Restorative Procedures in Colonic Crohn Disease

Sean T. Martin, MD¹ Jon D. Vogel, MD, FACS, FASCRS¹

¹Department of Colorectal Surgery, Digestive Disease Institute, Cleveland Clinic, Cleveland, Ohio

Address for correspondence Jon D. Vogel, MD, Department of Colorectal Surgery, Digestive Disease Institute, Cleveland Clinic, Cleveland, OH 44195 (e-mail: vogelj@ccf.org).

Clin Colon Rectal Surg 2013;26:100–105.

Abstract

Keywords

- Crohn colitis
- restorative surgery
- ileorectal anastomosis
- ileal pouch rectal anastomosis
- ileal pouch anal anastomosis

Surgical management for refractory Crohn colitis often involves creation of a temporary or permanent stoma. Traditionally, the procedure of choice has been a total proctocolectomy with permanent ileostomy. However, restorative procedures that help to avoid a permanent stoma are being used with more frequency. In this article, the authors will address these procedures, including colocolonic anastomosis, ileorectal anastomosis, ileal pouch rectal anastomosis, and ileal pouch anal anastomosis. Factors that may influence one's decision to perform these procedures, such as patient age and nutritional status, medical comorbidities, sphincter function, desire to avoid a permanent ostomy, and prior medical therapy, will be discussed. Functional outcomes regarding these procedures will also be described. One should keep in mind that surgery does not cure Crohn disease and that postoperative long-term management is essential in preventing progression or recurrence of disease.

CME Objectives: Upon completion of this article, the reader should have a comprehensive understanding of the various restorative surgical options available for individuals with Crohn colitis.

Crohn disease (CD), first described in 1932 by Burrill Bernard Crohn and colleagues at Mount Sinai Hospital in New York City,¹ is an idiopathic, chronic inflammatory disease, which can affect any part of the gastrointestinal tract from the mouth to the anus. The disease typically has two peaks in incidence, in early adult years and in the 50- to 70-year-old-age group.^{2–4} Factors postulated to be etiologic in the development of CD include genetic mutations,^{5,6} smoking,^{7,8} and environmental influences.^{9,10} There is a well-established genetic predisposition to CD. Approximately 15 to 20% of patients with CD have a first-degree relative affected by inflammatory bowel disease.¹¹ Concordance levels for CD approaches 50% in monozygotic twins compared with 5% in dizygotic twins. To date, genome-wide screening has identified nine loci associated with inflammatory bowel disease in the CARD 15/NOD 2 gene on chromosome 16.^{12,13} These mutations are implicated in host defense against enteric organisms and such mutations are thought to be responsible for 15 to 30% of cases of CD. In 2005, the Montreal Working Group classified CD according to age at diagnosis (< 16, 16–40, and > 40 years old), anatomic

location (ileal, colonic, ileocolonic, and isolated upper small bowel), and disease behavior (nonstricturing, nonpenetrating; stricturing, penetrating; perianal disease).¹⁴ In 25 to 35% of cases, the colon alone is affected and in 30 to 50% of cases both the small and large bowel are affected (typically ileocolic disease). Approximately 80% of patients with ileocolic CD will ultimately require surgical intervention within 10 years of diagnosis.^{15,16} Classically, indications for surgery include failed medical therapy, free perforation, contained perforation with abscess or fistula, obstruction, hemorrhage, and less often, dysplasia or cancer.¹⁷ Surgery is rarely curative; the focus of surgery is to alleviate symptoms, improve quality of life (QOL) and maintain intestinal continuity, where possible. Intestinal complications are the commonest indication for surgical intervention, and operative strategy is determined by multiple factors, including patient's nutritional status, medication history, prior surgery, and desire to avoid a permanent ostomy.

The most common indications for surgery in colonic CD is inflammation refractory to medical therapy or complications of disease.¹⁸ In these patients, blood loss in the stool often results in anemia whereas a combination of fluid and nutrient loss, along with food aversion, often results in dehydration and/or malnutrition with weight loss.^{19,20} The indication for surgery and operative approach is dependent on the extent

Issue Theme Crohn Disease; Guest Editor, Brian R. Kann, MD, FACS, FASCRS

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Tel: +1(212) 584-4662.

DOI <http://dx.doi.org/10.1055/s-0033-1348048>.
ISSN 1531-0043.

and location of the disease. Approximately one-third of patients have segmental disease, a third have left-sided colitis and the remaining third have pancolitis. Ten years after diagnosis, approximately half of all patients with colonic CD will have had surgery and a quarter will have an ileostomy.²¹ Approximately half of all patients with severe Crohn colitis who avoid surgery with intensive medical therapy will require colectomy within 2 years of the severe acute attack.²²

Surgical Resection for Isolated Colonic Crohn Disease

When surgery is required for CD affecting the right side of the colon, right colectomy or extended right colectomy with ileocolic anastomosis is performed. In these cases, the ileocolic anastomosis may be created with standard stapled or sutured techniques. Alternatively, in patients with Crohn colitis that spares the right colon and involves either an isolated segment of the transverse or left colon, or multiple segments of the colon, total abdominal colectomy (TAC) with ileorectal anastomosis (IRA) is typically performed. The rationale behind this extensive surgery is that removing the entire colon eliminates the risk of colonic recurrence and that IRA provides both good function and quality of life. Data from the Mayo Clinic shows that the majority of patients (70–80%) will have a functioning IRA 5 years after surgery with improved QOL and overall health scores. However, female gender and young age at surgery were associated with failure of an IRA and need for reoperation.²³ Data from France has shown that 10 years after abdominal colectomy and IRA the likelihood of disease recurrence in the rectum is 83%. Despite this, three-fourths of patients had a functioning IRA at 10-year follow-up. In this study, prophylactic treatment with 5-aminosalicylate and the absence of extraintestinal manifestations were the main factors associated with long-term rectal preservation.²⁴

Although total abdominal colectomy is a time-honored and effective treatment for Crohn colitis, the removal of normal or relatively unaffected colon may be more than what is needed to control the disease. In fact, recent studies indicate that segmental colectomy (SC) can be performed, with good results, in select patients with Crohn colitis. A Swedish group, in analyzing their data on SC versus TAC/IRA did not find a difference in reresection rates between the two groups. Patients who underwent SC had fewer symptoms ($p = 0.039$), fewer loose stools ($p = 0.002$), and better anorectal function ($p = 0.027$). Multivariate analysis revealed the number of colonic segments removed to be the strongest predictive factor for postoperative symptoms and poor anorectal function ($p = 0.026$ and $p = 0.013$, respectively).²⁵

A Dutch retrospective analysis of patients undergoing SC ($n = 91$) found that 33% of patients had at least one repeat resection at median follow-up of 8 years. Female gender and history of perianal disease were predictive of reresection. In total, 56% of patients were stoma-free at the end of the study period, which led the authors to support the role of segmental resection for Crohn colitis.²⁶

A systematic review by Tekkis and colleagues found segmental colectomy to be associated with higher recurrence rates, particularly in individuals with more than one segment of colonic disease.²⁷ A more recent report on the Cleveland Clinic experience with segmental versus subtotal colectomy with ileosigmoid anastomosis or TAC with IRA demonstrated improved functional outcome in the segmental resection group without an increased risk for disease recurrence or the need for a future ostomy. Further, this study demonstrated that the presence of perianal sepsis and multiple comorbid conditions, but not segmental colectomy, were associated with reduced stoma free survival.²⁸

In patients who have undergone total or subtotal colectomy, ileosigmoid or ileorectal anastomosis (ISA or IRA) is the first restorative option to consider. Prior to this reconstruction, it is important to assess the anus and the quality and function of the remaining colon, rectum, and anus. To begin, anoperineal inspection, digital anorectal exam, and rigid proctoscopy are performed. A diseased perineum or anus is the first clue that a restorative procedure may be a poor option. Next, insufflation of air via the proctoscope will allow the surgeon to determine the dispensability and compliance of the rectum. Rectal compliance may also be measured by the ability of the patient to hold a 150-mL tap water enema. When the perineum, anus, and rectum are all in good condition, ISA or IRA is a good option for reconstruction. Alternatively, when these organs are diseased, restoration of bowel continuity will often result in a poor outcome and thus an ostomy should be considered in place of an anastomosis.^{29,30}

Several options are available for creation of an ileorectal or ileosigmoid anastomosis. The anastomosis can be sutured or stapled in a variety of configurations including end-to-end, end-to-side, side-to-end, or side-to-side. In cases in which the bowel wall is edematous or more fragile than usual, we favor a sutured anastomosis that is constructed using interrupted, absorbable vertical mattress sutures on the mesenteric side of the anastomosis, interrupted absorbable inverting seromuscular sutures on the antimesenteric side and a second row of full-thickness interrupted permanent sutures on the antimesenteric side (► Fig. 1). To our knowledge, there is no data supporting increased recurrence rates using either handsewn or stapled IRA or ISA techniques. Importantly, caution must be exercised in patients undergoing these anastomoses as leak rates are relatively high compared with more proximal intestinal anastomoses.^{31–33} In patients who are malnourished or immunosuppressed or when there are other reasons for heightened concern regarding the integrity of the anastomosis, the use of a defunctioning temporary (3 months) loop ileostomy may prevent a catastrophe related to anastomotic leak.

Ileal Pouch-Rectal Anastomosis

In some instances, a patient with CD will have inflammation of the colon and upper rectum and resection of the diseased large bowel will leave the patient with only a short segment of healthy rectum. Decreased storage capacity of the short rectal remnant will result in the need for more frequent bowel

Fig. 1 Sutured ileorectal anastomosis. (A) The mesenteric side of the ileorectal anastomosis is made with interrupted vertical mattress 3–0 absorbable sutures. The deep layer of the mattress stitch is full thickness; the superficial layer includes the mucosa and submucosa only. (B) The antimesenteric side of the anastomosis is made with interrupted, 3–0, absorbable sutures that include the serosa and muscle layers resulting in inversion of the mucosa when the suture is tied. (C) The antimesenteric side is reinforced with interrupted full thickness or Lembert-style, interrupted, 3–0, nonabsorbable sutures. (D) A Cheatele slit is sometimes required to create a more equitable size match between the ileum and rectum. (Reprinted with permission from Cleveland Clinic Center for Medical Art & Photography © 2012. All Rights Reserved.)

movements. In this scenario, construction of a small ileal reservoir may be considered. To achieve this, an 8 to 10-cm ileal pouch may be constructed, and bowel continuity restored with an ileal pouch-rectal anastomosis (IPRA) (→Fig. 2). In our experience with 23 patients who underwent IPRA, of the 22 with long-term follow-up, 11 (50%) developed

Fig. 2 Ileal pouch rectal anastomosis. The ileal pouch measures ~10 cm and can be made with a single fire of a 100-mm linear stapler. The pouch rectal anastomosis is typically made with a 29- or 33-mm circular stapler. (Reprinted with permission from Cleveland Clinic Center for Medical Art & Photography © 2012. All Rights Reserved.)

perianastomotic disease recurrence and two (10%) ultimately required pouch-rectal excision with permanent ileostomy or permanent defunctioning loop ileostomy. When compared with case-matched patients who underwent straight IRA, bowel movement frequency (median 6.5), fecal urgency and incontinence, and QOL were similar. On the contrary, nighttime fecal seepage and protective pad usage were more frequent after IPRA.³⁴ Because the alternative in these cases is most often permanent ileostomy, we feel that IPRA should be considered in appropriate patients.

Ileal Pouch-Anal Anastomosis

It is generally accepted that CD is an absolute contraindication to ileal pouch-anal anastomosis (IPAA).³⁵ This is based on the analysis of patients who underwent IPAA for presumed ulcerative or indeterminate colitis who subsequently underwent “phenotype crossover” to CD as indicated by the development of complications distant from their original surgery. However, there is a small, but growing body of evidence to support the highly selective use of IPAA in patients with known CD. A French group was the first to describe their experience with IPAA in patients with a preoperative diagnosis of CD limited to the colorectum. There were 31 patients of which six (19%) had short-term complications, including

pouch-perineal fistulas ($n = 2$, 6%), CD of the J-pouch ($n = 2$, 6%), pouch vaginal fistula ($n = 1$, 3%), and abscess ($n = 1$, 3%). In total, two (6%) patients had pouch failure, defined as a need for permanent diversion of, or excision of the ileo-anal reservoir. QOL was very good in the patient cohort across all parameters relating to functional outcome, social and sexual activity.³⁶ With 10-year follow-up of this group of patients, the rate of CD complications and pouch excision were 35 and 10%, respectively, leading the authors to conclude that IPAA is associated with good outcomes in carefully selected patients with CD of the colon and rectum if stringent selection criteria is used.³⁷

In contrast to the generally good results from France, a study based in the United Kingdom evaluating patients undergoing IPAA for CD or indeterminate colitis (IC) favoring CD found a pouch failure rate of 57% in a cohort of 26 patients,

leading the authors to question the appropriateness of IPAA in patients with CD.³⁸

Another study from Cleveland Clinic evaluated the outcome of IPAA in CD as it relates to the timing of diagnosis.³⁹ Three groups were assessed: Those with a diagnosis of CD before IPAA or the "intentional group" ($n = 20$, 10%), those with a pathology diagnosis made immediately after colorectal resection or the "incidental group" ($n = 97$, 47%), and those with a delayed diagnosis, made at a median of 36 months after IPAA construction ($n = 87$, 43%). The overall 10-year pouch-retention rate was 71%. The 10-year pouch retention rate for those individuals with an intentional pouch, an incidental pouch, or a delayed diagnosis pouch were 85%, 87%, and 53%, respectively. The most frequent complications were pouchitis in 54%, fistula in 35%, and IPAA stricture in 24%, all of which occurred more often in the delayed diagnosis group.

Fig. 3 (A) Stapled ileal pouch anal anastomosis. The ileal pouch is made to measure 15 to 20 cm in length. Two fires of a 100-mm linear stapler are often used to make the ileal pouch. The IPAA is typically made with a 29-mm circular stapler. (B) Ileal pouch anal anastomosis with defunctioning loop ileostomy. (C) Sutured ileal pouch anal anastomosis. (Reprinted with permission from Cleveland Clinic Center for Medical Art & Photography © 2012. All Rights Reserved.)

Independent risk factors for pouch loss were delayed diagnosis of CD, pouch-vaginal fistula, and pelvic sepsis.

As with other questions related to the appropriate use of various surgical techniques, the use of IPAA in CD is dependent on the details of individual cases. In a recent study from the Cleveland Clinic, the outcome of IPAA in CD was included in a review of all patients who underwent this procedure. Although individuals with CD had a higher rate of pouch failure compared with those with a diagnosis of ulcerative colitis or FAP (odds ratio [OR], 2.0; 95% confidence interval [CI], 1.2–3.3; $p = 0.01$), a pouch retention rate of 82% at 10 years was demonstrated and both QOL and functional outcome in this subgroup of patients were good and equivalent to those with other histologic diagnoses.⁴⁰

With our data and those of other investigators in mind, we reserve the option of IPAA in CD to a carefully selected subset of patients with disease limited to the colorectum, no perianal disease, adequate sphincter function, and the motivation to accept the reality that challenges with the IPAA may arise as time passes. For ease of surgery, a J-pouch is preferred, but an S-pouch configuration may be required when reach is limited. As with ulcerative colitis, a stapled IPAA is our preference in these cases. Mucosectomy with sutured IPAA is reserved for cases with an associated anoperianal or anovaginal fistula, rectal dysplasia, or severe inflammation of the low rectum. In any case in which an IPAA is created, our preference is for a temporary (3 months) defunctioning loop ileostomy (►Fig. 3).

Toxic Colitis

Patients with colonic CD presenting with acute fulminant or toxic colitis are unsuitable for a restorative procedure at time

of index surgery. It is our practice to perform a subtotal colectomy with end- or loop-end ileostomy and subcutaneous implantation of the distal sigmoid stump with the use of open, laparoscopic, or hand-assisted laparoscopic technique (►Fig. 4). A restorative procedure may be considered 4 to 6 months later once the acute inflammation has abated, the patient's nutritional status has improved, and steroids, immunomodulators, and antitumor necrosis factor- α drugs are no longer required to control the disease. As mentioned previously, the quality and compliance of the rectum and anus must be assessed prior to ileosigmoid or ileorectal anastomosis.

Conclusion

Large-bowel CD often presents a major therapeutic challenge. Surgery is reserved for those failing maximal medical therapy, dysplasia, or cancer, and complications of the disease. In addressing the surgical management of these patients, a multitude of factors must be considered: patient age and nutritional status, medical comorbidities, sphincter function, desire to avoid a permanent ostomy, and prior medical therapy. The basic tenets of surgery remain removal of the diseased segment of bowel, alleviating symptoms, and restoring QOL. One should aim to conserve bowel where possible, when uninvolved by disease or asymptotically involved by disease. In our practice, we restore intestinal continuity when possible, but have a low threshold for a temporary ostomy to prevent the complications of an anastomotic leak. In restoring intestinal continuity, surgeons should be aware of all of the restorative options including colocolonic anastomosis, ileorectal anastomosis, ileal pouch rectal anastomosis, and ileal pouch anal anastomosis. Surgery does not cure CD and the postoperative, long-term management involves a multidisciplinary approach with medical gastroenterology as newer medications can retard the progression or recurrence of disease.

Fig. 4 Subtotal colectomy with end ileostomy and subcuticular implantation of the sigmoid stump. The shaded portion of colon is removed. The stapled sigmoid stump is secured to the rectus fascia in a manner that leaves the staple line in the subcutaneous tissue. (Reprinted with permission from Cleveland Clinic Center for Medical Art & Photography © 2012. All Rights Reserved.)

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