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Original Article

Effects of fast-track surgery on perioperative indicators and postoperative recovery of patients undergoing laparoscopic radical resection of colon cancer

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Abstract: Objective: To explore the application value of fast-track surgery (FTS) in laparoscopic radical resection of colon cancer. Methods: A total of 200 patients who underwent laparoscopic radical resection of colon cancer were randomly divided into the observation group and control group, with 100 cases in each group. Patients in the observation group received laparoscopic radical resection in the FTS procedure, while those in the control group were treated with conventional laparoscopic radical resection. The differences of perioperative indicators (operation time, intraoperative blood loss, number of lymph node dissection and the length of stay) and postoperative gastrointestinal recovery (fasting time, postoperative first anal exhaust time, postoperative first defecation time and postoperative first semi-liquid feeding time) were compared between the two groups. In addition, nutritional indicators transferin (TRF), prealbumin (PAB) and albumin (ALB), and inflammatory factors (C-reactive protein (CRP) and procalcitonin (PCT)) were compared 1 week after operation. Results: No significant difference was observed in terms of operation time, intraoperative blood loss, and lymph node dissection between the two groups (P>0.05), while the length of stay of the observation group was significantly shorter than that of the control group (t=11.363, P<0.001). The fasting time, the first anal exhaust time, the first defecation time and the first semi-liquid feeding time after operation in the observation group were significantly shorter than those in the control group (P<0.001). There was no statistically significant difference in preoperative TRF, PAB and ALB levels between the two groups (P>0.05). The TRF level in the observation group was significantly increased while the PAB and ALB levels were markedly decreased after operation (P<0.001). And the TRF, PAB and ALB levels in the control group were markedly decreased after operation (P<0.001). The postoperative TRF and PAB levels in the observation group were significantly lower than those in the control group (P<0.001), except for the postoperative ALB level (t=1.693, P=0.092). As to the CRP and PCT levels, no significant difference was observed between the two groups before operation (P>0.05). However, the serum CRP and PCT levels were remarkably increased in both groups one week after operation (P<0.001), and the observation group showed significantly lower levels than the control group (P<0.001). Conclusion: The application of FTS in laparoscopic radical resection of colon cancer can not only effectively shorten the hospital stay, improve the nutritional status and inflammatory factors in the perioperative period, but also promote the recovery of postoperative gastrointestinal function of patients, which is worthy of clinical application.

Keywords: Colon cancer, laparoscopy, fast-track surgery, gastrointestinal function, inflammatory factors

Introduction

Colon cancer, with (mucinous) adenocarcinoma or undifferentiated cancer as the dominant pathological types, is one of the most common tumors of the digestive tract, a majority of which present polypoid or ulcerated tumor tissues [1, 2]. Statistics have demonstrated that, the generalization of disorders in people's dietary structure and daily routine are driving the rise of colon cancer, which is more prevalent in middle-aged and elderly patients and preferred in males [3, 4]. The onset of colon cancer is slow and occult. In general, it takes 10 to 15 years for intestinal epithelial cells to develop from normal cells to malignant tumors, with unconspicuous clinical symptoms in the early stage of colon cancer. Unfortunately, its

strong metastasis capacity enables itself to transfer to other tissues through blood or lymphatic pathway, posing great challenge to clinical treatment and presenting poor prognosis [5-7]. Currently, radical resection is the main treatment for metastatic colon cancer.

As a traumatic treatment, radical resection of colon cancer will induce stress reaction of patients, thus affecting the rehabilitation effect of patients after operation. In 1997, Kehlet in Denmark first proposed the concept of fast-track surgery (FTS) [8]. It refers to a multi-disciplinary collaborative model in which surgeons, anesthesiologists and nurses are involved. This concept of rehabilitation is applied for patients throughout the perioperative period, including preoperative, intraoperative and postoperative period, so as to reduce the trauma and stress caused by surgery. Laparoscopic radical resection of colon cancer, as a minimally invasive surgical method, can effectively reduce the surgical trauma of patients [9]. However, how to further apply the concept of FTS in laparoscopic radical resection of colon cancer to further reduce the body's stress response remains the subject of investigation, which is of great significance for patients' postoperative rehabilitation. Presently in the stage of exploration and improvement, there is no unified standard for the FTS procedures of colon cancer patients. Nevertheless, it is of great clinical significance to study the application procedures and effect of FTS in the radical resection of colon cancer.

Based on previous reports on the FTS procedure, this study perfected the application procedures of FTS in the laparoscopic radical resection of colon cancer. In addition, a randomized controlled study was conducted to compare the application effect of traditional postoperative rehabilitation measures and FTS, aiming to provide reference for the clinical application of FTS in laparoscopic radical surgery for colon cancer patients.

Materials and methods

Patients

A total of 200 patients with colon cancer who underwent laparoscopic radical resection of colon cancer in Zhuji Hospital Affiliated to Shaoxing University from January 2015 to January 2019 were selected as the study objects. Patients met the following criteria were included: 1) patients meeting the clinical diagnostic criteria of colon cancer and confirmed by colonoscopic biopsy and pathology; 2) patients aged between 18-75 years old; 3) patients who met the indications of laparoscopic radical resection of colon cancer, without any previous surgical treatment [4]; 4) patients who completed computed tomography or magnetic resonance imaging examination before operation to ensure that there was no other organ metastasis; 5) patients with complete clinical data during treatment. In contrast, the exclusion criteria were as follows: 1) patients with severe hematological, immune or other malignant tumors; 2) patients who failed to receive the prescribed surgical treatment; 3) patients with incomplete intestinal obstruction or severe hypoproteinemia; 4) patients with preoperative infection or other organ diseases; and 5) patients with mental illness that failed to complete the follow-up.

This study was a randomized controlled study, in which all patients voluntarily received laparoscopic radical resection of colon cancer and signed the informed consent, and this study was approved by the Medical Ethics Committee of Zhuji Hospital Affiliated to Shaoxing University.

Surgical methods

Laparoscopic surgery: All patients underwent complete mesocolon resection. First, patients were placed in supine position, with the projection of the inferior mesenteric artery as the starting point of the middle approach. The tumor metastasis was observed under laparoscopy, and the tumor and corresponding lymphatic tissues were taken for pathological examination. Then lymph node dissection was performed on the suspected tumor metastases in all patients. After separating the left and right mesocolon to expose blood vessels, the fatty tissue around the root of mesenteric blood vessel was removed and the surrounding lymph nodes cleaned up. And then, the inferior colonic arteries and veins were clipped or severed according to the individual differences of patients. Attention was paid during the operation that blunt dissection of the fascia was required to ensure its integrity before clearing the lymph nodes around the root of the mesocolon vessels. And when clearing the lymph nodes, the

starting site of the blood vessels should be found and ligated at a high position. Besides, the integrity of resection was noted when removing tumors.

Routine rehabilitation: Patients in the control group received routine nursing after operation. Detailed procedures were shown in **Table 1**.

FTS nursing: Patients in the observation group received FTS nursing measures after surgery, and the detailed procedures were shown in **Table 2**.

Observation indicators

(1) The operation time, intraoperative blood loss, number of lymph node dissection and length of stay were compared between the two groups, which reflected the influence of FTS on operation procedure and recovery time of patients.

(2) The fasting time, the postoperative first anal exhaust time, the first defecation time and the first semi-liquid feeding time were compared between the two groups, which reflected the influence of FTS on gastrointestinal function recovery of patients.

(3) Nutritional indicators including transferrin (TRF), prealbumin (PAB), albumin (ALB) were compared before and after operation between the two groups. The 5 mL fasting venous blood was taken at admission and one week after operation. Then the serum was separated after centrifugation for the examination of TRF, PAB and ALB. Immunoturbidimetry was employed for TRF, PAB and ALB detection using the respective kit (Nanjing Xinfan Biological Technology Co., Ltd.). These indicators reflected the impact of FTS on postoperative nutritional status of patients.

(4) C-reactive protein (CRP) and procalcitonin (PCT) were compared between the two groups. The 5 mL fasting venous blood was taken upon admission and 1 week after surgery, and serum was separated for test after centrifugation. Then serum CRP and PCT levels were detected by ELISA, respectively using CRP and PCT kits (Nanjing Xinfan Biological Technology Co., Ltd.), in the purpose of reflecting the effect of FTS on postoperative inflammatory response of patients.

Statistical analyses

SPSS24.0 was employed for statistical analysis in this study. The counting data were expressed as cases/percentage (n (%)) and verified by χ^2 test at an α level of 0.05 (both sides). The measurement data were expressed as mean ± standard deviation ($\bar{x}$±sd), and an independent sample t test was used for comparison between groups at an α level of 0.05 (both sides). P<0.05 was considered as a statistically significant difference.

Results

Baseline

Age, sex and other general data did not differ significantly between the two groups (P>0.05; **Table 3**).

FTS nursing measures significantly improved perioperative index of laparoscopic radical surgery for patients with colon cancer

No significant difference was observed in terms of operation time, intraoperative blood loss, and number of lymph node dissection between the two groups (P>0.05), while the length of stay was significantly shorter in the observation group than that in the control group (t=11.363, P<0.001). FTS nursing measures significantly improved perioperative indexes of laparoscopic radical resection of colon cancer patients (**Table 4**).

FTS nursing measures obviously promoted postoperative recovery in patients with colon cancer

The fasting time, the postoperative first anal exhaust time, the first defecation time and the first semi-liquid feeding time in the observation group were significantly shorter than those in the control group (P<0.001), suggesting that FTS nursing measures could remarkably promote the postoperative recovery of colon cancer patients (**Table 5**).

FTS nursing measures significantly promoted postoperative nutrition in patients with colon cancer

The nutrition indicators represented by TRF, PAB and ALB levels did not identify any signifi-

Table 1. Routine nursing measures

Items	Contents
Preoperative enteral nutrition	Semi-liquid food was taken 2 days before operation, and liquid food was taken 1 day before operation.
Preoperative intestinal preparation	Diet was forbidden and routine cleaning enema was performed since 22 o'clock 1 day before operation.
Anesthesia	General anesthesia
Rehydration management	Traditional rehydration was adopted at the amount of 2,500-3,000 mL/d after operation. In addition, the amount of fluid was gradually reduced according to the amount of food intake.
Wound closure	After ordinary silk suture, the time to remove the stitches from the wound should be determined by the doctor according to the location of the wound. During the period, the dressing was changed every 3 days, the wound infection was observed, and the sterile operation was strictly followed.
Intraoperative and postoperative analgesia	According to the patient's needs, ropivacaine (Guangdong Jiabo Pharmaceutical Co., LTD., 10 mL: 75 mg) was injected into the muscle layer and subcutaneously through incision.
Postoperative breathing exercise	Regular oxygen for 2 h, no special breathing exercise.
Postoperative gastrointestinal nutrition	Patients began to drink water after exhaust, gradually making the transition to diet.
Drainage tube placement	One abdominal drainage tube was placed before operation, but removed when the drainage fluid was less than 50 mL/day after operation.
Stomach tube management	Gastric tube was routinely placed and then removed after anal exhaust.
Urine tube management	Routine indwelling catheter was removed 3 days later.
Early ambulation	Ambulation was conducted according to their own conditions.
Discharge criteria	Normal diet, gastrointestinal function recovery, removal of all pipelines, no need of pain control or well-controlled pain on oral medicine, walking without assistance

Table 2. FTS nursing

Items	Contents
Preoperative assessment	After admission, the patients were informed and taught by special personnel, and their medical records were collected and multidisciplinarily discussed to assess the high-risk factors as well as to draw up symptomatic support treatment plans and rehabilitation plans.
Preoperative psychological counseling	Responsible doctors communicated with patients and their families, informed them of the disease situation, treatment plan and rehabilitation process, and briefly introduced the previous results and expected effects of such surgery and rehabilitation plan, so as to eliminate patients' inner doubts and improve confidence. In addition, patients were not only informed of the risks of surgical treatment, but also the power of cooperation on the treatment effect during treatment and rehabilitation, in order to increase the cooperation degree while reducing the risk of doctor-patient conflicts.
Preoperative enteral nutrition	Liquid food was taken 3 days before the operation, and the enteral nutrient Ruineng Enteral Nutritional Emulsion (Fresenius KABI Pharmaceutical Co., LTD., 200 mL) was taken orally several times a day, according to the body weight of 20 to 25 mL (about 30 kcal)/kg per day.
Preoperative intestinal preparation	The solution of compound polyethylene glycol electrolyte powder was orally administered one night before operation, but no enema cleaning was performed. Diet was forbidden six hours before operation, and 500 mL 10% glucose was orally administered two hours before operation.
Preoperative pre-analgesia	The pre-analgesic time was 2 hours before the operation, and the analgesic regimen was as follows: oral administration: 400 mg cerexoxib capsules (Pfizer Co., Ltd., 0.2 g×6 tablets,) + 600 mg gabapentin capsule (Jiangsu Nhwa Pharmaceutical Co., Ltd., 0.3 g×12 tablets) + 1 g paracetamol tablets (Sichuan Pacific Pharmaceutical Co., Ltd., 0.5 g×20 tablets).

Anesthesia	Thoracic epidural block combined with general anesthesia.
Intraoperative insulation	Room temperature was controlled in the laminar flow operating room. Heat preservation blanket was used during the operation, and heated oxygen humidifier was used for oxygen absorption. The liquid was heated up before infusion, and the abdominal cavity was rinsed with warm water.
Rehydration management	The rate and amount of fluid infusion were controlled at 500 mL/h intraoperatively and 40 mL/h postoperatively.
Wound closure	The wound was thoroughly cleaned with normal saline and then wiped dry. After slightly drawing the skin, non-suture adhesive tape was applied to the central part of the wound in the vertical direction. The adhesive tape was changed every 3 days to observe the recovery of the wound. The whole procedure strictly followed aseptic technique. Patients were told not to move too much in the wound area to prevent wound disintegration which affects the healing.
Intraoperative and postoperative analgesia	Multi-mode analgesia was adopted. Non-opioid analgesia was administered intraoperatively according to clinical experience. Ropikaine (Guangdong Jiabo Pharmaceutical Co., Ltd., 10 mL: 75 mg) was injected intramuscularly and subcutaneously through the incision according to the patient's needs after the operation. The patients had controlled analgesia according to their own conditions through patient-controlled analgesia pump which was connected to epidural catheter.
Postoperative breathing exercise	Continuous low-flow oxygen was given for 2-8 hours on the day after the operation. The next day after the operation, patients were instructed to carry out deep breathing exercises for 1 hour a day, with intervals according to the patient's situation.
Postoperative gastrointestinal nutrition	Oral administration of 500-800 mL 10% glucose was given 2 hours after the operation. If without obvious discomfort, the liquid diet and false feeding (chewing gum) could be started 2 hours after the oral administration of glucose. On the next day, a small amount of clear water and enteral nutrition emulsion were taken orally for several times, as well as the liquid food. If the patient has no obvious discomfort, semi-liquid food was then gradually increased, which was further adjusted according to the digestive tract reaction of the patient.
Drainage tube placement	Intraoperative hemostasis was carefully observed without placement of abdominal drainage tube.
Stomach tube management	No gastric tube was placed before colorectal surgery.
Urine tube management	Urinary catheter was removed after ward round the next day after operation. Drugs were given to prevent urinary retention for patients with urinary system diseases such as benign prostatic hyperplasia.
Early ambulation	On the day after the operation, after awakening, the patient rested in bed for 2-4 hours. After that, the patient slowly got up and sat for 15 minutes. Then the patient walked around and rested intermittently on the chair for adjustment. In principle, the total time away from the bed should be no less than 2 hours. The next day after the operation, patients were asked to leave the bed for the cumulative 4-8 hours, instead of getting out of bed for a long time at one time.
Discharge standard	Normal diet, gastrointestinal function recovery, removal of all pipelines, no need of pain control or well-controlled pain on oral medicine, walking without assistance.

Note: FTS, fast-track surgery.

Table 3. Comparison of baseline data ($\bar{x}$±sd, n (%))

	Control group (n=100)	Observation group (n=100)	t/χ^2	P
Age (year)	49.25±7.12	47.93±8.29	1.208	0.229
Gender			0.041	0.840
Male	65 (65.00)	60 (60.00)		
Female	35 (35.00)	40 (40.00)		
Lesion location			0.652	0.346
Descending colon	7 (7.00)	8 (8.00)		
Ascending colon	42 (42.00)	45 (45.00)		
Transverse colon	9 (9.00)	6 (6.00)		
Sigmoid colon	42 (42.00)	41 (41.00)		
Differentiation degree			0.297	0.722
High	28 (28.00)	22 (22.00)		
Middle	48 (48.00)	53 (53.00)		
Low	24 (24.00)	25 (25.00)		
Dukes classification			0.385	0.672
A	24 (24.00)	26 (26.00)		
B	56 (56.00)	51 (51.00)		
C	20 (20.00)	23 (23.00)		

Table 4. Comparison of perioperative index ($\bar{x}$±sd)

	Control group (n=100)	Observation group (n=100)	t/χ^2	P
Operation time (min)	251.11±21.24	248.19±23.57	0.920	0.359
Intraoperative blood loss (mL)	91.19±12.23	89.11±10.19	1.307	0.193
Number of lymph nodes removal (n)	25.93±3.09	26.25±3.12	0.729	0.467
Length of stay (day)	14.11±2.58	10.22±2.25	11.363	<0.001

Table 5. Comparison of postoperative recovery ($\bar{x}$±sd)

	Control group (n=100)	Observation group (n=100)	t	P
Fasting time (h)	45.19±4.22	36.11±5.24	13.496	<0.001
First anal exhaust time (h)	66.11±7.19	53.19±6.23	13.581	<0.001
First defecation time (h)	83.11±9.58	68.22±10.25	10.613	<0.001
First semi-liquid feeding time (d)	4.21±0.98	2.92±0.85	9.944	<0.001

cant differences between the two groups before operation (P>0.05). The TRF level in the observation group was significant increased while the PAB and ALB levels were markedly decreased after operation (P<0.001). And the TRF, PAB and ALB levels in the control group were markedly decreased after operation (P<0.001). The postoperative TRF and PAB levels in the observation group were significantly higher than those in the control group (P<0.001). While no statistically significant difference was observed in ALB levels between the two groups 1 week after surgery (t=1.693, P=0.092). The application of FTS nursing measures could significantly enhance postoperative nutrition of colon cancer patients (**Table 6**; **Figure 1**).

FTS nursing measures significantly reduced postoperative inflammation levels in patients with colon cancer

There was no significant difference in preoperative CRP and PCT levels between the two groups (P>0.05). However, one week after operation, the serum CRP and PCT levels were increased

Table 6. Comparison of postoperative nutrition ($\bar{x}$±sd)

	Control group (n=100)	Observation group (n=100)	t	P
TRF (mg/L)				
Before operation	2.72±0.38	2.70±0.36	0.382	0.703
After operation	2.69±0.42###	2.96±0.34###	4.997	<0.001
PAB (mg/L)				
Before operation	349.65±24.32	351.12±26.28	0.411	0.682
After operation	308.35±19.52###	334.76±20.98###	9.216	<0.001
ALB (g/L)				
Before operation	38.98±5.95	39.73±6.25	0.869	0.386
After operation	35.46±4.85###	36.65±5.09###	1.693	0.092

Note: ###P<0.001, compared within the same group before operation. TRF, transferrin; PAB, prealbumin; ALB, albumin.

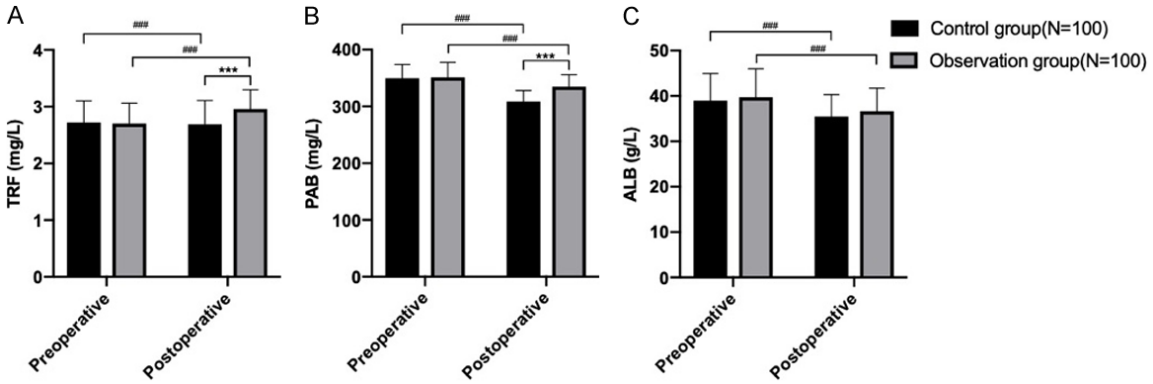

Figure 1. Comparison of nutritive index. A. TRF; B. PAB; C. ALB. ***P<0.001, compared with control group; ###P<0.001, compared with before operation. TRF, transferrin; PAB, prealbumin; ALB, albumin.

Table 7. Comparison of inflammation levels ($\bar{x}$±sd)

	Control group (n=100)	Observation group (n=100)	t/χ^2	P
CRP (mg/L)				
Before operation	3.43±1.21	3.51±1.24	0.462	0.645
After operation	12.32±3.76###	7.57±2.33###	10.738	<0.001
PCT (ng/L)				
Before operation	0.05±0.03	0.06±0.04	0.894	0.373
After operation	0.55±0.11###	0.38±0.07###	13.038	<0.001

Note: ###P<0.001, compared within the same group before operation. CRP, C-reactive protein; PCT, procalcitonin.

in both groups (P<0.001). The postoperative CRP and PCT in the observation group were significantly lower than those in the control group (P<0.001; **Table 7**; **Figure 2**), suggesting that FTS nursing measures could significantly control postoperative inflammation in patients with colon cancer.

Discussion

With the continuous development of minimally invasive surgery, laparoscopic radical resection has been gradually applied in the treatment of colon cancer, taking the advantages of small damage and higher safety [10-12]. Irrespective of the fact that laparoscopic surgery is superior to traditional laparotomy, as an invasive operation, it can still cause some damage to the patient's body, resulting in stress reaction. Therefore, how to effectively reduce the patient's stress response is key to promoting the postoperative recovery of patients. Advancement of the surgical modality on colon cancer

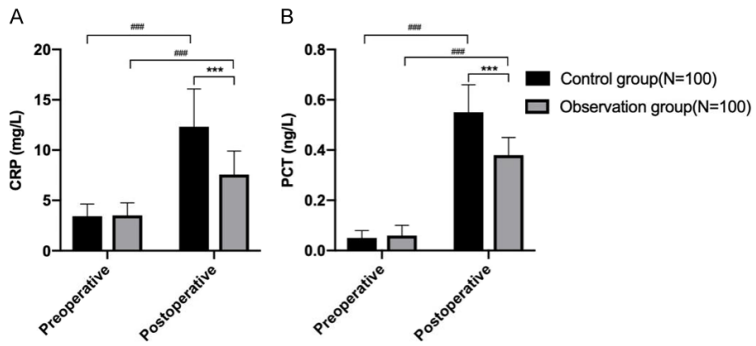

Figure 2. Comparison of serum inflammation levels. A. CRP; B. PCT. ***P<0.001, compared with control group; ###P<0.001, compared with before operation. CRP, C-reactive protein; PCT, procalcitonin.

brings forth the complete mesocolon resection, which has been widely used in colon cancer resection due to good effect [13-15]. By separating the visceral layer and parietal layer fascia, the mesocolon wrapped by the intact visceral layer fascia was dissociated, so as to fully expose and ligate the blood supplying artery of the intestinal segment. Complete mesocolon resection is a surgical plane established on the basis of anatomy, whose clinical efficacy has been confirmed by a number of studies. Ligation after complete dissociation of the mesentery can effectively maintain the integrity of the mesentery for fear of the spread of cancer cells caused by the rupture of the mesentery, and thus improve the surgical effect of the patients [16, 17]. In this study, all patients underwent complete mesocolic resection under the laparoscopy.

FTS is a new surgical concept whose core idea is to reduce patients' stress and trauma. Although complete mesocolic resection under the laparoscopy has reduced the trauma of patients in surgical mode, its nature as a traumatic therapy has not been changed, which has irrevocably activated inflammatory response system and neurohumoral system in the body of patients. While FTS can be applied in the perioperative period to lessen the stress response and psychological stress of patients as it has been proven, thereby accelerating postoperative recovery of patients. For instance, Martinez-perez et al. demonstrated that FTS could effectively relieve the stress level and promote the prognosis of patients [18]. In addition, with the in-depth studies on the reduction of stress response of patients in perioperative period, the content of FTS has been constantly improved and enriched.

In this study, with the procedures of FTS, patients in the observation group were systematically protected from the stress response before, during and after operation. To begin with, preoperative multidisciplinary discussion was conducted to make symptomatic support treatment and rehabilitation plans for patients, and effective psychological counseling was carried out for patients. Wahed's study showed that preoperative psychological counseling could effectively reduce the psychological stress level and improve the psychological resilience score of patients, making a better prognosis, which was also beneficial to the improvement of inflammatory factors [19]. In addition, FTS also differs from the traditional mode in preoperative enteral nutrition and intestinal preparation. For example, liquid food was introduced 3 days before the operation to avoid preoperative enema cleaning in the traditional mode. The study of Sambrook et al. revealed that cleaning enema would stimulate gastrointestinal stress response of patients, which was unfavorable for the gastrointestinal function's postoperative recovery of patients [20]. What's more, analgesia is of great significance to patients undergoing surgery, not only for the higher experience demand of them in medical treatment, but also for reducing the pain stress of the body effectively. Therefore, in the FTS procedures, preoperative pre-analgesia was performed on the patients 2 hours before surgery, and thoracic epidural block combined with general anesthesia with better anesthesia effect was used to avoid the risk of paralytic intestinal obstruction.

Intraoperative hypothermia may induce stress response, increase heart burden and stimulate the release of inflammatory factors, which is not conducive to postoperative recovery of patients [21, 22]. The FTS procedure in this study emphasized intraoperative heat preservation and improved the traditional fluid replenishment method to avoid the risk of hypovolemic shock. Besides, multi-mode analgesia was

adopted during the operation to further reduce the intraoperative stress of patients. And seamless tape bonding was used to reduce the trauma to the body. Kibanda et al. believed that intraoperative heat preservation measures should be introduced, and the fluid transfer temperature and input volume needed to be controlled, thereby reducing the risk of organ dysfunction and surgical stress response of patients, which helped postoperative recovery of patients [23].

Postoperative rehabilitation management is also of great significance to surgical patients [24]. Compared with the traditional rehabilitation model, FTS procedures highlights postoperative respiratory exercise and postoperative gastrointestinal nutrition to promote the recovery of patients' body function. Additionally, to reduce the stimulation of various tubes to the body, the drainage tube and gastric tube were not placed after the operation, and the urine tube was removed in the early stage.

The results of this study showed that, under the premise of the same discharge criteria, fasting time, postoperative first anal exhaust time, postoperative first defecation time, postoperative first semi-liquid feeding time and length of stay were significantly shortened when patients underwent laparoscopic radical resection of colon cancer under the FTS nursing. The reason was that FTS nursing puts emphasize on comprehensive reduction of patients' intraoperative stress and postoperative rehabilitation which promoted the recovery of gastrointestinal nutrition, inducing less inflammatory stimulation to the body. The current study showed that the nutritional indicators and serum inflammatory factors of the observation group were significantly better than those of the control group, indicating that the effect of FTS on recovery of gastrointestinal function may be related to nutritional indicators and serum inflammatory factors after operation.

There are still deficiencies in this study. First, as all the study subjects in the present study came from the same institution with limited medical records, there might be a lack of representativeness and selection bias. Second, the detection of relative indices of serum in patients was not completed by the same examiner at the same time, which resulted in some bias. Third, long-term follow-up was not conducted for patients after operation, nor did the long-term effects of FTS on the patients with colon cancer after radical resection be observed. It is therefore necessary to further expand the sample size, extend the follow-up time to study the application value of FTS in the radical resection of colon cancer.

In conclusion, FTS can effectively promote patients' gastrointestinal recovery and shorten hospital stay, which may be related to the better gastrointestinal nutrition and inflammation level of patients undergoing radical resection of colon cancer under FTS nursing. It is worthy of clinical application, however, remains to be further improved.

Disclosure of conflict of interest

None.

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