATIVE ≥ 1 -YEAR FOLLOW-UP ($N=17$)

M/F	Follow-up (months)	NVB sparing, n (%)	Postoperative daytime incontinence, n (%)				Postoperative nighttime incontinence, n (%)		
			None	Mild	Moderate	Severe	Good	Fair	Poor
Male ($n=13$)	47.3 $\pm$ 32.4 (12–94)	Bilateral: 12 (92.3) Unilateral: 1 (7.7)	10 (76.9)	2 (15.4)	1 (7.7)	N/A	7 (53.8)	2 (15.4)	4 (30.8)
Female ($n=4$)	35.3 $\pm$ 42.8 (13–58)	Bilateral: 4 (100)	—	2 (50)	2 (50)	N/A	1 (25)	3 (75)	—
Total M/F ($n=13/4$)	44.5 $\pm$ 30.4 (12–94)	Bilateral: 16 (94.1) Unilateral: 1 (5.9)	10 (58.8)	4 (23.5)	3 (17.7)	N/A	8 (47.1)	5 (29.4)	4 (23.5)

F=female; M=male; N/A=not applicable.

In Balbay's technique of constructing ICSPF, a vascular tape 20 cm in length is used for exact measurements of a 55-cm ileal segment to construct the pouch, and holding on stay sutures (3/0 Vicryl) are placed on both sides at 10, 20, 30, 40, and 55 cm points of the segregated ileal segment, which allows less traumatic manipulation of the ileum. Joining corresponding points on the ileum assures double folding of the pouch, which has been a major criticism of robotic intracorporeal pouch construction so far. Thus, Balbay's technique replicates the open approach, including double folding, and results in sufficient pouch volume with minimal pressure for urine storage. Studer's open technique requires double folding of ileal segments with internal stenting.¹⁵ Patients leave the operating room with a drain and a urethral catheter only. There are no ureteral catheters for bridging between the abdominal wall and neobladder, which prevent intestinal looping around these. This might also reduce both the number and severity of intestinal complications compared with previously published series.

In the International Robotic Cystectomy Consortium (IRCC) study comparing ICUD vs extracorporeal urinary diversion following RARC, 90-day complication rates were 41% vs 49%, favoring the ICUD group.⁷ Patients in the ICUD group had 32% of gastrointestinal complications.⁷ In our series, of the 32 complications, we observed ileus in 3 (9.3%) patients during the 90-day period. Therefore, one of the important advantages of our technique might be the decreased gastrointestinal complications. Internal stenting directs patient's own sterile urine into the pouch, which provides continuous low-pressure irrigation and helps washing out mucus formed by the ileal segments. In the postoperative follow-up, drain creatinine levels proved that drain fluid was

mainly lymphatic. Double-J stents are easily removed with a flexible ureteroscope. Leaving Double-J stents longer assures ureteral drainage and obviates the need for possible intervention in ureteral-intestinal anastomosis problems.

A positive SM rate (<10%) and LN yield (>15) are accepted as the most important factors related to surgical oncologic quality in open RC for BC.^{15,16} The largest multicenter RARC studies, including the EAU Robotic Urology Section and IRCC series, reported 4.8% and 7% positive SM rates, respectively.^{8,17} In our series, SMs were positive in 3 (9.1%) patients and mean LN yield was 38.6. Patients with positive SMs had pT4a ($n=2$) and pT3a ($n=1$) disease. Positive LNs were detected in 8 (36.4%) patients, all with $\geq$ pT3 disease. These results are suggestive of proper oncological safety of our technique.

In our series, we observed 25 and 7 complications during perioperative and postoperative periods, respectively (Table 4). Of those 32 complications, most were ($n=26$, 81.0%) minor complications (Grades 1 and 2). One of the patients had acute myocardial infarction during the perioperative period, this patient thereafter developed multiple complications mostly due to acute myocardial infarction, including ischemic brain injury and renal failure with prolonged lymphatic drainage, and died >90 days after surgery. If this patient is excluded, the number of complications would be even lower in our series. During the perioperative period, prolonged lymphatic drainage ($n=3$, 12%) and urinary tract infection ($n=6$, 24%) were the most common complications. This might be reflecting our previous experience on robotic surgery. In our previous series of 98 cases with RARC and ICSPF, we observed 30 minor and 20 major complications in the perioperative period and 6 minor and 7 major complications in the postoperative period.⁹

TABLE 6. POSTOPERATIVE ERECTILE FUNCTION OUTCOMES OF PATIENTS WITH MILD OR NO PREOPERATIVE ERECTILE DYSFUNCTION WHO HAVE COMPLETED POSTOPERATIVE ≥ 1 -YEAR FOLLOW-UP ($N=17$)

Preoperative erectile function status according to IIEF score	Mean preoperative IIEF score	NVB sparing, n (%)	Postoperative PDE-5-I use, n (%)	Mean IIEF score at latest FU
Mild dysfunction (IIEF score of 19–24) ($n=4$)	21.5 $\pm$ 1.09 (19–24)	Bilateral: 4 (100)	4 (100)	13.5 $\pm$ 4.6 (10–16)
No dysfunction (IIEF score >24) ($n=10$)	50.6 $\pm$ 10.4 (38–67)	Bilateral: 9 (90) Unilateral: 1 (10)	6 (60)	32.4 $\pm$ 7.4 (9–45)

FU=follow-up; IIEF=International Index of Erectile Function; PDE-5-I=phosphodiesterase type 5 inhibitor.

TABLE 7. OUTCOMES OF INTRACORPOREAL NEOBLADDER

Year	Author	Ref.	n	Operation time (minutes)	EBL (mL)	Transfusion rate (%)	Conversion rate	LOS (days)
2019	Current series	—	22	552	361.4	13.6	0	10.5
2015	Schwentner et al.	21	62	477	385	NR	0	16.7
2015	Atmaca et al.	23	32	586	412.5	56	NR	17.4
2014	Collins et al.	18	80	420	475	NR	5.7	9
2014	Desai et al.	22	132	456	430	NR	NR	11
2014	Desai et al.	24	18	387	200	17	0	9
2012	Goh et al.	25	8	450	225	38	0	8
2012	Canda et al.	11	25	594	429.5	NR	0	10.5

LOS=length of hospital stay; NR=not reported.

Collins et al. published minor and major complication rates as 17% and 27%, respectively, in the early postoperative period and 11% and 19%, respectively, in the late postoperative period at the Karolinska Institute, including 80 patients with RARC and intracorporeal neobladder.¹⁸ Recently, Simone et al. reported a 42.2% complication rate in 64 patients who underwent RARC and intracorporeal neobladder.¹⁹ Minervini et al. reported their outcomes of 18 patients who underwent RARC with intracorporeal neobladder formation.²⁰ Postoperative surgical complications occurred in 4 (22.1%) patients (Clavien–Dindo Grade 3, $n=1$, and Grade 1, $n=3$) and postoperative, medical, Clavien–Dindo Grade 2 complications occurred in 3 (16.7%) patients.²⁰ Regarding the series of RARC and ICSPF, including 62 patients, Schwentner et al. reported the early (<30 days) complication rates as 24.2% and 25.8% for minor (Grades 1 and 2) and major (Grades 3–5) complications, respectively.²¹

In our series, 17 patients had ≥ 1 -year follow-up and of those, 16 and 1 had bilateral and unilateral NVB sparing, respectively. Daytime and nighttime continence outcomes seem to be better in males ($n=13$); 77% had no daytime incontinence and 54% had good nighttime continence (Table 4). These promising outcomes, particularly in male patients, might be due to preserving both bilateral NVBs in most patients (92%) and also a long urethral length. In a small group of females ($n=4$), 50% had mild and 50% moderate daytime incontinence and 25% good and 75% fair nighttime continence. None of our patients developed severe daytime incontinence in both groups. In our study, full continence was defined as 0 to 1 security pad/day and mild incontinence was defined as 1 to 2 pads/day.^{12,13} Desai et al. described continence as 0 to 1 pad/day and 2 or more pads were accepted as incontinence and they reported 1-year daytime continence rates (0–1 pad/day) as 90% in their series of RARC and intracorporeal neobladder that included data available for 73 patients who had completed at least 6 months of follow-up.²² If we had similarly included patients using 1 pad/day into the continent group, our continence rate would exceed 90%.

We have evaluated erectile functional outcomes on 10 patients with ≥ 1 -year follow-up ($n=14$) and no preoperative ED. Bilateral NVB sparing ($n=9$) and unilateral NVB sparing ($n=1$) were performed in this patient group and only six patients used PDE-5 inhibitors following removal of the urethral catheter (Table 5). Of those 10 patients, 7 (70%) had no postoperative ED, suggesting promising erectile function outcomes. Table 7 presents outcomes of selected published

series on intracorporeal neobladder formation following RARC for BC. Operation time, EBL, transfusion rates, conversion rates, and length of hospital stay seem to be similar in most series.

Main limitations of the present study are it being retrospective in nature, including limited numbers of patients, absence of long-term follow-up time, and not having comparative outcomes.

Conclusions

The preliminary outcomes of our series of RARC and ICSPF with Balbay's technique with exact measurement and double folding of the ileal segment, ureteral-ileal anastomosis at the 10 cm point, and internal stenting suggest safe, feasible, and reliable operative, postoperative, pathological, oncological, and functional outcomes with lower gastrointestinal complication rates.

Author Disclosure Statement

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Supplementary Material

Supplementary Video S1

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Abbreviations Used

ASA = American Society of Anesthesiologists
BC = bladder cancer
BCG = bacillus Calmette–Guérin
BMI = body mass index
CSS = cancer-specific survival
CT = computed tomography
EBL = estimated blood loss
ED = erectile dysfunction
ePLND = extended pelvic lymph node dissection
ICSPF = intracorporeal Studer pouch formation
ICUD = intracorporeal urinary diversion
IIEF = International Index of Erectile Function
IRCC = International Robotic Cystectomy Consortium
LN = lymph node
LOS = length of hospital stay
NGT = nasogastric tube
NVB = neurovascular bundle
OS = overall survival
PCN = percutaneous nephrostomy
PDE-5 = phosphodiesterase type 5
pT = pathologic
RARC = robot-assisted radical cystectomy
RARP = robot-assisted radical prostatectomy
RC = radical cystectomy
RFS = recurrence-free survival rates
SD = standard deviation
SM = surgical margin
TURBT = transurethral resection of bladder tumor
UI = urinary incontinence