Laparoscopic versus Open Surgery for Rectosigmoid and Rectal Cancer

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Objectives: *The aim of this study was to evaluate feasibility and safety of laparoscopic surgery for rectosigmoid cancer and rectal cancer.*
Material and Method: *Twenty four patients who underwent laparoscopic surgery for rectosigmoid cancer or rectal cancer were retrospectively evaluated. Results were compared with those of 25 patients who had open surgery at the same period. The procedures of both groups were anterior resection, low anterior resection, coloanal anastomosis, abdominoperineal resection and subtotal colectomy.*
Results: *The mean operative time was significantly increased in the laparoscopic group. However, this group showed faster recovery of bowel function. There were no differences in the distal margin and yield of harvested lymph nodes of resected specimens. Although anastomotic leakage was comparable between 2 groups, surgical wound infection was significantly higher in open surgery group.*
Conclusion: *Laparoscopic surgery for rectosigmoid cancer and rectal cancer is feasible and can be performed safely with comparable oncological clearance.*

Keywords: *Laparoscopic surgery, Rectosigmoid cancer, Rectal cancer, Anterior resection, Low anterior resection, Coloanal anastomosis, Subtotal colectomy, Short term outcome*

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Several studies show that laparoscopic surgery is, at least, as equivalent as conventional open surgery for colon cancer in short term recovery outcome and long term oncological outcome[1-4]. The safely and feasibility of laparoscopic approach for rectal cancer, however, is not well established yet.

The early reports of laparoscopic approach for rectal cancer were mainly about the abdominoperineal resection or anterior resection for low and high lying tumor respectively[5-10]. However, this approach was not routinely recommended for sphincter preserving operation for rectal cancer because of the complexity of the technique required in laparoscopic approach to achieve total mesorectal excision (TME) as in open technique.

The objective of the present study was to evaluate feasibility and safety of laparoscopic surgery for rectosigmoid cancer and rectal cancer.

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Material and Method

Between June 2004 and May 2005, 70 patients with rectosigmoid cancer or rectal cancer underwent laparoscopic or open colorectal operations at King Chulalongkorn Memorial Hospital. Patients with locally advanced cancer with tumor invasion to neighboring structure were excluded. There were 24 patients who had laparoscopic surgery, and 25 patients in the open group. Type of the procedure was chosen based on surgeon's preference and patient's afford.

Data recorded included age, sex, body mass index (BMI), underlying disease, preoperative radiation, previous surgery, location of tumor, procedure performed, anastomosis technique, staging, operative and postoperative results, pathological data on resected specimens, and postoperative morbidity and mortality (Table 1-4).

Preoperative management and technique

All patients were evaluated by standardized preoperative assessment that included physical examination, barium enema, colonoscopy,chest x-ray, carcino-

embryonic antigen (CEA), ultrasonography, and abdominal CT. For a patient with preoperative radiation, the surgical procedure was performed 4-6 weeks after completion of radiation therapy.

A primary rectal carcinoma was defined according to the distance from anal verge if it was located in the lower third (0-6 cm), middle third (7-12 cm), or upper third of the rectum or rectosigmoid junction (above 12 cm).

For rectal cancer surgery, an anterior resection was defined as if the anastomosis was intraperitoneal, above the anterior peritoneal reflection. A low anterior resection was defined as if the anastomosis was below the anterior peritoneal reflection.

The technique of laparoscopic resections for rectosigmoid cancer and rectal cancer is performed by medial to lateral approach, including high ligation of inferior mesenteric artery (IMA) followed by retroperitoneal dissection of sigmoid and descending colon. Splenic flexor mobilization was mandatory for low anterior resection and coloanal anastomosis, and this step was done by ligation of inferior mesenteric vein (IMV) below the pancreas and dissection under the splenic flexor. After complete retroperitoneal dissection, lateral dissection of sigmoid, descending and splenic flexor was performed.

For the rectosigmoid cancer and upper rectal cancer, mesorectum was dissected and transected partially. Anastomosis was performed with handsewn or stapling technique. For middle and low rectal tumor, total mesorectal excision was performed and a low anterior resection using double stapling technique was accomplished if adequate rectal margin can be achieved, or intersphincteric dissection followed by handsewn coloanal anastomosis was done instead if tumor was closed to anal sphincter. If a sphincter saving operation could not be performed due to invasion of anal sphincter, an abdominoperineal resection was performed.

Statistical analysis

Statistical analysis was performed using Student's t -test, Fisher's exact test, Pearson X^2 test and the Mann-Whitney *U* test to determine significant differences between the laparoscopic and open groups. A *p* value less than 0.05 was considered significant.

Results

The patients' demographic data are summarized in Table 1. No significant differences were observed in baseline characteristics between the two groups, with the exception that underlying heart disease was significantly greater in the laparoscopic group ($p = 0.022$) and location of the tumor between the 2 groups was not in the same distribution ($p = 0.015$).

Procedures in both groups were anterior resection, low anterior resection, coloanal anastomosis and subtotal colectomy regarding the location of the tumor. Anastomosis was accomplished by handsewn or stapling technique without significant difference between 2 groups. Protective ileostomy was done for some cases with low anterior resection in open group and for all cases with handsewn coloanal anastomosis except one in laparoscopic group.

Four patients in the laparoscopic group and 1 patient in the open group had been simultaneous combined surgery performed. In the laparoscopic group, two patients underwent concurrent laparoscopic cholecystectomy and 1 patient, who was diagnosed as rectal cancer with a history of hereditary nonpolyposis colorectal cancer (HNPCC), underwent laparoscopic subtotal colectomy with concurrent TAH with BSO. One patient from each group had simultaneous liver biopsy performed. Two patients in laparoscopic group were converted to open surgery because of generalized bowel dilatation.

Mean operative time was significantly longer in the laparoscopic group, and there was no significant difference in perioperative blood loss and blood transfusion. However, patients in the laparoscopic group had significantly earlier return of bowel function, (Table 2).

On the pathological data, the distal margin clearance was comparable (2.44 cm vs. 2.98 cm) and the mean yield of harvested lymph nodes did not differ after laparoscopic and open surgery (21.2 lymph nodes vs. 24.44 lymph nodes), (Table 3). There was no perioperative mortality in both groups, the morbidity rate was 12.5% (3/24) in the laparoscopic group and 40% (10/25) in the open group. No significant differences were found in terms of anastomotic leakage, intestinal obstruction, urinary tract infection and postoperative bleeding. However, after open surgery the wound infection was higher compared to laparoscopic surgery ($p = 0.022$) (Table 4).

Discussion

Although there is level one evidence showing that laparoscopic colectomy improves postoperative recovery[1,2,8], few studies on laparoscopic rectal cancer surgery have addressed this issue. In the present study, short term outcomes were compared between laparoscopic and open surgery in patients with rectosigmoid cancer and rectal cancer.

Table 1. Demographics and Patient's characteristics

Parameter	Laparoscopic (n = 24)	Open (n = 25)	p-value
Age (year)†	63.2 ± 14.0	61.3 ± 8.4	0.581
Sex (M:F)‡	17 : 7	13 : 12	0.244
BMI (kg/m^2)†	21.5 ± 3.2	23.0 ± 3.5	0.162
Underlying disease‡			
DM	4	1	0.189
HT	8	6	0.684
Heart disease	5	0	0.022
COPD	1	1	1.000
Bleeding tendency	1	0	0.490
Preoperative Radiation‡	1	0	0.490
Previous abdominal surgery‡	4	7	0.342
Location of tumor			
Rectosigmoid and Upper rectum	10	12	
Mid rectum	2	9	
Lower rectum	12	4	
Procedure			
Anterior resection	4	7	
Low anterior resection	8	13	
Coloanal anastomosis	8	2	
Abdominoperineal resection	3	2	
Subtotal colectomy	1	1	
Other procedure			
Cholecystectomy	2	0	
Liver biopsy	1	1	
TAH with BSO	1	0	
Anastomosis (handsewn : stapler) ‡	14 : 7	15 : 8	0.869
Protective ileostomy‡	7	5	0.360
Conversion	2	-	-
Staging§			0.060
Stage I	5	1	
Stage II	7	9	
Stage III	9	15	
Stage IV	3	0	

† Student's t -test; ‡ Fisher's exact test; § Pearson X^2 test

Table 2. Operative and postoperative results

Parameter	Laparoscopic	Open	p-value
Operative time (minute)µ	370 (210-540)	242 (105-390)	0.000
Blood loss (cc) µ	328 (50-1000)	678 (50-4000)	0.129
Blood transfusion (unit) µ	0.38 (0-3)	0.80 (0-4)	0.285
Day of return of bowel functionµ	1.9 (1-5)	3.6 (2-6)	0.000
Day of ambulationµ	2.4 (1-5)	3.1 (1-7)	0.079
Hospital stay (day) µ	11.0 (7-31)	12.9 (7-32)	0.111

µ Mann-Whitney U test

Several series have demonstrated that postoperative mortality rates following laparoscopic rectal cancer surgery were similar and there was no increased overall morbidity when compared with open surgery[1,2,5-7,11,12]. Despite longer operative time, the results from the present study indicate that this technique can be performed safely and does not result in higher morbidity or mortality than conventional open surgery. Moreover, patients in the laparoscopic group had faster return of bowel function and no one in this

Table 3. Pathological data on resected specimens

Parameter	Laparoscopic	Open	p-value
Distal margin (cm)†	2.44 ± 1.58	2.98 ± 1.66	0.247
Number of lymph nodes†	21.20 ± 9.37	24.44 ± 13.84	0.345

† Student's t -test

Table 4. Postoperative complication

Parameter	Laparoscopic (n = 24)	Open (n = 25)	p-value
Mortality	0	0	-
Morbidity‡			
Anastomotic leakage	2	2	1.000
Intestinal obstruction	0	1	1.000
Wound infection	0	6	0.022
Urinary tract infection	0	1	1.000
Bleeding	1	0	0.490
Total	3	10	0.051

‡ Fisher's exact test

group developed surgical wound infection compared to six patients in the open surgery group who had laparotomy wound infection. These findings are consistent with other series[1,2,5,13].

In the laparoscopic group, anastomotic leakage was found in 2 patients (1 low anterior resection and 1 coloanal anastomosis). Diverting ileostomy without detachment of anastomosis was performed for both patients and subsequent ileostomy closure was successfully done in the next hospital admission.

Total mesorectal excision (TME) is well established as a standard operation for rectal cancer in achieving adequate distal and lateral margin[14,15]. The extent of adequately radical surgery may be a major problem with laparoscopic surgery, but many comparative studies have clearly demonstrated that oncological principles, are not compromised by laparoscopic technique, and that the yield of lymph nodes and surgical margins are comparable to those with conventional open surgery[5,6,11,13,16,17]. In the present study, yields of lymph nodes and surgical margins were not significantly different in laparoscopically and conventionally resected specimens and it can be concluded that an equally radial operation can be performed.

Techniques of laparoscopic intersphincteric dissection with handsewn coloanal anastomosis had been reported for patients with lesions located in the lower rectum without any fixation to anal sphincter[11,18-20]. This technique allows a sufficient distal margin to be obtained under direct vision. The laparoscopic sphincter saving operation performed in the present study was 87.5% (21/24) that composed of 8 handsewn coloanal anastomosis (33.5%).

In conclusion, the present study demonstrates that laparoscopic surgery for rectosigmoid cancer and rectal cancer can be performed safely with comparable morbidity and mortality to open surgery, and that it offers benefits in terms of bowel function and wound complication. Despite lacking of long term data, no difference is found on pathologic data on resected specimens, and it can be used as surrogate end point for oncological outcome.

According to good recovery outcomes and early oncological outcomes, further studies, in the context of large randomized trials, are needed to determine its long term oncological outcomes.

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การศึกษาประสิทธิผลของการผ่าตัดด้วยกล้องส่องในการผ่าตัดรักษาโรคมะเร็งลำไส้ใหญ่ส่วนปลายและมะเร็งทวารหนัก เปรียบเทียบกับการผ่าตัดแบบเปิดช่องท้อง

ชูชีพ สหกิจรุ่งเรือง, จิรวัฒน์ พัฒนะอรุณ, กษยา ตันติผลาชีวะ, อรุณ โรจนสกุล

วัตถุประสงค์: *เพื่อประเมินผลของการผ่าตัดด้วยกล้องในการรักษาโรคมะเร็งลำไส้ใหญ่ส่วนปลายและมะเร็งทวารหนัก (rectosigmoid and rectal cancer) เปรียบเทียบกับการผ่าตัดแบบเปิดช่องท้อง โดยศึกษาด้านความปลอดภัยและความเป็นไปได้ ที่จะนำมาใช้จริง*

วัสดุและวิธีการ: *เป็นการศึกษาย้อนหลังจากเวชระเบียนผู้ป่วยที่เข้ารับการผ่าตัด ที่โรงพยาบาลจุฬาลงกรณ์ด้วยโรคมะเร็งลำไส้ใหญ่ส่วนปลายและมะเร็งทวารหนัก ระหว่างเดือนมิถุนายน พ.ศ.2547 ถึงเดือนพฤษภาคม พ.ศ. 2548 มีผู้ป่วยในการศึกษาทั้งสิ้น 49 คน แบ่งเป็นกลุ่มที่ได้รับการผ่าตัดด้วยกล้องส่อง 24 คน และกลุ่มที่ได้รับการผ่าตัดแบบเปิดช่องท้อง 25 คน วิธีการผ่าตัดที่ใช้ในผู้ป่วยทั้งสองกลุ่ม ได้แก่ anterior resection, low anterior resection, coloanal anastomosis, abdominoperineal resection และ subtotal colectomy*

ผลการศึกษา: *กลุ่มที่ได้รับการผ่าตัดด้วยกล้องส่องใช้เวลาผ่าตัดนานกว่ากลุ่มที่ได้รับการผ่าตัดแบบเปิดช่องท้องอย่างมีนัยสำคัญทางสถิติ อย่างไรก็ตามผู้ป่วยที่ได้รับการผ่าตัดด้วยกล้องส่องมีการฟื้นตัวกลับมาทำงานของลำไส้ได้รวดเร็วกว่าอย่างมีนัยสำคัญ จากการศึกษาผลทางพยาธิวิทยา ในด้านระยะห่างของขอบลำไส้ส่วนปลายกับเนื้อมะเร็ง (distal margin) และจำนวนต่อมน้ำเหลือง พบว่าไม่มีความแตกต่างในผู้ป่วยทั้งสองกลุ่ม จากการศึกษาภาวะแทรกซ้อนหลังผ่าตัด ถึงแม้ว่าวิธีทั้งสองจะมีอัตราการรั่วของรอยต่อลำไส้ไม่แตกต่างกัน แต่พบว่าอัตราการติดเชื้อของแผลผ่าตัดของผู้ป่วยที่ได้รับการผ่าตัดของผู้ป่วยในกลุ่มที่ได้รับการผ่าตัดแบบเปิดช่องท้องสูงกว่าอย่างมีนัยสำคัญทางสถิติ*

สรุป: *การผ่าตัดมะเร็งลำไส้ใหญ่ส่วนปลายด้วยกล้องส่อง มีความปลอดภัยและสามารถตัดเนื้อเยื่อได้ขอบเขตพอเพียงทัดเทียมกับวิธีการผ่าตัดมาตรฐาน*