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Clinical efficacy of laparoscopic minimally invasive surgery for rectal cancer and its effect on anorectal dynamics.

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Abstract

Objective: The aim of this work is to investigate the clinical efficacy of laparoscopic minimally invasive surgery for rectal cancer and its effect on anorectal dynamics.

Methods: A total of 150 patients with rectal cancer who were admitted in our hospital from January 2015 to January 2017 were selected. The patients were divided into A group (n=80) and B group (n=70) according to the treatment method administered to them. The patients in the A group underwent minimally invasive laparoscopic surgery, whereas the patients in B group underwent laparotomy. The clinical efficacies and effects on anorectal dynamics between the two groups were compared.

Results: The operation duration of the A group (211.41 ± 17.67 min) was significantly longer than that of B group (p<0.05). The intraoperative blood loss (101.16 ± 15.24 ml), exhaust time (45.69 ± 11.53 min), and time of off-bed (42.32 ± 12.78 h) were significantly lower than those of the B group (p<0.05). The length of anal high pressure zone, anal resting pressure, and anal maximal systolic pressure of the A group at first, second, and fourth postoperative months were significantly higher than those of the B group (p<0.05). In the same periods, the MTL (168.61 ± 12.32, 180.65 ± 12.68, and 203.72 ± 13.63 pg/ml, respectively), GAS (76.73 ± 4.31, 81.84 ± 5.28, and 91.43 ± 5.75 μmoL/L, respectively), and NPY (156.64 ± 9.36, 165.37 ± 10.43, and 181.86 ± 11.53 pg/ml, respectively) of the A group were significantly higher than those of the B group (p<0.05).

Conclusion: Minimally invasive laparoscopic surgery for rectal cancer offer short operation time, decreased intraoperative blood loss, and minimal trauma to the body and effects on anorectal dynamics and gastrointestinal hormones, which are beneficial to the postoperative rehabilitation of patients.

Keywords: Rectal cancer, Laparoscopy, Anorectal dynamics, Gastrointestinal hormones.

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Introduction

Rectal cancer is one of the most common digestive tract malignant tumors [1]. In China, despite the improvements in living standards, people are at increased risk of contracting rectal cancer because of the changes in their lifestyles and diets [2]. Laparoscopic surgery is an emerging minimally invasive surgery. In contrast to traditional laparotomy, laparoscopic surgery requires only a small incision and thus results in minimal trauma, mild postoperative pain, and short recovery time [3]. However, the effects of both treatment methods on anorectal dynamics and gastrointestinal hormones in patients with rectal cancer are rarely reported. Therefore, the clinical efficacy of laparoscopic minimally invasive surgery for rectal cancer and its effect on anorectal dynamics were discussed in this paper to provide a basis for the improvement of clinical treatment.

General Information and Methods

General information

A total of 150 patients with rectal cancer admitted in our hospital from January 2015 to January 2017 were selected. Inclusion criteria were as follows: definite diagnosis by endoscopy, ultrasound, MRI and pathology, no distant metastasis, no multiple neoplastci foci, no defunctioning stoma, and informed consent provided by patients. Meanwhile, the exclusion criteria were mental diseases, cognitive disorders, combined with other malignant tumors, serious tumor complications, and serious organ diseases. The patients were classified into A group (n=80) and B group (n=70) according to the treatment method they received. The A group included 45 males and 35 females, both aged 6.8648-72 y with an average age of 54.78 ± 7.86 y and had duration of 1-5 y with average duration of 3.05 ± 1.26 y. The B group comprises 40 males and 30 females, both aged 48-72 y old with an average of 55.48 ± 8.36 y and had duration of 1-5 y with average duration of 3.02 ± 1.46 y. The general information

showed no statistically significant difference between the two groups (p>0.05).

Method

Smoking and drinking were routinely banned in patients before their respective operations. Bowel preparation was performed in three preoperative days. The patients received metronidazole and gentamicin orally and underwent clysis in one preoperative day. The patients in the A group underwent minimally invasive laparoscopic surgery. The patients were administered with general anesthesia by tracheal intubation. Routine disinfection was performed, and sterile towels were sheeted. The pneumoperitoneum was established. The pressure was controlled between 12 and 14 mmHg, and three to four 10 mm observation holes were set below the belly button. The inferior mesenteric artery was separated using the ultrasound knife from right to left. The mesenteric artery root was ligated, the perivascular lymph nodes were dissected, and the pararectal space was dissociated. The distal rectum was closed, and the puncture hole was expanded. The proximal bowel was severed, and purse string suture was performed after the specimen was removed. Transanal anastomat was then placed. The digestive tract was reconstructed under the laparoscope. The anastomat was removed after adequate hemostasis. The abdominal cavity was flushed routinely and then closed.

Meanwhile, the patients in the B group underwent laparotomy. Tracheal intubation general anesthesia was performed. Routine disinfection was performed, and the sterile towels were sheeted. The abdominal cavity was cut open through the rectus abdominis incision, and the blood vessel was separated and ligated. The rectum was gradually dissociated, and the distal rectum was severed. The rectum and descending colon were anastomosed using the anastomat. The patients in the two groups were treated with anti-inflammation medication, fluid infusion, and nutrition support.

Observation index

Operation time, intraoperative blood loss, exhaust time, and time of off-bed of patients in the two groups were observed. The anorectal hemodynamic indexes, including length of anal high pressure zone, anal resting pressure, and anal maximal anal systolic pressure were measured using the digestive tract pressure detector in first, second, and fourth postoperative months. The fasting venous blood samples (5 ml from each patient) were collected before the operation and in first, second, and fourth postoperative months. Serum gastrointestinal hormone indexes, MTL, GAS, and NPY, were measured.

Statistical analysis

The data were analysed with SPSS22.0. The count data were expressed using the "%", and χ^2 test was performed. The enumeration data were expressed using the "$\bar{x} \pm S$" before t test was performed. A p value of <0.05 indicated significantly statistical difference.

Results

Clinical efficacy comparison between the two groups

The operation time of A group (211.41 ± 17.67 min) was significantly longer than that of B group (p<0.05). The intraoperative blood loss (101.16 ± 15.24 ml), exhaust time of (45.69 ± 11.53 min), and time of off-bed of (42.32 ± 12.78 h) of the A group were significantly lower than those of the B group (p<0.05; Table 1).

Table 1. Clinical efficacy comparison between the two groups.

Group	Operation time/min	Intraoperative blood loss/ml	Exhaust time/min	Time of off-bed/h
A group (n=80)	211.41 ± 17.67	101.16 ± 15.24	45.69 ± 11.53	42.32 ± 12.78
B group (n=70)	179.87 ± 20.24	208.24 ± 19.28	70.42 ± 15.25	70.23 ± 16.85
t	10.190	37.946	11.282	11.509
P	0.000	0.000	0.000	0.000

Comparison of anorectal dynamics between the two groups

The length of anal high pressure zone, anal resting pressure, and anal maximal systolic pressure of the A group in the first, second, and fourth postoperative months were significantly higher than those of the B group (p<0.05), as shown in Table 2.

Comparison of gastrointestinal hormones between the two groups

The MTL ((168.61 ± 12.32), (180.65 ± 12.68), and (203.72 ± 13.63) pg/ml), GAS ((76.73 ± 4.31), (81.84 ± 5.28), and (91.43 ± 5.75) μmoL/L), NPY ((156.64 ± 9.36), (165.37 ± 10.43), and (181.86 ± 11.53) pg/ml) of A group in the 1, 2, and 4 postoperative months were significantly higher than those of B group (p<0.05), as shown in Table 3.

Table 2. Comparison of anorectal dynamics between the two groups.

Group	Time	Length of anal high pressure zone/cm	Anal resting pressure/ mmHg	Anal maximal systolic pressure/ mmHg
A group (n=80)	Preoperative	4.33 ± 0.35	44.91 ± 3.76	134.19 ± 11.98
	1 month	2.61 ± 0.18	28.42 ± 1.92	106.62 ± 2.67
	2 months	3.14 ± 0.23	30.19 ± 2.11	111.74 ± 2.85
	4 months	4.05 ± 0.16	35.62 ± 2.36	115.67 ± 3.26
B group (n=70)	Postoperative	4.31 ± 0.37	45.12 ± 4.37	134.24 ± 12.23
	1 month	3.61 ± 0.24*	36.92 ± 2.36*	122.29 ± 2.71*
	2 months	4.09 ± 0.25*	39.37 ± 2.48*	130.28 ± 2.94*
	4 months	4.32 ± 0.21*	44.23 ± 2.74*	133.17 ± 3.21*

Note: *Compared with B group, p<0.05

Table 3. Comparison of gastrointestinal hormones between the two groups.

Group	Time	MTL (pg/ml)	GA (μmoL/L)	NPY (pg/ml)
A group (n=80)	Preoperative	270.26 ± 15.63	110.36 ± 8.32	230.53 ± 14.85
	1 month	168.61 ± 12.32	76.73 ± 4.31	156.64 ± 9.36
	2 months	180.65 ± 12.68	81.84 ± 5.28	165.37 ± 10.43
	4 months	203.72 ± 13.63	91.43 ± 5.75	181.86 ± 11.53
B group (n=70)	Postoperative	270.31 ± 15.61	110.62 ± 8.05	230.36 ± 14.82
	1 month	211.67 ± 13.64*	91.58 ± 5.46*	186.37 ± 11.46*
	2 months	234.56 ± 13.96*	102.64 ± 5.82*	200.48 ± 12.79*
	4 months	259.71 ± 15.58*	107.86 ± 6.06*	219.65 ± 13.38*

Note: *Compared with B group, p<0.05

Discussion

Rectal cancer refers to the cancer occurring from the dentate line to the junction of the rectum and sigmoid colon. Rectal cancer is one of the most common malignant tumors in the digestive tract [4]. The position of rectal cancer is low and is easily diagnosed by rectal touch and colonoscopy. However, the rectum is deep into the pelvic cavity, and the anatomic relation is complicated. Moreover, the operation is not thorough, and rectal cancer has a high recurrence rate. Surgery is the main treatment method for rectal cancer. However, surgical trauma often causes inflammation in patients, promotes the release of anti-inflammatory cell transplantation and systemic inflammatory response syndrome, influences the anorectal dynamics of patients with rectal cancer, and results in tachycardia, polypnea, leukocytosis, and fever [5]. The middle and lower rectal cancer is close to the anal sphincter. The difficulty to preserve the anus and its function is one of the problems during the operation and remains a controversial issue in this method. The median age of rectal cancer onset in China is approximately 45 y, although its incidence in young people is increasing. The previous clinical treatment emphasis for rectal cancer lies in lesionectomy. However, although it offers a certain curative effect, it presents postoperative complications, thus seriously affecting the quality of life of patients [6]. Through surveys, sexual dysfunction are found to be one of the common complications of rectal cancer surgery. Fortunately, owing to the continuous development of medical technology, novel clinical treatments for rectal cancer are constantly emerging. The most common method is total mesorectal excision. This surgical method offers a definite curative effect and can also improve the postoperative life quality of patients. However, this approach also presents some disadvantages [7].

In this study, we found that minimally invasive laparoscopic surgery can protect immune function in patients with rectal cancer and reduce the incidence of infectious complications. Laparoscope-assisted or total laparoscopic radical surgery are preferred for patients, except for those with large volumes of gross tumor that invade the serosa, involving the peripheral organs and blood vessels, and swelling lymph nodes in the vessel root fusing, in combination with obstruction, multiple major abdomen operations, and pneumoperitoneum intolerance [8]. Thus, surgeons and assistants should be experienced in radical resection of colon cancer before they undergo relevant advanced laparoscopic technology training. They must also obtain relevant qualifications before they can perform

laparoscopic colorectal cancer radical surgery. At present, the international treatment guideline for rectal cancer is also recommended [9]. Early and middle colon cancer radical surgery under the laparoscope is a standard operation. However, for patients with middle and low rectal cancers, which already invaded the mesorectum and showed local lymph node metastasis, the preoperative standardized chemoradiotherapy must be performed prior to laparoscopic surgery to improve the rate of anal preservation and reduce the recurrence rate [10]. In this paper, the A group was significantly longer operation time and lower intraoperative blood loss, exhaust time, and time of off-bed than those of the B group (both had p of >0.05). In the first, second, and fourth postoperative months, the length of anal high pressure zone, anal resting pressure, and anal maximal systolic pressure of the A group were significantly higher than those of the B group ($p<0.05$), and the MTL, GAS and NPY of A group were significantly higher than those of the B group ($p<0.05$). The results showed that the minimally invasive laparoscopic surgery exerted less effect on the anorectal dynamics and gastrointestinal hormones of patients with rectal cancer. When time was extended, the patients gradually recovered, further indicating that minimally invasive laparoscopic surgery is beneficial for the postoperative rehabilitation of patients.

Conclusion

Minimally invasive laparoscopic surgery for rectal cancer offers short operation time, low intraoperative blood loss, minimal trauma to the body and effects on the anorectal dynamics and gastrointestinal hormones. Thus, this surgery favors the postoperative rehabilitation of patients.

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