ORIGINAL ARTICLE

Robot-assisted laparoscopic radical cystectomy is a safe and effective procedure for patients with bladder cancer compared to laparoscopic and open surgery: Perioperative outcomes of a single-center experience

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Summary *Objective:* We compared the perioperative outcomes of patients with bladder cancer according to three different procedures: robot-assisted laparoscopic radical cystectomy (RALC), laparoscopic radical cystectomy (LRC), and open radical cystectomy (ORC).
Methods: From April 2008 to March 2017, 36 consecutive patients underwent radical cystectomy and ileal conduit with RALC ($n = 10$), LRC ($n = 10$), or ORC ($n = 16$). All patients underwent RALC and LRC with extracorporeal urinary diversion. Perioperative data were patient demographics, perioperative laboratory data including hematocrit and creatinine, intraoperative crystalloids and colloids, estimated blood loss (EBL), allogeneic transfusion, respiratory parameters including maximum end-tidal carbon dioxide ($EtCO_2$) and respiratory rate, arterial blood gas data including highest pH, partial pressure of CO_2 ($PaCO_2$), partial pressure of oxygen (PaO_2), operative time, opiate consumption including intraoperative and postoperative anesthesia, time of hospital stay, time to oral intake and normal diet, and adverse events.
Results: EBL was less for RALC than for other procedures ($p = 0.0004$). No blood transfusions were performed for RALC, but ORC required significant blood transfusions ($p = 0.003$). Respiratory rate was highest and $PaCO_2$ was lowest for RALC. Preoperative creatinine levels were significantly worse for the RALC group, but no significant differences were noted after surgery.

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There were no significant differences among the groups in regard to hematocrit levels. Operative time, laparoscopic time, intraoperative anesthesia, and postoperative anesthesia did not differ among the groups. High-grade adverse events were only seen for ORC.

Conclusion: Although RALC required a steep Trendelenburg position, which might add elements of risk, RALC was safe even for this small cohort.

1. Introduction

Muscle-invasive bladder cancer and nonmuscle-invasive bladder cancer with treatment failure have been traditionally treated with open radical cystectomy (ORC) because they are diseases that depend heavily on aggressive resection to optimize cancer control.[1–5] During the past decades, widespread use of minimally invasive surgery has been used for the treatment of urologic diseases. Although this approach was initially restricted to prostate cancer and kidney diseases,[6–8] recent reports have supported the feasibility of laparoscopic radical cystectomy (LRC) and robot-assisted laparoscopic radical cystectomy (RALC) for patients with bladder cancer.[9–12]

In addition, because of the high morbidity commonly associated with ORC, the potential benefits of other procedures with regard to perioperative factors associated with minimally invasive modalities increased their attractiveness. A recent systematic review and meta-analysis showed that LRC and RALC have demonstrated decreased blood loss and hospital stay and more rapid recovery but longer operative time than ORC.[9] A randomized trial indicated that RALC was associated with less blood loss and longer operative times compared with ORC.[1] Another recent randomized trial indicated that there was no significant difference in 90-day complication rates among the three modalities.[2] Moreover, systematic reviews indicated better perioperative findings for patients treated with RALC than with ORC.[10,11]

Although the International Robotic Cystectomy Consortium (IRCC) has reported more than 1000 cases treated with RALC,[13] and although several publications revealed lower or comparable rates of complications, quick recovery, and equivalent oncologic outcomes compared with ORC and LRC, RALC is not yet established as a standard treatment.[9–12] In this study, we compared the perioperative outcomes, including laboratory data, intraoperative valuables, opiate consumption, and adverse events, of patients with bladder cancer who underwent RALC, LRC, or ORC.

2. Methods

2.1. Patients

This study was approved by the ethics committee of Kitasato University School of Medicine and Hospital (B17-003) and was conducted in accordance with the Declaration of Helsinki. Patients with suspected regional lymph node metastasis and distant metastasis, as indicated by computed tomography or magnetic resonance imaging, were excluded from surgical management. From April 2008 to March 2017, 60 consecutive patients were treated with radical cystectomy. Among these patients, five had colon cancer, two had prostate cancer, one had cloacal exstrophy, one had uterine cancer, one had urethral cancer, one had pelvic sarcoma, and one had metastasis of renal cell carcinoma in the prostate; these patients were excluded from this study. Twelve patients, including five who underwent neobladder reconstruction, one who underwent continent reservoir replacement, and six with end-stage renal disease without urinary diversion, were also excluded from this study. The remaining 36 patients underwent radical cystectomy with an ileal conduit using RALC ($n = 10$), LRC ($n = 10$), or ORC ($n = 16$). Regional lymphadenectomy was performed for all patients. Two surgeons performed RALC or LRC, and three performed ORC. The decision of whether to perform the surgical modality was left to the discretion of the attending physicians. Twelve patients received neoadjuvant therapy consisting of two courses of platinum-based chemotherapy. No patients were treated preoperatively with radiation therapy.

2.2. Surgery

All patients underwent RALC and LRC with extracorporeal urinary diversion. ORC was performed through a low abdominal midline incision below the umbilicus. Our LRC procedure was, in part, previously reported.[14] After the laparoscopic procedure, regional lymphadenectomy was performed through a low abdominal midline incision. RALC was performed using a six-port technique (four for robotics and two for the assistant). Open laparotomy was initially performed 2 cm above the umbilicus, and a 12-mm trocar was used for the camera. Two 8-mm robotic trocars were placed 8 cm apart from the camera port in line with the umbilicus. The fourth robotic trocar was placed 8 cm lateral to the left-side robotic trocar vertically above the iliac crest. A 12-mm assistant port was placed 8 cm lateral to the right-side robotic trocar. A 5-mm suction port was placed 7 cm above the line between the camera and the left-side robotics trocar. The patients were then placed in a steep Trendelenburg (25°) position. Epidural anesthesia was performed before surgery for all patients.

Initially, seminal vesicles were identified and the vas deferens was transected. The posterior plane was developed beneath the posterior layer of Denonvilliers' fascia to

detach the bladder from the rectum. Regional lymphadenectomy was performed, including the internal iliac, external iliac, and obturator nodes. The ureters were identified and divided close to the bladder. An immediate frozen section analysis of the ureteral margins was performed to check the remnant cancer. The lateral vascular bundles were transected close to the bladder. Then, the bladder was mobilized off the anterior abdominal wall by dividing the medial umbilical ligaments and urachus. The endopelvic fascia was divided, and the lateral vascular bundles at the prostate were transected. The anterior surface of the prostate was exposed, and the dorsal vein complex was controlled and divided. The urethra was proximally ligated without spillage of the urine, and then it was divided sharply. The bladder and prostate were removed through a lower abdominal 5-cm to 7-cm incision using a camera port. Before the ileal conduit was extracorporeally diverted using a lower abdominal incision, the robot was undocked and the Trendelenburg position was restored. When the cancer was located in the trigon or prostatic urethra, urethrectomy was started using the perineal approach.

An anterior pelvic exenteration was performed for women. The vaginal incision was extended distally on either side of the urethra. The urethra was proximally ligated without spillage of the urine, and then it was divided sharply. The en bloc specimen consisted of the bladder, uterus, fallopian tubes, ovaries, anterior wall of the vagina, and urethra, which were delivered through the vagina. The vagina was reconstructed before the robot was undocked. After the Trendelenburg position was restored, the external meatus and distal remnant urethra were circumferentially cored using a perineal approach, and the ileal conduit procedure was simultaneously performed through a lower abdominal incision using the camera port.

2.3. Data analysis

Clinical stage was based on the histological report of the transurethral resection specimens, chest and abdominal CT, and bone scans. Preoperative symptoms and overall health status were assessed by the American Society of Anesthesiologists (ASA) scores.[15] The pathological stage was determined according to the 2011 TNM classification.

Perioperative data were patient demographics, perioperative laboratory data including hematocrit and creatinine, intraoperative crystalloids and colloids, estimated blood loss (EBL), allogeneic transfusion, respiratory parameters including maximum end-tidal carbon dioxide ($EtCO_2$) and respiratory rate, arterial blood gas data including highest pH, partial pressure of CO_2 ($PaCO_2$), partial pressure of oxygen (PaO_2), operative time, opiate consumption including intraoperative and postoperative anesthesia, time of hospital stay, time to oral intake and normal diet, and adverse events.

Perioperative laboratory data were preoperative, postoperative outcomes, first day of hospital stay, and last day of hospital stay. Opiate use consisted of fentanyl and remifentanil. The operative time comprised the time from the start of surgery to the end of surgery, including cystectomy, lymphadenectomy, urethrectomy, and urinary diversion. The operative time for laparoscopy comprised the time from the start of laparoscopic surgery to the end of cystectomy. Total EBL comprised the total hemorrhage volume during the entire operative time, whereas EBL for laparoscopy comprised the hemorrhage volume during the operative time for laparoscopy. Adverse events related to surgery within 30 days were recorded, defined, and graded according to the Clavien-Dindo classification.[16]

2.4. Statistical analysis

Comparisons among the surgical groups were performed using the chi-squared test (or Fisher's exact test, if appropriate) for categorical variables, and Mann–Whitney test and Kruskal–Wallis for continuous variables. All analyses were performed with StatView (version 5.0; SAS Institute, Cary, NC, USA), and $p < 0.05$ was considered statistically significant.

3. Results

Patient demographics are shown in Table 1. There were no significant differences among the groups in terms of age, gender, body mass index, or ASA score.

Table 2 summarizes the perioperative hematocrit and creatinine values, including preoperative values, values on

Table 1 Patient demographics.

	RALC (n = 10)	LRC (n = 10)	ORC (n = 16)	p
Age, years (range)	67.3 (51–78)	67.0 (41–77)	69.2 (44–82)	0.75
Male	8	8	11	0.74
Female	2	2	5	
Neoadjuvant	4	3	5	0.87
ASA physical status				
1	0	5	9	
2	10	5	6	
3	0	0	1	0.07
Body mass index (range)	22.5 (19.1–26.7)	23.3 (18.4–27.9)	23.1 (18.6–28.7)	0.85

ASA = American Society of Anesthesiologists; LRC = laparoscopic radical cystectomy; ORC = open radical cystectomy; RALC = robotic-assisted laparoscopic radical cystectomy.

Table 2 Perioperative laboratory values.

	RALC (n = 10)	LRC (n = 10)	ORC (n = 16)	p
Hematocrit, % (range)				
Preoperative	39.9 (32.7—47.4)	39.2 (27.8—44.4)	35.8 (26.3—44.0)	0.14
First postoperative	31.9 (21.8—40.4)	31.5 (25.2—43.6)	30.6 (24.0—36.1)	0.73
Discharge	33.5 (26.3—40.7)	33.8 (28.1—37.3)	32.3 (25.8—40.0)	0.5
Creatinine, mg/dL (range)				
Preoperative	1.03 (0.81—1.26)	0.82 (0.49—1.12)	0.88 (0.49—1.86)	0.02
First postoperative	1.13 (0.94—1.44)	0.98 (0.55—1.70)	0.97 (0.70—1.83)	0.08
Discharge	1.00 (0.82—1.24)	0.90 (0.61—1.19)	0.89 (0.59—1.52)	0.14

LRC = laparoscopic radical cystectomy; ORC = open radical cystectomy; RALC = robotic-assisted laparoscopic radical cystectomy.

the first postoperative day, and values on the last day of hospital stay. Preoperative creatinine levels were significantly worse for the RALC group, but no significant differences were noted after surgery. There were no significant differences among the groups in regard to hematocrit levels.

Intraoperative valuables including fluid administration, EBL, respiratory levels, arterial blood gas levels, and operative time are reported in Table 3. Intraoperative crystalloid and colloid administration were not different; however, mean EBL was 1700 mL for the ORC group, 961 mL for the LRC group, and 450 mL for the RALC group (p = 0.0004). No blood transfusions were performed for the RALC group, but ORC patients required significant transfusions (p = 0.003). Respiratory rates were highest for patients who underwent RALC (p = 0.003), but the highest recorded $EtCO_2$ concentration did not differ among groups. According to the respiratory rate, the highest $PaCO_2$ was significantly lower for the RALC group (p = 0.03). There were no differences in terms of the highest pH and PaO_2 among the groups. Operative time and laparoscopic time did not differ among the groups.

Pain management and opiate consumption are described in Table 4. Although patients who underwent ORC were more likely to have high consumption of fentanyl and remifentanil, there was no difference among groups regarding intraoperative anesthesia. In terms of postoperative epidural anesthesia, there was also no significant difference among the groups.

Postoperative outcomes are shown in Table 5. When patients were divided into organ-confined (<pT3) and extravesical disease (≥pT3) groups, there was no difference among the groups. Length of hospital stay and the initial postoperative day when a normal diet was allowed did not differ among the groups; however, oral intake of water was allowed earlier for the RALC group than for the other groups (p = 0.04).

There were no intraoperative complications among groups. Although several minor adverse events occurred among the groups, there were no adverse events in the RALC group. Five patients in the ORC group experienced grade III adverse events. Two patients had hydronephrosis and underwent insertion of ureteral stents using radiological intervention. One patient had leakage from the ileal

Table 3 Intraoperative variables.

	RALC (n = 10)	LRC (n = 10)	ORC (n = 16)	p
Fluid (range)				
Intraoperative crystalloids, mL	3537 (2200—8470)	3250 (1750—4300)	3709 (1350—6200)	0.7
Intraoperative colloids, mL	970 (0—2000)	1430 (800—2350)	1413 (0—3000)	0.21
Estimated blood loss, mL	450 (0—1085)	961 (190—2620)	1700 (400—3100)	0.0004
Estimated blood loss in laparoscopy, mL	100 (0—440)	173 (30—680)	—	0.29
Blood transfusion rates, %	0	10	56	0.003
Respiratory, highest (range)				
$ETCO_2$	39.9 (35—46)	38.3 (34—42)	36.0 (27—42)	0.09
Respiratory rate	14.1 (12—16)	12.9 (10—16)	11.3 (10—14)	0.003
Arterial blood gas, highest (range)				
pH	7.420 (7.359—7.495)	7.444 (7.402—7.490)	7.420 (7.320—7.530)	0.13
$PaCO_2$	40.5 (33.2—48.1)	45.9 (37.3—54.2)	43.3 (36.5—50.0)	0.03
PaO_2	207.0 (130—360)	187.4 (113—282)	198.1 (123—423)	0.82
Operative time, min (range)				
All procedures	499 (352—605)	432 (290—620)	434 (245—679)	0.13
Laparoscopy or console	168 (94—308)	187 (115—261)	—	0.27

$EtCO_2$ = maximum end-tidal carbon dioxide; LRC = laparoscopic radical cystectomy; ORC = open radical cystectomy; $PaCO_2$ = partial pressure of CO_2; PaO_2 = partial pressure of oxygen; RALC = robotic-assisted laparoscopic radical cystectomy.

Table 4 Opiate consumption.

	RALC (n = 10)	LRC (n = 10)	ORC (n = 16)	p
Intraoperative anesthesia				
Fentanyl, μg (range)	275.0 (100−600)	128.6 (50−200)	306.3 (50−700)	0.26
Remifentanil, mg (range)	13.4 (2.5−68.0)	8.8 (3.6−15.8)	24.1 (4.0−115.0)	0.88
Postoperative epidural anesthesia				
Fentanyl, μg (range)	420.0 (0−600)	370.0 (300−500)	450.0 (0−600)	0.14

LRC = laparoscopic radical cystectomy; ORC = open radical cystectomy; RALC = robotic-assisted laparoscopic radical cystectomy.

Table 5 Postoperative outcomes.

	RALC (n = 10)	LRC (n = 10)	ORC (n = 16)	p
<pT3	5	7	9	0.65
≥pT3	5	3	7	
Length of hospital stay, days (range)	22.3 (17−29)	22.9 (14−31)	28.6 (17−53)	0.18
Oral intake, days (range)	2.2 (1−3)	3.3 (2−5)	4.4 (1−14)	0.04
Normal diet, days (range)	9.2 (4−14)	9.5 (5−14)	12.5 (5−35)	0.59
Adverse events				
All	0	3	12	0.002
≥G3	0	0	5	0.03

LRC = laparoscopic radical cystectomy; ORC = open radical cystectomy; RALC = robotic-assisted laparoscopic radical cystectomy.

anastomosis. One patient had paralytic ileus. One patient had a pelvic abscess that was treated with drainage.

4. Discussion

Several reports have shown acceptable perioperative outcomes of minimally invasive radical cystectomy, including laparoscopic and robotic modalities.[9−12] Even during early experiences, like the present study, the surgical and perioperative findings appeared to be comparable to those of the open modalities.[17,18] Although the potential merits of the minimally invasive approaches that have been described in meta-analyses include low EBL, early return of bowel function, and more rapid postoperative convalescence,[9−11] there were no meticulous comparisons among the surgical groups in terms of opiate consumption, intraoperative fluid and laboratory valuables such as respiratory and arterial blood gas. It would be relatively difficult to compare these data in meta-analysis, however, single-center experience potentially provides more detailed data and analyses compared to large series. We believe that these data will reflect a perioperative condition of patients and show a clue what has happened around the surgery.

In the present study, the 30-day complication rates were significantly lower for patients treated with RALC than for those treated with ORC and LRC. Although RALC was associated with low EBL, low blood transfusion rate, low $PaCO_2$ with high respiratory rate, and early oral intake compared with the other modalities, there was no significant difference in terms of perioperative opiate consumption. Although two studies have shown the direct comparison in terms of the oncological outcomes and adverse events in patients with bladder cancer who underwent RALC, LRC or ORC,[2,19] to our knowledge, this study is the first report

provided opiate consumption and perioperative laboratory data among three surgical procedures.

Although RALC is perceived as a less invasive modality, our results demonstrated that intraoperative and postoperative opiate consumption rates were similar among the groups. Webster et al[20] revealed that patients treated with robot-assisted laparoscopic radical prostatectomy received similar total mean morphine volumes compared to those who underwent open radical prostatectomy during their hospital stay. Possible reasons were that robot-assisted surgery requires no movement at the time of console manipulation because of the robotics attached to the patient, resulting in the requirement for more opiates despite being less invasive, and that we utilized epidural analgesia after surgery. Postoperative pain may be an important factor in the length of hospital stay. For patients with low postoperative pain and reduced venous opiate consumption, an earlier discharge could be achieved. Liu et al[21] reported the superiority of epidural analgesia compared to intravenous opiate analgesia for control of postoperative pain. We used postoperative epidural analgesia for all patients and showed that there were no significant differences in terms of opiate dose and length of hospital stay without delay recovering bowel functions among the groups.

RALC requires a steep Trendelenburg position, although this position is generally well-tolerated.[22] However, the steep Trendelenburg position may make ventilation and oxygenation difficult, particularly if patients have respiratory comorbidities. Functional residual capacity was decreased because the abdominal contents were pushed up to the diaphragm by gravity. Then, pneumoperitoneum using CO_2 leads to exacerbated ventilation, which is more challenging. In this study, patients treated with RALC showed significantly increased respiratory rates and had

lower $PaCO_2$ than those who underwent other procedures. These results showed that appropriate ventilation was effectively managed. Generally, respiratory-induced changes in $PaCO_2$ play a role in cerebral blood flow.[23] Increased $PaCO_2$ leads to vasodilation of cerebral arteries subsequent to elevation of cerebral blood flow, whereas decreased $PaCO_2$ leads to vasoconstriction subsequent to the reduction of it.[24,25] Cerebral blood flow was unclear in patients who underwent RALC with steep Trendelenburg positioning; however, Closhen et al[26] reported a clinically irrelevant decrease in cerebral oxygen saturation over 4 h with steep Trendelenburg positioning (40°) and CO_2 pneumoperitoneum in patients treated with robot-assisted laparoscopic radical prostatectomy. This surgical position and low $PaCO_2$ seem to be acceptable in terms of cerebral oxygenation, and we did not encounter any neurological or mental disorders after RALC in this study.

RALC has required longer operative times in previous reports. Li et al[10] demonstrated in their systematic review and meta-analysis that pooling data for 668 patients included significantly longer operative times for RALC than for ORC. Novara et al[11] showed in their systematic review and cumulative analysis that the weighted mean operative time was 360 min (range, 230–618) for RALC involving an extracorporeal conduit. Khan et al[2] reported that mean operative times were significantly longer for the RALC group than for the ORC group or LRC group (389, 293, and 301 min, respectively). Our data showed that RALC was likely to involve long operative times; however, there were no significant differences among the groups. LRC remains a technically challenging procedure, and it lacks the ergonomic advantages offered by RALC. Our outcomes were insufficient to recommend LRC beyond RALC; however, LRC could achieve good results when performed by an expert. A potentially steep learning curve was reported for laparoscopic and robotic modalities.[27] Collins et al[28] demonstrated that operative times could significantly decrease with surgical experience. In the IRCC report,[13] the median overall operative times were 441, 368, and 307 min for those surgeons who had performed fewer than 30 cases, 30–50 cases, and more than 50 cases, respectively. The IRCC report revealed an association between total operative time and surgical volume.

Most of the previous studies that examined the benefits of RALC showed that minimal intraoperative hemorrhage leads to a lower incidence of postoperative adverse events. Li et al[10] showed pooling data of 668 patients indicating that EBL was significantly lower for the RALC group than for the ORC group. Novara et al[11] reported that EBL was significantly lower for the RALC group than for the ORC group. The mean EBL was 375 mL (range, 208–763), and the mean blood transfusion rate was 12% for RALC with an extracorporeal conduit. In addition, Wu et al showed that perioperative mortality and morbidity rates were related to minimal EBL in patients who underwent major non-cardiac surgery.[29] However, Khan et al[2] demonstrated that there was no difference in terms of EBL between the RALC group and the LRC group (585 vs 460 mL). Fonseka et al[9] reported in a systematic review and meta-analysis that the LRC group had reduced EBL compared to the ORC group, but it was not different from that of the RALC group. Because LRC requires an open procedure for lymphadenectomy and urinary diversion after laparoscopic surgery at our institution, there was a significant difference between the RALC and LRC groups in terms of total EBL. However, EBL associated with laparoscopy was not significantly different between groups. Previous reports suggested that laparoscopic surgery including RALC and LRC had lower EBL and transfusion rates than ORC; these are the main merits of these modalities.

A robotic approach has been shown to reduce complication rates. Novara et al[11] reported that the risk of experiencing postoperative complications was lower with RALC than with ORC. For patients with RALC with an extracorporeal conduit, overall 30-day and 90-day complication rates were 44% (range, 26–78) and 59% (range, 30–77). High-grade complications at 30 days and 90 days were 11.8% (range, 0–35) and 15% (range, 4–19). Li et al[10] revealed pooling data of 474 patients indicating that the RALC group showed a significantly lower rate of perioperative complications compared to the ORC group. Ng et al reported that patients treated with RALC experienced lower postoperative complications than those treated with ORC.[3] However, Khan et al[2] showed that there were no statistically significant differences among the surgical groups in terms of 30-day and 90-day major complications and total complications at 90 days. The other three randomized trials compared RALC with ORC. RALC has improved some perioperative parameters, including EBL and length of hospital stay; however, no significant differences in complication rates were demonstrated in the three studies.[1,4,5] A systematic review and meta-analysis comparing RALC with LRC and ORC showed that the complication rates were 28%, 72%, and 47%, respectively.[9] Another review reported complication rates between 8% and 42% for LRC.[30] Our data demonstrated that although RALC and LRC did not show more than grade 3 complications in a small cohort, patients who underwent ORC need to be cautious after surgery. This may be because patients with a history of abdominal surgery were selected as candidates for ORC.

There were several limitations of this study. The sample size of this study was too small. However, EBL during cystectomy, transfusion rate, oral intake, and adverse events can be considered statistically significant, even if the number of patients is low. The present study was a single-institutional retrospective study. Treatment selection bias among the procedures cannot be ignored: a multicenter, prospective study is warranted for more accurate evaluations. Each surgical modality was performed by different surgeons, which may potentially show bias. However, this bias was minimized because all surgeons were well-trained and past their learning curves for their respective operative modality. We did not collect perioperative pain scores. However, perioperative opiate consumption was not significantly different among the procedures. Although pain scores reflect patients' conditions subjectively, we believe opiate consumption reflects pain conditions objectively. No cost analysis was performed. Several studies have published comparisons of costs of RALC and ORC. RALC requires equipment for the procedure, thus leading to increased material costs; however, RALC appears to be more cost-effective when complications after a long hospital stay are taken into consideration.[31] Our findings demonstrate that

RALC represents a safe and oncologically effective procedure for patients with bladder cancer. Although we did not conclude how to control cancer in our short follow-up periods, several reports demonstrated equivalent outcomes for ORC.[12] Nonetheless, RALC is associated with lower risks of EBL, postoperative transfusions, and adverse events.

5. Conclusion

Over the past few decades, the surgical concept has moved away from the obsolete principle of one radical modality. Although the current laparoscopic surgery combined effective cancer control with a minimal impact on quality of life, it seems that the management of patients with bladder cancer remains suboptimal. We face a new paradigm because precision medicine and the need to overcome this aggressive cancer require the application of new technologies like robotics. RALC requires a steep Trendelenburg position, which might add elements of risk, thereby resulting in lower $PaCO_2$ and higher respiratory rates. However, RALC had less EBL, fewer complications, and earlier bowel function recovery compared to other modalities. RALC is a safe and effective procedure, even in this small cohort. Therefore, it can be considered an attractive alternative to conventional modalities.

Conflicts of interest

All authors declare no conflicts of interest.

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