Comparison of prolonged postoperative ileus between laparoscopic right and left colectomy under enhanced recovery after surgery: a propensity score matching analysis

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Abstract

Background: There were differences in the recovery of bowel function and prolonged postoperative ileus (PPOI) between laparoscopic right colectomy (RC) and left colectomy (LC) under the guidance of enhanced recovery after surgery.

Methods: We selected 870 patients who underwent elective laparoscopic colectomy from June 2016 to December 2021, including 272 patients who had RC and 598 who had LC. According to 1:1 proportion for propensity score matching and correlation analysis, 247 patients who had RC and 247 who had LC were finally enrolled.

Results: The incidence of PPOI in all patients was 13.1%. Age, sex, smoking habit, preoperative serum albumin level, operation type, and operation time were the important independent risk factors based on multivariate logistic regression and correlation analysis, 247 patients who had RC and 247 who had LC were finally enrolled.

Conclusions: The return of bowel function in LC was faster than that in RC, and the incidence of PPOI was relatively lower. Therefore, caution should be taken during the early feeding of patients who had laparoscopic RC.

Keywords: Enhanced recovery after surgery, Prolonged postoperative ileus, Laparoscopic colectomy, Colon cancer

Introduction

Postoperative ileus (POI) is defined as an inevitable, temporary decrease in gastrointestinal motility following major abdominal surgery. The average gut dysmotility is widely reported to last 0–24 h in the small intestine, 24–48 h in the stomach, and 48–72 h in the colon [1, 2]. Prolonged postoperative ileus (PPOI) is a gastrointestinal function that does not recover beyond this time. The
principal manifestation of PPOI is nausea and vomiting, abdominal distension, pain, inability to eat or drink, and delayed passage of flatus and stool, which lead to increased postoperative complications, slow rehabilitation, extended length of hospital stay, aggravating financial burden, and increased mortality risk [3, 4].

The enhanced recovery after surgery (ERAS) program aims to promote early feeding and progressive patient mobilization, shorten the length of hospital stay, and improve the quality of life of patients without affecting the overall survival and relapse-free survival [5–7]. ERAS has been rapidly popularized and applied in recent years. In 2017, the American Society of Colon and Rectal Surgeons (ASCRS) and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) jointly released the clinical practice guideline of ERAS in colorectal surgery to provide important references and guidance for clinical work [8]. There are obvious differences in clinicopathological features, molecular biology, histological features, and prognosis between left and right colon tumors [9, 10]. Moreover, there are differences in the return of bowel function and complications after surgery [11]. However, the ERAS clinical practice guideline does not distinguish between right colectomy (RC) and left colectomy (LC). Therefore, the present study aimed to compare the incidence of PPOI and postoperative return of bowel function between laparoscopic RC and LC with the ERAS protocol.

**Methods**

**Patients**

Patients who underwent elective laparoscopic colectomy at Fujian Cancer Hospital from June 2016 to December 2021 were selected for the study. The inclusion criteria were as follows: (1) pathologically confirmed colon cancer; (2) radical resection; (3) adequate implementation of more than 70% compliance with the ERAS protocol (The ERAS pathway is shown in Table 1); and (4) complete clinical characteristics. The exclusion criteria were as follows: (1) emergency surgery for preoperative intestinal hemorrhage and ileus; (2) multi-organ resection combined with colorectal cancer; (3) mental disturbance; (4) temporary ileostomy; and (5) conversion to open surgery during the operation.

**Definitions**

RC is defined as the removal of the terminal ileum and the ascending right colon followed by an ileo-colonic anastomosis, including cecal, ascending, and hepatic flexure colon cancers.

LC is defined as the resection of the descending colon or the sigmoid colon followed by a colo-colonic anastomosis, including splenic flexure, descending, sigmoid, and rectosigmoid junction colon cancers [12, 13]. During the study period, 870 patients with colon cancer were included as research subjects, including 598 who had LC and 272 who had RC.

The definition of PPOI has not been unified yet. According to references, PPOI is defined as meeting two or more of the following criteria, which were assessed on or after the fourth day of the postoperative period [14, 15]: 1. nausea or vomiting, 2. inability to tolerate an oral diet over the last 24 h, 3. abdominal distention, 4. absence of flatus over the last 24 h, and 5. ileus noted on plain abdominal films or computed tomography scans.

**Statistical analysis**

The SPSS 24.0 software was used for all statistical analyses. The continuous data were evaluated using the Student’s t test or Mann–Whitney U test. The chi-square test was used to compare the count data of the two groups. Univariate analysis was performed to identify risk factors associated with PPOI. Variables with p < 0.05 in the univariate analyses were analyzed in the subsequent multivariable logistic regression model. The nearest neighbor matching method was used for 1:1 matching, and the caliper value was 0.05. Statistical significance was set at p < 0.05.

**Results**

**Postoperative outcomes of patients**

PPOI occurred in 13.1% (114/870) of all patients with colon cancer. The average length of postoperative hospital stay in patients with PPOI was 8.6 ± 2.5 days, which was significantly longer than the 6.3 ± 1.1 days in patients without no PPOI before case matching (t = 12.049, p = 0.000).

**Univariate and multivariate analysis of PPOI risk factors in colon cancer**

Among the same background and comorbidity measures, sex, age, smoking habit, preoperative serum albumin level, operation type, and operation time were associated with PPOI (Table 2). All these variables were entered in the multivariate logistic regression model. Multivariate analysis found the following independent risk factors for PPOI: sex (odds ratio [OR] = 2.242), age (OR = 0.935), smoking habit (OR = 1.732), preoperative serum albumin level (OR = 1.072), operation type (OR = 2.193), and operation time (OR = 2.205) (Table 3).

**Comparison of the type of surgical procedure of patients who had RC**

The occurrence probability of PPOI in patients who had laparoscopic right colectomy (LRC) was higher than that in patients who had totally laparoscopic
Table 1  ERAS protocol applied in the study

| Preoperative period                                                                 | Intraoperative period                                                                 | Postoperative period                                                                 |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1. Preoperative assessment and education                                             | 7. Antibiotic prophylaxis given 30–60 min before the first incision                   | 11. Removal of nasogastric tubes immediately after the surgery                       |
| 2. Mechanical bowel preparation is not to be used routinely (according to guidelines) | 8. Intraoperative goal-directed fluid therapy                                         | 12. Restrictive perioperative fluid management after the surgery                      |
| 3. Nutritional assessment and enteral nutrition support throughout the day before the surgery | 9. Intraoperative warming for the prevention of intraoperative hypothermia             | 13. Remove the catheter 24 h after the surgery                                        |
| 4. Low molecular weight heparin or compression stockings for thromboprophylaxis     | 10. Try to put as little intra-abdominal drains as possible                            | 14. Prevention of postoperative nausea and vomiting (5-HT3 receptor antagonist + dexamethasone + metoclopramide) |
| 5. Preoperative fasting for clear liquids (water, coffee, juice without pulp) limited to 2 h and 6 h for solids |                                                                                      | 15. A multimodal, opioid-sparing, pain management plan was employed and implemented   |
| 6. Drink 50 g of carbohydrate in at least 400 mL of fluid up to 2 h before the induction of anaesthesia |                                                                                      | 16. Early oral feeding (drink water 2 h after the surgery) and soft-food diet on the second postoperative day |
|                                                                                      |                                                                                      | 17. Early mobilization (sit in a chair at 2 h after the procedure. Out-of-bed activity on the first postoperative day) |

5-HT3 5-hydroxytryptamine subtype 3
| Variable                                      | PPOI (n=114) | NO PPOI (n=756) | Univariate OR (95% CI) | p value |
|----------------------------------------------|--------------|----------------|------------------------|---------|
| Sex                                          |              |                |                        |         |
| Male                                         | 83           | 440            | 1.923 (1.242–2.977)    | 0.003   |
| Female                                       | 31           | 316            |                        |         |
| Age (years)                                  | 64.4±10.3    | 55.6±12.0      | 0.932 (0.913–0.950)    | 0.000   |
| Diabetes mellitus                            |              |                |                        |         |
| No                                           | 71           | 514            | 0.777 (0.517–1.170)    | 0.227   |
| Yes                                          | 43           | 242            |                        |         |
| Hypertension                                 |              |                | 0.859 (0.569–1.296)    | 0.469   |
| No                                           | 73           | 510            |                        |         |
| Yes                                          | 41           | 246            |                        |         |
| Smoking habit                                |              |                | 1.830 (1.211–2.766)    | 0.004   |
| No                                           | 71           | 568            |                        |         |
| Yes                                          | 43           | 188            |                        |         |
| Current alcohol use                          |              |                | 0.774 (0.511–1.172)    | 0.227   |
| No                                           | 74           | 533            |                        |         |
| Yes                                          | 40           | 223            |                        |         |
| Previous abdominal surgery                   |              |                | 0.741 (0.438–1.254)    | 0.264   |
| No                                           | 94           | 653            |                        |         |
| Yes                                          | 20           | 103            |                        |         |
| Chronic obstructive pulmonary disease        |              |                | 0.723 (0.412–1.269)    | 0.258   |
| No                                           | 97           | 671            |                        |         |
| Yes                                          | 17           | 85             |                        |         |
| BMI (kg/m²)                                  | 22.8±2.5     | 23.1±3.2       | 1.043 (0.977–1.113)    | 0.207   |
| Preoperative anemia                          |              |                | 0.817 (0.532–1.256)    | 0.358   |
| No                                           | 79           | 555            |                        |         |
| Yes                                          | 35           | 201            |                        |         |
| Preoperative serum albumin level (g/L)       | 37.7±3.7     | 39.0±4.6       | 1.070 (1.022–1.120)    | 0.004   |
| ASA score                                    |              |                | 0.728 (0.476–1.114)    | 0.143   |
| I–II                                         | 77           | 560            |                        |         |
| III–IV                                       | 37           | 196            |                        |         |
| Tumor size                                   |              |                | 0.768 (0.517–1.141)    | 0.191   |
| <5 cm                                        | 51           | 388            |                        |         |
| ≥5 cm                                        | 63           | 368            |                        |         |
| Operation type                               |              |                | 2.414 (1.619–3.600)    | 0.000   |
| LC                                           | 58           | 540            |                        |         |
| RC                                           | 56           | 216            |                        |         |
| Operation time (min)                         |              |                | 1.799 (1.196–2.707)    | 0.005   |
| <180                                         | 41           | 380            |                        |         |
| ≥180                                         | 73           | 376            |                        |         |
| Intraoperative blood loss (ml)               | 179.8±101.6  | 169.3±72.7     | 0.998 (0.986–1.011)    | 0.178   |
| Grade of differentiation                     |              |                | 0.997 (0.739–1.364)    | 0.987   |
| Well                                         | 22           | 119            |                        |         |
| Moderate                                     | 56           | 426            |                        |         |
| Poorly                                       | 36           | 211            |                        |         |
| Lymph node resected                          |              |                | 1.010 (0.988–1.032)    | 0.395   |
| pTNM stage                                   |              |                | 1.022 (0.774–1.349)    | 0.880   |
| I                                            | 23           | 124            |                        |         |
| II                                           | 46           | 354            |                        |         |
| III                                          | 45           | 278            |                        |         |

PPOI: prolonged postoperative ileus, OR: odds ratio, BMI: body mass index, ASA: American Society of Anesthesiologists, LC: left colectomy, RC: right colectomy
right colectomy (TLRC). Compared with LRC, TLRC was associated with shorter first flatus, first semi-liquid diet, and postoperative length of stay \( (p<0.05) \) (Table 4).

Comparison of general clinicopathological data of patients who had RC and LC before matching
Compared with patients who had RC, statistical differences were observed in age, sex, body mass index BMI, preoperative serum albumin level, operation time, and grade of differentiation in patients who had LC before case matching. The incidence of PPOI in patients who had RC was 20.6\% (56/272), which was higher than the 9.7\% incidence (58/598) in patients who had LC. The first flatus, semi-liquid diet, and length of postoperative hospital stay in patients who had RC were higher than those in patients who had LC (Table 5).

Clinicopathological characteristics after case matching
To reduce the possibility of selection bias, we conducted propensity score matching. Based on baseline data, the propensity score matching method was conducted with 1:1 matching, and 247 patients were included in each group. The clinicopathological features between the two groups were not statistically significantly different after matching (Table 6).

**Discussion**
Compared with open colectomy, laparoscopic colectomy has many advantages, such as faster postoperative return of bowel function, fewer complications, less pain, fewer hospital stays, and similar long-term effect \([16–18]\). The clinical practice guideline for enhanced recovery after colon and rectal surgery from the ASCRS and SAGES strongly recommends employing a minimally invasive surgical approach whenever expertise is available and appropriate for colon cancer \([8]\). Laparoscopic colectomy has been widely recognized worldwide. Since 2016, most patients with curable colon cancer have undergone laparoscopic surgery in our hospital. Patients who underwent laparoscopic surgery were included in this study to eliminate errors and improve the reliability of research.

Murphy et al. \([19]\) studied 9734 patients identified from the colectomy-specific American College of Surgeons National Surgical Quality Improvement Program (Table 3).

### Table 3: Multivariate analysis of PPOI after colon cancer surgery

| Parameter            | \( \beta \) | Std. error | Wald chi-square | \( p \) value | Odds ratio | 95\% CI for odds ratio |
|----------------------|------------|------------|----------------|--------------|------------|-----------------------|
| Age                  | -0.068    | 0.011      | 40.126         | 0.000        | 0.935      | 0.915–0.954            |
| Sex                  | 0.807     | 0.239      | 11.382         | 0.001        | 2.242      | 1.403–3.583            |
| Smoking habit        | 0.549     | 0.228      | 5.820          | 0.016        | 1.732      | 1.109–2.706            |
| Preoperative Serum albumin level | 0.069    | 0.026      | 7.042          | 0.008        | 1.072      | 1.018–1.128            |
| Operation type       | 0.785     | 0.222      | 12.476         | 0.000        | 2.193      | 1.418–3.390            |
| Operation time       | 0.791     | 0.227      | 12.185         | 0.000        | 2.205      | 1.415–3.438            |

95\% CI: 95\% confidence interval

### Table 4: Comparison of postoperative gastrointestinal function recovery and discharge time between LRC and TLRC

| Group      | LRC (\( n=181 \) ) | TLRC (\( n=91 \) ) | \( t/\chi^2 \) | \( p \) value |
|------------|---------------------|---------------------|----------------|--------------|
| PPOI       |                     |                     | 7.707          | 0.005        |
| No         | 135                 | 81                  |                |              |
| Yes        | 46                  | 10                  |                |              |
| First flatus (days) | 3.8±2.6    | 2.8±1.9            | 3.009          | 0.003        |
| First semi-liquid diet (days) | 5.3±2.6    | 4.4±2.0            | 3.011          | 0.003        |
| Postoperative length of stay (days) | 7.8±2.8    | 7.1±1.7            | 2.239          | 0.026        |

LRC laparoscopic right colectomy, TLRC totally laparoscopic right colectomy

Comparison of the return of bowel function and length of postoperative hospital stay between the two groups after matching
The occurrence probability of PPOI in patients who had RC was 21.9\% (54/247), while the occurrence probability of PPOI in patients who had LC was 13.0\% (32/247). The time of first flatus, semi-liquid time, and length of postoperative hospital stay in patients who had LC were lower than those in patients who had RC \( (p<0.05) \) (Table 7).
## Table 5  Demographic characteristics of patients and postoperative functional recovery before matching

| Variable                                      | LC \( n=598 \) | RC \( n=272 \) | \( t/\chi^2 \) | \( p \) value |
|-----------------------------------------------|----------------|----------------|----------------|--------------|
| Sex                                           |                |                | 4.073          | 0.044        |
| Male                                          | 373            | 150            |                |              |
| Female                                        | 225            | 122            |                |              |
| Age (years)                                   | 55.8±11.7      | 58.8±12.7      | -3.458         | 0.001        |
| Diabetes mellitus                             |                |                | 0.204          | 0.652        |
| No                                            | 405            | 180            |                |              |
| Yes                                           | 193            | 92             |                |              |
| Hypertension                                  |                |                | 0.672          | 0.412        |
| No                                            | 406            | 177            |                |              |
| Yes                                           | 192            | 95             |                |              |
| Smoking habit                                  |                |                | 0.212          | 0.645        |
| Nonsmoker                                     | 442            | 197            |                |              |
| Smoker                                        | 156            | 75             |                |              |
| Current alcohol use                           |                |                | 0.846          | 0.358        |
| No                                            | 423            | 184            |                |              |
| Yes                                           | 175            | 88             |                |              |
| Previous abdominal surgery                    |                |                | 0.093          | 0.760        |
| No                                            | 512            | 235            |                |              |
| Yes                                           | 86             | 37             |                |              |
| Chronic obstructive pulmonary disease         |                |                | 0.064          | 0.801        |
| No                                            | 529            | 239            |                |              |
| Yes                                           | 69             | 33             |                |              |
| BMI (kg/m²)                                   | 23.3±3.2       | 22.7±2.7       | 2.416          | 0.016        |
| Preoperative anemia                           |                |                | 1.826          | 0.177        |
| No                                            | 444            | 190            |                |              |
| Yes                                           | 154            | 82             |                |              |
| Preoperative serum albumin level              |                |                | 3.055          | 0.002        |
| No                                            | 39.1±4.5       | 38.1±4.4       |                |              |
| Yes                                           | 184            | 88             |                |              |
| ASA I–II                                      | 443            | 194            | 0.725          | 0.395        |
| ≥III                                          | 155            | 78             |                |              |
| Tumor size                                    |                |                | 0.387          | 0.534        |
| <5 cm                                         | 306            | 133            |                |              |
| ≥5 cm                                         | 292            | 139            |                |              |
| Operation time (min)                          |                |                | 5.744          | 0.017        |
| <180                                          | 273            | 148            |                |              |
| ≥180                                          | 325            | 124            |                |              |
| Blood loss (ml)                               | 168.9±76.2     | 174.7±79.1     | -1.039         | 0.127        |
| Grade of differentiation                      |                |                | 12.860         | 0.002        |
| Well                                          | 92             | 49             |                |              |
| Moderate                                      | 355            | 127            |                |              |
| Poorly                                        | 151            | 96             |                |              |
| Lymph node resected                           | 23.9±9.6       | 24.9±9.4       | -1.527         | 0.127        |
| pTNM stage                                    |                |                | 3.808          | 0.149        |
| I                                             | 103            | 44             |                |              |
| II                                            | 262            | 138            |                |              |
| III                                           | 233            | 90             |                |              |
| PPOI                                          |                |                | 19.470         | 0.000        |
| No                                            | 540            | 216            |                |              |
| Yes                                           | 58             | 56             |                |              |
| First flatus                                  | 2.1±1.8        | 3.5±2.4        | -9.379         | 0.000        |
| First semi-liquid diet                         | 3.6±1.8        | 5.0±2.5        | -9.765         | 0.000        |
| Length of stay                                | 6.2±1.4        | 7.6±2.3        | -9.674         | 0.000        |

LC left colectomy, RC right colectomy, BMI body mass index, ASA American Society of Anesthesiologists, PPOI prolonged postoperative ileus
| Variable                                | LC (n=247) | RC (n=247) | t/χ²   | p value |
|----------------------------------------|------------|------------|--------|---------|
| Sex                                    |            |            | 0.206  | 0.650   |
| Male                                   | 143        | 138        |        |         |
| Female                                 | 104        | 109        |        |         |
| Age (years)                            | 57.5±12.2  | 59.1±12.9  | −1.353 | 0.177   |
| Diabetes mellitus                      |            |            | 0.037  | 0.848   |
| No                                     | 166        | 164        |        |         |
| Yes                                    | 81         | 83         |        |         |
| Hypertension                           |            |            | 0.144  | 0.704   |
| No                                     | 165        | 161        |        |         |
| Yes                                    | 82         | 86         |        |         |
| Smoking habit                          |            |            | 0.041  | 0.840   |
| Nonsmoker                              | 180        | 178        |        |         |
| Smoker                                 | 67         | 69         |        |         |
| Current alcohol use                    |            |            | 0.778  | 0.378   |
| No                                     | 177        | 168        |        |         |
| Yes                                    | 70         | 79         |        |         |
| Previous abdominal surgery             |            |            | 0.067  | 0.796   |
| No                                     | 211        | 213        |        |         |
| Yes                                    | 36         | 34         |        |         |
| Chronic obstructive pulmonary disease  |            |            | 0.074  | 0.786   |
| No                                     | 215        | 217        |        |         |
| Yes                                    | 32         | 30         |        |         |
| BMI (kg/m²)                            | 23.1±3.2   | 22.7±2.8   | 1.511  | 0.131   |
| Preoperative anemia                    |            |            | 1.448  | 0.229   |
| No                                     | 184        | 172        |        |         |
| Yes                                    | 63         | 75         |        |         |
| Preoperative serum albumin level (g/L) |            |            | 0.680  | 0.497   |
| No                                     | 182        | 175        |        |         |
| Yes                                    | 65         | 72         |        |         |
| ASA                                    |            |            | 0.495  | 0.482   |
| I–II                                   | 182        | 175        |        |         |
| III–IV                                 | 65         | 72         |        |         |
| Tumor size                             |            |            | 0.203  | 0.653   |
| <5 cm                                  | 123        | 118        |        |         |
| ≥5 cm                                  | 124        | 129        |        |         |
| Operation time (min)                   |            |            | 0.980  | 0.322   |
| <180                                   | 115        | 126        |        |         |
| ≥180                                   | 132        | 121        |        |         |
| Blood loss (ml)                        |            |            | −0.305 | 0.760   |
| <180                                   | 115        | 126        |        |         |
| ≥180                                   | 132        | 121        |        |         |
| Grade of differentiation               |            |            | 1.149  | 0.563   |
| Well                                   | 47         | 46         |        |         |
| Moderate                               | 119        | 109        |        |         |
| Poorly                                 | 81         | 92         |        |         |
| Lymph node resected                    |            |            | −0.652 | 0.515   |
| I                                      | 49         | 50         |        |         |
| II                                     | 95         | 106        |        |         |
| III                                    | 103        | 91         |        |         |

LC left colectomy, RC right colectomy, BMI body mass index, ASA American Society of Anesthesiologists
After matching the differences in clinicopathologic features between the two groups were not statistically significant. The first flatus, first semi-liquid diet, length of postoperative hospital stays, and PPOI in patients who had RC were higher than those of patients who had LC. It shows that the return of bowel function after RC surgery is slower and the incidence of PPOI is higher than that in patients who had LC. Consistent with previously published studies, Garfinkle et al. [13] conducted a study based on 40,636 patients who had colon surgery in the public database of the American College of Surgeons and concluded that the PPOI of patients who had RC was 35% higher than the PPOI of those who had LC (OR=1.35, 95% CI: 1.25–1.47). The RC group also had a longer mean length of stay and more 30-day readmissions. Yuan et al. [11] studied 94 consecutive patients undergoing elective colorectal resections with primary anastomosis and found that LC results in a faster return of bowel function than RC. Grass et al. [12] found that the operative time of LC was longer than that of RC, but the incidence of PPOI in LC was lower than that in RC.

The pathophysiological mechanism underlying the slower recovery of bowel function and higher incidences of PPOI in RC has not been fully clarified. One possible explanation is that the most distal region of the colon has a specialized “rectosigmoid brake” role, with retrograde cyclic motor patterns (CMPs) occurring prominently after meals at a rate of approximately 2–4 cycles per minute, which limits rectal filling and thereby potentially contributes to continence [27]. A recent manometry study in patients who had RC showed that the distal colon becomes hyperactive after surgery with CMPs [28]. Another explanation could be that the colonic peristalsis and transit are regulated by the ileocecal valve. The ileocecal valve’s loss during RC and bowel disturbances are due to bacterial translocation from the colon to the small intestine [29, 30]. A third explanation could be the increased trauma to the small bowel associated with an ileocolic anastomosis compared to a more distal anastomosis. Surgical trauma results in a surge in sympathetic and adrenergic motor neuron activity, which
causes intestinal analysis [31]. Other authors have also cited differences in vagal innervation between the proximal colon (inputs from the brainstem) and distal colon (inputs from pelvic ganglia). It has been proposed that the “pacemaker” regions in the distal colon contribute to the normal regulation of the intestinal transit, and resection of these may lead to accelerated postoperative transit through the distal colon [21].

The surgical procedure for RC is not standardized, including LRC and TLRC. TLRC was associated with significantly faster to first flatus, first semi-liquid diet, and postoperative length of stay, confirming that TLRC leads to faster recovery of bowel functions after surgery. LRC requires extracorporeal anastomosis, while TLRC requires directly intracorporeal anastomosis. TLRC with a lesser bowel mobilization, manipulation, and traction could lead to faster recovery of bowel function [32].

Conclusion

Although ERAS has been widely accepted and popularized, PPOI remains an incurable complication after colectomy. The return of bowel function in patients who had RC was slower than those who had LC, and the incidence of RC’s PPOI was relatively higher. ERAS requires normal oral intake to be restored as soon as possible, but it may be necessary to appropriately extend the fasting time for patients who had RC.

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