

**THE EFFECT OF LAPAROSCOPIC AND OPEN SURGERY ON TRAUMATIC STRESS
AND PROGNOSIS IN PATIENTS WITH COLON CANCER**

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ABSTRACT

Aim: to analyze the effects of laparoscopic surgery and open surgery on traumatic stress and prognosis in patients with colon tumor. **Methods:** 96 patients with colorectal tumors treated in the hospital from August 2012 to March 2015 were selected for study. They were randomly divided into minimally invasive group (laparoscopic surgery) and open group (open surgery). The operation related indexes, trauma stress indexes, complications and prognosis related indexes of the two groups were compared. **Results:** The intraoperative blood output of minimally invasive group was lower than that of open group, and the incision length was shorter than that of open group, The recovery and exhaust time of anus was earlier than that of laparotomy group ($P < 0.05$). There was no significant difference in operation time, lymph node clearance and hospitalization time between the two groups ($P > 0.05$). The levels of aldosterone, cortisol and upper gland surface in minimally invasive group were lower than those in laparotomy group at 1D, 3D and 5D after operation ($P < 0.05$) There was no significant difference in the total incidence of complications and the incidence of different types of complications between the two groups ($P > 0.05$). One case of anastomotic flaccidity and two cases of intestinal obstruction in the open group were cured by surgery, and the other complications were improved after conservative treatment. There was no significant difference in the follow-up time between the two groups ($P > 0.05$). Five patients in the minimally invasive group were lost to follow-up, There was no significant difference in 5-year local recurrence rate, distant metastasis rate, overall survival rate and tumor-free survival rate between the two groups ($P > 0.05$). **Conclusion:** The prognosis of laparoscopic surgery for colonic tumors is similar to that of laparotomy, but the traumatic stress caused by surgery is small.

KEYWORDS: Colon cancer; Laparotomy; Laparoscopic surgery; Radical surgery; Prognosis; Trauma; Stress response.

Colon cancer is a common clinical malignancy, and its incidence rate is third in both the domestic and globally.^[1] However, many studies in China show that the incidence rate of colorectal cancer is not only high but also rising.^[2] Laparoscopic surgery has been used in the clinical treatment of colon cancer for nearly 30 years. The effect of lymph node dissection and the degree of tumor resection are equivalent to those of laparotomy, and it has the advantages of less trauma and rapid recovery of gastrointestinal function. Many studies have compared the long-term survival rate of colon cancer patients after laparoscopic laparotomy, and concluded that the long-term survival rate is similar.^[3] However, few studies compare the traumatic stress caused by the two surgical methods. Traumatic stress not only has a great impact on the psychological state of patients, but also may inhibit the immune function. With the change of medical model, the pursuit of minimal traumatic stress is also an important goal of modern medicine. In this

study, the effects of laparoscopic surgery and laparotomy on traumatic stress and prognosis of colon cancer patients were observed. The results are reported as follows.

1 Data and methods

1.1 General information: 96 patients with colorectal cancer treated in the hospital from August 2012 to March 2015 were selected for the study. They were randomly divided into minimally invasive group and laparotomy group. There were 48 patients in the minimally invasive group, 31 male patients and 17 female patients. The TNM stage included 17 patients in stage I, 20 patients in stage II and 11 patients in stage III. The tumor classification included 13 patients with ulcer type, 17 patients with invasive type and 18 patients with mass type. The degree of differentiation included 19 patients with high differentiation, 19 patients with medium differentiation and 10 patients with low differentiation.

The radical operation methods included 22 patients with right hemicolectomy, 14 patients with left hemicolectomy and 2 patients with transverse colectomy, radical sigmoid resection was performed in 10 patients. There were 48 patients in the laparotomy group, 29 male patients and 19 female patients. The TNM stage included 15 patients in stage I, 21 patients in stage II and 12 patients in stage III. The tumor classification included 15 patients with ulcer type, 18 patients with invasive type and 15 patients with mass type. The degree of differentiation included 17 patients with high differentiation, 23 patients with medium differentiation and 8 patients with low differentiation. The radical operation methods included 21 patients with right hemicolectomy, 16 patients with left hemicolectomy and 1 patient with transverse colectomy, radical sigmoid resection was performed in 10 patient. There was no significant difference in general data between the two groups ($P>0.05$). The study was approved by the hospital medical ethics committee.

1.2 Inclusion and Exclusion criteria

Inclusion criteria: TNM stage I ~ stage III had no previous operation history of gastrointestinal cancer, and imaging examination did not find liver or lung metastasis, and the tumor diameter was less than 5cm; No major organ dysfunction; Patients with good compliance signed informed consent.

Exclusion criteria: Patients with ascites, pelvic metastasis or peritoneal metastasis complicated with intestinal perforation or intestinal obstruction, patients with intraoperative tumor rupture, intolerance to general anesthesia and establishment of pneumoperitoneum, patients with palliative surgery, pregnant women with incomplete clinical and follow-up data.

1.3 Treatment plan

Intravenous prophylactic administration for anti infective treatment, cleaning the intestinal tract and indwelling the urinary catheter. The location of the tumor was located by colonoscopy or CT before operation, and the staging was carried out according to the results of abdominal ultrasound and X-ray film. The minimally invasive group was treated with laparoscopic radical resection of colon cancer and general anesthesia. Patients with sigmoid or transverse colon tumors were treated with lithotomy position, patients with descending colon tumors were treated with right tilt position, and patients with ascending colon tumors were treated with left tilt position. Pneumoperitoneum was established routinely, and endoscopy and instruments were placed by 5-hole method to explore the location, size and metastasis of tumor. The tumors distributed in the ascending colon or cecum were treated with radical right hemicolectomy, the right colonic vessels and ileocolic vessels were ligated at the root, and lymph node dissection was performed. The tumors distributed in the middle of the transverse colon were treated with radical transverse colectomy, the submesenteric vessels were ligated at the

root, and lymph node dissection was performed. The tumors distributed in the sigmoid colon were treated with radical sigmoid colectomy, The sigmoid vessels were ligated at the root and lymph node dissection was performed. When the tumor was distributed in the descending colon, the left hemicolon was treated with radical resection, and the inferior mesenteric vessels were ligated at the root and lymph node dissection was performed. The minimally invasive group was treated with end-to-end intestinal anastomosis in vivo or in vitro. The open group was treated with traditional open surgery. Anti infective treatment was given 7 days after operation. Stage II and III patients with high-risk factors such as less than 12 lymph node biopsies, poor histological differentiation, tumor infiltration into blood vessels or lymph nodes were given 6 cycles of adjuvant chemotherapy, mainly including oxaliplatin combined with capecitabine, oxaliplatin combined with formyltetrahydrofolate, 5-fluorouracil, calcium folinate combined with 5-fluorouracil.

1.4 Observation indicators

Surgical indexes: the operation time, intraoperative bleeding, incision length, lymph node clearance, anal recovery and exhaust time and hospitalization time of all patients were counted. The levels of cortisol, aldosterone and epinephrine were measured before operation and 1, 3 and 5 days after operation. The renal gland was detected by high performance liquid chromatography combined with electrochemical method, Aldosterone and cortisol were detected by radioimmunoassay. The incidence of perioperative complications were counted. The prognosis was followed up once in the first year and 3 months after operation, and once in the follow-up half a year. Local recurrence, distant metastasis and survival during follow-up were counted. Histological or imaging examination showed that the tumors at the anastomotic stoma, pelvic wall, perineum, trocar hole, intestinal canal and incision were local recurrence, and the tumors in brain, lung, peritoneum and liver were metastasis.

1.5 statistical analysis

The data were analyzed by spss180. The counting data were expressed in $n(\%)$, χ^2 test was used, and the latest data were expressed in $(\bar{x} \pm s)$. The survival rate was calculated by t test and Kaplan Meier method. The difference was statistically significant when $P<0.05$.

2 RESULTS

2.1 comparison of surgical indexes between the two groups: The intraoperative blood output in the minimally invasive group was lower than that in the open group, the incision length was shorter than that in the open group, and exhaust time of the anus was earlier than that in the open group, the difference was statistically significant ($P<0.05$). There was no significant difference between the two groups in operation time, lymph node clearance and hospital stay ($P>0.05$) (see Table 1.).

Table 1: Comparison of surgical indexes between the two groups($\bar{x}\pm s$)

Index	Minimally invasive group	Laparotomy group	t	p
Operation time (min)	178.21 \pm 44.52	165.45 \pm 48.11	1.349	0.181
Intraoperative bleeding volume (ML)	99.58 \pm 31.04	171.69 \pm 34.26	10.807	< 0.001
Cut length (CM)	5.9 4 \pm 2.38	13.82 \pm 3.95	11.38	< 0.001
Number of lymph node dissections (piece)	13.28 \pm 3.05	13.12 + 3.23	0.250	0.803
Anal recovery exhaust time (d)	3.41 \pm 0.76	4.58 \pm 1.09	6.100	< 0.001
Length of hospital stay(d)	11.54 \pm 3.11	12.06 \pm 3.87	0.726	0.470

Table 2: Comparison of trauma stress indexes between the two groups($\bar{x}\pm s$).

Index	time	Minimally invasive group	Laparotomy group	t	P
Cortisol (μ g/dL)	Preoperative	7.13 \pm 1.76	7.06 \pm 2.03	0.181	0.857
	day after operation	9.28 \pm 2.31	12.15 \pm 2.46	5.892	<0.001
	3days after operation	8.56 \pm 1.79	10.83 \pm 2.25	5.470	< 0.001
	5days after operation	7.25 \pm 1.96	9.34 \pm 1.83	5.400	<0.001
Aldosterone (PG / ml)	Preoperative	55.02 \pm 15.83	54.89 \pm 16.12	0.040	0.968
	1 day after operation	55.71 \pm 17.28	68.83 \pm 18.51	3.590	0.001
	3days after operation	56.28 \pm 14.19	65.37 \pm 16.24	2.920	0.004
	5days after operation	56.14 \pm 13.07	61.99 \pm 14.28	2.094	0.039
Adrenaline (ng / L)	Preoperative	241.72 \pm 23.87	243.56 \pm 25.11	0.368	0.714
	1 day after operation	243.17 \pm 26.8 2	295.71 \pm 39.43	7.633	<0.001
	3days after operation	242.8 6 \pm 22.58	275.94 \pm 30.62	6.024	<0.001
	5days after operation	242.05 \pm 24.26	267.29 \pm 25.11	5.008	<0.001

Note: compared with that before operation, * P < 0.05

2.2 There was no significant difference in the preoperative levels of aldosterone, cortisol and adrenaline between the two groups ($P > 0.05$). The levels of aldosterone, cortisol and adrenaline in the minimally invasive group were lower than those in the open group at 1D, 3D and 5D after operation. The difference was statistically significant ($P < 0.05$). (see Table 2)

2.3 Comparison of complications between the two groups: there was no significant difference in the total incidence of complications and the incidence of different types of complications between the two groups ($P > 0.05$). In the open group, 1 case of anastomotic leakage and 2 cases of intestinal obstruction were cured by operation, and the other complications were improved after conservative treatment. (see Table 3.)

Table 3: Comparison of complications between the two groups n (%)

Index	Minimally invasive group	Laparotomy group	χ^2	P
Infected	2(4.17)	3(6.25)	0.211	0.646
intestinal Obstruction	0(0.00)	2(4.17)	2.043	0.153
Anastomotic Stoma	0(0.00)	1(2.08)	1.011	0.314
Cardiovascular Accident	0(0.00)	1(2.08)	1.011	0.314
Total incidence	2(4.17)	7(14.58)	3.065	0.080

2.4 Comparison of prognosis between the two groups: The median follow-up time in minimally invasive groups was 53 months (39 ~ 82 months) and in that in open group was 55 months (37 ~ 84 months). There was no significant difference in follow-up time ($P > 0.05$). 5 patients in the minimally invasive group were lost to

follow-up, and 9 patients in the open group were lost to follow-up. There was no significant difference in 5-year local recurrence rate, distant metastasis rate, overall survival rate and tumor-free survival rate between the two groups ($P > 0.05$). (see Table 4.)

Table 4: Comparison of prognosis between the two groups n (%)

Index	Minimally invasive group (n = 43)	Laparotomy group (n = 39)	χ^2	P
Local recurrence	8(18.60)	7(17.95)	0.006	0.938
Distant metastasis	8(18.60)	10(25.64)	0.591	0.442
Overall survival	29(67.44)	25(64.10)	2.393	0.122
Tumor free survival	27(62.79)	22(56.41)	0.346	0.556

3 DISCUSSION

Because the incision recurrence rate is higher than that of open surgery, the safety of laparoscopic surgery in the early treatment of colon cancer has been widely questioned. However, with the improvement of laparoscopic instruments and operation technology in recent years, the safety of colon cancer treatment has also been significantly improved. This study found that the intraoperative blood loss in the minimally invasive group was lower than that in the open group, the incision length was shorter than that in the open group, and the anal recovery and exhaust time was earlier than that in the open group. The results showed that laparoscopic surgery was better than open surgery in minimally invasive and postoperative gastrointestinal function recovery. Many studies have found that laparoscopic surgery takes longer than open surgery, which is attributed to the difficulty of operation.^[4] However, there

are also reports that the operation time is similar.^[5] This study found that there was no significant difference in operation time between minimally invasive group and laparotomy group, which may be related to the more mature application of laparoscopic technology in colon cancer. The improvement of operation technology and instrument conditions promoted the shortening of operation time. Lymph node dissection is considered to have a certain value in evaluating the prognosis of tumors.^[6] Other studies have found that the more lymph node clearance, the higher the survival rate of patients with stage II and III colon cancer.^[7] In this study, it was found that the number of lymph node dissection in the two groups was similar to that reported in the previous literature, and there was no significant difference between the two groups, indicating that the lymph node dissection effects of the two operations were similar.

Appropriate traumatic stress is the normal response of the body to resist external damage, which is conducive to the protection of body function, but excessive stress response may further aggravate tissue damage.^[8] The stimulation caused by surgical trauma is transmitted to the central nerve through the peripheral nerve to stimulate the sympathetic nerve and enhance the excitability of the hypothalamus pituitary adrenocortical axis.^[9] Adrenal cortex can promote the activation of inflammatory factors such as granulocytes, lymphocytes and macrophages, and then activate renin and angiotensin system.^[10] Studies have confirmed that traumatic stress can stimulate the hypothalamus to secrete adrenocorticotrophic hormone, and then increase the secretion of adrenaline and cortisol.^[11] Adrenaline and cortisol can enhance the function of adenohypophyseal adrenocortical system.^[12] Other studies have found that cortisol levels are related to the severity of stress response.^[13] This study found that the levels of cortisol, adrenaline and aldosterone in the two groups were higher than those before operation, and then decreased gradually. The levels of trauma stress in minimally invasive group were lower than those in laparotomy group at day1, day3 and day5 after operation. The results showed that laparoscopic surgery caused less traumatic stress than open surgery. Qiu Dongda's^[14] comparison of the impact of laparoscopic surgery and laparotomy on trauma in right colon cancer resection is consistent with the results of this study. As a minimally invasive surgery, laparoscopic surgery leads to less trauma than open surgery, and the trauma stress is reduced accordingly. Previous studies believe that laparoscopic surgery is less safe than open surgery, mainly considering the high risk of recurrence of incision and trocar hole.^[15] In this study, the following measures were taken to reduce the risk of recurrence (1) conventional incision protection device; (2) Make an incision of appropriate size to avoid damage when pulling out the specimen; (3) The results showed that there was no significant difference in the local recurrence rate between the two groups, indicating that reasonable operation can improve the tumor safety of laparoscopic surgery. The prognosis of the two groups was compared from three aspects: distant metastasis rate, overall survival rate and tumor-free survival rate. The results showed that there was no significant difference in the above indexes. The results suggest that laparoscopic surgery and open surgery can achieve similar long-term therapeutic effects in the surgical treatment of colon cancer.

In conclusion, the prognosis of laparoscopic surgery for colon cancer is similar to that of open surgery, but the traumatic stress caused by surgery is less. However, the sample size of this study is small, and the research conclusion needs to be further verified. In addition, patients with TNM IV were not included in this study. The effects of the two operations on traumatic stress and prognosis of patients with TNM IV colon cancer need to be studied.

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