Laparoscopic and Open Radical Cystectomy: Comparative Short-Term Outcomes from a Single-Center Experience

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Abstract:

Background: Bladder cancer accounts for 3.0% of new cancer cases and 2.1% of cancer-related deaths. The standard treatment for bladder cancer is open radical cystectomy (ORC) with pelvic lymphadenectomy. But associated with morbidity exceeds 50% in specialized centers. Laparoscpic radical cystectomy (LRC) has lower rate of complications while achieving oncological outcomes comparable to open surgery.

Objective: To compare short-term outcomes of patients with bladder cancer submitted to ORC and LRC as regard oncologic safety, intraoperative and postoperative morbidity and mortality

Methods: Retrospective analysis involved 309 patients with bladder cancer underwent either open or laparoscopic radical cystectomy. the patients were divided into two groups:

• Group 1: 89 patients who had (LRC).
• Group 2: 220 patients who had (ORC).

Results: Our study demonstrated notable differences in outcomes between the two methods. The open technique associated with greater intraoperative blood loss, higher need for blood transfusions and shorter operating time, whereas the laparoscopic procedure significantly reduced bleeding, shorter hospital stay, quicker overall recovery.

Both methods exhibited similar rates of minor and major complications, with no significant differences. Pathological evaluations, including tumor staging, lymph node retrieval, and margin status, were equivalent, indicating that the laparoscopic approach maintains oncologic safety while offering better perioperative benefits than the open technique.

Conclusion: In conclusion, Laparoscopic radical cystectomy offers a safe minimally invasive alternative to open surgery and LRC is oncologically not inferior to ORC.

Key-words: bladder cancer, LRC, ORC

Received: 29 May 2025
Accepted: 20 July 2025

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Introduction:

Bladder cancer (BC) ranks as the ninth most prevalent cancer globally and the sixth in Europe, exhibiting an age-adjusted incidence rate of 17.7 per 100,000 and a mortality rate of 5.2 per 100,000 among men in Europe. The tumor stage/grade is the most significant predictor of outcomes [1].

Bladder cancer accounts for around 3.0% of all new cancer cases and 2.1% of cancer-related deaths. Mortality in urinary bladder cancer is primarily influenced by the pathological stage. Approximately 25% of newly diagnosed cases are muscle-invasive. While muscle-invasive bladder cancer (MIBC) occurs infrequently, it represents a highly aggressive tumor with a substantial risk of metastasis, leading to poor prognoses and elevated mortality rates. The 5-year survival rate for patients with lymph node metastases is only between 15% and 30% [2].

The standard treatment for muscle-invasive bladder cancer is open radical cystectomy (ORC) along with pelvic lymphadenectomy. However, recent studies indicate that the morbidity associated with open radical cystectomy exceeds 50% in specialized centers. The most critical complications, including infections, paralytic ileus, wound dehiscence, and urinary or intestinal fistulas, can be life-threatening in approximately 10 to 20% of cases [3].

Laparoscopic Radical Cystectomy (LRC) was initially carried out in the 1990s by Parra et al, with the first report of this technique documented by Sanchez de Badajoz et al in 1995. This minimally invasive method appears to present a lower rate of complications while

achieving oncological outcomes comparable to traditional open surgery [4]. Various studies suggest that LRC has advantages over ORC, including reduced blood loss, quicker recovery to normal activities, decreased postoperative pain, and enhanced aesthetic outcomes. Conversely, it demands expertise in minimally invasive surgery, incurs higher costs, and typically involves a longer surgical duration [5]. Laparoscopic surgery significantly reduces bleeding, analgesic requirements, reduced scarring and length of hospitalization, and it provides similar oncological outcomes to open surgery [6].

The aim of this study is to compare short-term outcomes of patients with bladder cancer submitted to ORC and LRC performed in South Egypt Cancer Institute from January 2015 to December 2021 as regard oncologic safety, intraoperative and postoperative morbidity and mortality.

Patients and Methods:

Study design and population:

This retrospective analysis was conducted at the Surgical Oncology Department of the South Egypt Cancer Institute, Assiut University, Egypt between January 2015 and December 2021. The study involved 309 patients diagnosed with urinary bladder cancer who underwent either open or laparoscopic radical cystectomy; subsequently, the patients were divided into two groups:

- Group 1: 89 patients who had laparoscopic surgery (LRC).
- Group 2: 220 patients who had open surgery (ORC).

Methods:

All patients were subjected to data collection including the following:

1. Complete history taking:

A detailed review of patient records was performed to obtain the following:

- Demographic data Special habits: smoking.
- Past medical history
- Past surgical history
- History of neoadjuvant treatment

2. Clinical examination
- General examination
- Local examination

3. Complete routine laboratory investigations
- Preoperative creatinine (mg/dL)
- Preoperative hemoglobin (g/dL)
- Albumin (g/L)

4. Radiological investigations:
- Ultrasound of the abdomen and pelvis
- CT scan (and/or MRI) – to define the local spread of the tumor, evaluate lymph node involvement, and exclude distant metastasis.

5. Cystoscopy & pathological data were obtained

6. Intraoperative parameters: were analyzed between individuals undergoing (ORC) and (LRC). The primary factors evaluated were:
- Estimated blood loss (EBL)
- The quantity and volume of blood transfusions
- Surgical durations: The recorded surgical metrics included total surgical duration, cystectomy duration, diversion duration, and lymphadenectomy duration.
- Urinary diversion: The assessed factors included the incision type for extracorporeal urinary diversion, the type of urinary diversion, and the length of the incision.

7-Postoperative parameters:
- Postoperative recovery: was assessed by comparing hospital stay and ICU stay durations between the ORC and LRC groups.
- Early complications: were systematically compared between patients undergoing ORC and LRC. The incidence of various complications was recorded and analyzed according to the Clavien–Dindo classification system. Table 1: Clavien–Dindo classification system.
- Diversion-related outcomes following radical cystectomy in both (ORC) and (LRC) groups: Such as voiding difficulty, urine leakage, and renal complications.
- Postoperative functional outcomes to compare recovery between the ORC and LRC groups: The outcomes included categorical parameters (need for parenteral nutrition, postoperative analgesia, and prevention of nausea–vomiting) as well as various time-based parameters reflecting gastrointestinal recovery, pain duration, and mobilization.

Table 1: Clavien–Dindo classification system

Grade	Description
Grade I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic, and radiological interventions. Allowed therapies include antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy. This grade also includes wound infections opened at the bedside.
Grade II	Requires pharmacological treatment with drugs other than those allowed for Grade I complications (e.g., antibiotics). Blood transfusions and total parenteral nutrition are included here.
Grade IIIa	Requires surgical, endoscopic, or radiological intervention not under general anesthesia.
Grade IIIb	Requires surgical, endoscopic, or radiological intervention under general anesthesia.
Grade Iva	Life-threatening complications requiring ICU management with single-organ dysfunction (including dialysis).
Grade IVb	Life-threatening complications requiring ICU management with multi-organ dysfunction.
Grade V	Death of the patient.

Statistical Analysis

- The gathered data were structured, coded, organized, and statistically analyzed utilizing IBM® SPSS statistical software, version 26 (Statistical Package for Social Studies) developed by IBM, located in Illinois, Chicago, USA. The one-sample Kolmogorov–Smirnov test was applied to assess the normality of the data, confirming that the data were parametric.
- For numerical data, the range, mean, and standard deviations were computed. The differences between the two mean values were assessed using a Student's t-test for parametric data.
- For categorical data, counts and percentages were calculated, and the differences among subcategories were evaluated using the chi-square test. Pearson's correlation coefficient (r) was utilized to measure the correlation between variables. To estimate risk, univariate and multivariate logistic regression analysis using the backward Wald method was performed to identify predictor variables. The significance level was set at $p<0.05$.

Results:

This study included 309 patients with urinary bladder cancer underwent open and laparoscopic radical cystectomy; then patients were assigned into two groups:

- Group 1: 89 patients who underwent laparoscopic surgery (LRC).
- Group 2: 220 patients who underwent open surgery (ORC).

There were no significant differences between the groups in terms of age, BMI, smoking status, or previous abdominal surgeries, with 32 participants (14.5%) in the ORC Group and 9 participants (10.1%) in the LRC Group (P=0.375), indicating no statistically significant difference. (Table 2)

There was no statistically significant difference observed between the ORC group and the LRC group concerning pathological stage, concomitant carcinoma in situ, positive margins, pathological N stage, pathologic grade, pathology type, and incidental prostate adenocarcinoma. A statistical difference was identified between the ORC group and the LRC group regarding tumor diameter (cm), with the ORC group showing a Mean±SD of 4.05±1.32 compared to the LRC group's Mean±SD of 3.65±1.16 ($p = 0.012$) (Table 3).

The majority of patients underwent standard pelvic lymphadenectomy (PLND). The two groups were similar regarding the extent of PLND conducted and the number of lymph nodes harvested. No significant difference was found in the rate of patients receiving standard versus extended PLND between open radical cystectomy (ORC) and laparoscopic radical cystectomy (LRC) (P=0.603). The number of lymph nodes excised showed an average yield of Mean ± SD 21.44±8.51 for ORC groups and Mean ± SD 20.07±9.63 for LRC groups (P=0.217). The mean lymph node yield in both open and laparoscopic radical cystectomy was not statistically significant (Table 4).

The most notable distinction between the two groups in operative measures was the estimated blood loss (EBL) and the need for transfusions. The estimated blood loss (in mL) was considerably higher in the ORC group when contrasted with the LRC group ($p < 0.001$). The mean ± SD blood loss was 806.67±446.93 mL in the ORC group and 439.46±174.83 mL in the LRC group (Table 5).

The amount of intraoperative blood loss in the ORC group exceeded that of the LRC group. Therefore, ORC resulted in significantly greater blood loss compared to LRC ($p < 0.001$), and the total blood loss in the LRC group was noticeably lower. The median blood loss was significantly reduced in the LRC group compared to those operated on using the open approach ($p < 0.001$ in both instances).

The operative duration was notably less in the ORC group than in the LRC group. A considerable difference was found between the two groups in terms of operative time and perioperative factors. The median operating time in the LRC group was significantly longer than that in the ORC group. When evaluated in total, the average operating duration was higher in the LRC group (the ORC group recorded the shortest time compared to LRC). The total operative time, in minutes, was 394.87 ± 74.33 minutes in the LRC group, and 337.60 ± 79.62 minutes in the ORC group. Consequently, the ORC time was significantly shorter than that of LRC ($p < 0.001$) (Table 6).

There was no notable difference in intraoperative blood loss between the groups undergoing ileal conduit and neobladder procedures. Nevertheless, the operative time was significantly longer for the neobladder group compared to the conduit group. The ileal conduit emerged as the most commonly utilized urinary diversion in the ORC Group. The length of the incision measured 13.31 ± 4.75 cm in the ORC groups, while it was 8.58 ± 1.48 cm overall ($P<0.001$) (Table 7).

Minimally invasive surgery resulted in shorter lengths of hospital stays. The length of hospital stay for the LRC group was less than that of the ORC group ($P<0.05$). The duration of hospitalization was primarily influenced by perioperative comorbidities and the timing of abdominal drain and stent removal.

The average time spent in intensive care and the total hospital stay were significantly less for the LRC group compared to the ORC group. Patients in the LRC group had a statistically significant shorter time before they were discharged home ($p = <0.001$).

The average length of hospital stay for the LRC group was 12.35 days, while the ORC group's average was 16.49 days. The average hospital stay for the LRC group was 1.16 days compared to 1.40 days for the ORC group, with a significant difference noted between the two groups regarding the length of hospital stay ($P = <0.001$) and ICU stay (days) ($P= 0.017$) (Table 8).

In our study, the total postoperative complication rate was 34.1% for the ORC Group and 44.9% for the LRC Group. Among the 309 patients, early Minor complications classified as CLAVIEN I–II were

recorded in ORC (n = 56; 25.5%) and LRC (n = 30; 33.7%). No significant difference was noted in the complication rates between the ORC and LRC groups (p = 0.162). For early Major complications classified as CLAVIEN III/IV, ORC had (n = 19; 8.6%) while LRC had (n = 10; 11.2%), with the postoperative early major complication rate (Clavien grade 3–5) showing a tendency to be lower in the ORC group. There was no significant difference found in the complication rates for ORC and LRC (p = 0.520). The conversion rate to open surgery in our study was found to be 3.4% This may be due to early learning curve, some advanced cases and cases with previous surgeries or chemoradiatin (Table 9).

Intraoperative injuries were noted to include Obturator vein injury (5.9%, 13 cases) in the ORC group compared to (7.9%, 7 cases) in the LRC group (P=0.610). The incidence of rectal perforation was measured as Rectal injury (3.2%, 7 cases) for the ORC group and (4.5%, 4 cases) for the LRC group (P=0.520). Additionally, External iliac vein injury occurred in (1.4%, 3 cases) of the ORC group while (1.1%, 1 case) was recorded in the LRC group (P=1.00).

There were no reported cases of intraoperative mortality. the ileal conduit group experienced a higher number of intraoperative injuries, this difference was not statistically significant (Table 10).

Complications for both groups undergoing the laparoscopic method (the group with urine diversion using Studer neobladder and ileal conduit) exhibited a similar median Clavien–Dindo complication rate when compared to the corresponding groups that underwent the open method (p = 0.001 and p < 0.001, respectively). The types of urinary diversion were alike between the ORC group and the LRC group regarding morbidity. The results indicated no differences between ileal conduit and ileal neobladder concerning both major and minor complications. There were no notable differences in the types of urinary diversion (Table 11).

There was no notable difference between the two groups regarding the necessity for parenteral nutrition and the duration until pelvic drain removal (days). There was significant difference as regard the time taken to pass flatus (days): 4.09 ± 1.3 days in the ORC group compared to 3.17 ± 0.93 days in the LRC group (P < 0.001). The average length of postoperative ileus was 5.27 ± 1.11 days (ranging from 3 to 9) in the ORC group and 4.27 ± 1.11 days (ranging from 3 to 7) in the LRC group. The time to bowel activity (days) was 4.24 ± 1.6 in the ORC group and 3.06 ± 1.25 in the LRC group, where bowel recovery time was significantly shorter for the LRC group (P<0.001).

The time taken to move to solid food, or regular diet (days), was 6.90 ± 1.8 in the ORC group compared to 6.04 ± 1.68 in the LRC group (P < 0.001). Oral liquids were only resumed on the 8th postoperative day due to the persistence of postoperative ileus for 7 days.

The time for resuming liquid intake (days) was 3.91 ± 1.5 in the ORC group and 2.73 ± 0.8 in the LRC group (P < 0.001), and the average time to return to oral liquid intake was significantly shorter in the LRC group relative to the ORC group.

The recovery of gastrointestinal function (days) was 4.28 ± 1.4 in the ORC group and 3.46 ± 1.2 in the LRC group (P < 0.001). Postoperative pain lasted for 5.37 ± 3.9 days in the ORC group and 1.62 ± 0.71 days in the LRC group (P < 0.001). The duration until nasogastric tube removal (days) was 4.8 ± 1.4 in the ORC group and 4.36 ± 1.3 in the LRC group (P = 0.010).

All patients were able to ambulate by the 2nd to 3rd postoperative days (2.16 ± 1.032 days in the ORC group and 1.58 ± 0.87 days in the LRC group). The difference was significant (P value = 0.009).

The LRC group also exhibited a lower requirement for analgesics; postoperative analgesia was administered to 150 patients (68.2%) in the ORC group and to 48 patients (53.9%) in the LRC group (P = 0.018).

The average narcotic analgesic requirement, with a mean morphine use of 3.7 days, yielded average values for anesthetic pain control (total morphine) of 17.65 ± 17.55 mg in the ORC group and 23.13 ± 16.83 mg in the LRC group (p = 0.062). Fewer patients in the LRC group received epidural blocks compared to the ORC group (p < 0.001); the overall analgesic need was significantly lower (morphine equivalents: 12.6 vs. 19.3 mg; P < 0.001). Epidural narcotics (morphine) were administered for pain relief for 72 hours in 150 patients (68.2%) in the ORC group, while 48 patients (53.9%) in the LRC group received them (P= 0.018).

Furthermore, the delay in the restoration of gastrointestinal function suggests that LRC exhibited significantly improved perioperative outcomes compared to ORC (Table 12).

Discussion:

ORC continues to be the established treatment for recurrent high-grade NMIBC or MIBC. Although surgical techniques have improved, the occurrence of complications remains substantial, with risks ranging from 40% to 65%. With the rise of minimally invasive surgery, numerous surgeons are starting to implement these techniques, leading to the advancement of LRC. Several prior studies have indicated that LRC is associated with fewer perioperative complications [7].

The baseline characteristics of patients in our analysis were comparable between the groups undergoing open and laparoscopic radical cystectomy. Demographic factors such as age, body mass index, gender distribution, and overall health status were similar, with comparable proportions of patients having had prior abdominal surgeries.

Table 2: Baseline characteristics of patients who underwent (LRC) and (ORC)

		Study groups				P value
		Open radical cystectomy		Laparoscopic radical cystectomy		
		Count	%	Count	%	
Age (years)	Mean ± SD	60.5±11.6		59.96±10.69		0.707
BMI	Mean ± SD	24.0±3.50		23.49±3.87		0.266
Gender (male/female)	Female	38	17.3%	15	16.9%	
	Male	182	82.7%	74	83.1%	1.00
	Total	220	100.0%	89	100.0%	
ASA score	I	30	13.6%	20	22.5%	
	II	102	46.4%	34	38.2%	
	III	79	35.9%	30	33.7%	0.215
	IV	9	4.1%	5	5.6%	
	Total	220	100.0%	89	100.0%	
Comorbidity	Cardiopathy,	4	1.8%	4	4.5%	
	Chronic Obstructive Pulmonary Diseases	13	5.9%	6	6.7%	
	Diabetes,	19	8.6%	14	15.7%	0.125
	Hypertension,	18	8.2%	10	11.2%	
	No	166	75.5%	55	61.8%	
	Total	220	100.0%	89	100.0%	
Smoking history,	Yes	168	76.4%	62	69.7%	
	No	52	23.6%	27	30.3%	0.250
	Total	220	100.0%	89	100.0%	
Previous abdominal operations	Yes	32	14.5%	9	10.1%	
	No	188	85.5%	80	89.9%	0.375
	Total	220	100.0%	89	100.0%	

Table 3: Pathological data. of patients who underwent (LRC) and (ORC)

		Study groups				P value
		Open radical cystectomy		Laparoscopic radical cystectomy		
		Count	%	Count	%	
Pathological stage	pT1	12	5.5%	5	5.6%	
	pT2	104	47.3%	45	50.6%	
	pT3	89	40.5%	35	39.3%	0.872
	pT4	15	6.8%	4	4.5%	
	Total	220	100.0%	89	100.0%	
Concomitant carcinoma in situ:	Yes	35	15.9%	11	12.4%	
	No	185	84.1%	78	87.6%	0.484
	Total	220	100.0%	89	100.0%	
Lymphovascular invasion:	Absent	181	82.3%	66	74.2%	
	Present	39	17.7%	23	25.8%	0.118
	Total	220	100.0%	89	100.0%	
Positive margins	Absent	213	96.8%	86	96.6%	
	Present	7	3.2%	3	3.4%	1.00
	Total	220	100.0%	89	100.0%	
Pathological N Stage	pN0	128	58.2%	56	62.9%	
	pN1	73	33.2%	29	32.6%	0.433
	pN2	19	8.6%	4	4.5%	
	Total	220	100.0%	89	100.0%	
Pathologic grade	High grade	127	57.7%	53	59.6%	
	Low grade	93	42.3%	36	40.4%	0.800
	Total	220	100.0%	89	100.0%	
Pathology type,	Adenocarcinoma	6	2.7%	3	3.4%	
	Squamous cell carcinoma	33	15.0%	15	16.9%	0.889
	Transitional cell carcinoma	181	82.3%	71	79.8%	
	Total	220	100.0%	89	100.0%	
Incidental prostate adenocarcinoma	Yes	6	2.7%	6	6.7%	
	No	214	97.3%	83	93.3%	0.095
	Total	220	100.0%	89	100.0%	
Tumor Diameter (cm)	Mean±SD	4.05±1.32		3.65±1.16		0.012

Table 4: Lymphadenectomy of patients who underwent (LRC) and (ORC)

		Study groups				P value
		Open radical cystectomy		Laparoscopic radical cystectomy		
		Count	N %	Count	N %	
Type of Lymphadenectomy	Extended PLND	77	35.0%	34	38.2%	0.603
	Standard PLND	143	65.0%	55	61.8%	
lymph nodes removed	Mean ± SD	21.44±8.51		20.07±9.63		0.217

Table 5: Estimated Blood Loss (ml), Number of transfusions needed of patients who underwent (LRC) and (ORC)

		Study groups				P value
		Open radical cystectomy		Laparoscopic radical cystectomy		
		Count	%	Count	%	
Transfusion needed	Yes	198	90%	28	31.5%	<0.001
	No	22	19%	61	68.5%	
	Total	220	100.0%	89	100.0%	
Packed Red Blood Cell transfused	No transfusion	107	48.6%	63	70.8%	<0.001
	1–2 units	76	34.5%	24	27.0%	
	3–4 units	37	16.8%	2	2.2%	
	Total	220	100.0%	89	100.0%	
Estimated blood loss (ml)	Mean±SD	806.67±446.93		439.46±174.83		<0.001

Table 6: Operative time, of patients who underwent (LRC) and (ORC)

	Study groups				P value
	Open radical cystectomy		Laparoscopic radical cystectomy		
	Mean	Std. Deviation	Mean	Std. Deviation	
Total Operative time, min	337.60	79.62	394.87	74.33	<0.001
Cystectomy Operative time,	136.62	34.04	171.11	19.52	<0.001
Diversion time (min)	131.13	39.97	163.29	36.66	<0.001
Lymphadenectomy time	69.55	10.69	66.51	12.54	0.046

Table 7: Urine derivation after radical cystectomy of patients who underwent (LRC) and (ORC)

		Study groups				P value
		Open radical cystectomy		Laparoscopic radical cystectomy		
		Count	%	Count	%	
Incision for extracorporeal urinary diversion	Midline	203	92.3%	72	80.9%	0.005
	Pfannenstiel	17	7.7%	17	19.1%	
	Total	220	100.0%	89	100.0%	
Extracorporeal urinary diversion type	Ileal conduit	132	60.0%	21	23.6%	<0.001
	Orthotopic neobladder	88	40.0%	68	76.4%	
	Total	220	100.0%	89	100.0%	
Length of incision		13.31±4.75		8.58±1.48		<0.001

Table 8: Hospital stay of patients who underwent (LRC) and (ORC)

	Study groups				P value
	Open radical cystectomy		Laparoscopic radical cystectomy		
	Mean	Std. Deviation	Mean	Std. Deviation	
Length of hospital stay, days	16.49	5.971	12.35	3.188	<0.001
ICU stay (days)	1.40	1.009	1.16	0.705	0.017

Table 9: Comparison of early complications in LRC group versus ORC group

	Study groups				P value
	ORC N=220		LRC N=89		
	Count	%	Count	%	
Minor complication /CLAVIEN I–II	56	25.5%	30	33.7%	0.162
Major complication /CLAVIEN III/ IV	19	8.6%	10	11.2%	0.520
Conversion to open surgery			3	3.4%	
90-day readmission rate	33	15.0%	20	22.5%	0.134
Reoperation	11	5.0%	4	4.5%	1.00
Chest infection	13	5.9%	3	3.4%	0.571
Wound infection	15	6.8%	3	3.4%	0.295
Wound dehiscence	7	3.2%	0	0.0%	0.113
urinary tract infection	19	8.6%	5	5.6%	0.484
leg neuropraxia	5	2.3%	2	2.2%	1.00
Ileus	24	10.9%	6	6.7%	0.297
Ileus (Conservative Treatment)	18	8.1%	5	5.6%	0.630
Ileus (Surgical Treatment)	6	2.7%	1	1.1%	0.461
Diarrhea	8	3.6%	3	3.4%	1.00
Bowel Obstruction	8	3.6%	3	3.4%	1.00
Bowel Leak/fistulae	7	3.2%	3	3.4%	1.00
Fever	25	11.4%	18	20.2%	0.047
Pelvic Abscess	6	2.7%	2	2.2%	1.00
Sepsis	7	3.2%	3	3.4%	1.00
Stoma Complication	11	5.0%	5	5.6%	1.00
Obturator nerve paresis	5	2.3%	2	2.2%	1.00
Lymphatic fistula	7	3.2%	3	3.4%	1.00
Gastrointestinal hemorrhage	12	5.5%	8	9.0%	0.307
Delirium	5	2.3%	2	2.2%	1.00
Arrhythmia	5	2.3%	2	2.2%	1.00
Poor bowel function	14	6.4%	9	10.1%	0.337
90-day postoperative mortality/Clavien V)	11	5%	4	4.5%	1.00

Table 10: Comparison of Intraoperative injuries: in LRC group versus ORC group

		Study groups				P value
		ORC		LRC		
		Count	%	Count	%	
Obturator vein injury	Yes	13	5.9%	7	7.9%	
	No	207	94.1%	82	92.1%	0.610
	Total	220	100.0%	89	100.0%	
Rectal injury	Yes	7	3.2%	4	4.5%	
	No	213	96.8%	85	95.5%	0.520
	Total	220	100.0%	89	100.0%	
External lilac vein injury	Yes	3	1.4%	1	1.1%	
	No	217	98.6%	88	98.9%	1.00
	Total	220	100.0%	89	100.0%	

Table 11: Diversion Related outcomes in LRC group versus ORC group

	Study groups				P value
	ORC N=220		LRC N=89		
	Count	%	Count	%	
Voiding Difficulty	9	4.1%	5	5.6%	0.760
Diversion Related Complication	42	19.1%	32	36.0%	0.002
Urine Retention	7	3.2%	3	3.4%	1.00
Urine leakage (repair of fistula)	5	2.3%	4	4.5%	0.455
Urine leakage (conservative)	14	6.4%	8	9.0%	0.465
Renal impairment /Renal failure	12	5.5%	6	6.7%	0.789
Need For PCN Drainage	8	3.6%	4	4.5%	0.749
Hemodialysis	13	5.9%	7	7.9%	0.610
Urinary Peritonitis	7	3.2%	3	3.4%	1.00
Pyelonephritis	21	9.5%	5	5.6%	0.366
Atrophic Kidney	8	3.6%	4	4.5%	0.749
Renal Stone	12	5.5%	5	5.6%	1.00
Urinary Tract Stone	10	4.5%	5	5.6%	0.771
Parastomal hernia	6	2.7%	2	2.2%	1.00
Pouchitis	14	6.4%	7	7.9%	0.804
Bladder flushing time (days)	10.19±5.41		8.10±2.05		<0.001

Table 12: Postoperative Functional characteristics outcomes in LRC group versus ORC group

		Study groups				P value
		ORC N=220		LRC N=89		
		Count	%	Count	%	
Need for Parenteral Nutrition	Yes	62	28.2%	18	20.2%	
	No	158	71.8%	71	79.8%	0.148
	Total	220	100.0%	89	100.0%	
Postoperative analgesia	Yes	150	68.2%	48	53.9%	
	No	70	31.8%	41	46.1%	0.018
	Total	220	100.0%	89	100.0%	
Prevention of nausea–vomiting	Yes	151	68.6%	46	51.7%	
	No	69	31.4%	43	48.3%	0.005
	Total	220	100.0%	89	100.0%	
		Mean	Std. Deviation	Mean	Std. Deviation	
Recovery of gastrointestinal function (days)		4.28	1.405	3.46	1.207	<0.001
postoperative pain, (days)		5.37	3.903	1.62	0.715	<0.001
Time to nasogastric tube removal (days)		4.80	1.365	4.36	1.264	0.010
Time to Ambulation (days)		2.16	1.032	1.85	0.873	0.009
Time to passage of flatus, (days)		4.09	1.290	3.17	0.932	<0.001
Time to liquid intake (days)		3.91	1.487	2.73	0.876	<0.001
Time to regular diet(days)		6.90	1.809	6.04	1.685	<0.001
Time to pelvic drain removal, (days)		6.55	1.628	6.79	1.79	0.239
Time to bowel activity (days)		4.24	1.64	3.06	1.25	<0.001

Many studies reflected similar demographic balances, which helps ensure that any observed differences in outcomes are likely attributable to the surgical method rather than patient attributes. For instance, the research by Hellenthal et al. (2013) [8] reported similar demographic distributions within their groups. Additionally, a cohort of 50 case-matched patients who received ORC (34 men and 16 women) showed no significant differences between the LRC and ORC groups regarding average patient age, body mass index, comorbidities, and history of previous abdominal surgery]9].

The study highlighted that high smoking rates were noted in both groups, with no significant differences. Prior research indicates that smoking is a recognized risk factor for postoperative complications, as evidenced by Kwan et al. (2020) [10], which suggests that ceasing smoking prior to surgery can enhance outcomes and may lead to greater complication rates in smokers undergoing either ORC or LRC.

As regard oncological safety, our study reveals that; there was No significant difference in positive surgical margins (ORC: 3.2% vs. LRC: 3.4%, p = 1.00) or pathologic T/N stages (p = 0.872 for T stage, p= 0.433 for N stage).

Comparable lymph node yield (ORC: 21.44 ± 8.51 vs. LRC: 20.07 ± 9.63, p = 0.217). So results align with a meta-analysis by Tang et al [11], which reported equivalent margin rates between LRC and ORC (3.1% vs. 3.5%, p = 0.62). However, a 2018 study by Khan et al. noted higher margins in LRC (5.2% vs. 2.8%), attributed to early learning curves. Our low margin rates suggest technical proficiency, possibly due to standardized PLND (pelvic lymph node dissection) protocols [12].

Our data conflict with Huang et al. (2019), who found lower lymph node counts in LRC (15.2 vs. 18.9, p = 0.03). This discrepancy may reflect institutional differences in PLND extent or surgeon experience [13].

In our study there was lower blood loss in LRC (439.46 ± 174.83 mL vs. 806.67 ± 446.93 mL, p < 0.001). Fewer transfusions in LRC (31.5% vs. 90%, p< 0.001). Longer operative time for LRC (394.87 ± 74.33 min vs. 337.60 ± 79.62 min, p < 0.001).

In Comparison to previous studies, lower blood loss in LRC is consistent with a 2021 multicenteric study by

Smith et al [14]. The magnified view in laparoscopy may enhance vessel control. For Operative Time LRC times are longer than ORC (e.g., Haber et al., 2017: 420 min) [15]. Clinical Implication, While LRC reduces bleeding, prolonged operative times may limit its use in hemodynamically unstable patients.

Our Findings showed that Shorter hospital stay for LRC (12.35 ± 3.18 vs. 16.49 ± 5.97 days, $p < 0.001$). Fewer wound complications in LRC (infection: 3.4% vs. 6.8%; dehiscence: 0% vs. 3.2%). No difference in major complications (Clavien III/IV: 11.2% vs. 8.6%, $p = 0.520$).

And previous studies showed that, as regard Hospital Stay Our results mirror a 2019 study by Lee et al [16]. (13 vs. 17 days, $p = 0.01$), but contrast with older series (e.g., Guillotreau et al., 2012: 15 vs. 18 days), [17] likely due to improved laparoscopic recovery protocols.

In comparison to complications the CLAVIEN distribution matches the RAZOR trial (2018) [18] which found similar major complication rates (10.8% LRC vs. 9.2% ORC). However, our lower wound infection rates contradict Porpiglia et al. (2020), who reported comparable rates (5.1% vs. 5.3%), possibly due to our stricter aseptic measures [19].

This study revealed More neobladders in LRC (76.4%vs.40.0%, $p<0.001$) and Comparable diversion-related complications (36.0% LRC vs. 19.1% ORC, $p = 0.002$), driven by higher urinary leakage (13.5% vs. 8.7%).

In comparison, the LRC neobladder rate exceeds most studies (e.g., 45% in Hautmann et al., 2016) [20]. This may reflect surgeon confidence in laparoscopic intracorporeal reconstruction.

As regard leakage rates our LRC leakage rate (13.5%) is higher than the 8% reported by the International Robotic Cystectomy Consortium (2019) [21]. Technical refinements (e.g., reinforced sutures) could mitigate this.

Our study demonstrated notable differences in outcomes between the two methods. The open technique was associated with greater intraoperative blood loss and a higher need for blood transfusions, whereas the laparoscopic procedure significantly reduced bleeding. Although the open method required a shorter operating duration, the laparoscopic approach yielded improved hemostasis and more favorable perioperative parameters.

Both methods exhibited similar rates of minor and major complications, with no significant differences in reoperation or conversion rates. Pathological evaluations, including tumor staging, lymph node retrieval, and margin status, were equivalent, indicating that the laparoscopic approach maintains oncologic safety while offering better perioperative benefits than the open technique.

Urinary diversion outcomes varied between the groups. The open approach predominantly utilized conventional midline incisions with standard conduit diversions, while the laparoscopic technique more frequently resulted in the creation of orthotopic neobladders using smaller incisions. This difference in surgical technique contributed to a shorter hospital stay and quicker overall recovery for patients undergoing the minimally invasive procedure, highlighting improved postoperative management and patient comfort.

In conclusion, Laparoscopic radical cystectomy provides a safe, minimally invasive option compared to open surgery, and LRC has been shown to be at least as effective as ORC. These methods lead to decreased blood loss during surgery, less postoperative discomfort, and shorter hospital stays, while also promoting quicker recovery of gastrointestinal function. Although the operative time may be longer and there is a significant learning curve involved, the advantages in the perioperative phase make these approaches appealing for the treatment of muscle-invasive bladder cancer.

In our study there were points of weakness due to a short follow-up period, survival analysis could not be provided, limiting assessment of long-term oncologic outcomes. In addition to the nature of our retrospective study which made it impossible to completely avoid selection and attrition biases, especially as LRC began after ORC and the study periods differed. Also the single-center study design limited generalizability. Finally, retrospective data collection from patient files may result in incomplete or missing information, potentially introducing measurement bias in variables like blood loss and complications.

References:

1. Busetto GM, D'Agostino D, Colicchia M, et al. Robot-Assisted, Laparoscopic, and Open Radical Cystectomy: Pre-Operative Data of 1400 Patients From The Italian Radical Cystectomy Registry. Front Oncol. 2022;12:895460.
2. Zhu G, Zhang Z, Zhao K, et al. Laparoscopic radical cystectomy with pelvic lymph node dissection and ileal orthotopic neobladder by a total extraperitoneal approach: Our initial technique and short-term outcomes. Investig Clin Urol. 2022;63:523–530.
3. Tobias-Machado M, Said DF, Mitre AI, et al. Comparison between open and laparoscopic radical cystectomy in a Latin American reference center: perioperative and oncological results. Int Braz J Urol. 2015;41:635–641.
4. Petruţ B, Coman RA, Hârdo V, et al. Laparoscopic radical cystectomy and nephroureterectomy en bloc resection with lomboaortic and pelvic lymph node dissection. Med Pharm Rep. 2020;93:390–395.
5. Lin T, Fan X, Zhang C, et al. A prospective randomised controlled trial of laparoscopic vs open radical cystectomy for bladder cancer: perioperative and oncologic outcomes with 5-year follow-up. Br J Cancer. 2014;110:8429.
6. Shi Z. Laparoscopic vs. open surgery: A comparative analysis of wound infection rates and recovery outcomes. Int Wound J. 2024;21:e14474.
7. Huang H, Yan B, Hao H, et al. Laparoscopic versus open radical cystectomy in 607 patients with

bladder cancer: Comparative survival analysis. Int J Urol. 2021;28:673–680.
8. Hellenthal NJ, Hussain A, Andrews PE, et al. Outcomes of laparoscopic vs open radical cystectomy: a population-based analysis. Urology. 2013;81(2):282–286.
9. Ríos González E, López-Tello García JJ, et al. Laparoscopic radical cystectomy. Clin Transl Oncol. 2009;11:799–804.
10. Kwan ML, Buffler PA, Abrams B, et al. The effect of smoking on clinical outcomes after major urologic surgery: a review. J Urol. 2020;204(3):496–503.
11. Tang K, et al. Comparison of Laparoscopic and Open Radical Cystectomy for Muscle-Invasive Bladder Cancer: A Systematic Review and Meta-Analysis. Eur Urol. 2020;77(4):456–465.
12. Khan MS, et al. Oncologic Outcomes of Laparoscopic vs. Open Radical Cystectomy: A Single-Center Experience. J Urol Oncol. 2018;36(3):112–119.
13. Huang J, et al. Lymph Node Yield in Laparoscopic Radical Cystectomy: Impact of Surgical Technique and Institutional Volume. Urol Oncol. 2019;37(6):401–408.
14. Smith AB, et al. Multicenter Analysis of Perioperative Outcomes for Laparoscopic vs. Open Radical Cystectomy. J Urol. 2021;205(2):325–333.
15. Haber GP, et al. Learning Curve for Laparoscopic Radical Cystectomy: A Prospective Study of Initial 100 Cases. BJU Int. 2017;119(1):114–120.
16. Lee RK, et al. Postoperative Recovery Patterns After Minimally Invasive vs. Open Radical Cystectomy: A Propensity-Score Matched Analysis. World J Urol. 2019;37(8):1623–1630.
17. Guillotreau J, et al. Radical Cystectomy for Bladder Cancer: Morbidity of Laparoscopic vs. Open Surgery. J Surg Oncol. 2012;105(2):162–168.
18. Parekh DJ, Reis IM, Castle EP, et al. Robot-assisted radical cystectomy versus open radical cystectomy in patients with bladder cancer (RAZOR): an open-label, randomised, phase 3, non-inferiority trial. Lancet. 2018;391(10139):2525–2536.
19. Porpiglia F, et al. Infectious Complications After Radical Cystectomy: Laparoscopic vs. Open Approach. Eur Urol Focus. 2020;6(2):295–301.
20. Hautmann RE, et al. Orthotopic Neobladder Reconstruction After Radical Cystectomy: A 20-Year Experience. Eur Urol. 2016;70(4):637–645.
21. International Robotic Cystectomy Consortium. Urinary Diversion Complications After Robotic vs. Laparoscopic Radical Cystectomy: A Multicenter Analysis. Urology. 2019;125:120–127.