



## Bladder Cancer

# Robotic and Laparoscopic Radical Cystectomy for Bladder Cancer: Long-term Oncologic Outcomes

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### Article info

#### Article history:

Accepted August 9, 2013  
Published online ahead of print on August 20, 2013

#### Keywords:

Bladder neoplasm  
Minimally invasive  
Laparoscopy  
Robotic assisted  
Urinary diversion

### Abstract

**Background:** Extended oncologic outcomes after minimally invasive cystectomy have not been previously reported.

**Objective:** To report outcomes of robot-assisted radical cystectomy (RARC) and laparoscopic radical cystectomy (LRC) for bladder cancer (BCa) at up to 12-yr follow-up.

**Design, setting, and participants:** All 121 patients undergoing RARC or LRC for BCa between December 1999 and September 2008 at a tertiary referral center were retrospectively evaluated from a prospectively maintained database.

**Intervention:** RARC or LRC.

**Outcome measurements and statistical analysis:** Primary end points were overall survival (OS), cancer-specific survival (CSS), and recurrence-free survival (RFS) calculated using Kaplan-Meier curves. Secondary end points were survival analysis by number of lymph nodes (LNs) and type of procedure. Surgical outcomes, including complications, were analyzed.

**Results and limitations:** Most tumors were muscle invasive ( $\geq$ pT2;  $n = 81$ ; 67%) urothelial carcinomas ( $n = 102$ ; 84%). Extended LN dissection was performed in 98 patients (81%), with a median of 14 nodes removed (interquartile range [IQR]: 8–18). Twenty-four patients (20%) had node-positive disease (N1: 10 [8%]; N2: 14 [12%]). Eight patients (6.6%) had positive soft tissue margins. Median follow-up was 5.5 yr (mean: 5.9; IQR: 4.2–8.2; range: 0.13–12.1). At last follow-up, 58 patients (48%) had no evidence of disease, 3 (2%) were alive with recurrence, 59 (49%) had died, and status was unknown in 1. Twenty-eight patients (23%) died from cancer-specific causes, 20 (17%) from unrelated causes, and 11 (9%) from unknown causes. The 10-yr actuarial OS, CSS, and RFS rates were 35%, 63%, and 54%, respectively. At last follow-up, OS for pT0, pTis/a, pT1, pT2, and pT3 versus pT4 was 67%, 73%, 53%, 50%, and 16% versus 0%, respectively ( $p = 0.02$ ). At last follow-up, CSS for pT0, pTis/a, pT1, pT2, and pT3 versus pT4 was 100%, 91%, 74%, 77%, and 56% versus 0%, respectively ( $p = 0.03$ ).

**Conclusions:** The longest oncologic outcomes following RARC and LRC for BCa reported demonstrates results similar to those reported for open RC. Continued analysis and direct randomized comparison between techniques is necessary.

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## 1. Introduction

Muscle-invasive urothelial bladder cancer (BCa) has long been treated with open radical cystectomy (ORC) because it is a disease that relies heavily on aggressive surgical treatment to optimize patient survival [1,2]. Although ORC with extended pelvic lymph node dissection (PLND) is the current gold standard for organ-confined muscle-invasive or recurrent high-grade superficial BCa, minimally invasive techniques have increased in application with the goal of minimizing patient morbidity. In nonrandomized comparisons, robot-assisted radical cystectomy (RARC) and laparoscopic radical cystectomy (LRC) have been associated with longer operative time, yet decreased blood loss, lower transfusion rate, quicker bowel function, decreased hospital stay, and more rapid recovery [3]. Because of encouraging perioperative and intermediate-term (5-yr) oncologic data for minimally invasive cystectomy, RARC and LRC are increasing in popularity, albeit in highly specialized tertiary medical centers [4]. The paucity of long-term oncologic outcomes of RARC and LRC remains a valid concern, especially given the vital importance of negative surgical margins (NSM) and the thoroughness of lymph node dissection (LND) in radical cystectomy (RC) surgery. As such, reported herein are long-term oncologic outcomes of RARC and LRC with follow-up of up to 12 yr (median: 5.5).

## 2. Patients and methods

From December 1999 to September 2008, six surgeons performed RARC/LRC with curative intent for BCa in 121 patients. Inclusion criteria comprised patients with recurrent or high-grade superficial or muscle-invasive urothelial cell carcinoma (UCC) or another subtype without evidence of extravesical spread or metastatic disease on preoperative imaging. High-grade recurrent superficial BCa was defined as pT1G3 UCC or any BCa that had recurred despite three or more transurethral resections (TURs) or treatment with intravesical bacillus Calmette-Guérin. Twelve patients (10%) received neoadjuvant chemotherapy. Adjuvant

chemotherapy was administered to 11 patients (9%) based on surgical pathology and follow-up imaging.

Demographic data, preoperative BCa data, perioperative data, complications, pathology, adjuvant treatments, and follow-up data were collected in a prospective computerized, secure database with institutional review board approval. Typical postcystectomy follow-up consisted of history as well as physical and serum creatinine at 1 mo along with abdominopelvic computed tomography scans and chest x-ray every 6 mo for 2 yr, then annually thereafter. For this study, follow-up data were obtained either by chart review or telephone contact directly with the patient or with surviving family members or by a check of the Social Security Death Index. Complications were recorded prospectively and graded retrospectively according to an established five-grade Clavien classification [5].

The technique of RARC and LRC with urinary diversion (UD) has previously been reported [4,6]. During the initial development of the technique in 2000, standard PLND was used, which consisted of excising lymphatic tissue from the external iliac artery, external iliac vein, obturator nerve, and hypogastric artery up to the common iliac artery. Since August 2002, most surgeries have used an extended template for excising lymphatic tissue, including standard PLND in addition to resection of tissue medial to the genitofemoral nerve and along the common iliac artery up to the aortic bifurcation [7]. The types of UD, performed mostly extracorporeally, and other intraoperative data are listed in Table 1.

Outcome measures evaluated included pathologic and perioperative outcomes, disease recurrence, overall survival (OS), and cancer-specific survival (CSS). Kaplan-Meier curves were constructed to estimate the survival rate for the whole sample and within subgroups. The log-rank test was used to compare the Kaplan-Meier curves between stage, number of lymph nodes (LNs) removed, type of procedure, and margin status. All statistics were two-tailed, with  $p < 0.05$  considered significant. Analysis was done using JMP Statistical Discovery (SAS Institute, Cary, NC, USA).

## 3. Results

### 3.1. Patient demographics

The study population is described in Table 2. History of previous upper-tract and nonurologic cancers were present

**Table 1 – Intraoperative and postoperative features**

	Median (range, IQR) or no. (%)	Complications, Clavien grade, no. (%)					
		Total	1	2	3	4	5
Type of procedure							
Pure laparoscopic	17 (14)	9 (53)	2 (22)	2 (22)	4 (44)	1 (11)	0 (0)
Laparoscopic assist*	87 (72)	34 (39)	9 (26)	12 (35)	7 (21)	6 (18)	0 (0)
Robotic assist*	17 (14)	9 (53)	2 (22)	2 (22)	3 (33)	2 (22)	0 (0)
Type of UD							
Bricker ileoconduit	84 (69)	36 (43)	10 (28)	14 (39)	8 (22)	4 (11)	0 (0)
Orthotopic neobladder	29 (24)	11 (38)	2 (18)	2 (18)	4 (36)	3 (27)	0 (0)
Indiana pouch	6 (5)	4 (67)	1 (25)	0 (0)	1 (25)	2 (50)	0 (0)
Anephric	2 (2)	1 (50)	0 (0)	0 (0)	1 (100)	–	0 (0)
Total complications**	–	52 (43)	13 (25)	16 (31)	14 (27)	9 (17)	0 (0)
EBL, ml	400 (25–4000, 200–750)	–	–	–	–	–	–
OR time, h	7.5 (2–12, 6–9.4)	–	–	–	–	–	–
Conversion	6 (5)	–	–	–	–	–	–

IQR = interquartile range; UD = urinary diversion; EBL = estimated blood loss; OR = operating room.

\* Laparoscopic assist and robotic assist included laparoscopic or robotic cystectomy with a planned extracorporeal UD.

\*\* Complications according Clavien grade [5].

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