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Original Article

A preliminary comparison of clinical efficacy between laparoscopic and open surgery for the treatment of colorectal cancer

Hougang Huang[1], Zhongfu Li[2], Dachun Xiao[2], Gan He[2], Bin Jian[2], Lian Bai[2], Qiang Yang[2]

Departments of [1]Anesthesiology, [2]Gastrointestinal Surgery, Yongchuan Hospital, Chongqing Medical University, China

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Abstract: Objective: To explore the clinical efficacy and safety of laparoscopic and open surgery for colorectal cancer. Methods: From May 2011 to May 2012, 227 patients pathologically confirmed as colorectal cancer in our hospital were divided into laparoscopic surgery (LS) group (n=152) and open surgery (OS) group) (n=75) according to the total mesorectal excision (TME) principle. Clinical data including postoperative complication rate and long-term efficacy were observed and compared between two groups. Results: All the patients completed the surgery, and no mortality was found during the perioperative period. No patient in LS group needs laparotomy. The duration of LS was significantly longer than that of the OS group, the difference was statistically significant (P<0.05); blood loss in LS group was significantly less than that in the OS group (P<0.05); the anus preservation rate and the number of lymph node in LS group and OS group showed no significant difference (P>0.05). The mean time to passing first flatus and oral intake for solid foods in LS group were earlier than those in OS group, while the laparoscopic group indwelling time of a urethral catheter and the length of hospital stay were shorter than those in OS group (P<0.05). The incidence of infection in LS group was 5.3% (8/152), which was significantly lower than that in the OS group 22.7% (17/75) (P<0.05). No statistically significant difference was found among one-year (98.7% vs 97.3%), two-year (90.1% vs 92.0%) and three-year (77.6% vs 80.0%) survival rate (P>0.05). No statistically significant difference was found in 3-year local recurrence rate (2.0% vs 1.3%) and metastasis rate (9.2% vs 10.7%) between the two groups (P>0.05). Conclusions: Laparoscopic surgery for treatment of colorectal cancer is feasible and the short-term and the long-term therapeutic efficacy is similar to that of open surgery. However, Laparoscopic surgery has advantages in postoperative recovery, infection rate and length of postoperative hospital stay.

Keywords: Colorectal cancer, laparoscopy, total mesorectal excision, survival rate

Introduction

Colorectal cancer surgery is still the most curative treatment for colorectal cancer. However, the principle of surgery is to ensure the efficacy and maximum minimize the suffering of patients. Traditional open surgery for treatment of colorectal cancer was undisputed due to its accurate resection of the lesions. Laparoscopic surgery as a minimally invasive surgery, has potential advantages such as less invasive and earlier recovery, but it still has some controversy in the short and long term efficacy of the treatment and complications. The purpose of this study was to explore the efficacy and safety of laparoscopic surgery and open surgery for colorectal cancer through retrospective analysis of 227 patients with colorectal cancer meeting entry criteria.

Materials and methods

Inclusion criteria

Patients must meet the following inclusion criteria: ① pathologically confirmed colorectal cancer; ② tumor diameter ≤5 cm; ③ distance from tumor loci to the anal margin position ≤15 cm; ④ tion ionn ≤15 tumor surgery; ⑤ t Duke's staging of A, B and C phase; ⑥ no distant metastasis; ⑦ signed an informed consent form and voluntarily enrolled in this study.

Table 1. General clinical data in two groups

Characteristic	LS group (n=152)	OS group (n=75)	*P* Value
Gender (M/F, n)	88/64	43/32	>0.05
Age (year)	62.6±8.2	62.2±7.9	>0.05
Duke's stage			>0.05
A	43	17	
B	72	41	
C	37	17	
Tumor diameter (cm)	3.2±0.5	3.3±0.6	>0.05
Distance of tumor location from the anal margin (cm)	10.2±2.3	10.4±2.4	>0.05

Table 2. Comparison of surgery related indicators between the two groups

Group	n	Operation duration (min)	Blood loss (ml)	Sphincter preservation rate [n (%)]	Number of lymph node dissection [n]
LS group	152	162.3±22.7	92.6±15.8	118 (77.6)	12.3±2.5
OS group	75	123.7±18.9	165.7±32.6	57 (76.0)	13.1±2.2
P Value		<0.05	<0.05	>0.05	>0.05

Exclusion criteria

Patients have one of the following conditions are excluded in the study: ① coagulation disorders; ② severe liver and kidney dysfunction; ③ severe uncontrollable hypertension; ④ American Society of Anesthesiologists (ASA) grade class 4 to 5.

Clinical information

All 227 cases of patients pathologically confirmed as colorectal cancer after surgery were selected during May 2011 to May 2012 in our hospital and were retrospectively analyzed. The 227 cases were divided into 152 cases of LS group and 75 cases of OS group according to the treatment method. There were 88 males and 64 females in LS group. Mean age at surgery was 62.6±8.2 years (range 45~81 years). Duke's stage A, B and C was 43, 72 and 37 cases, respectively. Tumor size 1.2~4.8 cm, average (3.2±0.5) cm, tumor location from the anal margin 3.1~14.2 cm, average (10.2±2.3) cm; there were 43 males and 32 females in OS group. Mean age at surgery was 62.2±7.9 years (range 42~80 years). Duke's stage A, B and C was 17, 41 and 17, respectively. Tumor diameter was 1.3~4.9 cm, the mean (3.3±0.6) cm, tumor location from the anal margin was 2.7~14.5 cm, average (10.4±2.4) cm. There were no significant difference in gender, age, tumor stage, tumor size and distance of tumor location from the anal margin between the two groups (P>0.05 **Table 1**).

Surgical methods

LS group and open group were laparoscopic colorectal cancer resection and traditional open resection, respectively. Surgical procedure strictly followed the principle of total mesorectal excision (TME). Surgical approach was determined based on the location of the tumor from the anus, >5.0 cm using Dixon surgery, <5.0 cm using the Miles surgery. The operations were performed in our hospital by the same team with extensive experience.

LS group: patients to take general anesthesia, maintaining postural foot high head low lithotomy position, fully exposed to the lower left abdomen. Insert umbilical laparoscopic CO_2 pneumoperitoneum establish and maintain the pressure at 12~14 mmHg. An observation hole was established 10 mm in the outer edge of the right lower abdomen. abdomen and left rectus abdominis done at 5 mm hole, conventional abdominal exploration, isolating the free sigmoid mesangial protect bilateral ureter, cutting the inferior mesenteric artery, mesenteric Vascular folder at the root of 2 cm transverse processing hemilock, then with cancer colectomy, do the sigmoid colon and rectum anastomosis. After the surgery is completed to do the cleaning, drainage, stitching and other operations.

OS group: traditional open surgery was performed, the incision was in lower middle of the abdomen, separate the tissues conventionally, remove the tumor lesions, and the following steps were the same as the LS group.

Table 3. Postoperative recovery related indicators (x±s)

Group	n	Passing first flatus (d)	Hospital stay (d)	Oral intake for solid foods (d)	Indwelling time of a urethral catheter (d)
LS group	152	2.9±0.8	9.1±2.8	3.9±0.9	3.1±0.6
OS group	75	4.3±1.1	13.7±3.7	5.4±1.3	5.6±1.2
P Value		<0.05	<0.05	<0.05	<0.05

Table 4. Comparison of postoperative complications [n (%)]

Group	n	Infection	Adhesive ileus	Uroschesis	Anastomotic fistula
LS group	152	8 (5.3)	4 (2.6)	4 (2.6)	5 (3.3)
OS group	75	17 (22.7)	2 (2.7)	3 (4.0)	3 (4.0)
P Value		<0.05	>0.05	>0.05	>0.05

Table 5. Long-term efficacy of the two groups [n (%)]

Group	n	Survival rate			Local recurrence	Metastasis rate
		One-year	Two-year	Three-year		
LS group	152	150 (98.7)	137 (90.1)	118 (77.6)	3 (2.0)	14 (9.2)
OS group	75	73 (97.3)	69 (92.0)	60 (80.0)	1 (1.3)	8 (10.7)
P Value		>0.05	>0.05	>0.05	>0.05	>0.05

Evaluation indicators

Surgery-related indicators: Comparison of surgery-related indicators, such as duration of surgery, blood loss, sphincter preservation rate and the number of lymph node dissection in the two groups.

Postoperative recovery related indicators: Comparison of postoperative recovery related indicators, such as anal exhaust time, hospitalization time, into the solid food time and catheterization time in the two groups.

Postoperative complications: Comparison of postoperative complications, such as infection, adhesion ileus, urinary retention, anastomotic fistula in the two groups.

Long-term efficacy: All patients had received at least three years of follow-up or follow-up to the death between the two groups. 1, 2, 3-year survival rates, as well as 3-year rate of metastasis and local recurrence rate were compared.

Statistical methods

Statistical analyses were performed using SPSS 12.0. Data was expressed as $\bar{x}$±S. Pair comparison was performed using T-test. Count data were compared using χ^2-test, *P* value < 0.05 was considered to be statistically significant.

Results

Comparison of surgery related indicators

Two groups of patients all completed the surgery and no mortality was found during the perioperative period. No patient in LS group needs laparotomy. The duration of LS was significantly longer than that of the OS group, the difference was statistically significant (P<0.05); blood loss in LS group was significantly less than that in the OS group (P<0.05); the anus preservation rate and the number of lymph node in LS group and OS group showed no significant difference (P>0.05, **Table 2**).

Postoperative recovery related indicators

The postoperative recovery status shows that the mean time to passing first flatus and oral intake for solid foods in LS group were earlier than those in OS group, while the laparoscopic group indwelling time of a urethral catheter and the length of hospital stay were shorter than those in OS group (P<0.05, **Table 3**).

Comparison of postoperative complications

The results showed that the incidence of infection in the LS group was significantly lower than the open group, the difference was statistically significant (P<0.05); but the incidence of adhesion ileus, urinary retention and anastomotic leakage showed no statistically significant difference between two groups (P>0.05, **Table 4**).

Long-term efficacy of the two groups

No statistically significant difference was found among one-year (98.7% vs 97.3%), two-year (90.1% vs 92.0%) and three-year (77.6% vs 80.0%) survival rate (P>0.05). No statistically significant difference was found in 3-year local recurrence rate (2.0% vs 1.3%) and metastasis rate (9.2% vs 10.7%) between the two groups (P>0.05, **Table 5**).

Discussion

Since 1993 Cuillou reported LS for treatment of 59 cases of patients with colorectal cancer, the laparoscopic technique has been greatly developed in recent 20 years. The majority of clinical surgeons continued to explore new technologies, combined with TME principle, making the range of applications and indications for laparoscopic surgery in colorectal cancer more extensive. The 2006 edition of "Laparoscopic surgery for colorectal cancer radical operation guide" indicated that indications for colorectal cancer is similar between LS and OS. In recent years, a considerable number of clinical studies and meta-analyzes [1, 2] showed that LS in the treatment of colorectal cancer is not inferior to OS in the efficacy, and with less trauma, quicker recovery after surgery, which may be more suitable for the treatment of colorectal cancer. However, there are still quite some scholars do not support this point of view [3, 4]: ① rectum is located in a narrow pelvis, especially ultralow resection, laparoscopic surgery requires higher skills, is currently cannot carry out in all the hospital; ② rectum surrounding anatomical complexity makes TME surgery more difficult; ③ long-term efficacy of laparoscopic treatment of colorectal cancer based on evidence-based science is not sufficient; ④ whether CO_2 pneumoperitoneum may cause tumor proliferation, metastasis and spread. However, clinical studies showed that LS make vision clearer, thus reducing the occurrence of surgery blind area. Through amplification, LS can more clearly see the seminal vesicle, anterior sacral nerve and vaginal rectal space complex anatomical structure, therefore will reduce more damage and will not affect patients' sexual function and urinary function.

The results showed that compared with traditional OS, LS has the following advantages: ① lower incidence of postoperative infection. Studies have shown that wound infection and lung infection rates are higher after open surgery, laparoscopic surgery can greatly reduce postoperative infection rates due to the small incision; ② rapid postoperative recovery. The results showed that the gastrointestinal activity time, time to start solid foods is faster in LS group than those in OS group, and indwelling catheter time and hospital stay is shorter than those in OS group, the difference was significant; ③ trauma. The results showed that blood loss is significantly smaller in LS group patients with immune function and stress response may be more beneficial to reduce postoperative complications, reduced tumor diffusion and metastasis [5]; ④ Short-term effect is not worse than open surgery. By means of laparoscopic magnification and HD performance, the number of laparoscopic lymph node dissection is not lower than open surgery, which is close to the literature [6-8].

In aspect of long-term efficacy, 1 year, 2-year and 3-year survival rates were 98.7%, 90.1% and 77.6% in the LS group, respectively, showing no significant difference compared with OS group. 3-year local recurrence rate and metastasis rate were 2.0% and 9.2% in LS group, and 1.3% and 10.7% in OS group, the difference was not significant. Obviously, long-term efficacy of LS and OS in treatment of colorectal cancer was close. LS plays functional role in colorectal cancer. Bonjer HJ et al. [9] reported 1044 cases of patients within 30 research centers in eight countries, of which 699 cases underwent LS, 345 cases underwent OS, results showed after 3 years, both group recurrence rate were 5.0% (95% CI -2.6-2.6, P>0.05), while the 3-year overall survival rates were 86.7% and 83.6% (95% CI -1.6-7.8, P>0.05), the difference was no statistically significant, which was consistent with the results of our study. Zhao et al. [10] analyzed 14 RCTs including 2114 cases of patients, including 1111 cases receiving LS, 1003 cases receiving OS, the results of the meta-analysis showed that 3-year distant metastasis and 3-year overall survival difference was not statistically significant between the two groups, the results also support our conclusions.

In summary, LS for treatment of colorectal cancer can achieve satisfactory short- and long-term efficacy, and less invasive, quicker recovery and fewer complications compared with OS, which may be more suitable for patients with colorectal cancer. However, the present study still has some deficiencies, including ① not randomized controlled studies, which may lack some convincing results; ② the longest follow-up period was three years, which lack more long-term efficacy data; ③ number of cases is too small. We believed that with the implementation and development of more rigorous clinical trial of laparoscopic techniques, laparoscopic treatment of colorectal cancer in the field will get continuous progress.

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Disclosure of conflict of interest

None.

Address correspondence to: Zhongfu Li, Department of Gastrointestinal Surgery, Yongchuan Hospital, Chongqing Medical University, Xuanhua Road 439, Yongchuan District of Chongqing, China. Tel: 023-85381609; E-mail: zhongfu2@aol.com

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