

Original Article

# Short-term Surgical Result and Oncological Follow up of Laparoscopic Anterior Resection for Malignant Disease

Ming-Cheng Chen  
Feng-Fan Chiang  
Hwei-Ming Wang  
Hsiu-Feng Ma  
De-Xing Chao

Division of Colorectal Surgery, Department  
of Surgery, Taichung Veterans General  
Hospital, Taichung, Taiwan

## Key Words

Laparoscopy;  
Anterior resection;  
Colorectal cancer

**Background.** Laparoscopic anterior resection has been recognized as a safe and effective alternative to conventional anterior resection, but the experience sharing is rare in Taiwan.

**Methods.** This was a single-surgical team, single-center retrospective study. From 1998 to 2006 all patients admitted via our out-patient department for elective anterior resection of proved colorectal malignancy were evaluated for eligibility. Cases of emergent operation and obvious sign of bowel obstruction were excluded.

**Results.** Laparoscopic anterior resection was associated with shorter hospital stay (10.3d vs. 15d,  $p < 0.001$ ), with higher hospital fee (\$121112 vs. \$106721,  $p < 0.0001$ ), lower wound complication rate (0% vs. 11%,  $p < 0.0001$ ), and longer operation time (180.8 minutes vs. 140 minutes,  $p < 0.0001$ ) compared with conventional anterior resection. Increased incidence of liver metastasis was found in laparoscopy group while overall survival was not affected.

**Conclusion.** Laparoscopic anterior resection is a safe alternative to conventional anterior resection for colorectal malignancy in Taiwanese patients. The increased incidence of liver metastasis in laparoscopy group deserved further investigation and may be caused by pneumoperitoneum. The operation time and hospital fee were longer and higher for laparoscopy surgeries.

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Since the advent of laparoscopic colorectal surgery in the 1990's, anterior resection by laparoscopic approach has been accepted as a safe and feasible alternative to conventional anterior resection for malignant disease. The recognized benefits of laparoscopic surgery include shorter hospital stay, less post-operative pain, lower incidence of wound complication and fewer occurrences of post-operative ileus.<sup>2-6,11</sup> Oncological results of the laparoscopic approach have not been inferior to those of conventional surgery.<sup>2-6</sup> In Taiwan, however, few studies have been conducted di-

rectly comparing conventional and laparoscopic anterior resection in the same period. In this article, a single-center, single surgical team, retrospective analysis study comparing the two types of colorectal surgery is presented.

## Patients and Methods

This study was based on a retrospectively col-

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Correspondence to: Dr. Hwei-Ming Wang, Division of Colorectal Surgery, Taichung Veterans General Hospital, No. 160, Sec. 3, Chung-Kang Rd., Taichung, Taiwan. Tel: +886-4-2359-2525 ext. 5162; Fax: +886-4-2350-0920; E-mail: henry\_chen@vghtc.gov.tw

lected database approved by the hospital's Institutional Review Board. Only one of the two surgical teams at our hospital that perform laparoscopic surgery was included in the current study. From July 1998 to Nov 2006, patients admitted via the out-patient department to the of colorectal surgery division, surgery department of Taichung Veteran's General Hospital's surgical department for elective anterior resection of proved malignancy of sigmoid colon and upper third rectum were evaluated for eligibility in this study. Patients requiring emergent surgery, patients admitted via other medical department (Gastrointestinal section, for example), patients with signs of total obstruction, and patients with metastatic colorectal cancer were excluded from this study. All patients' demographic data and American Society of Anesthesiologists class were recorded in our database.

The patients were admitted one or two days prior to scheduled surgery. Basic surveys including cell counts, biochemistry, blood coagulation profiles, chest-X-ray and electrocardiography were obtained. Clear liquid diet, oral cathartics and mechanical colon preparation were given one day before surgery. We do not routinely use oral antibiotics for chemical colon preparation.

The conventional surgery was either performed by one of four attending staffs on our surgical team, or by senior residents (R4 and CR) under direct supervision of visiting staff. The laparoscopic surgery was performed by two visiting staff of our surgical team (Hwei-Ming Wang and Feng-Fan Chiang). The decision for conversion to conventional surgery would be considered if one of the following conditions occurred: unexpected bowel injury, ureter injury, uncontrolled bleeding, extensive adhesion, or the tumor was so far advanced that proceeding with laparoscopic surgery would jeopardize favorable outcome.

Operation time was recorded on skin-to-skin basis. All transfusions given intraoperatively or within 3 days of operation were recorded as surgery-related transfusions. Mortality was defined as death within 30 days of operation. In addition, we also accessed the Bureau of Health Promotion's database, in order to record patients who died at home and help clarify our database. Anastomosis leakage was diagnosed when

clinical signs indicated: pus, gas, or fecal content from drainage tube, fecal material passage from wound, or radiologically apparent peritonitis or pelvic abscess revealed by computed tomography of abdomen. We do not routinely perform post-operative lower GI series to document a subclinical leak. Wound infection was defined as deterioration of wound condition requiring removal of stitches and application of wet-dressing.

The tumor size, number of lymph nodes harvested, distal margin and proximal margin of resection were confirmed by pathology studies. Hospital fees were calculated based on our applications to the Bureau of National Health Insurance for reimbursement of admission fees plus fee for disposable laparoscopy instruments. As such, patients admitted via non-surgical department were excluded from the study in order to avoid confounding the results of fee analysis. Only fees from the surgical ward were included in the study. Because laparoscopic surgery is not covered by National Health Insurance during the study period, patients paid an additional charge of \$30000 per surgery for disposable laparoscopy instruments.

## **Follow-up**

Post-operatively, standard follow-up by the surgeon consisted of regular visits at 3-months intervals for the first 3 years, 6-month intervals for the 4<sup>th</sup> and 5<sup>th</sup> year, and yearly visits thereafter. The adjuvant chemotherapy was conducted if indicated by NCCN guidelines. Follow-up studies included physical examination, CEA (carcinoembryonic antigen), chest X-ray, abdominal sonography or abdominal computed tomography at each visit. Colonoscopy follow-up was done in the first year and repeated in the next year if positive for adenoma or other malignancies. If negative, colonoscopy was done three years later. Other studies were performed on an as-needed basis.

## **Operative techniques**

Laparoscopic anterior resection was performed according to the standardized method used at our hospital, as follows. The patient was put under right-tilt Trendelenburg position, and pneumoperitoneum with

a pressure of 12 cm H<sub>2</sub>O was initiated after the first trocar site using Hasson's method. Totally, 5 trocars were used and we used: two 12 mm trocars (umbilicus and right lower abdomen) and three 5 mm trocars. The procedure began at incision of medial peritoneum of sigmoid mesocolon, the so-called medial-to-lateral approach. The inferior mesenteric artery root was exposed, skeletonized and high ligation was done next to its origin from abdominal aorta. The inferior mesenteric vein was divided, and dissection was done bluntly to separate mesocolon from retroperitoneal structures. Dissection was carried out across sacral promontory if necessary, and peritoneal reflection was not incised in such cases. Then the white line of Toldt would be lysed to totally mobilized the sigmoid colon. One of the trocar was enlarged for specimen extraction and anvil placement. We routinely used a commercial wound protector ("Rogan ") when extracting the specimen to protect the wound from infection and prevent wound seeding of cancer cells. The anastomosis was carried out using standard double-stapling technique, and rectal wash was performed routinely before rectal transection. During the whole procedure blunt dissection was carried out under magnified direct vision and 1<sup>st</sup>, 2<sup>nd</sup> generation harmonic scalpel (Johnson and Johnson ), ligasure scalpel (Tyco co. Ltd.) were used if sharp dissection or hemostasis was required. Air-leak test was performed routinely to detect staple failure.

Conventional surgery was performed following the same oncological principle of high ligation and no touch, and double stapling as with laparoscopic surgery. Thus, the specimens obtained from conventional surgery were the same as those obtained from laparoscopic surgery. The attending surgeon would choose lateral-to-medial or medial-to-lateral approach.

Protective ileostomy was considered under the following conditions when the risk of leakage was thought to be high: multiple cardiopulmonary comorbidities, diabetes or uremia with poor healing ability, multiple stapling when rectal transection, and air-leak test positive.

### Statistical analysis

The variables tested in the treatment groups were

compared using the  $\chi^2$  test and independent t-test (and, when necessary, the Mann-Whitney U test). Survival analysis (Kaplan–Meier) and log-rank tests were used to evaluate the efficacy of the treatments. Significant differences were accepted for  $p < 0.05$ . Data are presented as mean  $\pm$  SD. The data were analyzed by the statistical program SPSS for Windows 10.0 (SPSS, Inc., Chicago, IL).

## Results

### Patients' characteristics (Table 1)

From July 1998 to November 2006, a total of 276 patients received elective anterior resection for curative resection of adenocarcinoma of colon was enrolled. There were totally 163 males and 113 females with mean age of 65.65 years, mean BMI of 23.52, mean body height of 160.96 cm, and a mean body weight of 61.86 kgs. Among all patients, 73.1% (202/276) had an ASA score of 1-2 points, and 26.9% (74/276) had an ASA score of 3-4 points. Among them, 140 patients received laparoscopic anterior resection, 99 patients received conventional anterior resection, 6 patient received laparoscopic surgery followed by conversion to the open method, and 31 received a combined procedure (tumor invasion rather than iatro-

**Table 1. Demographics**

	Lap <sup>&amp;</sup> (n = 140)	Open (n = 99)	p-Value <sup>m</sup>
Age (years)	62.7 (29, 87)	63.7 (25, 86)	0.717
body height (cm)	161.9 (142, 180)	159.8 (136, 180.5)	0.049
Body weight (Kg)	62.7 (37, 102)	61.4 (37, 95.5)	0.362
Body Surface Index	23.9 (14.10, 36.45)	24.0 (13.67, 38.01)	0.910
Sex ratio Male/Female	90/50	52/47	0.091 <sup>y</sup>
Male	90 (64.3)	52 (52.5)	
Female	50 (35.7)	47 (47.5)	
#ASA score (%)			0.115 <sup>y</sup>
1~2	110 (78.6)	68 (68.7)	
3~4	30 (21.4)	31 (31.3)	
Location of primary tumor (%)			0.037 <sup>y</sup>
Rectum	4 (2.9)	10 (10.2)	
Colon	136 (97.1)	88 (89.8)	

<sup>y</sup> Yate's Continuity Correction.

#: American society of anesthesiologists  
&: Laparoscopy surgery group

genic induced hysterectomy, segmental resection of ureter, partial cystectomy, and so on). Patients whose surgery was converted or who underwent a combined procedure were excluded from the analysis. There was no difference between the laparoscopy and conventional group with regard to age, body mass index and ASA score.

### Tumor status and staging

In all patients, 28.9% (n = 80) were classified as having stage I disease, 36.6% (n = 101) had stage II disease, and 31.5% (n = 87) had stage III disease. There was a higher percentage of patients with stage I disease in the laparoscopic group compared with the conventional group, but there were higher percentages of patients with stage II and stage III disease in the conventional group compared with the laparoscopic group. ( $p = 0.038$ ) (Table 2)

The tumor was located at rectum in 6% (n = 17) and at colon in 94% (n = 259), respectively, with a higher percentage of patients with rectal cancer in the open group (2.9% (n = 4) vs. 10.2% (n = 10),  $p = 0.037$ ).

The mean tumor size was 3.8 mm in the laparoscopic group and 4.6 mm in the conventional surgery group, and the tumor size was significantly larger in the conventional group. ( $p = 0.019$ ).

### Tumor resection and radicality

All patients received R0 resection based on the findings of the pathology report. There was significantly more lymph nodes harvested in the conventional group (mean 15.9 vs. 13.5,  $p = 0.019$ ). Proximal and distal cut end was not significantly different between the two groups.

### Intra-operative data, short term result, blood transfusion and morbidity

The mean operation time was 180.8 minutes for laparoscopic operations, compared with 140 minutes for the open method ( $p < 0.0001$ ). More patients received transfusions in the open method surgery than laparoscopic surgery ( $p = 0.009$ ). (Table 2)

### Protective ileostomy

In the laparoscopic group, 1.4% (n = 2) patients received protective ileostomy and in the open group, 3% (n = 3) received it. There was no difference between the two groups. ( $p = 0.652$ ) (Table 2)

### Short term operative result

Laparoscopic method had the same amount of leakage, fewer wound infections, shorter hospital stay and lower hospital fee compared with conventional surgery.

The mean hospital stay was 10.3 days for the laparoscopic group, which was significantly shorter than 15.0 days for the open method group. ( $p < 0.0001$ ). (Table 3) Meanwhile, there were no wound infections (0%) in the laparoscopic group (0/140) vs. 11.1% (n = 11) in the open method group ( $p < 0.0001$ ), and anastomosis leakage rate was not different between the two groups, 0.7% (n = 1) vs. 2% (n = 2),  $p = 1.000$ . The hospital fee were significantly higher in the laparoscopy group. (\$121112 NTD vs. \$ 106721 NTD,  $p < 0.0001$ ).

30-day mortality rate was zero in both the laparoscopic and conventional group.

### Survival

Disease-free survival at 5 years was 78.7% in the laparoscopy group and 72.7% in the open group. Disease-free survival was not different between the two groups. (Fig. 1). In nodal-positive stage III diseases, there was also no survival difference between the two groups: disease-free 5-year survival was 62.8% in the laparoscopic group and 59.9% in the open method group. Although without statistical significance, we noticed decreased survival rate of laparoscopic group patients in the 2<sup>nd</sup> and 3<sup>rd</sup> post-operative year (68.5% vs. 82.5% and 62.8% vs. 73.3%), not due to local failure but higher incidence of liver metastasis in laparoscopy group. The most common site of failure was liver (25%), followed by local recurrence (22.5%), peritoneal seeding (15%), lung (10%), and retroperitoneal lymph node (2.5%). Among those cases, 20% had multiple sites of metastatic disease. The median

**Table 2. Operative data**

	Lap <sup>&amp;</sup> (n = 140)	Open (n = 99)	p-Value <sup>m</sup>
Blood transfusion (n)	0.3 (0, 8)	0.8 (0, 16)	0.004
Operative time (minutes)	180.8 (95, 420)	140 (85, 420)	< 0.0001
Loop ileostomy	2 (1.4)	3 (3.0)	0.652 <sup>f</sup>
Hospital stay (days)	10.3 (5, 53)	15.0 (7, 58)	< 0.0001
Hospital fee (NTD)	121112.3 (87562, 506205)	106721.1 (59530, 589096)	< 0.0001
Wound infection (%)	0 (0.0)	11 (11.1)	< 0.0001 <sup>f</sup>
Leakage (%)	1 (50.0)	2 (50.0)	1.000 <sup>f</sup>
Mortality (within 30 days, %)	0	0	0.410 <sup>y</sup>
Lymph nodes harvested	13.5 (0, 53)	15.9 (2, 57)	0.019
Tumor size (cm)	3.8 (0.7, 13)	4.6 (0.52, 11.5)	0.011
Proximal margin (cm)	7.1 (2, 27)	8.4 (0.5, 28)	0.102
Distal margin (cm)	4.1 (0.5, 12)	4.6 (1, 19)	0.192
Stage (%)			
I	49 (35.3)	20 (20.2)	0.038 <sup>p</sup>
IIA+IIB	44 (31.7)	41 (41.4)	
IIIA+IIIB+IIIC	46 (33.1)	38 (38.4)	
Grade of differentiation (%)			
WD <sup>a</sup>	5 (4.0)	8 (9.4)	0.282 <sup>p</sup>
MD <sup>b</sup>	112 (90.3)	72 (84.7)	
PD <sup>c</sup>	7 (5.6)	5 (5.9)	

<sup>p</sup> Pearson Chi-Square test.

<sup>y</sup> Yate's Continuity Correction.

<sup>f</sup> Mann-Whitney U test.

<sup>a</sup> Well-differentiated; <sup>b</sup> Moderately-differentiated; <sup>c</sup> poorly-differentiated.

&: Laparoscopy surgery group.

follow-up time of living patients was 48.3 months for the laparoscopy group and 50.2 months for the open group.

## Discussion

Since 1990, laparoscopy operation for colorectal cancer has been confirmed by many authors as a safe treatment modality with surgical outcomes and oncological results equivalent to those of conventional surgery.<sup>5</sup> Although this study was not a prospective randomized-controlled trial, it was probably the largest series that directly compared laparoscopy with the conventional method in Taiwanese patients recruited at a single center over the same time period. We did not exclude patients with extreme obesity; many international randomized controlled studies excluded patients with body mass index higher than 30. In this study, even patients with a body mass index of 38.5 successfully underwent laparoscopic surgery. We also did not exclude patients who had previously under-

gone abdominal surgery or elderly patients (Our eldest patient was 87 years old in the laparoscopy group). Thus, under less strict patient selection criteria, our data may provide a more accurate reflection of daily practice at a single Taiwanese medical center, rather than the product of careful patient selection. The tumor size was significantly larger ( $p = 0.011$ ) with a higher percentage of patients with stage III disease ( $p = 0.038$ ) in the conventional surgery group; because we are more likely to adopt the conventional procedure for large and advanced tumors if pre-operative abdominal computed tomography showed a large tumor and advanced disease. Under such conditions, the large wound required to retrieve a large tumor would offset the benefit of laparoscopy. The resulting conversion rate for laparoscopic surgery was 4.1% (6/146), and conversion rates have been reported to be 21% to 5.6% in large scale studies<sup>1,10</sup> in the same period. This was an above-standard performance under our daily practice performance.

Although we did not include conversion cases in the laparoscopy group on intention-to-treat basis, out-



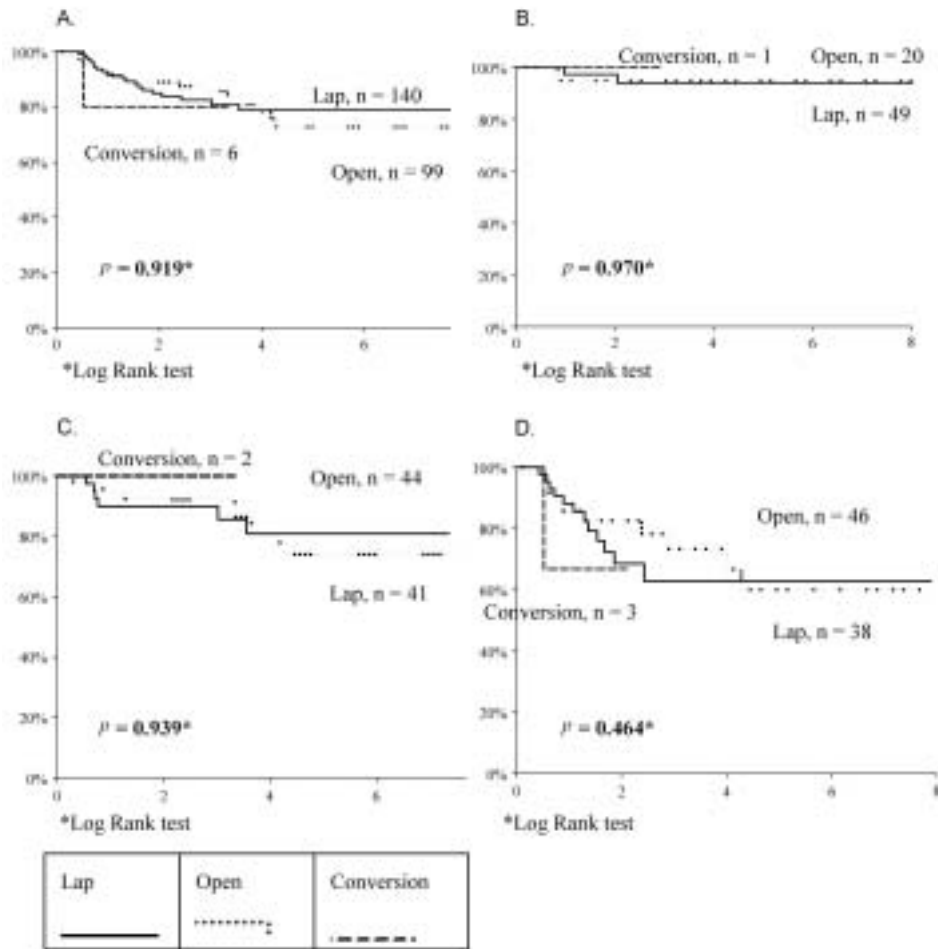


Fig. 1. Cumulative proportion of survival. A. All stages B. Stage I C. Stage II D. Stage III

comes in the conversion group were still characterized by shorter hospital stay (9.2 days vs.15 days), no wound infection (0/6), no mortality and no anastomosis leakage. Due to the fact that a significant proportion of conventional surgeries were performed by surgeons under training (R4 or CR), the benefit of decreased complication rates and shorter hospital stay of laparoscopy surgery should be interpreted with extreme caution. The complication rates and hospital stays of conventional surgeries may be over-estimated. Recent series also showed that conversion did not adversely affect surgical outcomes.<sup>14,15</sup> Besides the benefits on short-term outcome, a 10 year follow-up of a prospective randomized-controlled trial reported by Simon et al. have demonstrated a benefit on long-term outcome; fewer patients in the laparoscopy group developed bowel adhesion requiring hospitalization ( $p = 0.001$ ), and the long term morbidity

rate was also lower for the laparoscopy group ( $p = 0.012$ ).<sup>16</sup> This study proved that minimal-invasive surgery may provide the patients not only short-term benefit of quick recovery, but also long-lasting protection from long term complications such as intestine obstruction.

The first proposed unique complication of laparoscopic operation, trocar site recurrence, was totally absent in this study. Trocar site recurrences were reported only in early series. In two recent large-scale randomized studies, no difference in the incidence of wound recurrence was found between laparoscopy and open method.<sup>16,17</sup> Trocar site metastasis has been thought by many authors to be totally avoidable by procedural improvement.<sup>11,16,17</sup>

The short term benefits of laparoscopic surgery have been well-recognized.<sup>1-7</sup> In Cochrane's review of 25 randomized trials involving 3526 patients, short

-term benefit of less blood loss ( $p = 0.0006$ ), less post-operative pain ( $p = 0.0002$ ), improved pulmonary function ( $p < 0.0008$ ), decreased length of post-operative ileus ( $p < 0.0001$ ), shorter hospital stay ( $p < 0.0001$ ), and decreased surgical morbidity ( $p = 0.02$ ), were noted. In this study, under the coverage of insurance system, we found that hospital stay in the laparoscopy group was 4.7 days shorter ( $p < 0.0001$ ), which compared favorably with a 1.4 days reduction in Cochrane's review.<sup>13</sup> With regard to surgical morbidity and mortality, we analyzed wound infection, anastomosis leakage and 30-day mortality in this study. Interestingly, the wound infection rate and mortality rate was zero in the laparoscopy group. This further contributed to the relatively good result of hospital stay. This result, however, should be interpreted with extreme caution, because a significant proportion of conventional surgeries were performed by surgeons under training, while all of the laparoscopy surgeries were performed by experienced surgeons. Because the definition of wound infection in this study is the wound condition that required wet-dressing, there may be minor wound infections or fat necrosis for which wet dressing is not required. Such minor infections were not recorded in this study. Due to short wound, home care is usually appropriate for such kind of minor infections, thus the presence of minor infections would have little effect on hospital stay and other post-operative data such as hospital fee.

Regarding duration of operation, the existing data show a prolonged duration for laparoscopy in randomized trials.<sup>1,2,4,6</sup> In one randomized controlled trial conducted by *Clinical Outcomes of Surgical Therapy Study Group*, the operative time was 150 minutes vs. 95 minutes,  $p < 0.001$ , laparoscopy vs. open method. In our study, the operation time was 180.8 vs. 140 minutes,  $p < 0.0001$ , and significantly prolonged operation time for laparoscopy surgery was found. Moreover, the operation time of conventional surgery group could be over-estimated due to the fact that some of the conventional surgeries were performed by non-experienced surgeons (CR or R4).

In a series reported by Ka Lau Leung et al., the hospital cost for laparoscopy vs. open method was \$9297 USD (\$325395 NTD) vs. \$7148 USD (\$250180 NTD) ( $p < 0.001$ ).<sup>2</sup> In our study, the hospital fee per-surgery

was \$121112 NTD vs. \$106721 NTD ( $p < 0.0001$ ), significantly more for laparoscopy group mainly due to cost of disposable laparoscopy instruments. That is to say, the amount of money saved by the reduction of hospital stay did not cover the cost of disposable instrument. The quickness of recovery is something either patients or the bureau of health insurance should pay for. Because we ask for self-payment for laparoscopy instruments and applied for insurance payment in the same manner in both laparoscopic and conventional surgery cases, we actually saved the Bureau of National Health Insurance NT\$18608 per patient, which is clearly advantageous in our increasingly budget-conscious health care system. The cost of laparoscopy instruments is substantial and should be taken into consideration. (Table 3)

In a recent publication of the 5 year follow-up of COST trial, the technique of laparoscopy for colorectal malignancy is proved to be reproducible among surgeons. Furthermore, powered by 872 cases and completeness of long-term follow-up, the oncological result of laparoscopy was proved to be not inferior to conventional surgery.<sup>18</sup> On the other hand, long term oncological results were no better than those of conventional surgery even with the added benefit of dissection being carried out under the magnified view of the laparoscope.<sup>1-8</sup> In our series, the survival rate, including stage III alone, was comparable to the best survival rates reported in large series.<sup>1-4,6,9</sup> The reason for increased incidence of liver metastasis in the 2<sup>nd</sup> and 3<sup>rd</sup> post-operative year for laparoscopy group deserve further investigation.

Pneumoperitoneum had been well known to promote tumor growth in several ways. The chimney effect, which was thought to be associated with trocar site recurrence, was well proved by both animal and

**Table 3. Details and fees of disposable laparoscopy instruments**

Item	Fee (\$NTD)
Harmonic scapel	9000
Endoscopic GIA (Gun)	12000
Endoscopic GIA (Staple)	6000
5 mm trocar	900 4 = 3600
Camera port	1500
Rogan wound protector	900
Total	33000

human studies.<sup>20,21</sup> Through surgical trauma to port site wound and carbon-dioxide flowing through the wound, tumor implantation is promoted. Furthermore, animal models displayed stimulated tumor growth under carbon-dioxide pneumoperitoneum clearly.<sup>22,23</sup> Pneumoperitoneum is also known to promote cancer cell accumulation in portal vein, hence enhancing probability of liver metastasis. Moreover, the effect is directly related to the pressure of pneumoperitoneum.<sup>24,25</sup> The promoting effect of pneumoperitoneum on cancer cell growth is both local and systemic. Both local recurrence and liver metastasis could be enhanced by pneumoperitoneum. Hence, the assertion that laparoscopic colectomy have the same oncologic result as conventional method should be re-evaluated. Probably the only solution to the issue of enhanced tumor growth by pneumoperitoneum is mini-incision colectomy. Mini-incision colectomy is demonstrated to preserve tactile sensation of hands, with the benefit of quick-recovery by minimal invasive surgery without need of expensive laparoscopic instruments, and more importantly, without potential harmful effect of pneumoperitoneum on cancer spread.<sup>26</sup> The skill of mini-laparotomy colectomy, however, is difficult to learn and is only limited to certain surgical experts.

Lacy et al. ever reported better survival rates for laparoscopy surgery in stage III cases.<sup>6</sup> We do not observe this phenomenon, nor has it been found in other series, which indicates that it may have been a chance finding. In our opinion, the fact that the benefit of carrying out dissection under a magnified view has not manifested in a long term improvement in survival, demonstrated that there is room for improvement. Our study includes data from the early period when surgeons had not yet perfected their techniques, so any potential benefits of laparoscopic surgery may be masked by this early phase. Korean and Japanese groups have already conducted large scale multi-center randomized controlled trials to address these unresolved issues and this is an area in which we will focus our attention in future studies. One pilot study on mesorectal dissection using the da-vinci robotic arm was published recently.<sup>18</sup> Ambitious innovations of technique and technology will surely bring the minimal invasive surgery closer and

closer to perfection in the future. To sum up, this study was the result of a single surgical team from the early period of gaining experience and developing surgical skills to the more recent period of technical maturity. Other studies have also shown that the oncological outcomes were no different between laparoscopic and conventional surgeries. However, based on our findings in the current study, we now routinely recommend that patients receive laparoscopic anterior resection if the pre-op abdominal CT does not show a bulky tumor > 7 cm or invasion to adjacent organ, and the patient could afford the self-paid fee. In our hospital, history of abdominal surgery, obesity, old age, poor ASA score, and liver metastasis are no longer considered contraindications for laparoscopy surgery. Meanwhile it is important to be upfront with patients who choose the laparoscopic procedure and state that while laparoscopy surgery is a safe and feasible alternative to traditional surgery which may offer some short-term benefits. The conventional method still has a role for locally advanced disease and for cases requiring extensive lymphadenectomy or synchronous resection of liver metastasis, which can not be accomplished by laparoscopic surgery. Mini-incision colectomy preserves benefits of minimal invasive surgery meanwhile avoiding potential harmful effects by pneumoperitoneum such as promoting liver metastasis. We should take care not to exaggerate the potential benefits to the patient of laparoscopy surgery compared with conventional surgery.

## Conclusion

Laparoscopic anterior resection for colorectal cancer is as safe as conventional surgery, providing short-term benefits of shorter hospital stay and a lower wound complication rate in experienced hands. Increased rate of liver metastasis was found in laparoscopy group. The stimulating effect of pneumoperitoneum on cancer growth deserve further investigation. Large scale randomized-controlled trial in Taiwan should be conducted in the future to identify variables which may improve long-term survival of patients who undergo laparoscopic surgery.



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原 著

## 腹腔鏡前位切除術治療惡性疾病之 短期手術成果及追蹤

陳明正 蔣鋒帆 王輝明 趙德馨 馬秀峰

台中榮民總醫院 大腸直腸外科

**目的** 腹腔鏡前位切除術已被廣泛認定為傳統手術之外一個安全及有效的選擇，然而國內針對此的經驗分享並不多。

**方法** 這是一個單一醫學中心，由單一外科團隊執行的研究。從 1998 年至 2006 年所有自門診住院接受前位切除以治療大腸直腸癌的病人皆會接受評估是否符合於此一研究。急診手術及腸道完全阻塞的案例被排除在外。

**結果** 腹腔鏡手術有較短的住院天數 (10.3 天 VS. 15 天,  $p < 0.001$ )，較高的住院費用 (121112 元 VS. 106721 元新台幣  $p < 0.0001$ )，較低的傷口併發症率 (0% VS. 11%,  $p < 0.0001$ )，較長的手術時間 (180.8 分 VS. 140 分,  $p < 0.0001$ )。腹腔鏡手術組有較多的肝轉移但五年存活率相似。

**結論** 在臺灣人當中，腹腔鏡前位切除術是安全的，較多肝轉移的現象值得進一步討論。可能和氣腹有關；並且，腹腔鏡手術耗時且較貴。

**關鍵詞** 腹腔鏡、前位切除、大腸直腸癌。