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Research Article

Clinical Efficacy Analysis of Two Different Surgical Approaches to Laparoscopic Radical Cystectomy with Urinary Diversion for Invasive Bladder Cancer

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ABSTRACT

Objective: The present study aimed to compare the efficacy, and advantages and disadvantages of laparoscopic radical cystectomy + extraperitoneal bilateral ureterocutaneostomy versus laparoscopic radical cystectomy + ileal cystoplasty (Bricker procedure) in the treatment of invasive bladder cancer.

Method: Forty-five patients (retrospectively registered) with grade II–III bladder invasive urothelial carcinoma were divided into two groups to compare clinical efficacy, operative duration and blood loss, postoperative intestinal function recovery, length of hospitalization, and complications. Those in the ureterocutaneostomy group (n=25) were treated using laparoscopic radical cystectomy + extraperitoneal bilateral ureterocutaneostomy, while those in the ileal cystoplasty group (n=20) were treated using laparoscopic radical cystectomy + ileal cystoplasty.

Results: Laparoscopic radical cystectomy + extraperitoneal bilateral ureterocutaneostomy shortened the operation, improved patient tolerance, and decreased postoperative intestinal function recovery time. However, its long-term clinical efficacy needs further study using larger sample sizes to confirm these results.

Conclusion: Results of this study demonstrated that extraperitoneal bilateral ureterocutaneostomy after cystectomy had advantages of less trauma, a shorter learning curve, less surgical bleeding, and quicker postoperative recovery. Although early and mid-term follow-up revealed a slightly higher incidence of hydronephrosis, the severity of complications was not high in most patients. Nevertheless, the long-term clinical efficacy of this procedure needs further study using larger sample sizes.

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Introduction

Malignant bladder cancer is associated with the highest morbidity and mortality among diseases of the urinary system, and its incidence is increasing annually [1]. With advances in the development of endoscopic technology in recent years, laparoscopic radical cystectomy with urinary diversion has become the standard procedure for treating superficial bladder tumors that are refractory to bladder infusion chemotherapy and it is necessary for muscle-invasive bladder cancers [2,

3]. Forty-five patients, who were diagnosed with grade II–III bladder invasive urothelial carcinoma between January 2012 and July 2017, were divided into two groups: one treated using laparoscopic radical cystectomy + extraperitoneal bilateral ureterocutaneostomy (n = 25); and the other using laparoscopic radical cystectomy + ileal cystoplasty (n = 20). The safety and efficacy of the two treatments were evaluated and compared.

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Materials and Methods

I Clinical Data

Forty-five patients with bladder cancer, who underwent laparoscopic radical cystectomy in the authors' hospital between January 2012 and July 2017, were divided into two groups (Table 1). The ureterocutaneostomy group comprised 25 patients (18 male, 7 females; mean [\pm SD] age, 67.3 ± 7.8 years), among whom 14 had primary bladder cancer and 11 experienced recurrence. Imaging, cystoscopy, and biopsy revealed advanced urothelial carcinoma or invasive urothelial carcinoma in 12 patients with stage \geq T2 and 13 with $<$ T2 cancers. Twenty-one patients were treated with bilateral ureteral concomitant ureterostomy, which was performed in the right lower abdomen near McBurney's point, and 4 were treated using bilateral ureteral concomitant ureterostomy, which was performed in the left lower

abdomen around the anti-McBurney point. The ileal cystoplasty group comprised 20 patients (16 male, 4 females; mean age, 63.1 ± 6.3 years), among whom 12 had primary bladder cancer and 8 experienced recurrences. Imaging, cystoscopy, and biopsy revealed advanced urothelial carcinoma or invasive urothelial carcinoma in 9 with \geq T2 and 11 with $<$ T2 cancers. Individuals with distant metastasis before the operation and those with stage \geq T2 posterior urethral metastasis, according to cystoscopy, were excluded from the study. No patients in either group had severe cardiopulmonary or cerebrovascular disease(s). There were no statistically significant differences between the groups in terms of age, proportion of males, and the number of cases with \geq T2 cancer. Three days before the operation, a low-residue diet, oral metronidazole 0.2 g three times daily + levofloxacin 0.5 g every day were prescribed, in addition to a cleansing enema the night before and the morning of the day of the operation.

Table 1: Clinical data of bladder cancer.

| | Number of cases | sex | | Age(years) | Pathological stage | | primary | palindromia |
|---|-----------------|-------|--------|----------------|--------------------|-----------|---------|-------------|
| | | male | female | | $<$ T2 | \geq T2 | | |
| extraperitoneal bilateral ureterocutaneostomy | 25 | 18 | 7 | 67.3 ± 7.8 | 13 | 12 | 14 | 11 |
| ileal cystoplasty | 20 | 16 | 4 | 63.1 ± 6.3 | 11 | 9 | 12 | 8 |
| Statistical quantity | | 0.031 | | 0.452 | 1.867 | | 1.975 | |
| P-value | | 0.954 | | 0.687 | 0.325 | | 0.864 | |

II Surgical Methods

Patients underwent general anesthesia with tracheal intubation and placed in the Trendelenburg position, with the body shaped like an "X" and lower limbs slightly separated in the supine position. An incision was made at the lower edge of the umbilicus to establish artificial pneumoperitoneum (15 mmHg pressure). A 10 mm cannula was placed and 30° lens from the incision, under the screen monitoring, 5 mm cannula was penetrated into both sides which are 2 ~ 3 cm above the anterior superior iliac spine. A 12 mm cannula was placed at McBurney's point and the anti-McBurney point, respectively. On the surface of the iliac vessels, an incision was made in the pelvic floor peritoneum and pelvic lymph nodes were cleared away from the external iliac arteriovenous and obturator nerve. The bilateral ureter was freed from the medial iliac vessels and cut at the bladder entrance. The lymph nodes and adipose tissue around the external iliac artery were cleared up to the bifurcation of the iliac vessels. The lateral peritoneal membrane was opened to fully free the proximal ureter, open the anterior peritoneal reflex of the bladder and abdominal wall, fully free the bilateral walls of the bladder, open the pelvic fascia, and free the prostatic apex, suture penile dorsal deep vein complex, using 2-0 absorbable suture, 2 cm above the peritoneal reflex at the lowest point of bladder rectum depression incise peritoneum. The bilateral seminal vesicle glands were separated downward behind the seminal vesicle. Denon Villiers fascia was cut and separated from the anterior rectal space to the back of the prostatic apex. The bladder side ligament blood vessel was clamped using a Hemolok clip (Teleflex, Wayne, PA, USA), then cut using an ultrasonic knife. The lateral prostatic ligament was incised to the apex of the prostate, close to its tip, and the deep vein complex and urethra were cut off to complete excision of the bladder, prostate, and bilateral seminal vesicle glands.

After complete removal of the bladder in those in the ureterocutaneostomy group, the left ureter was pulled to the right side along the path of the lateral peritoneum through the posterior peritoneum space of the presacral sigmoid colon and cropped with the right ureter. A single J stent was placed in the ureter, which was then extracted through the right rectus abdominis puncture point, and sutured (interrupted) to the surrounding tissue.

After removal of the bladder in those in the ileal cystoplasty group, a 15-25 cm segment of free ileum with mesentery cut at 10-15 cm from the ileocecal region was used as a neobladder. The intestinal cavity was washed with dilute iodophor and saline. An intestinal stapler was used for side-to-side anastomosis, followed by the closure of the mesenteric hiatus using a stapler to close the proximal neobladder. Two small incisions were made on the contralateral mesenteric intestinal wall at 1.0 cm from the proximal closure of the neobladder. The left ureter was pulled back through the peritoneum to the right, and approximately 2 cm of the distal end of both the ureters were cut off. After placing a single J stent in the ureter, the neobladder was anastomosed, the single J stent on both sides was led out through the ileal outlet. Bilateral ureters were anastomosed with an ileum loop with the seromuscular layer embedded and fixed, approximately 2.0 cm of skin, subcutaneous and muscular layers were removed from McBurney's point, aponeurosis was cross-cut, the neobladder distal was put as fistula, and it was fixed at the McBurney's point; the mucous membrane of the neobladder output channel distal needed to be turned outward into a nipple. A double J stent was then placed and removed 3-6 months after the operation. After surgery, subcutaneous nadroparin calcium was administered immediately to prevent deep venous thrombosis. A B-ultrasound scanner was used for re-examination 3 months after the operation to evaluate hydronephrosis in both kidneys and the effects of surgery.

III Statistical Analysis

Statistical analysis was performed using SPSS version 13.0 (IBM Corporation, Armonk, NY, USA). Measurement data are expressed as mean \pm standard deviation, and count data were compared using the chi-squared test. Differences with $P < 0.05$ were considered to be statistically significant.

Results

All operations were successfully completed, and none required transition to open surgery during laparoscopic cystectomy. Total operative duration in the ileal cystoplasty group ranged from 230–420 min (mean, 316 min) (Table 2). The mean duration of laparoscopic surgery for ileal cystoplasty was 181 min (mean, 135 min). Intraoperative blood loss was 100–500 ml (mean, 247 ml), and time to recovery of intestinal function

was 3–6 days. The length of postoperative hospitalization was 10–23 days (mean, 16.9 days), and postoperative follow-up ranged from 6 months to 2 years. One patient developed ileal anastomotic fistula but improved after corrective surgery. Four patients developed incomplete intestinal obstruction, 2 of whom improved after receiving conservative treatment consisting of abrosia (abstinence from food), acid suppression, and enzyme inhibitors. The 2 other patients underwent open surgery after conservative treatment failed (1 improved after undergoing enterolysis + partial enterectomy, and the other was found to have tumor metastasis by colostomy and died of metastatic complications 17 months after the operation). Five patients experienced varying degrees of hydronephrosis during follow-up (2 bilateral, 3 unilateral). Two patients who experienced severe hydronephrosis underwent percutaneous nephrostomy for relief. Hydronephrosis was not further aggravated after a regular review of the other patients, who underwent expectant management.

Table 2: Perioperative conditions of patients in both groups.

| | Operation time | Intraoperative bleeding(ml) | Intestinal function recovery time(d) | Post-operative hospitalization days(d) |
|---|--------------------|-----------------------------|--------------------------------------|--|
| extraperitoneal bilateral ureterocutaneostomy | 277.39 \pm 48.46 | 219.44 \pm 35.29 | 3.87 \pm 1.19 | 11.42 \pm 3.65 |
| ileal cystoplasty | 315.98 \pm 57.21 | 247.35 \pm 39.52 | 5.38 \pm 1.83 | 16.91 \pm 3.74 |
| Statistical quantity | 7.569 | 1.298 | 3.776 | 5.361 |
| P-value | 0.014 | 0.028 | 0.021 | 0.017 |

After the operation, two patients developed narrow fistulas, which was improved after fistula dilatation (Table 3). Total operative time in the ureterocutaneostomy group ranged from 210–380 min (mean, 277 min). The mean duration of laparoscopic surgery was 174 min, and 103 min for bilateral ureterocutaneostomy. Intraoperative blood loss ranged from 100–400 ml (mean, 219 ml), and time to recovery of intestinal function ranged from 2–5 days. The length of postoperative hospitalization was 8–19 days (mean, 11.4 days), with follow-up lasting 3 months to 2 years. Among 5 patients who experienced incomplete intestinal obstruction, 4 improved with conservative treatment, and 1 underwent reoperation. During follow-up, 11 patients experienced different degrees of hydronephrosis (6 bilateral, 5 unilateral), most of which were mild.

However, hydronephrosis was severe in 3 patients, 2 of whom underwent percutaneous nephrostomy, with 1 case had a long-term indwelling single-J stent. Narrow fistula occurred in 3 patients, 2 of whom required a long-term indwelling single-J stent and 1 underwent percutaneous nephrostomy. Compared with the ileal cystoplasty group, the volume of blood loss was less, the length of hospitalization time was shorter, and the patients time of patients out of bed was early. However, the proportion of hydronephrosis in the ureterocutaneostomy group was slightly higher than that in the ileal cystoplasty group ($P < 0.05$). There was no significant difference in the incidence of other complications between the two groups ($P > 0.05$) (Table 3).

Table 3: Postoperative complications in two groups.

| | Infection of incisional wound | Urinary fistula | Incomplete intestinal obstruction | uronephrosis | Narrow fistula | Tumor recurrence and metastasis |
|---|-------------------------------|-----------------|-----------------------------------|--------------|----------------|---------------------------------|
| extraperitoneal bilateral ureterocutaneostomy | 3 | 1 | 5 | 11 | 3 | 2 |
| ileal cystoplasty | 2 | 1 | 4 | 5 | 2 | 1 |
| Statistical quantity | 0.368 | 0.486 | 0.754 | 0.697 | 0.945 | 0.842 |
| P-value | 0.453 | 0.518 | 0.819 | 0.027 | 0.754 | 0.689 |

Discussion

With advances in the development of endoscopic technology in the field of urology, laparoscopic radical cystectomy with urinary diversion has become an important treatment for muscle-invasive or high-grade bladder cancers [4–6]. Previous studies have reported no significant differences in operative time, intraoperative bleeding and transfusion volume, perioperative complications, postoperative drainage tube

indwelling time, and length of hospitalization between laparoscopic radical cystectomy and open radical cystectomy [7, 8]. Moreover, there was no significant difference in tumor metastasis, the pathological diagnosis of surgical specimens, the number of lymph nodes cleared, and oncological results. However, patients who undergo laparoscopic surgery experience obvious advantages compared with open surgery in terms of postoperative analgesic dosage, recovery time, and other aspects of evaluation. Aside from the advantages of minimally invasive

procedures, it is important that there is no significant difference between laparoscopic and open surgery. However, it is more difficult to perform laparoscopic surgery, the duration of the operation and the learning curve are longer, and familiarity with the anatomical path and procedural proficiency are required.

Therefore, urologists both domestically and abroad, are constantly trying to optimize the procedure and shorten the operation time to improve patient tolerance [9-11]. Although laparoscopic radical cystectomy is becoming more widely accepted, there are many options for urinary diversion after cystectomy. Commonly used urinary diversion procedures include ileal cystoplasty (the Bricker procedure is the most classic), modified Indiana pouch, and in situ neobladder reconstruction. Among these, the Bricker procedure is the most widely used due to its small impact on the internal anatomy and fewer complications and can improve the quality of life of patients, effectively protect renal function, and minimize the associated complications caused by urinary diversion. In the present study, we compared the classic Bricker procedure with extraperitoneal bilateral ureterocutaneostomy after laparoscopic radical cystectomy to evaluate the efficacy and advantages and disadvantages of these two procedures in the treatment of invasive bladder cancer. After laparoscopic radical cystectomy, extraperitoneal bilateral ureterocutaneostomy shortened the operation and improved patient tolerance; however, the proportion of hydronephrosis using this method was slightly higher than that of the Bricker procedure. Ureterostomy has been performed in high-risk patients in poor general condition, older age, and anticipated difficulty with tolerating other urinary diversions. In the early iterations of this procedure, bilateral ureterostomy was performed on both sides of the lower abdomen.

However, daily nursing is more inconvenient and has a significant negative influence on the quality of life. In this study, after cystectomy, the left ureter was pulled to the right side along the path of the lateral peritoneum through the posterior peritoneum space of the presacral sigmoid colon and cropped together with the right ureter. A single J stent was placed in the ureter, then extracted through the right rectus abdominis puncture point to minimize ureteral interference with abdominal organs and reduce the incidence of internal hernia and intestinal obstruction. In addition, bilateral ureter combined with colostomy facilitates daily care that patients can easily accept. During the years this operation was performed, it became evident that patients with a history of repeated pelvic surgery and radiotherapy are not the most suitable candidates. Although a history of abdominal surgery is not an absolute contraindication, it will increase the difficulty and duration of laparoscopic surgery. The visual field of laparoscopic surgery is clearer, which makes it easier to separate vascular nerves and clear the pelvic lymph nodes. The probability of rectal injury is less, and it is safer than open surgery. The ureter should be free of the renal hilum as fully as possible, and the surrounding tissues and blood vessels should be retained as much as possible to reduce complications such as ureteral ischemic necrosis caused by ureteral vascular injury.

In the operation, the bladder side ligament blood vessel was clipped using a Hemolok then cut using an ultrasonic knife. The lateral prostatic ligament was incised to the apex of the prostate to reduce intraoperative bleeding. The catheter was clamped using a Hemolok and cut off the distal catheter when removing the distal urethra – on the one hand, to facilitate pulling the specimen and, on the other, to reduce tumor

implantation and urine contamination. When reconstructing the fistula, the ureter should be cut vertically and folded out and suture the ureteral end intermittently so that its papilla protrudes from the skin surface. The length of the distal ureteral indwelling should be as long as possible to avoid papilla retraction after ureteral peristalsis. An inner ureteral stent tube (i.e., single J stent) should be retained for at least 3 months and longer if necessary.

Patients should be encouraged to follow-up regularly, and poor urine drainage or pain in the waist should be treated in a timely manner. In this study, patients with severe hydronephrosis required renal puncture fistula, likely caused by failure to seek medical treatment in time. Most patients with renal hydronephrosis experienced relief after conservative treatment or re-installation of an indwelling internal stent tube. Previous studies have reported that, based on the development of the existing laparoscopic procedure, ileal orthotopic neobladder is the first recommendation for the reconstruction of the lower urinary tract after total cystectomy [12, 13]. Orthotopic sigmoid colon neobladder or sigma-rectum pouch surgery can also be used in obese patients.

In conclusion, the results of this study demonstrated that extraperitoneal bilateral ureterocutaneostomy after cystectomy had advantages of less trauma, a shorter learning curve, less surgical bleeding, and quicker postoperative recovery. Although early and mid-term follow-up revealed a slightly higher incidence of hydronephrosis, the severity of complications was not high in most patients. Nevertheless, the long-term clinical efficacy of this procedure needs further study using larger sample sizes.

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Conflicts of Interest

None.

Competing Interests

None.

Author Contributions

BT, SG and JC contributed equally to this study. LZ and LFZ were involved in the design of this study. SG and JC contributed to the database searching. BT wrote the manuscript. BT, LFZ and JC contributed to the experiment research. LZ, LFZ and SG interpreted the results and revised the manuscript.

REFERENCES

1. Clark PE, Spiess PE, Agarwal N, Bangs R, Boorjian SA et al. (2016) NCCN Guidelines Insights: Bladder Cancer, Version 2.2016. *J Natl Compr Canc Netw* 14: 1213-1224. [[Crossref](#)]
2. Yang LS, Shan BL, Shan LL, Chin P, Murray S et al. (2016) A systematic review and meta-analysis of quality of life outcomes after radical cystectomy for bladder cancer. *Surg Oncol* 25: 281-297. [[Crossref](#)]
3. Gschwend JE (2003) Bladder substitution. *Curr Opin Urol* 13: 477-482. [[Crossref](#)]
4. Haber GP, Campbell SC, Colombo JR Jr, Fergany AF, Aron M et al. (2007) Perioperative outcomes with laparoscopic radical cystectomy: "pure laparoscopic" and "open-assisted laparoscopic" approaches. *Urology* 70: 910-915. [[Crossref](#)]
5. Castillo OA, Miranda Utrera N (2014) Laparoscopic cystectomy and intracorporeal continent urinary diversion (Mainz II) in treatment for interstitial cystitis. *Actas Urol Esp* 38: 200-204. [[Crossref](#)]
6. DeGer S1, Peters R, Roigas J, Wille AH, Tuerk IA et al. (2004) Laparoscopic radical cystectomy with continent urinary diversion (rectosigmoid pouch) performed completely intracorporeally: an intermediate functional and oncologic analysis. *Urology* 64: 935-939. [[Crossref](#)]
7. Porpiglia F, Renard J, Billia M, Scoffone C, Cracco C et al. (2007) Open versus laparoscopy-assisted radical cystectomy: results of a prospective study. *J Endourol* 21: 325-329. [[Crossref](#)]
8. Tang K, Li H, Xia D, Hu Z, Zhuang Q et al. (2014) Laparoscopic versus open radical cystectomy in bladder cancer: a systematic review and meta-analysis of comparative studies. *PLoS One* 9: e95667. [[Crossref](#)]
9. Gao ZL, Fan J, Zhao JJ, Xia SJ, Shi L et al. (2007) Laparoscopic radical cystectomy with extracorporeal ileal conduit urinary diversion for treatment of Chinese bladder cancer patients. *Urol Int* 79: 204-209. [[Crossref](#)]
10. Berger A, Aron M (2008) Laparoscopic radical cystectomy: long-term outcomes. *Curr Opin Urol* 18: 167-172. [[Crossref](#)]
11. Huang GJ, Stein JP (2007) Open radical cystectomy with lymphadenectomy remains the treatment of choice for invasive bladder cancer. *Curr Opin Urol* 17: 369-375. [[Crossref](#)]
12. Huang J, Lin T, Liu H, Xu K, Zhang C et al. (2010) Laparoscopic radical cystectomy with orthotopic ileal neobladder for bladder cancer: oncologic results of 171 cases with a median 3-year follow-up. *Eur Urol* 58: 442-449. [[Crossref](#)]
13. Challacombe BJ, Bochner BH, Dasgupta P, Gill I, Guru K et al. (2011) The role of laparoscopic and robotic cystectomy in the management of muscle-invasive bladder cancer with special emphasis on cancer control and complications. *Eur Urol* 60: 767-775. [[Crossref](#)]