

## Clinical research

# Laparoscopically assisted subtotal colectomy with ileorectal anastomosis for slow transit constipation

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## Abstract

**Introduction:** The aim of this study was to retrospectively review the surgical outcomes of laparoscopically assisted subtotal colectomy with ileorectal anastomosis, in order to evaluate the feasibility, utility, and functional outcomes of this procedure in patients with slow transit constipation.

**Material and methods:** The analysis included patients treated between January 2012 and January 2015. Slow transit constipation was diagnosed following a colonic transit test, anal manometry test, balloon expulsion test, and barium enema to exclude secondary causes. Patients deemed suitable underwent laparoscopically assisted total colectomy with ileorectal anastomosis. The main outcome measures included the operative time, estimated blood loss, time to first flatus, length of hospital stay, and complications.

**Results:** Ten female patients (mean age: 36.9 years) underwent laparoscopically assisted subtotal colectomy with ileorectal anastomosis for slow transit constipation. The mean operative time was 133 min, while the mean length of the largest incision was 4.2 cm, and the mean estimated blood loss was 90 ml. The mean time to first flatus was 2.4 days, and the mean duration of hospital stay was 7.6 days. No conversion to laparotomy was noted (0%). Post-operative complications included one wound infection and one ileus. There was no mortality associated with the procedure, and 9 (90%) patients expressed excellent or good satisfaction regarding the outcomes.

**Conclusions:** Laparoscopically assisted subtotal colectomy with ileorectal anastomosis is well tolerated, and careful patient selection results in excellent outcomes, with improvement in bowel function. Laparoscopic techniques may represent a safe and efficient option to manage slow transit constipation.

**Key words:** outcome measures, colon, colonic inertia, laparoscopic surgery.

## Introduction

Constipation refers to the inability to evacuate the bowel. Patients with constipation are not able to evacuate the bowel in a complete and spontaneous form at least three or more times per week, and typically present one or more of the following symptoms: hard, infrequent stools, excessive straining, incomplete evacuation, excessive time attempting to evacuate, and dissatisfaction after defecation [1–3].

Slow transit constipation (STC) is caused by the loss of motor activity of the bowel. While overall uncommon, STC occurs most often in women in the third decade of life, and typically manifests as one or fewer bowel movements per week. The diagnosis is made with a colonic transit test revealing a delay in the emptying of the radiopaque markers [1, 2, 4]. Therefore, if the patient does not have a pelvic outlet obstruction and the condition responds poorly to conservative treatment using laxatives, surgical intervention may represent an effective treatment option [5].

The purpose of the present study was to report the feasibility, utility, and functional outcome of laparoscopically assisted subtotal colectomy with ileorectal anastomosis in patients with STC.

## Material and methods

### Patients

Of the patients who were treated between January 2012 and January 2015 in our department, those diagnosed with constipation compatible with the Rome II criteria [6] underwent laboratory tests for assessment of thyroid function, serum calcium and glucose levels, and complete blood count. All patients underwent clinical evaluation involving digital rectal examination and psychological assessment, and extensive investigations were performed in order to exclude secondary causes such as colonic obstruction, metabolic disorders, and drug-induced constipation. The STC diagnostic work included a colonic transit test, anorectal manometry test, balloon expulsion test, and barium enema. The colonic transit test was defined as positive in patients with > 20% retention of radiopaque markers in the colorectum at 96 h after ingestion of the capsule. The anorectal manometry and balloon expulsion tests were arranged to ensure that there was no outlet obstruction defecation and to rule out pelvic floor dysfunction. Patients underwent barium enema to rule out mechanical obstruction problems, and it revealed redundant colon in all patients. Colonoscopy results were normal, and anal ultrasound showed no disruption of the external anal sphincter. Patients were considered suitable for laparoscopically assisted subtotal colectomy with ileorectal anastomosis if the following conditions were fulfilled: positive results of the colonic transit test (> 20% retention at 96 h after capsule ingestion); and normal results of the barium enema, balloon expulsion test, anal manometry test, colonoscopy, and anal ultrasound. The study protocol was reviewed and approved by the Institutional Review Board of our hospital (approval no.: 105-E-10). The study was conducted in compliance with the Helsinki Declaration. The patients provid-

ed written informed consent prior to undergoing surgery, and patient information was anonymized and de-identified prior to analysis.

### Data collection

Recorded data included age, body mass index, preoperative laxative use, preoperative duration of defecation, colonic transit time, operative time, length of the largest incision, volume of blood loss, operative complications, postoperative bowel movements, length of hospital stay, and functional outcome.

### Surgical technique

In all cases, the planned procedure was laparoscopic subtotal colectomy with ileorectal anastomosis. Surgical procedures were performed by the same team in all patients. The patients were placed in the modified lithotomy position under general anesthesia. Five trocars were used. The primary trocar with a 10-mm port was inserted to gain access to the peritoneal cavity, with establishment of pneumoperitoneum above the umbilicus for the insertion of a 30° laparoscope. Another four working ports were created as follows: a 12-mm port at the right iliac fossa; a 10-mm port at the left iliac fossa; a 5-mm port into the right upper quadrant of the abdomen; and another 5-mm port into the left upper quadrant of the abdomen. Mobilization of the colon segments was started on the right-side colon, and performed using endoshears (LigaSure device; Valleylab, Tyco Healthcare UK, Gosport, UK). After the colon was fully mobilized, it was resected to the level of the rectosigmoid junction using a laparoscopic linear stapler. The rectal stump was mobilized to facilitate the transanal insertion of the circular stapler or Hegar dilator.

The mobilized bowel segment was brought out through a 4–5 cm Pfannenstiel incision. The terminal ileum was divided a few centimeters proximally to the ileocecal valve using the anvil of a circular stapling device inserted into the lumen of the ileum. The ileum with the anvil secured was placed into the abdominal cavity. Finally, transanal end-to-end anastomosis was performed using a circular stapling device. One Jackson Pratt drain was inserted into the pelvis, and the abdominal wall wounds were closed.

## Results

Ten patients who underwent laparoscopically assisted subtotal colectomy with ileorectal anastomosis between January 2012 and January 2015 were included in the study. All patients were diagnosed with STC. The preoperative characteristics of the patients are presented in Table I. All of the patients were women, with a mean age of 36.9

**Table I.** Preoperative characteristics of patients with slow transit constipation (*n* = 10)

Variable	Value
Age [years]	36.9 (27–56)
Body mass index [kg/m <sup>2</sup> ]	24.3 (22.8–26.2)
Preoperative dependence on laxatives [years]	11.5 (5–20)
Preoperative defecation duration [days]	8.8 (5–14)
Colonic transit time [h]	121.2 (96–144)
Previous abdominal surgery	3 (30%)
Preoperative abdominal pain	10 (100%)

Values given as mean (range) or total number (percentage).

years (range: 27–56 years) and a mean body mass index of 24.3 kg/m<sup>2</sup> (range: 22.8–26.2 kg/m<sup>2</sup>).

All patients had severe constipation, and the mean duration of defecation (i.e., time between bowel movements) was 8.8 days (range: 5–14 days). Three (30%) patients had previous abdominal surgery (cesarean section in all cases). Preoperatively, all patients complained of intermittent abdominal pain.

The intra- and postoperative characteristics are given in Table II. The mean operative time was 133 min (range: 110–170 min), and the mean length of the largest incision was 4.2 cm (range: 4–5 cm). The mean estimated blood loss was 90 ml (range: 50–150 ml). The mean time to first flatus was 2.4 days (range: 2–3 days), and the mean time to passing the first stool was 2.9 days (range: 2–3 days). The mean time to first oral intake was 3.1 days (range: 2–4 days). The mean time to discharge from the hospital was 7.6 days (range: 6–14 days). During hospitalization, 4 (40%) patients used medication for pain control, and the mean dose of Demerol was 70 mg (range: 50–100 mg).

**Table III.** Intraoperative and postoperative complications after laparoscopically assisted subtotal colectomy with ileorectal anastomosis in patients with slow transit constipation (*n* = 10)

Complications	Number of patients
Intraoperative complications:	
None	10 (10)
Postoperative complications:	
None	8 (80)
Urinary tract infection	0
Ileus lasting over 5 days	1 (10)
Incisional hernia	0
Wound infection	1 (10)

Values given as total number (percentage).

**Table II.** Surgical and postoperative characteristics of patients who underwent laparoscopically assisted subtotal colectomy with ileorectal anastomosis for slow transit constipation (*n* = 10)

Variable	Value
Operation time [min]	133 (110–170)
Conversion to open surgery	0 (0%)
Length of the largest incision [cm]	4.2 (4–5)
Estimated blood loss [ml]	90 (50–150)
Time to first flatus [days]	2.4 (2–3)
Time to first stool passing [days]	2.9 (2–3)
Time to oral intake [days]	3.1 (2–4)
Dose of Demerol used [mg]	70 (50–100)
Duration of hospital stay [days]	7.6 (6–14)
Use of pain control medication	4 (40%)
Postoperative bowel frequency [times/day]	2.5 (1–4)
Satisfaction, excellent/good/poor	9/0/1 (90%/0%/10%)

Values given as mean (range) or total number (percentage).

No intraoperative complications occurred (Table III). The following postoperative complications were noted: one patient developed infection of the Pfannenstiel incision wound, and remained hospitalized for longer; another patient developed prolonged ileus (over 5 days). No patient developed urinary tract infection or incision hernia. All patients were able to tolerate an oral diet consisting of clear liquids on the fourth postoperative day. The Jackson Pratt drain was removed on the day of discharge. There was no mortality associated with the surgery, and none of the patients required conversion to exploratory laparotomy.

An overview of the functional outcomes is given in Table IV. The patients were followed up in our outpatient department for at least 1 year. The

**Table IV.** Functional outcome after laparoscopically assisted subtotal colectomy with ileorectal anastomosis in patients with slow transit constipation (*n* = 10)

Functional outcome	Number of patients reporting this outcome	
	Score: 0/1/2/3	Mean
Bowel movement	4/6/0/0	0.6
Strained defecation	1/9/0/0	0.9
Urgency	1/8/1/0	1
Perianal irritation	5/5/0/0	0.5
Abdominal fullness	0/5/5/0	1.5

The outcomes were rated on a four-point scale: 0, perfect; 1, good; 2, acceptable; 3, unacceptable.

mean frequency of bowel movement improved to 2.5 times per day (range: 1–4 times). Nine (90%) patients expressed excellent satisfaction with the procedure, while 1 (10%) patient expressed poor satisfaction related to prolonged ileus (over 5 days) that developed postoperatively.

## Discussion

Constipation is a condition that occurs predominantly in women [7]. Constipation can typically be managed with diet changes and the use of laxatives. If the condition recurs, the existence of secondary causes such as underlying metabolic, organic, or pharmacological factors should be investigated. While the cause of STC remains unclear, it is known that slow transit involves fewer high-amplitude propagated contractions of the colon or reduced colonic contractile response to a meal [8]. The STC involves prolonged delay in the transit of the stool through the colon in the absence of pelvic floor dysfunction or underlying systemic, metabolic, or pathologic disorders [9]. The delay may be caused by the primary dysfunction of the colonic smooth muscle or nerve innervation [10]. Patients with STC may have abnormal expression of serotonin receptors and abnormal motor responses to cholinesterase inhibitors [11, 12]. The STC may also be caused by a decrease in the number of interstitial cells of Cajal, which are situated in the submucosal and myenteric plexus of the bowel wall, and act as neuromuscular transducers between enteric motor neurons and the smooth muscle of the bowel [13].

In constipated patients, physiologic examinations are necessary and typically include colonic transit investigations with a radiopaque marker, balloon expulsion test, anorectal manometry test, and defecography [14]. The primary examination for patients with STC should include a colonic transit study. The radiopaque marker test is easy to perform and most informative. In addition, anorectal manometry should be performed to rule out the presence of pelvic floor dysfunction. All our patients underwent an anorectal manometry test, which revealed no abnormal anorectal inhibitory reflex. Colonoscopy and barium enemas also represent useful tools for assessing the presence of pathology and structural lesions [15]. One study evaluated 2042 patients with constipation and found that only 9.9% were fit to undergo surgical treatment, as they had no untreated underlying disease. In these patients, constipation was resistant to medical therapy (dietary fiber supplements, osmotic laxatives, stimulant laxatives, cathartics, and prokinetics), and colonic transit time was consistent with that of STC [16].

Laparoscopic resections for STC are associated with better cosmetic results compared with those

provided by open procedures [17]. For the surgical treatment of benign and malignant colorectal disease, our previous prospective randomized study showed that hand-assisted laparoscopic colectomy resulted in an average incision length of 7 cm and mean estimated blood loss of 193 ml, while open colectomy resulted in an incision length of 13 cm and blood loss of 343 ml [18]. However, in the present study, laparoscopic subtotal colectomy for STC resulted in an incision length of 4.2 cm and blood loss of 90 ml, which are significantly smaller than the values obtained via open or hand-assisted laparoscopic colectomy in the management of colorectal disease.

Webster and Dayton performed total abdominal colectomy in 55 patients with STC, and noted postoperative complications including prolonged ileus (24%), small bowel obstruction (8%), and anastomotic leak (4%) [5]. In our study, postoperative complications included one (10%) infection of the Pfannenstiel incision and one (10%) occurrence of prolonged ileus that was associated with the longest hospital stay. No patients developed urinary tract infection or incision hernia, once more suggesting that the outcomes in our patients were above the reported average.

Laparoscopic techniques have been successfully applied in colon surgery, being associated with lower morbidity, mortality, and length of hospital stay [19, 20]. In patients with STC, the typical length of hospitalization is 7–13 days [11, 21, 22], with postoperative ileus as a common complication delaying discharge [5]. In our study, the mean length of hospital stay was 7.6 days (range: 6–14 days), and the mean time to first flatus was 2.4 days (range: 2–3 days). These results are in agreement with previous reports, and indicate above average outcomes in our patients.

Concerning functional outcomes of surgical treatment for STC, several studies have reported good outcomes, with overall success rates of 80% to 100%. Outcomes have generally been evaluated in terms of frequency of bowel movements, which was reported to improve significantly from 0.5–1.4 to 15–26 times per week [21–24]. Postoperatively, the use of laxatives was reported to decrease from 4.12 to 0.37 [25]. In our study, while the mean defecation duration was 8.8 days (range: 5–14 days) preoperatively, the mean frequency of bowel movement reached 2.5 times (range: 1–4 times) per day within 12 months after surgery. Abdominal distention with pain and vomiting also improved after the surgery, which is consistent with previous reports [25]. In the study by FitzHarris *et al.*, subtotal colectomy for STC increased the frequency of bowel movements, but the persistence of abdominal pain, diarrhea, or postoperative incontinence adversely affected the quality of life following the surgery [26]. In our

study, we evaluated functional outcomes in terms of frequency of bowel movements, strained defecation, urgency, perianal irritation, and abdominal fullness. The outcomes were rated by the patients on a four-point scale (0, perfect; 1, good; 2, acceptable; 3, unacceptable), and scores of 0–1 were obtained for bowel movement frequency (100%), strained defecation (100%), urgency (90%), perianal irritation (100%), and abdominal fullness (50%). The symptoms of STC improved postoperatively, and no poor rating was reported for any of the outcomes evaluated (unacceptable: 0%).

In conclusion, based on our results, we conclude that laparoscopically assisted subtotal colectomy with ileorectal anastomosis is well tolerated by the patients, and can provide excellent outcomes with improvement in bowel function provided that patient selection is performed carefully. Although the use of minimally invasive laparoscopically assisted subtotal colectomy with ileorectal anastomosis is technically challenging in patients with STC, it carries a low rate of operative morbidity and mortality, and is associated with good functional outcome. While conventional laparotomy remains a viable strategy for subtotal colectomy with ileorectal anastomosis in patients with STC, the laparoscopic approach should be equally considered, and represented the preferred approach for our young female patients.

### Conflict of interest

The authors declare no conflict of interest.

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