Original article

A comparison of perioperative and early post-operative complications with laparoscopic radical cystectomy with open radical cystectomy in bladder cancer

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Objectives To compare perioperative complications and early post-operative complications occurring within 90 days following laparoscopic radical cystectomy (LRC) and open radical cystectomy (ORC).

Methods This ambispective cohort study included 175 patients who underwent radical cystectomy (100 LRC and 75 ORC) between January 2006 and June 2016. Primary outcomes evaluated complications occurring within 90 days of the operation as defined by the modified Clavien-Dindo system. Secondary outcomes evaluated included operative duration, blood loss, blood transfusion, post-operative pain score, post-operative opioid usage, and length of hospital stay. Primary and secondary outcomes were compared between the two groups.

Results Comparable rates of Clavien-Dindo grade 1-5 complications were observed in both groups and no differences were observed in intraoperative complications. Mean operative times were longer in the LRC group (p<0.05). Mean blood loss and total blood transfusion was lower in the LRC group (p<0.05) as were mean pain scores and total opioid usage (p<0.05). Mean length of hospital stay was the same in both groups.

Conclusion LRC patients have less blood loss, lower blood transfusion rate, and decreased post-operative pain and opioid usage compared to ORC patients. Operative time is shorter for ORC patients. There are no statistically significant differences in post-operative complication rates between LRC and ORC. A limitation of this study was the preponderance of female patients. **Chiang Mai Medical Journal 2016;55(4):153-8.**

keywords: bladder cancer, laparoscopic, open surgery

Introduction

Radical cystectomy is the standard treatment for non-metastatic muscle-invasive, localized bladder cancer and high risk recurrent non-muscle-invasive bladder cancer. It is also the standard care for persistent high-grade disease following two courses of intravesical therapy[1-8]. The operation is composed of radical cystectomy, pelvic lymph nodes dissection and urinary diversion. The complexity of surgical technique needs long time operation and has a significant complication especially in the old patients who has underlying diseases such as cardiovascular, pulmonary and renal dis-

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ease[9]. Minimally invasive surgery and laparoscopy were developed in an effort to reduce morbidity, shorten recovery time, allow smaller incisions and reduce blood loss[3,4]. Because of the relatively small size of the incision, these techniques can decrease postoperative pain and reduce fluid shift resulting from prolonged exposure of peritoneal surfaces to the outside environment[7]. Laparoscopic radical cystectomy (LRC) can reduce blood loss and shorten hospital stays but it does increase operative times compared to open radical cystectomy (ORC)[5,7]. Our study compared perioperative complications and early complications with ORC and with LRC.

Materials and methods

Our study is an ambispective cohort study: retrospective from January 2006 to December 2013 and prospective from January 2014 to June 2016. Data were collected by reviewing the electronic medical records of all radical cystectomy cases at Chiang Mai University Hospital between 2006 and 2013. We excluded six patients diagnosed urethral cancer because of differences in clinical staging, three patients who had concomitant upper urinary tract carcinoma performing nephroureterectomy in the same setting with radical cystectomy, two patients needed to convert from laparoscopic to open technique because of severe fibrosis and tumor invasion of the rectum. An additional 14 patients were lost to follow up. (10 in the ORC group and 4 in the LRC group). Urinary diversion, orthotopic neobladder or ileal conduit were performed using an extracorporeal approach.

Perioperative complications were recorded for the first 90 days after surgery. All perioperative complications were graded using a modified Clavien-Dindo system[10]. Pathologic stage and tumor grading were classified using the 2002 TNM system and the World Health Organization/International Society of Urological Pathology 1998 classification system. Pain scores using a visual analog scale of 0-10 were recorded for the first 24 hours. The formula for calculating total post-operative intra venous opioid usage in milligram was : milligram of morphine = milligram of pethidine/10 = milligram of fentanyl x 100 and we excluded the patients who had epidural anesthesia.

Data was analyzed using the Stata 12.0 program. Median was computed for continuous variables, Student's t-test was used for comparisons between groups and chi-square was used with continuous variables. Multivariate analysis with odds ratio and confidence intervals was also conducted. All tests were two-tailed with statistical significance set at $p<0.05$.

Results

Baseline characteristics

Seventy-five patients underwent open radical cystectomy and 100 patients were operated on using the laparoscopic technique. There were no significant differences in age, body mass index, ASA score, underlying diseases, tumor stage, tumor size, diversion type or neo-adjuvant treatment between the groups. The percentage of females was significant higher in the ORC group ($p<0.05$) (Table 1).

Operative time was significantly higher in the LRC group (6.35 hr vs. 5.34 hr, $p<0.001$), while there was significantly more blood loss and greater blood transfusion in ORC group ($p<0.0001$). Postoperative pain in the first 24 hours was not significantly different between the groups, but the mean combined post-operative pain scores for the first three days was lower in LRC group ($p=0.004$) as was total post-operative opioid usage ($p<0.001$). Incidence of perioperative complications such as bowel injury and iatrogenic bladder perforation were similar in both groups. Early postoperative complications in the first 90 days classified by the Clavien-Dindo system were not significantly different between the two techniques. Similarly, length of hospital stay was not significantly different (Table 2). Multivariate analysis shows that ORC had shorter operative times but higher blood loss and blood transfusion (Table 3).

Discussion

The primary goal of this study was to compare perioperative and early post-operative complications between ORC and LRC patients. Our study found that the ORC technique had significantly higher blood loss and a higher intraoperative blood transfusion rate than LRC. Some studies have reported no statistically significant difference in blood loss and transfusion between the two techniques[11,16] while a number of other studies have reported that

Table 1. Patient characteristics

Demographic data	ORC (n=75)	LRC (n=100)	*p*
Gender, n(%)			0.002*
Male	57 (76)	93 (93)	
Female	18 (24)	7 (7)	
Age, mean(SD)	62.46 (11.58)	61.16 (9.86)	0.422
BMI, mean(SD)	21.33 (4.27)	22.29 (3.67)	0.112
ASA, n(%)			0.417
Grade 1	12 (16)	18 (18)	
Grade 2	53 (70.67)	75 (75)	
Grade 3	10 (13.33)	7 (7)	
Underlying diseases, n(%)			
Hypertension	24 (32)	40 (40)	0.342
Heart disease	8 (10.67)	8 (8)	0.602
Pulmonary disease	3 (4)	3 (3)	1.000
DM	7 (9.33)	13 (13)	0.483
Creatinine >1.2	33 (44)	38 (38)	0.441
Prior abdominal surgery	8 (10.67)	8 (8)	0.602
Anemia	3 (4)	5 (5)	1.000
Cerebrovascular	1 (1.33)	0 (0)	0.429
Cirrhosis	1 (1.33)	1 (1)	1.000
Pathologic stage, n(%)			0.418
CIS	2 (2.67)	1 (1)	
Ta	5 (6.67)	3 (3)	
T0	1 (1.33)	2 (2)	
T1	11 (14.67)	22 (22)	
T2	25 (33.33)	35 (35)	
T3	19 (25.33)	29 (29)	
T4	12 (16)	8 (8)	
Nodal stage, n(%)			0.159
Stage 0	51 (68)	80 (80)	
Stage 1	7 (9.33)	9 (9)	
Stage 2	16 (21.33)	10 (10)	
Stage 3	1 (1.33)	1 (1)	
Tumor grade, n(%)			1.000
Low	7 (10.14)	10 (10.53)	
High	62 (89.86)	85 (89.47)	
Tumor type, n(%)			0.671
Transitional cell carcinoma	69 (92)	95 (95)	
Adenocarcinoma	2 (2.67)	1 (1)	
Squamous cell carcinoma	2 (2.67)	2 (2)	
Rhabdomyosarcoma	0 (0)	1 (1)	
Leiomyoma	1 (1.33)	0 (0)	
Paraglanglioma	1 (1.33)	0 (0)	
Neuroendocrine tumor	0 (0)	1 (1)	
Diversion, n(%)			0.638
Ileal conduit	63 (84)	80 (80)	
Studer neobladder	10 (13.33)	18 (18)	
Hartmann's pouch neobladder	1 (1.33)	2 (2)	
Colon conduit	1 (1.33)	0 (0)	
Neoadjuvant chemotherapy, n(%)			0.688
None	69 (92)	95 (95)	
Gemcitabine/Cisplatin	4 (5.33)	4 (4)	
MVAC	2 (2.67)	1 (1)	

Table 2. Perioperative and early postoperative outcomes

Parameter	ORC n=75	LRC n=100	*p*
Operative time (min), mean (SD)	320.66 (61.12)	381.40 (67.54)	<0.001*
Blood loss (ml), mean (SD)	1566.13 (839.68)	757.50 (564.62)	<0.001*
Blood transfusion (ml), mean (SD)	769.46 (440.26)	276.72 (307.03)	<0.001*
Pain score 24 hour, mean (SD)	3.61 (1.32)	3.76 (1.32)	0.545
Pain scores 3 day, mean (SD)	4.10 (0.96)	3.33 (1.27)	0.004*
Total opioid usage (mg), mean (SD)	28.90 (18.59)	19.7 (13.01)	<0.001*
Intraoperative complications, n (%)			0.873
Bowel injury	2 (2.6)	5 (5)	
Ruptured bladder	1 (1.3)	2 (2)	
Clavien-Dindo classification, n (%)			
No complication	14 (18.67)	19 (19.00)	1.000
Grade I	27 (36.00)	38 (38.00)	0.881
Grade II	18 (24.00)	27 (27.00)	0.728
Grade III	3 (4.00)	9 (9.00)	0.238
Grade IV	10 (13.33)	6 (6.00)	0.115
Grade V	3 (4.00)	1 (1.00)	0.315
Complications, n (%)			
Blood transfusion post operation	10 (13.33)	10 (10)	0.623
Wound	8 (10.67)	10(10)	1.000
Gastrointestinal	5 (6.67)	11 (11)	0.430
Ileus	3 (4)	5 (5)	0.241
Bowel obstruction	2 (2.67)	5 (5)	0.240
Genitourinary	2 (2.67)	5 (5)	0.700
UTI	10 (13.33)	12 (12)	0.821
Post-operative ventilator support	10 (13.33)	5 (5)	0.060
Thromboembolic event	3 (4)	0 (0)	0.770
Length of hospital stay in days, mean (SD)	13.84(7.66)	13.09 (7.23)	0.509

Table 3. Multivariable analysis of LRC and ORC outcomes

Parameter	OR	95%C.I	*p*
Operative time	1.025	1.016-1.034	<0.001
Blood transfusion	0.996	0.994-0.998	0.002
Blood loss	0.998	0.997-0.999	<0.021

laparoscopic cystectomy provides the benefit of less blood loss and transfusion[5,13,15,18]. Use of a pneumoperitoneum and a hemostatic sealing device such as a vascular stapler or LigaSure® (Covedien product, MEDTRONIC PARKWAY, MINNEAPOLIS) is helpful in decreasing blood loss and reducing the need for blood transfusion. Operative time was significantly longer in the LRC group, a finding which agrees with other studies[5,7,13] although Basillote et al. found no statistically significant difference[16].

Post-operative analgesic usage and pain scores have been reported to be lower with LRC in many studies[7,13,15,16] just as in our study. That difference is due to the smaller incision midline wound and lower abdominal retraction[7].

The modified Clavien-Dindo classification system is used for reporting surgical complications[5,10]. A cohort study by Khan *et al.* found no statistically significant differences in early complications between the two methods when classified using the Clavien-Dindo system[14]. Guillotreau *et al* reported in a prospective non-randomized controlled trial which, rather than using the Clavien-Dindo system, categorized complications as either major or minor. They found significantly more minor complications in the ORC group than the LRC group, but no

significant differences in term of major complications. They reported that the ORC group had more incidents of cardiopulmonary decompensation, sepsis, deep abscess than the LRC group[15]. A retrospective study by Basillote et al. compared surgeries involving an ileal neobladder and found no statistically significant difference in either minor or major complications between the two groups[16].

Many studies have reported that the length of hospital stays were shorter with LRC[5,11,13,15]. Cohort studies by Hemal and Khan found no statistically significant differences in length of hospital stay with ORC and LRC[7,14]. Our study reported that the length of hospital stay in both techniques is nearly 2 weeks because most of our intended to stay in the hospital until the ureteric catheter has been removed which is on day 10 to day 14.

Limitations of this study are retrospective aspect and small populations.

Conclusions

LRC is a safe procedure which can reduce blood loss, blood transfusion rates, post-operative pain and analgesic usage compared to ORC, but it does result in longer operative times. Complications as measured using the Clavien-Dindo classification system are comparable to those with an open technique.

Abbreviations and Acronyms

LRC = Laparoscopic radical cystectomy

ORC = Open radical cystectomy

RARC = Robotic assist laparoscopic radical cystectomy

RC = Radical cystectomy

MVAC=Mitomycin, Vinblastin, Adriamycin and cisplatin

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การเปรียบเทียบภาวะแทรกซ้อนในระยะแรกของการผ่าตัดกระเพาะปัสสาวะแบบผ่าตัดผ่านทางกล้องและผ่าตัดเปิด

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วัตถุประสงค์ เพื่อศึกษาเปรียบเทียบภาวะแทรกซ้อนระหว่างการผ่าตัดและหลังผ่าตัดภายในระยะเวลา 90 วัน ของการผ่าตัดกระเพาะปัสสาวะแบบผ่าตัดผ่านทางกล้องและผ่าตัดเปิด

วิธีการ การศึกษาแบบ Ambispective cohort study ตั้งแต่ มกราคม พ.ศ. 2549 ถึงมิถุนายน พ.ศ. 2559 โดยมีผู้ป่วยทั้งหมด 175 ราย ได้รับการผ่าตัดรักษาแบบผ่าตัดผ่านทางกล้อง 100 ราย และผ่าตัดแบบเปิด 75 ราย วัตถุประสงค์หลักของการศึกษาเพื่อประเมินภาวะแทรกซ้อนโดยการใช้ Modified Clavien-Dindo system วัตถุประสงค์รองเพื่อศึกษา ระยะเวลาในการผ่าตัด การเสียเลือด การเติมเลือด ระดับความเจ็บปวดหลังการผ่าตัด การใช้ยาแก้ปวดกลุ่ม opioid หลังการผ่าตัด ระยะเวลาในการนอนโรงพยาบาลโดยศึกษาเปรียบเทียบทั้งสองวิธี

ผลการทดลอง ไม่มีความแตกต่างของภาวะแทรกซ้อนระดับ 1-5 ระหว่างการผ่าตัดและหลังการผ่าตัด 90 วัน กลุ่มผ่าตัดผ่านทางกล้องใช้ระยะเวลาการผ่าตัดนานกว่า แต่มีภาวะการเสียเลือดและการเติมเลือดน้อยกว่า และลดระดับความเจ็บปวดและการใช้ยากลุ่ม opioid เทียบกับกลุ่มผ่าตัดแบบเปิดอย่างมีนัยสำคัญทางสถิติ (p<0.05) แต่ไม่มีความแตกต่างระยะเวลาในการนอนโรงพยาบาล ของทั้งสองกลุ่ม

สรุป ประโยชน์ของการผ่าตัดผ่านทางกล้องในการศึกษานี้ คือ ลดการเสียเลือดและการเติมเลือด ลดระดับความเจ็บปวดและการใช้ยากลุ่ม opioid แต่ใช้เวลาในการผ่าตัดนานกว่าผ่าตัดแบบเปิด และไม่พบความแตกต่างของภาวะแทรกซ้อนระหว่างผ่าตัดและหลังการผ่าตัด 90 วัน ข้อจำกัดของการศึกษาวิจัยนี้คือเป็นการศึกษาแบบ Ambispective cohort ทำให้มีความลำเอียงในการเลือกผู้ป่วยและวิธีการผ่าตัด จึงมีความแตกต่างของประชากรโดยเพศหญิงมากกว่าในกลุ่มผ่าตัดเปิด **เชียงใหม่เวชสาร 2559;55(4):153-8.**

คำสำคัญ: bladder cancer, laparoscopic, open surgery