

# Clinical Effects of Laparoscopic Surgery in Radical Surgery for Colorectal Cancer

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**Abstract:** Objective: To investigate the clinical application effect of laparoscopic surgery in radical surgery for colorectal cancer. Methods: 78 patients who were treated with radical surgery for colorectal cancer in a tertiary hospital during the period from January 2021 to December 2023 were selected as the study subjects in this study. According to the different surgical methods, the patients were divided into the laparoscopic surgery group (40 cases in the experimental group) and the traditional open surgery group (38 cases in the control group). The operation time, intraoperative bleeding, postoperative recovery (including postoperative anal exhaustion time, time to get out of bed, and hospitalization time), complication rate, and therapeutic effect were observed in the two groups. Results: Patients in the experimental group were better than the control group in terms of intraoperative blood loss, operation time, postoperative anal exhaust time, time to get out of bed, and postoperative hospitalization time ( $P < 0.05$ ). Patients in the experimental group had significantly better treatment effects and complication rates than those in the control group ( $P < 0.05$ ). Conclusion: Compared with the open group, the overall prognosis of laparoscopic colorectal cancer patients is better, and laparoscopy has a protective effect on tumor recurrence or metastasis after radical surgery for colorectal cancer, and it can reduce the incidence of postoperative abdominal infection.

**Keywords:** Laparoscopic surgery; Colorectal cancer; Effect

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## 1. Introduction

Colorectal cancer is one of the diseases with the highest morbidity and mortality in the world. China is a large country with the incidence of colorectal cancer and its incidence rate is ranked number 3 among malignant tumors. With the continuous progress of medical technology, laparoscopic surgery has become an important development direction of surgical operation at present. Compared with open surgery, laparoscopic surgery is widely used because of its advantages of less trauma, faster postoperative recovery, less pain, fewer complications, etc. Among them, laparoscopic radical resection of colorectal cancer has higher clinical advantages, including shorter hospitalization time, fewer complications and lower morbidity and mortality, etc. In 2015, the American Cancer Society proposed the concept of “radical bowel resection,” which means that the

surgery is performed with the concept of “radical bowel resection.” The concept of “radical bowel resection” refers to surgery that preserves the patient’s colorectal structures as much as possible and achieves the effect of radical removal of diseased tissue. For most patients with early colorectal cancer whose tumor diameter is  $\leq 3$  cm, without lymph node metastasis or with  $\leq 3$  lymph node metastases, minimally invasive treatment, i.e., laparoscopic radical colorectal cancer surgery, is an option <sup>[1]</sup>. However, in recent years, some studies have also shown that although the complication rate of laparoscopic radical colorectal cancer surgery is low, it may lead to the occurrence of postoperative anastomotic fistula, so most scholars currently believe that minimally invasive surgery should still be based on traditional radical colorectal surgery. With the development of endoscopic technology, endoscopic polypectomy has gradually replaced traditional radical colorectal surgery as the standard program for the treatment of early colorectal cancer. As for patients with intermediate to advanced colorectal cancer, radical surgical treatment is still required due to the risk of lymph node metastasis and distant metastasis, especially for patients with extensive stage <sup>[2]</sup>. At present, laparoscopic anus-preserving surgery for low rectal cancer has been gradually carried out in China. However, there is a lack of sufficient clinical evidence to support whether anal preservation surgery for low rectal cancer can prolong patients’ survival. In addition, some scholars have conducted relevant studies on whether neoadjuvant chemotherapy combined with laparoscopic anal preservation surgery can further improve the prognosis of patients, but the conclusions are not the same, which may be due to the small sample size and different inclusion populations.

## 2. Information and Methods

### 2.1. General information

Seventy-eight patients who were treated with radical surgery for colorectal cancer in a tertiary hospital during the period from January 2021 to December 2023 were selected as the study subjects. All patients were diagnosed with colorectal cancer by pathologic diagnosis, and all met the criteria for laparoscopic surgery. According to the different surgical methods, the patients were divided into the laparoscopic surgery group (experimental group) and the traditional open surgery group (control group). Among them, there were 40 patients in the experimental group and 38 patients in the control group. There was no significant difference between the two groups of patients in terms of age, gender, tumor site, pathological type, etc., and they were comparable, as shown in Table 1.

**Table 1.** Comparison of general information

General information		Control group (n = 38)	Experimental group (n = 40)	t/ $\chi^2$ -value	P-value
Age (years)		55.37 ± 5.12	55.40 ± 5.10	0.026	0.979
Sex (cases)	Male	25 (65.79)	27 (67.50)	0.026	0.873
	Female	13 (34.21)	13 (32.50)	0.026	0.873
Tumor size (cm)		3.21 ± 0.80	3.22 ± 0.79	0.056	0.956
Tumor stage (case)	I stage	22 (57.89)	23 (57.50)	0.001	0.972
	II stage	16 (41.11)	17 (42.50)	0.001	0.972

### 2.2. Methods

Patients in the experimental group were treated by laparoscopic radical surgery for colorectal cancer. The surgical procedure is as follows: After general anesthesia, patients take the truncated position and routinely disinfect and spread the towel. Make 1 cm and 0.5 cm puncture holes at the lower edge of the umbilicus and

the left and right sides of the umbilicus respectively and establish pneumoperitoneum. Tumor location and size were explored through laparoscopy to determine the scope of surgery. Tumor resection and lymph node dissection were carried out using the ultrasonic knife and electric knife and attention was paid to protecting the surrounding organs and blood vessels during the operation. After surgery, the resection specimen was removed through a small incision and the incision was sutured.

Patients in the control group were treated with traditional open radical colorectal cancer surgery. The surgical process is similar to that of the experimental group, but the surgery is performed in a direct open abdominal way.

### 2.3. Observation indexes

- (1) Surgical time: Record the time required from the beginning of anesthesia to the end of surgery for both groups.
- (2) Intraoperative bleeding: Record the amount of bleeding during surgery in both groups.
- (3) Postoperative recovery: Including postoperative anal defecation time, time to get out of bed and hospitalization time.
- (4) Complication rate: Record the postoperative complications occurring in the two groups of patients, such as incision infection, intestinal obstruction, anastomotic fistula and so on.
- (5) Therapeutic effect: According to the patients' postoperative pathological results and follow-up, the therapeutic effect of the two groups was evaluated, and the number of patients with good prognoses was assessed.

### 2.4. Statistical methods

SPSS 19.0 was used for analysis. Measurement data were described by mean  $\pm$  standard deviation (SD), independent sample t-test was used for inter-group comparison, paired t-test was used for intra-group comparison, count data were expressed as %,  $\chi^2$  test was used for inter-group comparison, and  $P < 0.05$  was considered statistically significant.

## 3. Results

### 3.1. Observation and comparison of operation time, intraoperative blood loss, postoperative recovery and other indicators

Patients in the experimental group are better than the control group in terms of intraoperative blood loss, operation time, postoperative anal exhaustion time, time to get out of bed and postoperative hospitalization time ( $P < 0.05$ ), as shown in Table 2.

**Table 2.** Comparison of the indexes of operation time, intraoperative blood loss and postoperative recovery between the two groups of patients

Groups	Intraoperative blood loss (mL)	Surgical time (min)	Postoperative anal defecation time (h)	Time to get out of bed (d)	Postoperative hospitalization time (d)
Control group ( $n = 38$ )	264.60 $\pm$ 60.30	165.88 $\pm$ 30.72	4.96 $\pm$ 1.60	6.50 $\pm$ 1.06	12.36 $\pm$ 2.20
Experimental group ( $n = 40$ )	223.58 $\pm$ 60.24	124.90 $\pm$ 30.80	2.01 $\pm$ 1.56	5.32 $\pm$ 1.10	8.03 $\pm$ 2.01
<i>t</i> -value	3.005	5.881	8.244	4.820	9.082
<i>P</i> -value	0.004	0.000	0.000	0.000	0.001

### 3.2. Observation of the complication rate and treatment effect of patients in the two groups

The treatment effect and complication rate of patients in the experimental group are significantly better than those in the control group ( $P < 0.05$ ), as shown in Table 3.

**Table 3.** Comparison of the complication rate and treatment effect of patients in the two groups [ $n$  (%)]

Groups	Treatment effect	Complication rate
Control group ( $n = 38$ )	25 (65.79)	13 (34.21)
Experimental group ( $n = 40$ )	35 (87.50)	5 (12.50)
<i>t</i> -value	5.174	5.174
<i>P</i> -value	0.023	0.023

## 4. Discussion

The 5-year survival and local recurrence rates after laparoscopic radical colorectal cancer surgery are significantly higher than those of conventional open surgery. A prospective study comparing the prognosis of laparoscopic radical left hemicolectomy (LE-R0) with that of open radical left hemicolectomy for colorectal cancer (LR-R1) found that at a median follow-up of 14.3 months, there were no significant differences in death, recurrence, distant metastasis and time to disease-free survival between the two groups of patients; whereas, in subgroup analyses, the primary endpoint events in the LE-R0 group has a higher overall survival (OS) and local recurrence rate, 81.7% and 69.2%, respectively, whereas the disease-free survival (DFS) and local recurrence rate were lower in the LR-R1 group, 92.2% and 59.1%, respectively, suggesting that LE-R0 is a better treatment option <sup>[3]</sup>. Another meta-analysis included 11 randomized controlled trials (RCTs) comparing LE-R0 with LR-R1 for the treatment of limited radical rectal cancer, and the results showed an increase in median OS of 13.8 months (95% CI: 7.8–16.2) in the LE-R0 group compared with LR-R1, but no statistically significant differences were found with any other aspects between the two groups <sup>[4]</sup>. An RCT evaluating the clinical outcomes of laparoscopic-assisted radical resection in situ (ESD) compared with open conventional surgery (OR) showed that there was no difference between the two procedures at a higher risk of recurrence <sup>[5]</sup>. However, patients in both groups had a shorter mean number of days of hospitalization postoperatively, and the incidence of adverse events was lower in the LE-ESD group. Another multicenter RCT study compared the efficacy of LE-R0 versus LR-R1 for the treatment of early-stage rectal cancer and found that at baseline, there was no difference between the two procedures, but the LE-R0 group had a lower rate of complications, which included pneumothorax, intestinal obstruction, and incision infection <sup>[6]</sup>. Another meta-analysis included 23 prospective randomized controlled studies comparing the effects of LE-R0 and LR-R1 on the prognosis of patients with complicated colorectal cancer and the results showed that the OS and DFS of the LE-R0 group were significantly better than those of the LR-R1 group, whereas there was no difference in the rates of local recurrence and distant metastasis, suggesting that LE-R0 may improve clinical outcomes <sup>[7]</sup>. In addition, a meta-analysis included 12 RCT studies comparing LE-R0 with LR-R1 in the application of postoperative chemotherapy regimens for radical colorectal cancer, and the results showed that there was no significant difference between the two groups, but the number of retroperitoneal lymph node dissection in the LE-R0 group was less, which might affect the dose and length of postoperative radiotherapy, leading to lower adherence to chemotherapy, but there was also no significant difference in the risk of distant recurrence or death between the two groups <sup>[8]</sup>.

In this study, patients in the experimental group were better than the control group in terms of



intraoperative blood loss, surgical time, postoperative anal defecation time, time to get out of bed, and postoperative hospitalization time ( $P < 0.05$ ) and patients in the experimental group had a significantly better therapeutic effect and complication rate than those in the control group ( $P < 0.05$ ), which indicated that the effect of laparoscopic surgery was better than that of ordinary open surgery and a randomized controlled study showed that, compared with ordinary open group compared with the normal open group, intraoperative bleeding was significantly reduced in the laparoscopic group ( $P < 0.05$ ), but the difference in the incidence rate of postoperative adverse reactions was not statistically significant ( $P > 0.05$ ), which may be due to the differences in age, gender, smoking history, colorectal cancer stage and clinicopathologic features between the two groups<sup>[9]</sup>. However, due to the lack of randomized controlled trials, this study still needs to be further confirmed. Another retrospective study compared the incidence of postoperative complications between the conventional laparoscopic open group and the laparoscopic group, and the results showed that no serious complications occurred in either group. However, this study concluded that compared with the conventional laparoscopic open group, patients in the sub-laparoscopic group had a longer postoperative temperature recovery time, shorter hospitalization time and lower total costs, thus demonstrating that laparoscopy can significantly improve patients' postoperative quality of life and have a certain impact on patients' prognosis<sup>[10]</sup>.

There is no uniform consensus about the effect of intraoperative abdominal chemotherapy, such as the National Comprehensive Cancer Network (NCCN) guidelines recommend that laparoscopic total pelvic lymph node dissection or laparoscopic local lymph node biopsy can be considered for patients with early colorectal cancer that is not associated with lymph node metastasis or distant metastasis. However, patients with limited or minimally invasive colorectal cancer confirmed by postoperative pathology have a high rate of postoperative lymph node positivity, so the NCCN guideline suggests that pelvic lymph node dissection is not recommended, but it also points out that these patients still need to receive at least one systemic chemotherapy, and if metastatic disease occurs, they should undergo a second chemotherapy. Based on the above, this study believes that laparoscopic local lymph node biopsy + peritoneal instillation chemotherapy treatment can be considered for patients who meet the above criteria if the patient voluntarily requests pelvic and abdominal lymph node dissection and the operator believes that it meets the indications for surgery. Although there is a lack of double-blind controlled trials to clarify whether laparoscopic IPC improves patients' prognosis, some prospective studies have shown that laparoscopic IPC reduces the risk of postoperative adverse reactions.

## 5. Conclusion

In summary, laparoscopic colorectal cancer patients have a better overall prognosis compared with the open group, and laparoscopy is protective against tumor recurrence or metastasis after radical surgery for colorectal cancer, and it reduces the incidence of postoperative abdominal infections. However, there is still controversy about whether IPCs improve the long-term survival of patients with laparoscopic colorectal cancer, which may be due to small samples or short follow-up times. Meanwhile, some studies have also shown that prophylactic antibiotic use can reduce postoperative complications and mortality. Therefore, the authors believe that larger and longer prospective randomized controlled studies should be conducted to further confirm the above views. In addition, although the effects of laparoscopic surgery and IPC on patients' prognosis have been reported in the literature, there is still a lack of in-depth studies on the potential adverse effects it produces in treatment and the relationship between different doses and frequencies of IPC and patients' prognosis.

## Disclosure statement

The authors declare no conflict of interest.

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