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The feasibility of laparoscopic subtotal colectomy with cecorectal anastomosis in community practice for slow transit constipation

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ABSTRACT

Background: The objective of this paper is to demonstrate if slow transit constipation (STC) can be accurately diagnosed, selecting patients appropriate for surgery, and safely perform laparoscopic subtotal colectomy with cecorectal anastomosis (CRA) with acceptable short and long-term outcomes in the setting of medically complex patients in a community practice.

Methods: A retrospective study was performed at a private community surgical practice. Cohort involved 10 patients with up to 10 years in follow-up care with a diverse range of ages, body mass index (BMI) and medical conditions. Pre-operative work-up followed a comprehensive algorithm designed to rule out organic conditions and dyssynergistic defecation. The Sitz Mark Colon Transit Study was used to confirm STC. Laparoscopic subtotal colectomy with CRA techniques were used in all cases. Frequency of BMs and patient satisfaction over the study period were tabulated.

Results: Average post-operative length of stay (LOS) was five days. One early major post-operative complication occurred, however there were no perioperative deaths, anastomotic leaks or revisions of the original surgery after discharge from the hospital. Two patients died due to non-bowel related causes. An incisional hernia was the single long-term complication. Initial post-operative BMs averaged several per day. In the 1–5 year follow-up, BMs tapered down from 1 to 2/day with some laxative use. By the 5th to 10th year follow-up, constipation occurred with 2–3 BMs/week, all requiring an osmotic laxative. Most patients, however, were satisfied with their bowel pattern.

Conclusion: Surgical candidates with severe STC can be accurately diagnosed and treated with minimally invasive surgery in community practice with acceptable outcomes as compared to outcomes published in the literature.

Introduction

Approximately 16% of the adult U.S. population are diagnosed with chronic constipation or constipation predominant IBS (IBS-C).[1] A subset of this group have a more lifestyle altering, severe form of constipation called slow transit constipation (STC) or colonic inertia (CI). Slow transit constipation is characterized by weekly or longer periods of time between bowel movements and progressively worsening abdominal distention and pain, although, abdominal pain may not be a predominant complaint.[3] These patients have surpassed the traditional medical treatments for chronic constipation including over-the-counter laxatives, prescription medications, supplemental fiber intake, and dietary changes. Despite the introduction of new and more expensive pharmaceuticals to treat IBS-C and opioid-induced constipation, such as the secretagogues naloxegol, lubiprostone or linaclotide,[4,5] there are no studies showing effectiveness with these medications with the most severe forms of STC. Therefore, to defecate, many STC patients require large volumes of osmotic laxatives allowing the hydrostatic effects of volume of the non-absorbable iso-osmotic agent (polyethylene glycol), along with enemas, to mechanically push feces toward the rectal vault. Often over years and even decades, these treatments become less and less efficacious and there is progressive worsening of abdominal symptoms and even less frequent bowel movements. The colon itself adapts to maintain a higher volume capacity resulting in physical changes of the colon such as dilation, elongation and redundancy.[29] More severe bouts of constipation and fecal impaction occur which may require acute hospitalization for obstructive symptoms such as nausea, vomiting, abdominal distention, and pain. Acute treatment may involve a therapeutic Gastrografin enema, rectal dis-impaction (manual or colonoscopic

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assisted), placement of a nasogastric tube for gastric decompression, or instilling osmotic laxatives as a gastric gavage. Unfortunately, some cases present with stercoral peritonitis due to colon wall necrosis from heavy stool burden or colonic volvulus, requiring emergent salvage surgery and colostomy

The challenge of treating this category of patient in community practice is recognizing that medical resources are often limited and most patients strongly prefer to remain in their community for treatment. From a surgeon's standpoint, patients with slow transit constipation are tenuous and require intensive medical management and follow-up before life-threatening complications occur. The objectives of this study are: 1) to evaluate the feasibility of a tailored selection process for surgical candidates with end-stage STC and then to 2) demonstrate the utility and outcome of a single subtotal colectomy technique in a non-academic, non-University, community surgical practice setting.

Methods

Beginning in 2008, patients with severe constipation were referred to my practice from either a primary physician or a gastroenterologist. A cumulative 10 patients were selected and monitored between October 2008 and October 2018. All patients underwent surgery, and were included in this study. Patient characteristics are listed in Table 1. In addition, eight patients were calculated to have a Wexner constipation score[7] of over 20, with two patients scoring between 15 and 20. All study patients were taking a combination of laxative, stimulant medications, or an osmotic agent for at least one year. No patients were using a fiber-bulking agent. The diagram and algorithm of work-up followed is presented in Fig. 1. All 10 study patients underwent either a colonoscopy or contrast (barium or Gastrografin) enema. Initial study exclusions were due to either organic etiologies as a cause for colon obstructive symptoms or clinical symptoms such as dysphagia or contrast upper GI studies demonstrating abnormal upper GI motility. A key diagnostic maneuver used is the digital anal rectal and pelvic floor exam.[1,2] This procedure is used to rule out dyssynergistic defecation which, if identified, would exclude further work-up in my practice and, instead, be recommended for University referral for detail anorectal and colonic pathophysiology studies. Lastly, Sitz Mark Colon Transit Study is performed on all candidates, with a value of 5 (or more) out of 20 radio-opaque markers present on abdominal x-ray on day 5 of the study (>20% retention) considered to be a positive study, confirming end stage STC. The subtotal colectomy technique used was hand-assisted laparoscopy (HAL) in all cases. The distal margin was at the rectosigmoid junction. The ileocolic mesentery and cecum were carefully preserved in all cases, closing the upper cecum transversely. An anastomosis was created using an end to end anastomosis (EEA) circular stapler approximating the cecal stump (at the site of the appendiceal orifice) to the rectosigmoid stump. There was little or no rotation of the cecum and the ileocolic mesentery to create the anastomosis. Post discharge from the hospital included follow-up clinic visits at approximately two and eight weeks, documenting frequency of BMs (Fig. 2), and patients overall satisfaction. All data regarding BMs was gleamed from chart notes or nurse telephone notes. Long-term follow-up was conducted primarily by telephone at 2 months or longer from the operative date.

Results

Clinical characteristics in this cohort, as shown in Table 1, consist of 5 males and 5 females ranging in age from 32 to 77 years of age, with a mean age of 63 years old. Chronic opioid dependence was seen in 7 of the 10 patients (70%). Opioid dependent patients tended to be leaner with an average BMI of 22. Contrasting, the non-opiate dependent patients (30%) tended to be morbidly obese. Table 2 shows operative and perioperative data of operative time, blood loss, and length of hospital stay (LOS). Including one patient which experienced a major perioperative complication requiring a proctectomy and ileostomy, average LOS was 5 days. No perioperative deaths, anastomotic leaks or revisions of the original surgery occurred after discharge from the hospital. A total of 40% of study patients, all narcotic dependent, required readmission within 30 days of discharge for pain management (see Table 3).

Long-term complications were limited to one incisional hernia. Additionally, during long-term follow-up, two patients died (one from myocardial infarction and one from pancreatic cancer). Post-surgical frequency of BMs are tabulated in Fig. 2. Beginning at two weeks post-surgery, BMs averaged several per day but, over the next several months, decreased rapidly down to 1–2 BMs per day. This was consistent through the first five years. However, toward the end of the five years, many patients returned to using an osmotic laxative as needed. The “Honeymoon Period”, where patients consider their BMs to be “normal”, occurred from two months post-operative to approximately two years post-operative. Constipation, however, recurred in all patients by years six through ten, requiring them to use an osmotic laxative to affect a bowel movement and averaged 1–3 bowel movements per week, depending upon the amount and schedule of their osmotic laxative use. Despite the need for a laxative, most patients were satisfied with their bowel function.

Discussion

Study participants demonstrate that STC patients are medically complex and are, more often than not, on one or multiple medications to manage other medical conditions (anti-depressants, anti-psychotics, anti-hypertensives, or opioids). However, widespread prescription opioid use in the United States, and the preponderance of opioid dependence (70% in this study) correlates with the detrimental impact of chronic use this class of medications has on gastrointestinal function, in particular colon function. This appears to correlate with a trend in general of more pervasive opioid use for pain beginning approximately 20 years ago in the United States.[20]

Due to the high costs, logistics of travel and the embarrassing nature of STC testing, most patients prefer to be treated locally, if

Table 1
Patient characteristics.

Gender (Male/Female)	50%/50%
Age, range (years)	32-77 (mean 63)
Chronic opioid dependence	70%
Body Mass Index (BMI) range	17–50
BMI, average, of chronic opioid dependent patients (7 patients)	22
BMI, average, of non-opioid dependent patients (3 patients)	43
Previous major abdominal surgery	80%

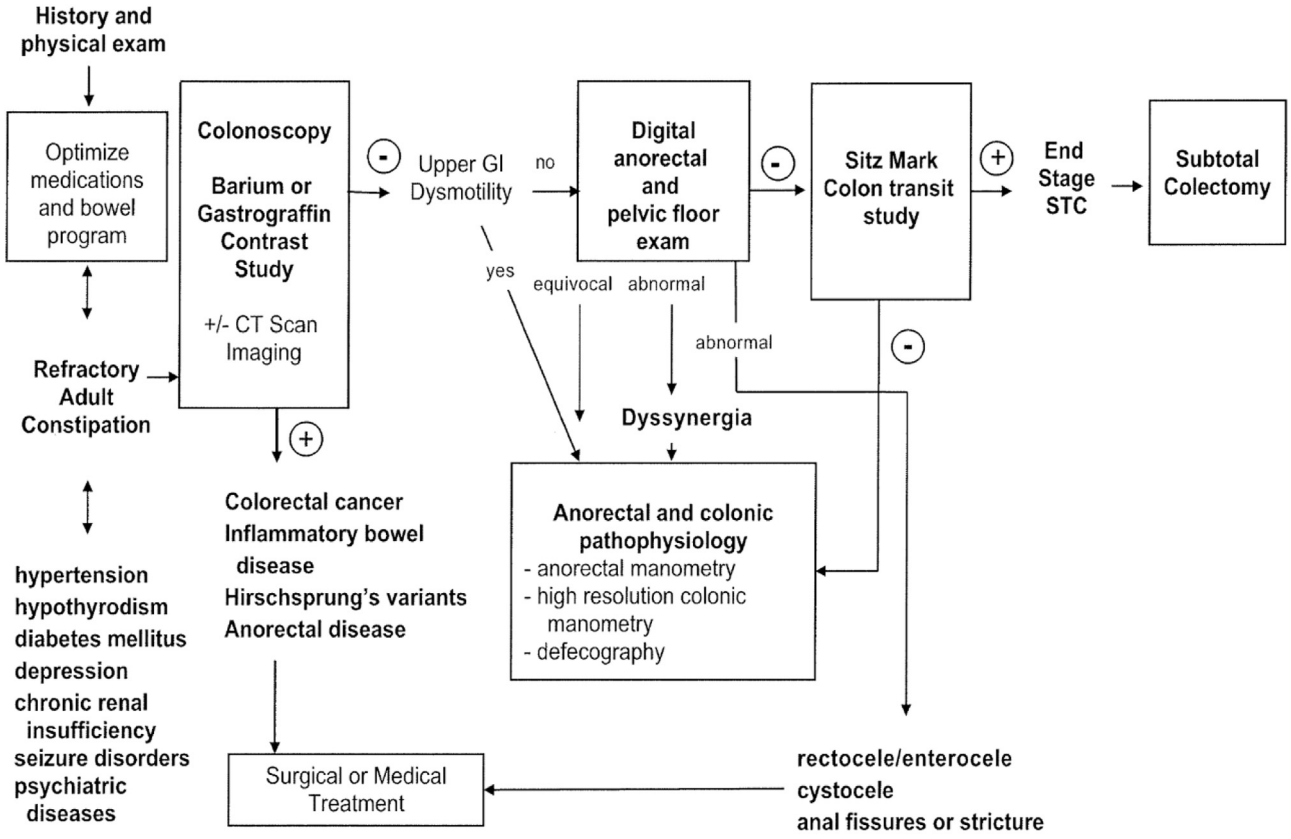

Fig. 1. Algorithm of workup of slow transit constipation (STC) in community practice.

possible.[21] As shown in the selection criteria algorithm (Fig. 1), a detailed physical exam and establishing rapport with patients is the most valuable means of knowing or suspecting behavioral problems as an etiology for their constipation. Initial patient exclusions are for conditions such as PTSD, history of child or sexual abuse. If these conditions are present, the patient is referred to a tertiary center for more comprehensive evaluation.

If organic, obstructive causes are ruled out during the initial work-up, and upper GI or global dysmotility is unlikely, then the next important intervention is the digital anal rectal and pelvic floor exam. For this exam, the patient is alert and non-sedated. This highly selective and sensitive exam[1,2] is essential to understanding if the patient has pelvic outlet obstruction, which would be another exclusion from this study. In particular, dyssynergetic defecation is characterized by the inability to coordinate abdominal, anorectal, and pelvic floor muscles resulting in the inability to evacuate stool from the rectum. The digital anorectal and pelvic floor exam is a cost-effect evaluation that can be done in the office setting.[28,29] A careful exam will allow: 1) finding sources of anal pain, such as fissures, 2) evaluate the resting sphincter tone, 3)provocative testing (on demand), such as squeezing and pushing out, mimicking defecation with demonstrated relaxation of the anal sphincter and intact puborectalis mechanism, 4) testing of anal wink sign[2] demonstrates intact reflex sacral nerve pathway[2] and 5) normal perineal descent of less than 3.5 cm is unlikely to be indicative of dyssynergia. However, any abnormal or equivocal findings on this exam is the threshold for referring the patient for more comprehensive diagnostic colonic and anorectal physiologic testing and exclusion from this study.

The type of subtotal colectomy to perform, whether ileocecal valve sparing, antiperistaltic cecorectal anastomosis (Sarli procedure)[10] (as utilized in this study), ileosigmoidal anastomosis, or the more traditional ileal rectal anastomosis, have been debated for decades. Other techniques, such as ileal pouch anal anastomosis for STC and "rectal inertia" have been studied[22] however, the majority of literature on this technique is in the treatment of ulcerative colits.[24] In a review study by Knowles regarding ileorectal anastomosis (IRA) performed during the 1980's and 1990's, the satisfaction or success rate ranged from 39 to 100%.[8] The long-term follow-up, however, in most of these studies was less than five years and the complication most likely to appear was bowel obstruction, which required surgery. In fact, in a review study by Dudekula,[9] examining trends and impact of colectomy for constipation from 1998 to 2011, the benefit of surgery for slow transit constipation

Table 2
Operative data and hospital length of stay (LOS).

	Average(range)
Operative time, all 10 study patients (minutes)	291 (210–450)
Operative time, 2 patients without previous major surgery (minutes)	219 (210–228)
Estimated Blood Loss (mL)	170 (25–350)
LOS (days, all 10 study patients)	5 (3–10)

Table 3
Post-operative complications.

Complication	Number of Patients
Perioperative (<30 days)	
Rectal hematoma/perforation at post-operative day 3 (requiring proctectomy and ileostomy)	1 (10%)
Readmission for abdominal pain (all opioid dependent patients)	4 (40%)
Long term (>1 month)	
Incisional hernia (1 year post surgery)	1 (10%)

was questioned. Morbidity during this time showed an overall perioperative complication rate of 42% for colectomy patients, with a perioperative readmission rate of 28% within the first 30 days.

Particularly concerning, and brought up in this article, addressing the global costs of a subset of IRA subtotal colectomy from 2005 to 2011, showed resource utilization (emergency department visits, hospitalizations, CT scans, additional abdominal surgeries) costs *increased* the year after surgery as compared to the year prior to subtotal colectomy surgery. Additional studies which showed post-operative small bowel obstruction as a major complication in IRA anastomosis included Wexner et al.[25] in the 36 month follow-up with 3 of 16 study patients "readmitted four times for successful conservative treatment of partial small bowel obstruction", 20% of Pikarksy et al.[26] patients admitted for small bowel obstruction, one half of whom required laparotomy and, similarly, in the paper written by Zuthi et al.,[27] 20% of patients developed small bowel obstruction, with over one-half of patients requiring surgery.

In the past 20 years, however, a number of studies have evaluated the effectiveness of cecorectal anastomosis, demonstrating long term durability with low reoperation rates and high patient satisfaction.[10–13] The preservation of the ileocecal valve in a colectomy has had a long-standing theoretical advantage by preserving the function of the terminal ileum, such as electrolyte, bile salt, and vitamin B12 absorption.[10] Additionally, the ileocecal valve seems to behave more as a sphincter rather than a valve, demonstrating decreased sphincter pressure with ileal distention and increased sphincter pressure associated with cecal distention, preventing the back flow of heavy bacterial cecal content into the small bowel.[14,19] Evidence from Crohn's disease research also shows an advantage to constructing an ileocecal valve after right hemicolectomy due to observation of increased recurrence of Crohn's without a valve-like mechanism and reconstruction.[15,19]

Laparoscopic technique, used in this study, demonstrates that the procedure can be performed safely with improved LOS, no revisions of the original surgery, and no admissions/surgery for bowel obstruction in the (up to) 10-year follow-up period. However, the one characteristic seen in all participants in this study with over five years follow-up (4 patients) was recurrent constipation. Despite the return of constipation, all four were satisfied with needing to use an osmotic laxative to affect a bowel movement, typically taken every 1–3 days. None complained of abdominal pain or bloating. The effective oral agent of one of the study's longest follow-up patient (9.2 years) was "cider and honey". This characteristic of recurrent constipation is seen in other studies in the literature which include longer follow-up periods, such as in this study. One example is the study by Yang[13] which consisted of 56 patients followed for over 60 months. Along with constipation, this group also had complaints of abdominal pain (80.4%), bloating (69.6%), and a sense of incomplete defecation (12.5%). The percentage of patient satisfaction was, interestingly noted, at 82.1%. Also, the CRA technique used here differed from the one in the current study since they utilized an iso-peristaltic CRA anastomosis, which requires a 180^0 rotation of the cecal stump and mesentery to create the CRA. In contrast to 0^0 rotation of the cecal stump to create the anti-peristaltic CRA (as in this study).

Although slow transit constipation has widely been accepted as a functional disorder, greater evidence points to slow transit constipation being a true enteric neuropathy. Clinically, the pathophysiology of slow transit constipation not only results in the late stage physical dilation and elongation changes of the colon, but also has been shown to decrease colonic smooth muscle activity, decrease intrinsic colonic nerves and neurotransmitters, and reduce the number of pacemaker interstitial cells of Cajal.[3,16–18] Consequently, the alterations in the enteric nervous system appear to render the colon unable to continue effective propulsive

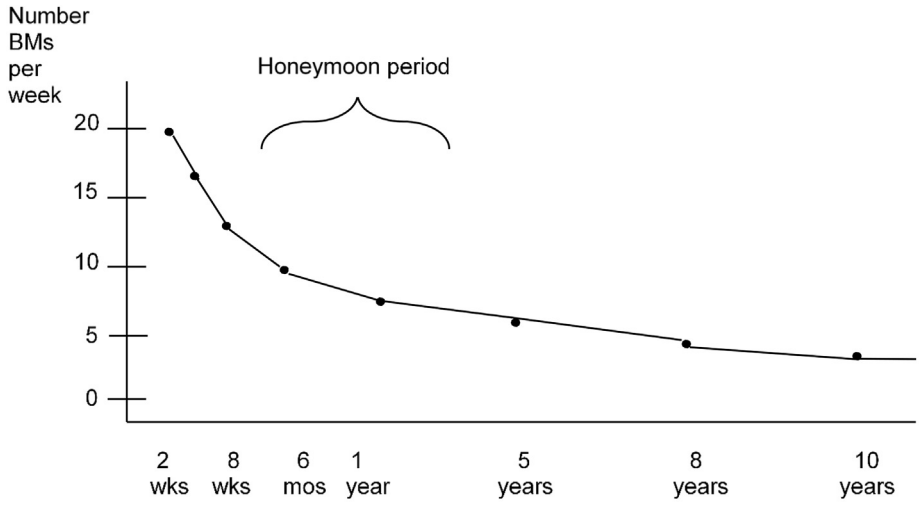

Fig. 2. Frequency of bowel movements (BMs)vs. Time post subtotal colectomy.

function therefore, the colon adapts to becoming a progressive, non-functional reservoir. At this point, the ability of any further medical management appears to become futile and is a strong indication to proceed with surgery. As seen in this study and demonstrated in Fig. 2, post-colectomy patients enjoy a period of time after the initial perioperative period of reasonable bowel movements, ranging from several per day to every other day, with increasing patient satisfaction. The "Honeymoon Period" in this study appears to last at least several years. But, with long-term follow-up, three patients developed recurrent constipation and required laxatives and, usually, an osmotic agent. Therefore, it appears that, although subtotal colectomy markedly reduces the colonic burden, the residual small portion of cecum, as well as the rectum continue to deteriorate with increasing dysfunction, confirming clinically that the disease process is a progressive enteric neuropathy.

Conclusion

In a community practice setting, this study demonstrates that, using the criteria put forth, it is feasible to perform minimally invasive surgery with optimal results and low morbidity for the treatment of end stage STC as compared to recent studies occurring in University setting. Utilizing an algorithm to ascertain functional disorders of the pelvic outlet as well as excluding behavioral disorders, true end stage slow transit constipation can be identified and treated. A low threshold for referral to a tertiary center for advanced anorectal studies if work-up findings show behavioral or pelvic outlet etiologies. Lastly, considering the complexity of the patient, this procedure can be performed safely and provide years of satisfaction and improved quality of life. Implications of this study suggest that, even though subtotal colectomy with colorectal anastomosis may provide a prolonged "Honeymoon Period", ultimately, chronic constipation will slowly recur. Therefore, research should continue to be directed at better understanding the pathophysiology and prevention of the progressive enteric neuropathy which appears intrinsic to slow transit constipation.

Conflict of interest disclosure

Dr. Macha has no conflicts of interest to disclose.

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