

# Outcomes and Complications of Simultaneous Laparoscopic Cystectomy and Laparoscopic Nephroureterectomy with Umbilical Reduced Port Surgery

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## Abstract

**Objective:** In recent years, although reduced port surgeries (RPS) have been reported for many urological diseases, there have been no reports regarding simultaneous laparoscopic cystectomy and unilateral or bilateral nephroureterectomy with umbilical RPS. Therefore, the aim of this study was to evaluate outcomes and complications of simultaneous laparoscopic cystectomy and unilateral or bilateral nephroureterectomy with umbilical RPS. **Methods:** We performed a preliminary case series of 4 patients with synchronous upper urinary tract (UUT) tumor and invasive bladder cancer who underwent simultaneous laparoscopic cystectomy and unilateral or bilateral nephroureterectomy with umbilical RPS between 2014 and 2017 at our hospital. Demographic data, pathologic features, the surgical technique, and outcomes were retrospectively analyzed. **Result:** All 4 patients were men whose median age was 79 years (range 65-85 years) and median body mass index was 24.2 kg/m<sup>2</sup> (range 21.5-27.3 kg/m<sup>2</sup>). The laparoscopic approach was technically successful in all 4 patients without the need for open conversion. The median total operative time was 434 minutes (range 372-481 minutes). The median estimated blood loss was 773 ml (range 153-923 ml), median interval to resuming oral intake was 2 days (range 1-7 days), and median hospital stay was 16 days (range 13-20 days). **Conclusion:** The reduced port approach is technically feasible in terms of many outcome measures, with significant cosmetic advantages. This method can be performed safely and recommended as a viable option for patients with concomitant UUT and bladder cancer.

**Keywords:** Cystectomy- nephroureterectomy- umbilical approach- reduced port surgery

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## Introduction

Urothelial carcinoma (UC) can involve the urinary bladder as well as ureters and the renal pelvis. However, simultaneous lower and upper UC is less frequent, affecting 0.3-2.3% of patients (Palou et al., 2005). Radical cystectomy and nephroureterectomy are standard procedures for bladder and upper urinary tract (UUT) malignancies. In patients with recurrent high grade or muscle invasive bladder UC and concomitant UUT tumors, simultaneous cystectomy and nephroureterectomy is the principle oncologic procedure of choice (Witjes et al., 2014). Other clinical conditions, such as dialysis-dependent end-stage renal disease and non-functioning kidney, are also indications for simultaneous removal of the bladder and kidney.

In the field of urology, a case report of laparoscopic simultaneous radical cystectomy and nephroureterectomy was initially written by Deng et al., (2002) and then the first series of eight patients was published by Barrows

et al., (2008). Afterward, a few series of robot-assisted simultaneous radical cystectomy and nephroureterectomy were published; however, to date no studies on simultaneous radical cystectomy and nephroureterectomy using reduced port surgeries (RPS) have been published. Urological laparoscopy has been rapidly switched to robot-assisted laparoscopy worldwide, and robot-assisted surgery has more gained popularity. Nevertheless, laparoscopic surgery is not inferior to the robot-assisted laparoscopy, as they have a similar oncological safety and operative outcomes. Laparoscopic surgery is suggested to have crucial advantages in terms of reduced postoperative pain, shorter hospital stay, less analgesic requirement, and faster recovery time. Laparoscopic surgery including RPS has been continued to be used and developed over the past decade to improve cosmetic results and to reduce patient invasiveness (Hermans et al., 2014; Tang et al., 2014; Aboumarzouk et al., 2013).

We describe outcomes and complications of our first 4 patients with synchronous UUT tumor and invasive

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bladder cancer treated with simultaneous laparoscopic cystectomy and nephroureterectomy with umbilical RPS at Anjo Kosei Hospital. To the best of our knowledge, this is the first series in the literature to describe the surgical steps of a small series of patients who underwent simultaneous laparoscopic radical cystectomy and nephroureterectomy as umbilical RPS for a specific indication.

## Materials and Methods

We describe our initial clinical results of 4 patients who underwent simultaneous laparoscopic radical cystectomy and unilateral or bilateral nephroureterectomy with umbilical RPS between 2014 and 2017 at our hospital. RPS was defined as laparoscopic surgery, which lessens the number of ports and size of the port site compared with conventional laparoscopic surgery. To decrease instrument interference and apply standard laparoscopic instruments, a multichannel trocar was placed beside the umbilical site. In our series, the operative procedure highlighted the use of a maximum of three trocars in each procedure (a multichannel port, one trocar for nephroureterectomy, and one port for cystectomy and lymph node dissection). However, we added one additional port in two cases.

Preoperatively, there were previous histories of muscle-invasive or recurrent non-muscle invasive UC of the bladder in all patients. The indications for individual surgeries were invasive bladder cancer with coexisting renal cell carcinoma (case 1), with upper tract UC (cases 2 and 3), and with end-stage renal disease kidney (case 4).

The Clavien-Dindo classification was used to evaluate postoperative complications.

Surgery was performed after obtaining informed consent from all patients, and the study was approved by the local ethics committee.

The present study examined the safety and initial effectiveness of laparoscopic cystectomy and laparoscopic nephroureterectomy with umbilical RPS procedures. Accordingly, patients' demographic characteristics, operative procedure, and perioperative outcomes were retrospectively collected and evaluated.

### *Surgical Technique*

All the surgeries were performed with transperitoneal access and reduced port laparoscopic surgery using the para-umbilical approach. All these procedures were performed by the same surgical team at one institution. Our technique for laparoscopic nephroureterectomy and cystectomy has been previously reported (Stifelman et al., 2005). The technique of our procedure is detailed as follows.

### *Laparoscopic nephroureterectomy*

Initially, the patient was placed in a 60° lateral decubitus position. After positioning was confirmed, transperitoneal laparoscopic nephroureterectomy was prepared.

Trocar placement is illustrated in Figure 1a-b. First, a multichannel port was inserted peritoneally through a 10-cm umbilical incision. To decrease instrument interference and apply standard laparoscopic

instrumentation, a multichannel trocar (E-Z ACCESS®, Lap protector®, Hakko Medical) was introduced (Figure 2a). Two 5-mm ports (E-Z trocar 5 mm®, Hakko Medical) and one 12-mm port (E-Z trocar 12 mm®, Hakko Medical) were inserted into a multichannel trocar, which served as a camera port and working port, respectively. Subsequently, a 5-mm trocar (E-Z trocar 5 mm®, Hakko Medical) as a second port was placed 6 cm away from the multichannel port along a line between the umbilicus and anterior-superior iliac spine to provide an adequate working angle for facilitating surgery. In all cases, the flexible laparoscopic camera was used throughout the entire procedures at the para-umbilical site using standard laparoscopic instruments (energy device LigaSure®, Covidien and WECK Hem-o-lok ligation clip®, Teleflex Medica).

Anatomical structures of the ureter and renal hilum were identified after port replacement. If it was difficult to perform suction because of reasons such as liver retraction or severe adhesions, we placed one additional 5-mm assistant port 6-8 cm upper laterally away from the multichannel port. After preparation and mobilization of the complete kidney and ureter, the renal artery was clipped with Weck Hem-o-lok ligation clip®, and it along with the renal vein were dissected in the same manner. After detaching the kidney from the surrounding tissue, we continued dissection from the ureter downward to the level of the iliac vessel. Finally, Jackson-Pratt Drain was placed from the upper laterally placed additional port site (Figure 3(1)).

### *Laparoscopic radical cystectomy (LRC)*

Next, the patient's position was changed to the lithotomy position, and the surgical field was re-prepared and re-draped. The previous multichannel port and one 5-mm port at the iliac site were retained, and then another 5-mm port (E-Z trocar 5 mm®, Hakko Medical) was placed along the other iliac side (Figure 2b). A flexible laparoscope was used from the multichannel port for all the procedures during cystectomy as well as during nephroureterectomy.

The detached kidney and lower ureter were identified and peeled away from the vesicoureteral junction. Additionally, the other side of the ureter was identified and dissected next to the bladder, and then a 6-French single J ureteral catheter was indwelled. The bladder was detached caudally, mobilizing the seminal vesicles and the base of the prostate at the anterior rectum. Subsequently, bilateral dissection of the peritoneum was performed to expose the lateral pedicles. Both pedicles were disconnected using the endo-GIA stapler. After completing posterior and lateral dissection, the peritoneum was incised anteriorly over the bladder. The endopelvic fascia was incised bilaterally. The dorsal venous complex was ligated using a 2-0 absorbable suture and transected, and then the urethra was transected. A Foley catheter was clipped with a Hem-o-lok clip to avoid urinary leakage and contamination. The entire specimen, including the kidney, ureter, urinary bladder, prostate, and urethra, was freed and removed through the umbilical multichannel port incision. Routine pelvic lymph node dissection was performed bilaterally in all

patients.

Open-assisted urinary diversions were performed from the umbilical open port site. In all three cases, except the case of total urinary tract excision, ureterocutaneostomy was performed when reusing the 5-mm trocar site to reduce the incision (Figure 3(2)).

Finally, the empty space from pelvic organ removal was irrigated, and hemostasis was achieved. The Jackson-Pratt Drain was placed from the other side of the iliac side port site. Postoperatively, all the port sites were reused to facilitate suturing and to conduct drainage extraction (Figure 3(1-2)).

## Results

Demographic data and pathological features of the bladder and upper tract tumors are presented in Table 1. The clinical characteristics and perioperative information are shown in Table 2.

All patients who underwent nephroureterectomy and cystectomy were men.

Patients' median age was 79 years (range 65-85 years) and median body mass index was 24.2 kg/m<sup>2</sup> (range 21.4-27.3 kg/m<sup>2</sup>). Preoperatively, all patients had a history of muscle invasive or recurrent muscle noninvasive UC of the bladder. They were classified as having an American Society of Anesthesiologists status class 1 or 2. Case 2 had a previous history of intravesical BCG immunotherapy. None of the patients had carcinoma in situ. Sites of the upper tract tumor sites were renal in 1 patient, renal pelvic in 1 patient, and ureteral in 2 patients. Left-side nephroureterectomy was performed in 2 patients, while right-side nephroureterectomy and bilateral nephroureterectomy were performed in 1 patient each.

Perioperative and postoperative information and the postoperative pathological stage are presented in Table 2. Conversion to standard multiport laparoscopy and open surgery was not necessary. The total median operative time was 430 minutes (range 372-481 minutes), median estimated blood loss was 773 ml (range 153-923 ml), median interval to resuming oral intake was 2 days (range 1-7 days), and median hospital stay was 16 days (range 13-20 days). Intraoperative and postoperative complications were no more than Clavien-Dindo classification grade III. Total blood transfusion was required in case 1 to maintain stable hemodynamics postoperatively. The median follow-up period was 27 months (range 10-42 months).

Each trocar was used in 3-4 ports. The postoperative scar 1 month postoperatively is shown in Figure 4 (case 2).

## Discussion

We successfully performed simultaneous laparoscopic cystectomy and unilateral or bilateral nephroureterectomy with umbilical RPS in the first 4 patients at our hospital.

The surgical techniques for all urinary organ diseases include laparoscopic surgery, reduced port surgery, and robot-assisted radical cystectomy with urinary diversion. The da Vinci robot-assisted procedure for

Table 2. Perioperative and Postoperative Data and Postoperative Pathological Stage

"Patient no."	"Bladder, pathological stage"	"Upper urinary tract, pathological stage"	"No. of pelvic lymph nodes dissected"	"No. of trocars"	"operative time(min)"	"Blood loss (ml)"	"Hospital stay(day)"	"Oral intake (day)"	"Follow-up period (months)"
1	UC,pT4a,G3	"Papillary RCC, p T1b"	7	4	394	923	20	7	19
2	No residual cancer	UC,pT2,G2,3	19	3	481	828	16	1	36
3	UC,pT3a,G3	UC,pTa,G1	6	4	372	153	16	1	42
4	UC,pT3,G3>G2	UC,pT3,G3>G2	2	3	475	718	13	3	10
Median			"6.5 (2-19)"		"434 (372-481)"	"773 (153-923)"	"16 (13-20)"	"2 (1-7)"	"27 (10-42)"

Table 1. Demographic Data and Pathological Features of the Bladder and Upper Tract Tumors

case no	sex	"Age (years)"	BMI(kg/m <sup>2</sup> )	"previous intravesical BCG therapy"	Bladder	Upper urinary tract	Type of surgery
1	Male	78	27.2	No	"UC p T2, G2>G3"	left kidney	"left-side nephroureterectomy cystectomy"
2	Male	65	27.3	Yes	"UC p Ta, G2>G3"	left ureter	"left-side nephroureterectomy cystectomy"
3	Male	85	21.5	No	"UC p T2, G3>G2"	Right renal pelvic	"Right-side nephroureterectomy cystectomy"
4	Male	80	21.5	No	"UC p T1, G3>G2"	"Right ureter (Functionless kidney)"	"Bilateral nephroureterectomy cystectomy"
Median		"79 (65-85)"	"24.2 (21.5-27.3)"				

No., number; UC, urothelial carcinoma; BCG, Bacillus Calmette-Guérin

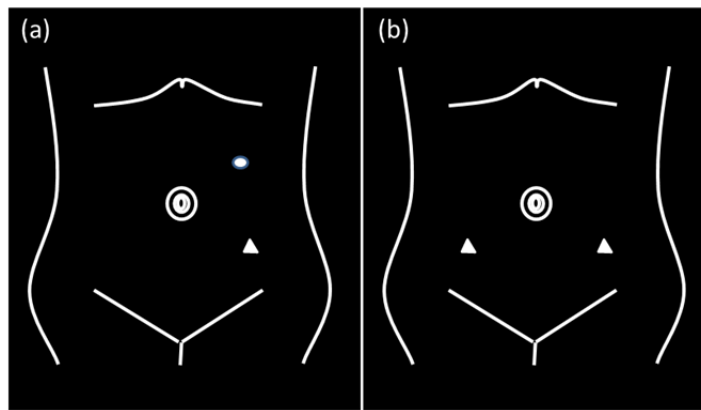


Figure 1. (a) Port placement for left-side nephroureterectomy. The double circles at the umbilical site indicates the multichannel EZ access port (10 cm). The triangle on the right side of the image indicates the 5-mm port. The circle on the left side of the image indicates the additional 5-mm port. (b) Port placement for radical cystectomy. The double circles and the triangle on the left side of the image are reused ports. The triangle on the right side of the image indicates a 5-mm port.

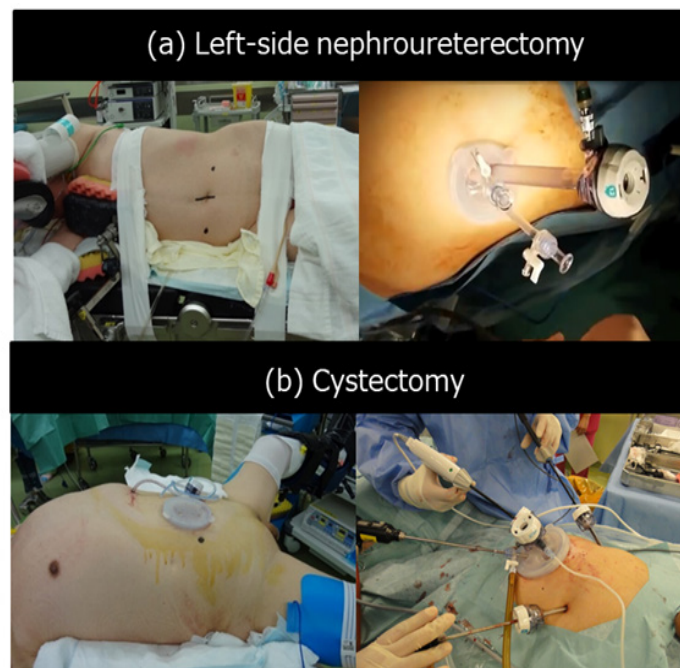


Figure 2. Intraoperative Positions and Port Placement for Left-Side Nephroureterectomy (a) and Cystectomy (b).

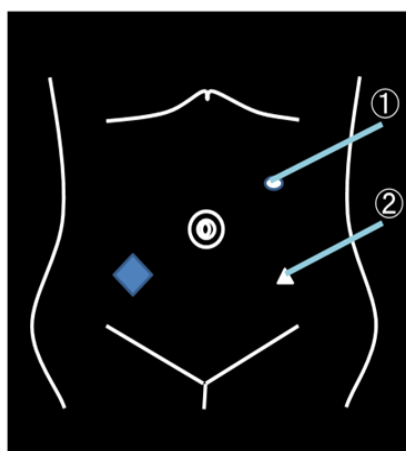


Figure 3. The Jackson-Pratt Drain is Placed from the Upper-Lateral Additional Port Site to the Nephrectomy Space (1) and Pelvic Space (2). The square indicates the reused port for ureterocutaneostomy at the 5-mm trocar site.

pelvic surgeries became popular after the success of radical prostatectomies (Abbou et al., 2001). The field of urologic robot-assisted surgery (e.g., nephrectomy,



Figure 4. The Postoperative Scar 1 Month Postoperatively.



partial nephrectomy, and cystectomy) includes treatment for almost all urinary organ diseases (Binder et al., 2001; Guillonnet et al., 2001; Stifelman et al., 2001; Sung et al., 1999). However, robot-assisted surgery is not feasible in every field because it is not applicable to all facilities, mostly due to economical expenses. Although robot-assisted surgery is influential and effective, laparoscopic surgery is still a necessary surgical technique. RPS is an ideal and rational technique to obtain a feasible result and high cosmetic quality (Porgiglia et al., 2014). Additionally, RPS offers adequate technical feasibility for a large variety of procedures and reduces economic burden without any special laparoscopic curved, articulating instruments or an even more expensive robot device (Yu et al., 2012). Considering the future of laparoscopic surgery, it seems reasonable that it should not be limited to the RPS technique, and it should challenge the use of small diameter instruments and new techniques.

Berglund et al., (2006) first reported the feasibility of LRC with bilateral nephroureterectomy. They inserted 9 ports during the entire procedure, and finally, the specimen was removed with the addition of a Pfannenstiel incision. Barros et al., (2008) reported the surgical technique with a longer follow-up of 8 patients who underwent simultaneous laparoscopic nephroureterectomy and cystectomy. They required at least 8 ports (5 ports for one-sided nephroureterectomy with 3 ports for the pelvic component) during the procedure and removed the specimen from the periumbilical space.

Ou et al., (2011) reported the feasibility and safety of simultaneous robot-assisted nephroureterectomy and cystectomy in patients with uremia and multifocal UC. The surgical procedure required 5 ports (4 trocars for nephroureterectomy with the addition of 1 port for cystectomy and lymph node dissection). The entire specimen was removed through an extended 4 to 5-cm supraumbilical or infraumbilical incision. Furthermore, Peter et al. in Germany reported 3 cases of robot-assisted radical cystoprostatectomy and laparoscopic nephroureterectomy that needed 6 ports in all procedures (Peter et al., 2012). The entire specimen was removed through a supraumbilical or infraumbilical incision. Recently, Buse et al., (2016) described 11 cases of robot-assisted simultaneous radical cystectomy and nephroureterectomy that required 7-8 ports in all procedures. To minimize the surgical trauma, we preferred to extract the intact specimen through a Pfannenstiel incision in our male patients. In our experience, these maneuvers minimized the trauma and maintained the best cosmetic results.

Umbilical surgery is technically feasible for various procedures, both ablative and reconstructive. Umbilical access offers adequate surgical outcomes, minimal postoperative pain, and fewer complications for the patient in the short term, and it has a noticeable economic advantage. In addition, the umbilicus was more commonly used for RPS in the aforementioned studies. The umbilical port can be used for LRC later in all surgical procedures and for planned ileal conduit stoma site. This port also can be extended periumbilically for further procedures of intact specimen removal and performance of all bowel

work, including the creation of the neobladder or ileal conduit as well as re-establishment of bowel continuity (Angulo et al., 2015; Garcia et al., 2014).

With advances in technology and instrumentation, urologic laparoscopic surgery has made great progress in minimally invasive surgery, resulting in its feasibility and safety, as well as its similar functional and oncological outcomes, better cosmetic results, and low cost compared with open or robot-assisted surgery.

The main limitation of our study was the small sample size (N=4). A large-scale prospective, randomized, controlled trial will be required to provide more information on this topic in the near future.

In conclusion, we demonstrated the initial technical feasibility of laparoscopic cystectomy and laparoscopic nephroureterectomy with umbilical RPS in patients with concomitant upper tract UC and bladder cancer.

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No competing financial interests exist.

#### Conflict of interest

The authors declare no conflicts of interest.

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