Interventional IBD: The Role of Endoscopist in the Multidisciplinary Team Management of IBD

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Inflammatory bowel disease (IBD) has been traditionally managed by IBD medical doctors or IBDologists and colorectal surgeons. Complications related to IBD and IBD surgery, such as stricture, fistula, and abscess, are common. For the past decade, endoscopic therapy has emerged as a valid treatment option for those complications. Endoscopic therapy provides more effective therapy for those structural complications than medical treatment, while being a less invasive approach than surgery. Endoscopic therapy plays a growing role in bridging medical and surgical therapies and is becoming an important component in the multidisciplinary approach to complex IBD. In fact, endoscopic therapy has become the treatment of choice for anastomotic stricture and anastomotic sinus. The role of endoscopic resection of colitis-associated neoplasia is currently being explored. Interventional IBD is intellectually and technically challenging. We are calling for proper teaching and training of our next generation of IBD interventionists.

Key Words: balloon dilation, complication, Crohn's disease, fistula, ileal pouch, interventional, interventionist, stricturotomy, surgery, ulcerative colitis

INDRODUCTION

The past 2 decades have witnessed rapid progress in medical therapy and a standardized surgical management of inflammatory bowel disease (IBD). A long list of cytokine- and adhesion molecule–targeted and pathway-targeted agents is rolling out from the pipeline. While the extensive use of anti–tumor necrosis factor (TNF), anti-integrins, and anti-interleukin (IL) has been shown to alter the disease course of Crohn's disease (CD) and ulcerative colitis (UC) in the short term, the long-term impact of those medications on the development of complications, including stricture, fistula, abscess, colitis-associated neoplasia (CAN), and the need for surgical intervention, remains to be seen. Unfortunately, the disease course in a majority of patients with CD would still eventually advance to result in those complications. Furthermore, a majority of patients with CD have recurrent disease even after bowel resection surgery, stricturoplasty, or ileostomy. In addition, a number of patients with UC who have undergone restorative proctocolectomy with ileal pouch-anal anastomosis (IPAA) later develop various forms of mechanical, inflammatory, and functional complications. Therefore, IBD including CD and UC, is far from being cured.

The role of endoscopy in IBD has traditionally been limited to the initial diagnostic evaluation and disease monitoring, dysplasia surveillance, and polypectomy for sporadic adenoma. A few endoscopists with an IBD background and a few IBDologists with an interest in advanced endoscopy have started doing endoscopic balloon dilation (EBD) of IBD- or IBD surgery–related strictures. With advances in imaging techniques, endoscopic equipment, and devices and, more importantly, a better understanding of the pathogenesis and disease nature of IBD, endoscopists have found their role being expanded beyond the traditional boundary of IBD.

A common scenario is that a patient with a long history of UC and primary sclerosing cholangitis (PSC) develops CAN with a raised lesion that was detected and initially treated with endoscopic submucosal dissection by an IBD interventionist. Multifocal flat CAN lesions later develop in other segments of the colon, resulting in restorative proctocolectomy and construction of IPAA by a colorectal surgeon. During the staged restorative proctocolectomy, the patient develops portal vein thrombosis (vascular medicine specialist consulted) and peristomal pyoderma gangrenosum (dermatologist consulted). Colectomy has been shown no impact on the disease course of PSC. The patient subsequently develops acute cholangitis from baseline PSC and is treated with biliary sphincterotomy and placement of a biliary stent by a pancreaticobiliary endoscopy interventionist. The patient's liver condition deteriorates, which leads to liver transplantation, performed by a liver transplant surgeon. While the patient's general liver condition improves, he develops inlet and outlet strictures in the ileal pouch, which require periodic EBD and/or endoscopic stricturotomy by an IBD interventionist. This case scenario illustrates that interventional IBD is an integral

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part of the multidisciplinary approach, playing an important role before and after surgery.

The Interventional IBD Unit (*i*-IBD) at the Cleveland Clinic, Cleveland, Ohio, was established in 2008, the first of its kind in the United States and in the world; it specializes in the endoscopic management of IBD-related and IBD surgery–associated complications. In this article, I reviewed the currently available literature and would like to share lessons and experience in endoscopic management of IBD over the past decade.

PRINCIPLES OF ENDOSCOPIC THERAPY IN IBD

Interventional IBD can be a technically challenging subspecialty, and its success and prosperity rely on a well-developed understanding of disease processes. In addition, a qualified IBD interventionist should be familiar with situations specific to IBD and understand advantages and limitations of endoscopic techniques and his or her expertise. What you can do is not necessarily what you should do. This doctrine is particularly important for those IBD interventionists who have a strong training background in advanced endoscopy, but limited expertise in IBD. A classic example is the attempted use of over-the-scope clip to close chronic anastomotic sinus. Not all non-natural "holes" on the wall of gastrointestinal (GI) track should be treated with closure procedures. Instead, the anastomotic sinus is best treated by "opening up," or sinusotomy. The approach for the "hole" in the anastomotic sinus vs in the fistula is completely different.

Disease Process

The disease process in IBD starts with inflammation, mucosal or transmural, and subsequent "mechanical or structural" complications, such as stricture, fistula, or abscess. The disease stage at the sequential events of inflammation-stricture-fistula-abscess dictates treatment modalities. Medical therapy plays a leading role in induction and maintenance of remission of inflammation and prevention of complications and permanent bowel damage. Once the structural complications develop, medical therapy only has a limited efficacy, with the leading role overtaken by surgery and growingly by endoscopic management. In fact, patients with dominant strictures or obstructive symptoms or abscess have been excluded from the majority of published randomized controlled trials of biological agents. However, steps have been made to maximize the effect of medical therapy on reduction of permanent bowel damage by setting histologic and endoscopic mucosal healing as therapeutic targets.

As an IBD interventionist, I have been advocating the use of a "slogan" that may fit the majority of clinical scenarios in small and large bowel CD: "No inflammation, no stricture; no stricture, no fistula; no fistula, no abscess, for intra-abdominal fistula or abscess." The early and effective control of inflammation with medical therapy is key to prevent subsequent complications. Once stricture develops, we should make an attempt to endoscopically manage concurrent strictures, while treating concurrent inflammation and fistula. Similarly, we should also fix fistula, while draining a concurrent abscess.

Intestinal fibrosis in IBD has posed a great challenge for endoscopic therapy. Transmural inflammation and fibrosis in CD disrupt the normal layered structure of bowel wall, which obviates a roadmap with transmural imaging (such as endoscopic ultrasound [EUS]) for endoscopic stricture therapy. Therefore, the "targeted" depth of the therapeutic tear or incision from EBD or endoscopic stricturomy has largely been empiric. Similarly, intra- and submucosal fibrosis and hyperplastic muscularis mucosae in UC have made endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD) for the treatment of CAN difficult.[1]

Chronic bowel inflammation predisposes the patient to the development of CAN. The tumorogenesis, natural history, and prognosis of CAN is different from those of sporadic colorectal cancer.[2] Flat lesions are more common in CAN than in sporadic colorectal neoplasia. There is a "field effect" that goes along with the chronic inflammation–low grade, dysplasia–high grade, dysplasia–colon cancer axis in CAN. While a majority of CAN lesions are endoscopically visible, particularly with chromoendoscopy, and endoscopically resectable, the long-term outcome of endoscopic treatment remains to be seen. Therefore, there has been a persistent debate on its management strategies, endoscopic vs surgical.

Bowel Anatomy

The anatomy of the GI track is often altered by the long-term disease process or surgery in IBD. Unlike the majority of GI premalignant or malignant conditions or non-IBD, benign GI diseases, the layered structures of the bowel wall in IBD, especially in CD, are often disrupted, as shown in our previous studies with optical coherence tomography.[3, 4] The lack of distinct anastomotic layers may make endocopic interventions difficult. Accessary imaging techniques, such as EUS, computed tomography (CT), or magnetic resonance imaging, may not be particularly helpful for guiding endoscopic stricture therapy. A common question for EBD or endoscopic stricturotomy is how deep we can tear or cut in patients with stricture. For that reason, we have been using luminal patency as the treatment target.

There is a long list of techniques and modalities for IBD surgery. IBD surgery, in most cases, is considered a reconstructive procedure. In addition to handsewn or stapled anastomoses with bowel resection, surgical modalities also include ileal pouch surgery, fecal diversion surgery with ostomies, gastrointestinal bypass surgery, and various forms of stricturoplasty. The alteration in the bowel anatomy has posed great challenges for IBD interventionists. For example, EBD and endoscopic stricturotomy for stricture can be difficult to perform in patients with stricturoplasty, which typically is located deep in the small bowel. Another example is that patients with

a stoma and long-term diverted large bowel or ileal pouch can have a completely sealed distal bowel outlet, and successful endoscopic therapy would need assistance of an interventional radiologist by a placement of a guidewire under imaging guidance.[5] It is important for an IBD interventionist to carefully review reports and images of previous endoscopy and radiological examination and reports of prior surgeries. Endoscopic therapy is ideally performed under fluoroscopy guidance.

Special Situations in IBD

Inflammation, stricture, fistula, and abscess often come hand in hand. A majority of patients were being treated with some forms of immunosuppressive medications. The use of systemic corticosteroids is associated with an increased risk for endoscopy-associated complications,[6] and severe consequences of those complications, such as bowel resection, fecal diversion, or even mortality.[7] Although the use of biological agents has not been shown to be associated with a higher risk for procedure-associated complications, IBD interventionists still need to exert extreme precaution when performing the therapeutic endoscopic procedure.

Special attention should be paid to IBD patients with concurrent systemic disorders, particularly PSC. Portal hypertension and thrombocytopenia are common in patients with PSC. The risks and benefits of endoscopic therapy should be carefully balanced.

Diseased Bowel and Targeted Lesions

The degree of aggressiveness of endoscopic treatment depends on multiple factors, including the patient's underlying IBD and systemic conditions, bowel anatomy, nature and location of the targeted lesion, the endoscopist's experience, and availability of immediate surgical back up, in case of complication. For example, consequences of procedure-associated perforation in the esophagus or duodenum are far more severe than a similar condition in the terminal ileum, distal large bowel, or ileal pouch in a patient with a stoma.

IBD, particularly CD, is often associated with complications, such as stricture, fistula, and abscess. In addition, rare complications can develop, such as bleeding and retention of bezoars and foreign bodies. Surgery in IBD patients has a higher risk for the development of postoperative complications, such as anastomotic leak and sinus and anastomotic stricture, than in non-IBD patients. Endoscopic therapy may be attempted by an experienced endoscopist (Table 1; Fig. 1). Endoscopic therapy should be performed for the right patient, right disease, and right lesion by a right IBD interventionist.

STRICTURE

Stricture therapy is the main application of interventional IBD. A majority of strictures in patients with IBD are amenable to endoscopic therapy.

Classification

We have proposed a detailed classification system of IBD-related strictures.[8] Briefly, IBD stricture can be divided into the primary (disease- or medicine-related) and secondary (anastomotic or medicine-related) types, based on etiology; long (≥4 cm) and short (<4 cm) based on length; single and multiple strictures, based on number; inflammatory and fibrotic strictures, based on relative degree of inflammation and fibrosis; and the presence or absence concurrent fistula and abscess. This classification is useful for guiding the selection of proper endoscopic and surgical treatment modalities. For example, inflammatory stricture may benefit from medical therapy. Long and/or multiple angulation strictures, particularly those with

TABLE 1. IBD- or IBD Surgery–Associated Complications Amenable to Endoscopic Therapy

Complications	Classification	Endoscopic Modalities
Stricture	Primary or disease-related strictures	Balloon dilation, endoscopic stricturotomy, stent?
	Secondary or anastomotic strictures	Balloon dilation, endoscopic stricturotomy, stent?
Fistula	Perinanal fistula	Fistulatomy, injection, clipping
	Suture line fistula	
Abscess	Perianal abscess	Incision and drainage, endoscopy-guided seton placement
	Anastomotic abscess	Endoscopic clipping of primary orifice
Anastomotic leak	Acute leak	Stent placement, endosponge
	Chronic leak or sinus	Endoscopic sinusotomy
Bleeding	Disease-associated bleeding	Endoscopic injection
	Anastomotic bleeding	Endoscopic injection, endoscopic clipping
Bezoars and foreign bodies		Endoscopic retrieval with or without concurrent stricture therapy
Neoplasia	Sporadic adenoma	Polypectomy
	Colitis-associated neoplasia	Polypectomy, endoscopic mucosal resection, endoscopic submucosal dissection

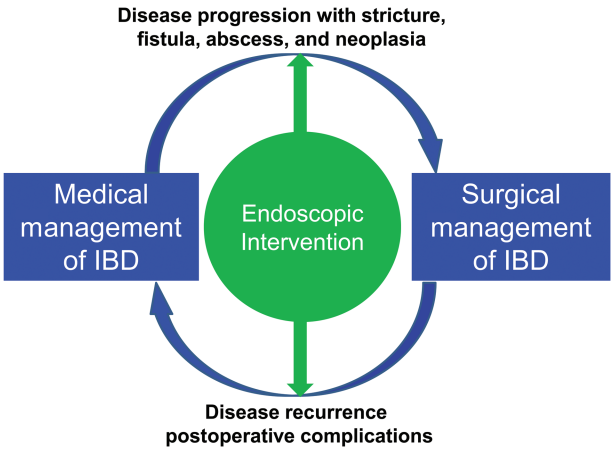

FIGURE 1. Positioning the bridging role of endoscopic therapy in medical and surgical management of inflammatory bowel disease.

prestenotic luminal dilation, will benefit more from surgical treatment. Simple, short fibrotic stricture is amenable to EBD (Fig. 2) or endoscopic needle knife stricturotomy (Fig. 3).

Endoscopic Balloon Dilation

It is interesting that concurrent systemic medical therapy provides limited benefits for EBD for CD strictures.[9] In addition, the presence of concurrent mucosal inflammation was shown to have a minimal impact on the long-term outcome of EBD for CD strictures.[8] Our group recently showed that outcomes of EBD in CD strictures vs benign non-CD strictures were comparable.[10] The results suggest that the mechanical component, rather than inflammatory component, has a direct impact on the outcome of EBD.

There are only few controlled studies in EBD for IBD strictures. It appears that re-dilatation-free and surgery-free survivals of EBD for the primary CD stricture and secondary CD stricture are comparable.[11] It is controversial whether concurrent, intralesional steroid injection during EBD for CD stricture provides an additional benefit for prolonging efficacy.[12, 13] Our group conducted a historic cohort study comparing EBD (n = 176) and surgical resection (n = 131) for the treatment of CD anastomotic stricture in patients who had ileocolonic resection and ileocolonic anastomosis.[14] While surgical therapy was shown to be more effective than EBD in terms of the need for subsequent surgical intervention, EBD was able to space out the need for surgery by an average of 6.45 years. The frequency of major complications in EBD (1%) was lower than that in surgery (8%). However, rescue surgery for failed EBD of ileocolonic anastomotic strictures in CD was shown to have a higher risk for postoperative complication than an upfront surgical approach.[15] We are currently conducting a controlled study on the outcome of EBD vs surgical resection in CD patients with the primary ileal or ileocolonic strictures.

Stricturoplasty has become a standard bowel-sparing surgical modality for the treatment of CD strictures. Our group has published a study of outcomes of EBD vs stricturoplasty in the treatment of ileal pouch strictures. We found that stricturoplasty was more effective than EBD. However, surgery-free survival curves of stricturoplasty treatment vs EBD treatment merged at approximately 3 years.[16] Currently we are conducting a study comparing EBD and stricturoplasty in small bowel strictures in CD.

Endoscopic Stricturotomy

Our team has also developed endoscopic stricturotomy using a needle knife or isolated tip (IT) knife for the treatment of IBD, IBD surgery, non-IBD strictures (Fig. 3).[17] In a study of 85 patients with strictures from CD or ileal pouches, endoscopic stricturotomy was shown to be feasible and maybe more effective than EBD.[17] We feel that endoscopic stricturotomy carries a higher risk for bleeding, but a lower risk for perforation, than EBD. One of the advantages of endoscopic stricturotomy over EBD is the endoscopist's full control of the location and depth of stricture treatment. This is particularly important in the distal rectal, distal ileal pouch, or anal strictures, in which potential iatrogenic injury to the sphincter

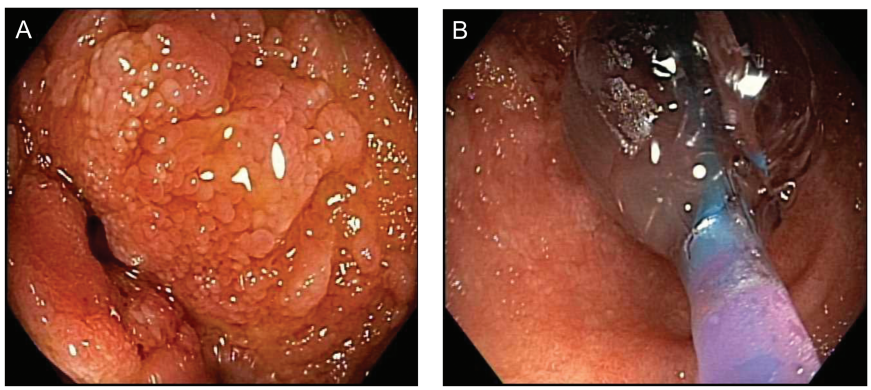

FIGURE 2. Endoscopic balloon dilation of stricture. A, Stricture at the outlet of stricturoplasty site. B, Balloon dilation of the stricture.

and vaginal wall (causing fistula) by blind EBD has been a concern.

Stent Placement

Investigators have explored the use of self-expanding metal stents (SEMS) in the treatment of refractory IBD-related primary or anastomotic strictures.[18–23] With the use of noncovered stents mainly for malignant strictures, partially covered or fully covered stents are used for IBD-related, benign strictures. The goal of the treatment can be short-term, long-term, or bridging for surgery. While being endoscopically removable, covered SEMS are commonly used, but biodegradable ones may emerge as a better alternative.[24, 25] The main theoretical advantage of SEMS over EBD is its slow radial expansion power, which may be more applicable in long, refractory strictures. It has been proposed that SEMS may be attempted for strictures longer than 5 cm.[26] On the other hand, procedure-associated complications, especially stent migration, are common after stent placement.[27]

Reported outcomes of stent placement in CD-related strictures varied, ranging from symptom relief with the stent in place, symptom improvement after stent removal, and endoscopic or imaging documentation of a reduced degree of stricture. There is no reported consensus on indications or contraindications for stent placement, type of stent and treatment during of stent, and ultimate treatment goal in patients with stricturing CD. We need more data on long-term efficacy (including recurrence of stent removal and eventual surgical intervention) and safety of stent treatment in IBD.

Selection of Proper Treatment Modality

We still need data on comparison of the efficacy and risks of endoscopic stricturotomy vs endoscopic stenting vs surgery in treating the primary or secondary IBD strictures in the small bowel (including duodenum), pylorus, colon, distal rectum, and anus, and stricturotomy site. Based on limited literature and practice at our *i*-IBD unit at the Cleveland Clinic, I would like to propose an algorithm (Fig. 4).

FISTULA AND ABSCESS

Fistula and abscess have become new targets for endoscopic therapy.[28] Surgical resection of the fistula track along

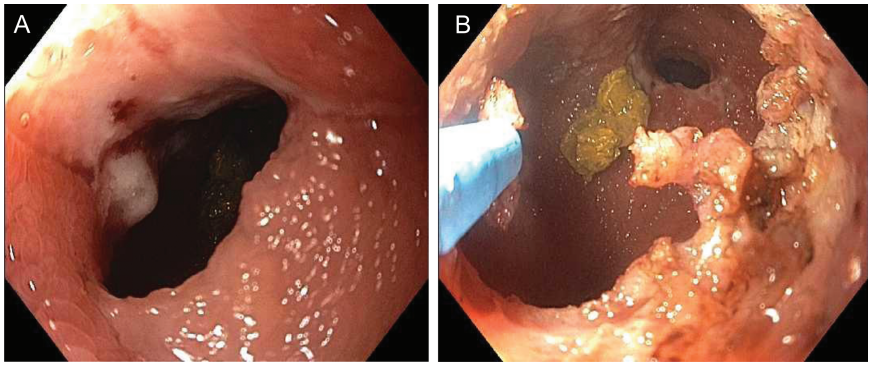

FIGURE 3. Endoscopic stricturotomy. A, Ulcerated stricture at the distal ileum, not traversable to an upper endoscope. B, Stricturotomy with a needle knife.

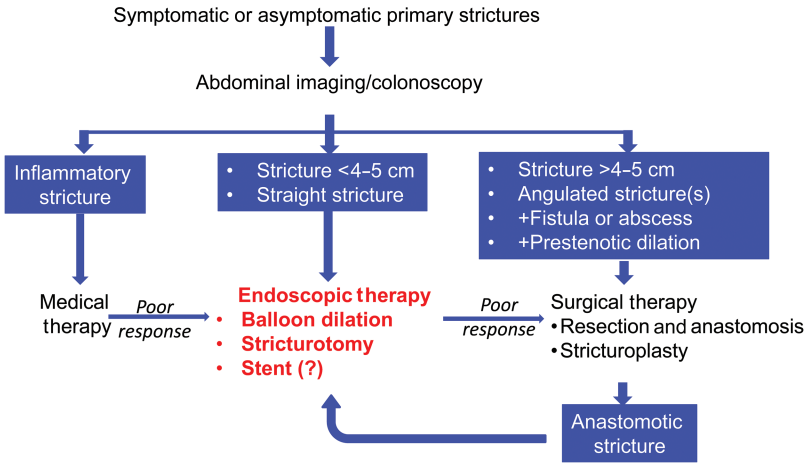

FIGURE 4. Proposed algorithm for the treatment of inflammatory bowel disease–related strictures.

with the diseased segment of bowel typically offers the best efficacy. However, not all IBD-related fistula and abscesses are amenable or feasible to elective surgical treatment. Under these circumstances, endoscopic therapy may be attempted.

Fistulotomy

A short and superficial suture line fistula in the distal bowel can be treated with complete fistulotomy. Some perianal fistula can also be treated with endoscopic fistulotomy (Fig. 5). Attempts have been made to close the primary orifice of fistula in CD patients using through-the-scope or over-the-scope clips, with suboptimal results.[17]

Perianal abscess can be drained at the endoscopy suite using a needle knife under local anesthesia and conscious sedation. Intra-abdominal abscesses from anastomotic leak can be drained by placement of a pigtail stent, followed by over-the-scope clipping in a separate session.

Drainage

The firstline approach for a CD-associated intra-abdominal or intra-pelvic abscess is effective transcutaneous drainage by our colleagues in interventional radiology (IR). Occasionally, IR drainage may not be feasible, for example, the presence of an overlying bowel loop on top of the abscess. Endoscopic drainage with placement of a pigtail stent may be attempted for those with a well-defined primary opening at the bowel site (typically at the anastomosis).[28] Subsequently, the internal opening of the abscess cavity can be closed by application of over-the-scope clips, after the abscess is completely drained.

Simple perianal fistula can be drained with a wire-guided, endoscopically placed seton (Fig. 6).[17, 29] Endoscopic ultrasound-guided abscess drainage has been reported in a patient with a J pouch.[30]

Clipping

Some GI endoscopists have had a tendency to close any "holes" on the wall of the GI track, carrying a mentality of "holding a golden hammer and looking for the nail." Yes, through-the-scope or over-the-scope clipping devices have been extensively used in the treatment of defects in the upper and lower GI track. Endoscopic clipping has been effective in treating iatrogenic or surgery ischemia–related bowel injury, but it is much less so in disease-associated bowel defects. The underlying disease process plays a key role in response to the treatment. This is particularly true in patients with IBD. For example, a leak at the tip of the "J" in patients with IPAA may be treated with the over-the-scope clipping system.[31] In contrast, CD-related fistula typically do not respond well to endoscopic clipping in the long term. Multiple factors may

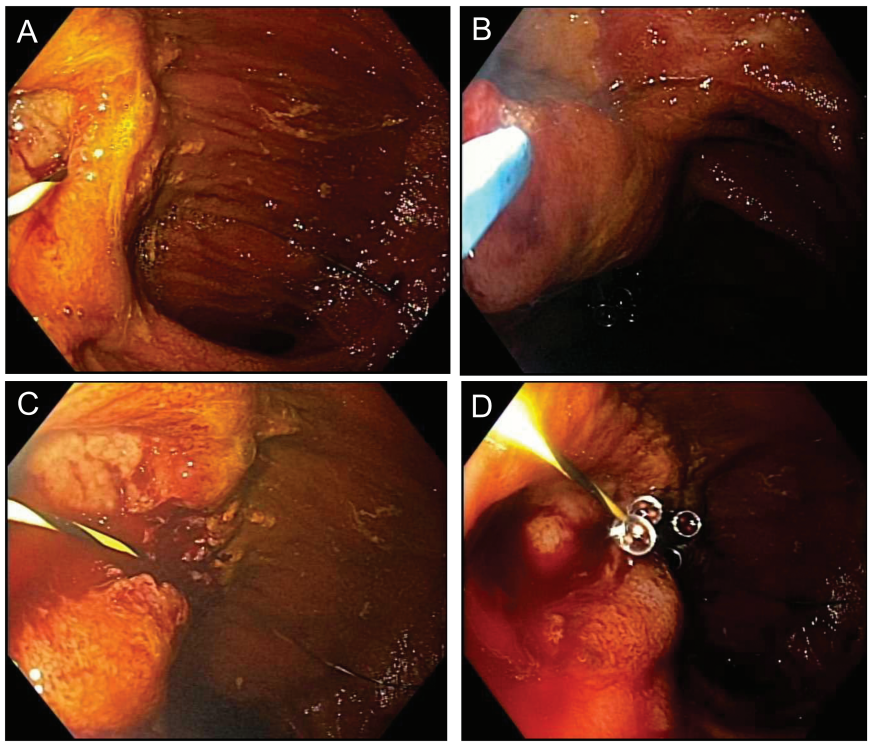

FIGURE 5. Endoscopic fistulotomy. A, Distal pouch-pouch fistula detected by a guidewire through endoscopy biopsy channel. B, Endoscopic fistulotomy with a needle knife and setting of endoscopic retrograde cholangiopancreatography (ERCP) endocut. C, The completely opened fistula track by the therapy. D, Endoclips placed along both incised edges to prevent reclosure of the fistula.

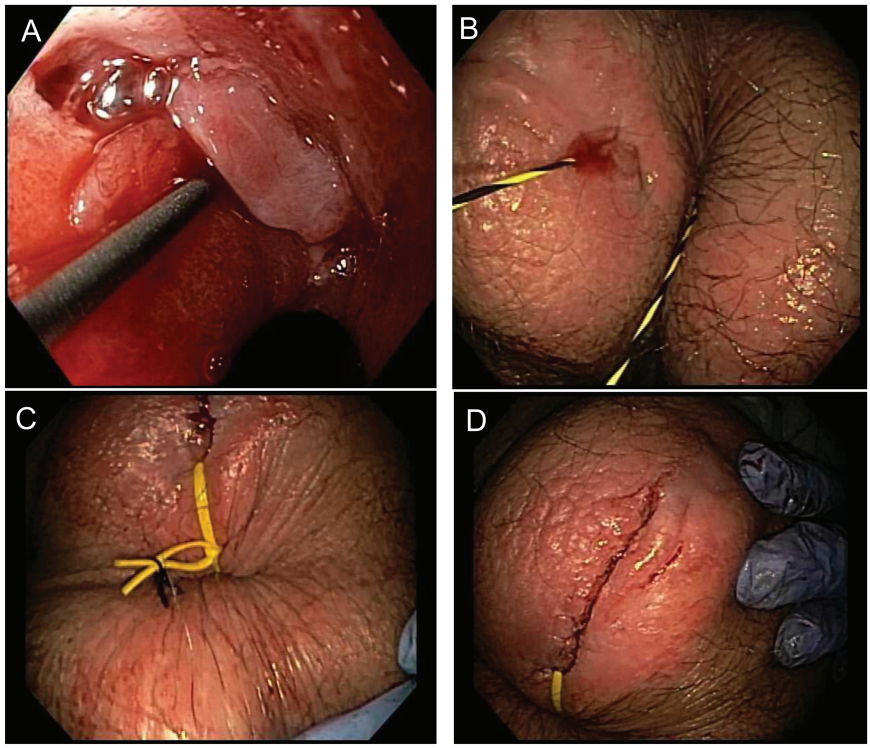

FIGURE 6. Endoscopy guide seton placement and fistulotomy. A, Fistula detected by guidewire. B, Introduction of guidewire through the secondary opening of the fistula track on skin side. C, Seton placed after the guidewire with a knot. D, Fistulotomy performed at the base of the seton site.

contribute to the poor response, including underlying inflammatory processes in and around the fistula track, epithelialization of the fistula track, concurrent use of immunosuppressive agents, and nutrition status. I would not recommend using the over-the-scope clipping system to treat rectal vaginal fistula or pouch vaginal fistula, as failure of the treatment may result in worsening of the fistula.

ANASTOMOTIC OR SUTURE LINE LEAK AND SINUS

The majority of patients with CD and approximately 25% of patients with UC would eventually require some forms of surgical intervention for their medically refractory disease or disease-associated complications. Commonly performed surgeries in IBD patients are bowel resection and anastomosis, stricturoplasty, and construction of an ileal pouch or ileostomy. All those surgeries involve anastomosis and/or suturing, either with stapling or hand-sewing. IBD surgery is associated with a higher risk for postoperative complications than non-IBD surgery. The leak can lead to an abscess, and chronic abscesses may result in a walled-off cavity, that is, sinus. Traditionally, those patients are managed with bowel rest, intravenous antibiotics, and parental nutrition or reoperation with a high chance of a diverting ostomy. Acute and chronic leaks have been one of the main causes of reoperative surgery in IBD. Here, an IBD interventionist may find his or her role in endoscopic management of those complications.

Acute Leak

Acute anastomotic leak in IBD patients may be managed endoscopically, with tools such as through-the-scope clips,[32, 33] over-the-scope clips,[34, 35] and an endoscopic suturing device.[23] There are no published studies that directly compare the efficacy between those endoscopic and surgical approaches. It appears that those endoscopic closure techniques are more effective in treating acute anastomotic leaks in non-IBD patients than those with IBD.

Chronic Leak and Anastomotic Sinus

Sinus usually results from chronic anastomotic leak and chronic abscess cavity. Common underlying disease conditions are restorative proctocolectomy and IPAA for UC and surgery for rectal cancer with a low ileo-rectal or colo-rectal anastomosis. The presacral space is the most common location of sinus in patients undergoing IBD-related surgeries. A complete closure of the orifice or origin of anastomotic leak before total resolution of the abscess can lead to a worsening of the abscess, causing sepsis or even osteomyelitis.

Presacral sinus has been traditionally treated with surgery, which often requires bowel resection, bowel

advancement, re-anastomosis, and fecal diversion.[36] We have developed a novel technique, namely endoscopic sinusotomy.[37] This outpatient procedure involves endoscopic dissection of the posterior wall of the pouch body between the pouch lumen and sinus cavity and a deployment of endoscopic clips along both edges of dissected wall. The goal is to convert the chronic abscess cavity or sinus into a diverticulum with epithelialization of its surface. Approximately 80% of patients in our first 65 patients had a partial or complete response to endoscopic therapy, with a minimum risk of bleeding or perforation (Fig. 7). At the Cleveland Clinic, endoscopic sinusotomy has become the treatment of choice for patients with a presacral sinus <5–6 cm.

Patients with an ileal pouch may develop a chronic suture line/anastomotic leak from the tip of the "J" to the presacral space. We have successfully treated the condition with a combined endoscopic sinusotomy (for the anastomotic leak) and endoscopic clipping (for a leak at the tip of the "J") (Fig. 7).

While surgery provides more definitive therapy for acute and chronic (sinus) leaks, fistula, and abscess, the less invasive, "nothing-to-lose" endoscopic approach may be attempted first. Here I am proposing an algorithm for the management of those conditions (Fig. 8).

COLITIS-ASSOCIATED NEOPLASIA

Long-term colonic involvement by the disease process of IBD makes the patient prone to the development of CAN. With advances in imaging techniques, especially chromoendoscopy, a vast majority of CAN lesions, even subtle or flat CAN lesions, can be reliably detected.[38] CAN on colonoscopy is classified into visible and invisible categories in the SCENIC consensus statement. The visible category is further divided into: (1) polypoid: pedunculated vs sessile; (2) nonpolypoid: superficial elevated vs flat vs depressed. The visible lesions are also described with the presence or absence of ulcers and distinct borders.[26]

Dysplastic lesions, if confirmed with histopathology, should be ablated endoscopically or surgically (with colectomy). CAN can be graded into no dysplasia, indefinite for dysplasia, low-grade dysplasia, high-grade dysplasia, and cancer, based on features of nuclei, cells, and tissue structure; and unifocal or multifocal. While consensus among pathologists on the diagnosis of high-grade dysplasia and cancer is high, the interobserver agreement on indefinite for dysplasia and low-grade dysplasia among them is low.[39, 40] Two main causes for the poor agreement are the presence of concurrent inflammation and experience of reading pathologists. From the IBDologist's point of view, effective control of mucosal inflammation with

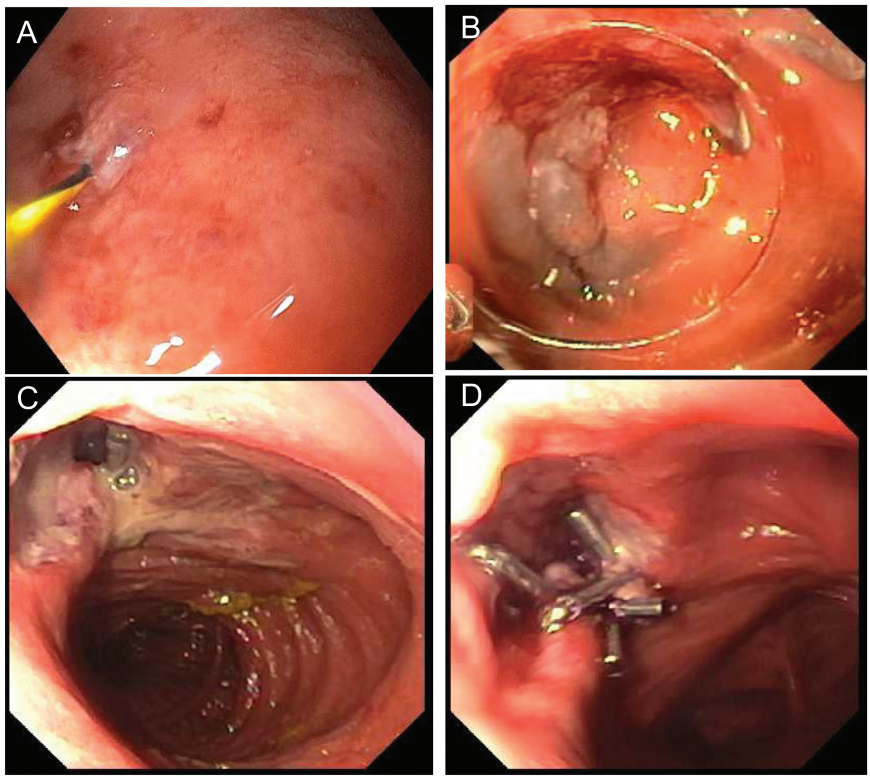

FIGURE 7. Endoscopic treatment of ileal pouch leaks in the same patient. A, A leak at the tip of the "J" detected with a guidewire via endoscopy. B, The leak is closed by over-the-scope clipping. C, Presacral anastomotic sinus. D, The sinus was treated by endoscopic needle knife sinusotomy with subsequent deployment of endoclips along both sides of the incised orifice.

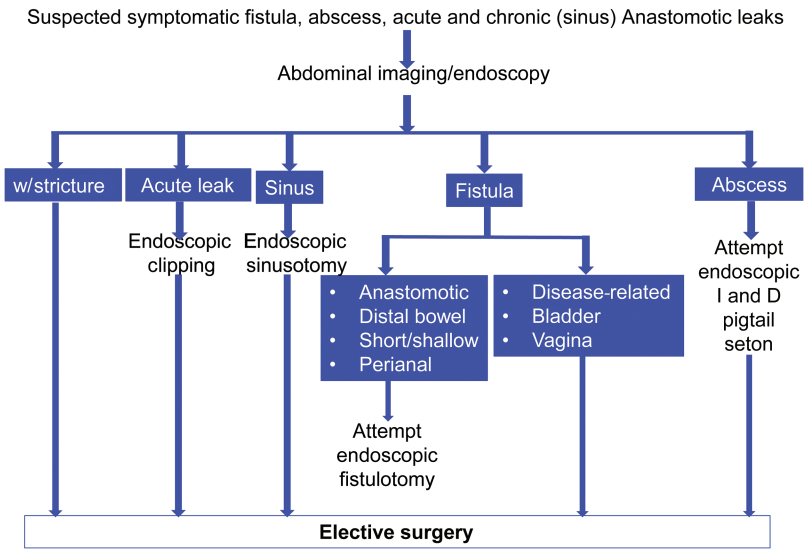

FIGURE 8. Proposed algorithm for the treatment of inflammatory bowel disease–related fistula, abscess, and sinus.

medical therapy before surveillance colonoscopy is important. In addition, adequate medical therapy may also help reduce the risk for dysplasia and other permanent bowel damages such as fibrosis and stricture.

Endoscopically nonresectable visible dysplastic lesions require surgery. In contrast, there is no consensus on how far we can push for endoscopic therapy for visible lesions. The definition of resectability varies, largely based on endoscopists' expertise. Endoscopic ablation techniques for polypoid or nonpolyoid lesions are different. In general, endoscopic resection of polypoid lesions is technically feasible and effective, with a low risk of subsequent development of synchronous or metachronous colorectal cancer.[41] Endoscopic ablation of a nonpolypoid lesion, especially a flat, nonraisable, or depressed lesion with ulceration or a lesion with an indistinct border, is not recommended. The attempt for EMR or ESD may be made for superficially raisable nonulcerated lesions with distinct borders. Ideal results are achieved with en bloc resection with a clear margin of neoplasia on histology. This will require expertise of the treating endoscopist.[1] EMR and ESD can be technically challenging, as mucosal and submucosal fibrosis is common, not only in CD, but also in UC.[42] There has been concern on the field effect of the chronic inflammation-dysplasia-cancer sequence in IBD. We still need data on long-term outcomes, that is, the risk for cancer and risk for eventual need of colectomy after endoscopic therapy.

A close endoscopic surveillance is needed after endoscopic ablation of CAN even after en bloc resection with a clear margin. Follow-up endoscopic surveillance should not only be targeted to the treated lesions, but also to the rest of the large bowel due to the "field effect" of long-term bowel inflammation.

OTHER APPLICATIONS OF ENDOSCOPIC THERAPY

Virtually all indications of therapeutic endoscopy in non-IBD patients may also be applied in IBD patients, including bleeding and removal of foreign bodies or bezoars.

Bleeding Control

Gastrointestinal bleeding in IBD patients can result from disease per se or from anastomosis. Friable mucosa, spontaneous bleeding, ulcers, and bleeding polyps can occur, which are usually a part of mucosal inflammation. Other common causes of GI bleeding in IBD patients include anastomotic ulcers and procedure-associated bleeding. Patients undergoing endoscopic therapy, such as EBD, stricturotomy, and ablation of CAN, may have a greater risk for procedure-associated bleeding complications. Finally, patients with concurrent use of corticosteroids or PSC with portal hypertension have a high risk for GI bleeding, even from minimally invasive mucosal biopsy.

While the best approach to control mucosal inflammation- or ulcer-associated bleeding is effective medical therapy, endoscopic polypectomy, endoscopic injection (with agents such as epinephrine, triamcinolone, or 50% dextrose), or clipping of the bleeding vessel or ulcer may be attempted. We found that suture line or staple line bleeding can be effectively controlled with endoscopic clipping. Endoscopic clipping is also effective in controlling procedure-associated (eg, EBD, stricturotomy, and fistulotomy) bleeding. In addition, we have routinely used spray of 50% dextrose to control nonpulsatile mucosal oozing of blood during therapeutic endoscopy.

Removal of bezoars and foreign bodies

IBD patients carry an increased risk for bezoars or foreign body retention due to narrowed bowel lumen from strictures or from altered bowel anatomy by various surgical procedures, such as stricturoplasty, continent ileostomy, diverted bowel, and ileal pouch.[43, 44] Finally, the management of retained video capsule in IBD patients with strictures or with surgically altered bowel continues to pose a challenge for endoscopists and surgeons.

There are a variety of endoscopy tools for the retrieval of bezoars and foreign bodies, such as endoscopic net and basket. Occasionally, ultrasound or laser lithotripsy may be needed for breaking up bezoars. Prior to retrieval of bezoars or foreign bodies, concurrent strictures often need to be treated endoscopically, with EBD or endoscopic stricturotomy.

RISK MANAGEMENT

Like any invasive procedures and operations, therapeutic endoscopy can cause complications, mainly excessive bleeding and perforation. It is estimated that the rate of EBD-associated perforation or major bleeding is between 3% and 5% (per patient).[45] In our recent study of 85 IBD patients with a total of 272 endoscopic stricturotomy sessions, procedure-associated bleeding was 10.6% (per patient) and perforation 1.2% (per patient). It appears that endoscopic stricturotomy may be associated with a high risk for bleeding, but a lower risk for perforation, than EBD. In our previous study of 65 patients undergoing endoscopic sinusotomy for presacral sinus, we reported a complication rate (bleeding) of 1.5% and no perforation.[37]

Every effort should be made to minimize the risk. In addition to expertise of IBD interventionists, other factors may contribute to a reduction in the risk of complications, including supporting personnel, room setting, anesthesia, equipment, and supplies.

Prevention and Anticipation

While endoscopic therapy is an effective modality for the treatment of complications of IBD, it can result in unwanted complications. The prevention and management of those complications should carefully be planned. During the execution of Plan A (the endoscopic treatment), we should have Plan B (endoscopic damage control; eg, endoscopic clip for perforation) and Plan C (surgical backup) in mind and logistically ready if complications happen. Early recognition, early diagnosis, and early management are key to reducing the risk for the development of "complication's complication".

Damage Control During and After Procedure

Bleeding during the procedure usually can be managed successfully with endoscopic approaches, such as spray or injection of 50% dextrose or epinephrine. Endoscopic clipping is also effective in controlling bleeding. Endoscopic clipping with through-the-scope or over-the-scope clips is also effective for the treatment of acute procedure-associated perforation. Those who have already undergone Plan B and showed no symptoms or signs of complication's complication should still be monitored closely, with a prolonged observation in the endoscopy recovery room or hospital admission. IBD interventionists should have a low threshold for triggering an evaluation with abdominal imaging, on-site surgical consultation, emergency room evaluation, and hospital admission. Those who have had endoscopic therapy with thermoinjury, such as stricturotomy and sinusotomy, should be closely monitored for delayed bleeding, up to 5 days after the initial procedure.

TEACHING AND TRAINING

There has been a gap in the training for the current and next generations of IBD interventionists. We can train the trainers. In our IBD community and advanced endoscopy community, there are a number of energetic young faculty members who are looking for their academic niche. Interventional IBD can be one of the niches. The trained trainers then teach their trainees. Our colleagues in colorectal surgery or surgical endoscopy can develop expertise in endoscopic therapy for IBD too.

During regular GI fellowship training, we can train our future IBDologists for advanced endoscopy, whereas advanced endoscopy fellows may also develop a "niche" for endoscopic treatment of complications of IBD. We should bring the best and brightest to our field. The trainees should ideally be trained in both subspecialties, IBD and advanced endoscopy. The training can be done during the 3-year GI fellowship. However, an advanced fourth year of formal training is advocated. A formal curriculum needs to be developed by experts in the field in conjunction with professional societies, such as the Crohn's Colitis Foundation, American Society for Gastrointestinal Endoscopy, and American Society of Colorectal Surgeons. Here, I would like to propose that our professional societies create a task force for systemic teaching and training. The curriculum should include relevant areas in GI pathology, GI radiology, colorectal surgery, IBD, advanced endoscopy, and statistics. The training process will take various formats: hands-on training, simulation lab, and animal lab. It has been a great help to me to inspect full-thickness diseased bowel in vivo and ex vivo in the operating room and in the frozen section room nearby. Therefore, I would like to recommend that our trainees should spend some time in the operating room during IBD surgery with surgical colleagues and in the frozen section room without GI pathologists. The teaching process can also include conferences, workshops, shadowing, and visiting fellowships, such as the ones with CCF. The matrix and outcome of training need to be developed.

HAPPY MARRIAGE: A MEDICAL, ENDOSCOPIC, AND SURGICAL TEAM

Today, IBDologists and our colorectal surgeons cannot live and work in isolated cubicles. The most successful programs in the management of IBD are those with multidisciplinary teams. The team traditionally consists of IBDologists and colorectal surgeons. For the past decade, advanced practitioners, nutritionists, psychologists, psychiatrists, GI pathologists, and GI radiologists have become integral parts of the team. Who is missing? The IBD interventionist! It is the time to bring the best and brightest to the team. We have challenges and opportunities. The IBD interventionist can play a bridging role between medical and surgical therapy. Endoscopic therapy provides more effective therapy for structural complications of IBD than the medical approach, whereas it yields a safer and less invasive treatment than surgery. Endoscopic therapy is becoming the treatment of choice for some postoperative complications, such as anastomotic strictures and anastomotic sinus. Multiple factors affect the choice among medical vs endoscopic vs surgical therapies, including age, duration of disease, duration between diagnosis and first surgery, frequency of surgery, predominant phenotype, location, number, and complexity of complications, and systemic conditions (such as smoking and comorbidities). In most cases, as in the one listed above, a combined approach with medical, endoscopic, and surgical therapy is needed. Disease components and their diagnosis and management approaches are expected to be built into the upcoming "Carepaths."

Endoscopic intervention in IBD is intellectually and technically demanding. However, we, with a mission, can achieve the best outcome when we have the right patient, right lesion, right setting, right time, right skills, and right backup plans. In the end, we are providing our patients with a new and combined approach to improve their life and quality of life.

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