Management of Crohn disease after surgical resection

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INTRODUCTION

Crohn disease (CD) is a chronic inflammatory bowel disease that results in significant morbidity and economic burden [1,2]. Although advances in medical therapy have coincided with lower rates of surgical resection in patients with CD, surgical intervention is often required in the setting of bowel obstruction, abscesses or fistulas, or refractory disease. The 10-year risk of surgical resection for CD is nearly 50 percent [3].

While surgery often leads to clinical remission of CD, most patients ultimately relapse. The risk and severity of recurrence after surgical resection is variable and needs to be balanced with the potential risk of preventative medical therapy [4].

This topic will discuss the management of patients with CD following surgical resection. The American Gastroenterological Association has published guidelines on the management of CD after surgery, the contents of which are reflected in the subsequent discussions [5]. Other aspects of the medical and surgical management of CD are discussed separately. (See "Overview of the medical management of mild (low risk) Crohn disease in adults" and "Medical management of moderate to severe Crohn disease in adults" and "Surgical management of Crohn disease".)

PATHOPHYSIOLOGY

Flow of intestinal contents through the neo-terminal ileum and surgical anastomosis plays a significant role in recurrence [6,7]. In one report, three patients with CD who had undergone ileocolonic resection with ileocolonic anastomosis and temporary protective proximal loop ileostomy had no evidence of ileitis at six months after resection [6]. However, infusion of the ileostomy contents into the bypassed ileal segment for seven days resulted in morphologic evidence of focal inflammation on ileal biopsy. Thus, intestinal contents including bile salts, digestive enzymes, bacteria, and dietary antigens may trigger the postoperative recurrence of ileal CD within the first days after surgery. These findings suggest that in select patients, medical therapy should begin soon after resection and ileocolonic anastomosis are performed and continued indefinitely. (See 'Higher-risk patients' below.)

POSTOPERATIVE RECURRENCE RATES

Surgery does not cure CD. Although clinical remission is often achieved, most patients eventually relapse. Recurrent disease can manifest by histologic or endoscopic findings or with clinical symptoms. Many patients will require subsequent surgery.

Histologic recurrence — The earliest form of recurrence detection is by histology. In one series of three patients examined within eight days after surgical resection, histopathology revealed induction of inflammatory cells and markers in ileal mucosa in all patients [6].

Clinical recurrence — Clinical recurrence rates range from 20 to 37 percent at one year and from 34 to 86 percent at three years [8]. Postoperative intervention trials showed clinical recurrence rates of 25 percent within two years [9,10]. A meta-analysis of the rates of clinical relapse in CD patients who were not receiving postoperative medical therapy found that the rates were 24 percent [11]. A meta-analysis of studies of patients with medically refractory CD who underwent any form of colectomy with permanent end ileostomy reported a clinical recurrence rate of 28 percent (95% CI, 22-35 percent) [12]. (See "Surgical management of Crohn disease", section on 'Surgical techniques'.)

Endoscopic recurrence — Rates of endoscopic recurrence are higher than clinical recurrence and may reach 70 to 90 percent at one year [13,14]. A meta-analysis of the rates of severe endoscopic recurrence in CD patients who were not receiving postoperative medical therapy found that the rates were 50 percent [11].

Surgical recurrence — The need for a second operation defines surgical recurrence. In a meta-analysis of 12 studies, the 5-year and 10-year rates of reoperation were 24 percent (95% CI 23-26) and 35 percent (95% CI 32-39 percent), respectively [15]. A meta-analysis of studies of

patients with medically refractory CD who underwent any form of colectomy with permanent end ileostomy reported an overall surgical recurrence rate of 16 percent (95% CI, 11-23 percent) [12].

Surgical intervention for CD often results in an ileocolic anastomosis and neo-terminal ileum, which is frequently the site of recurrence [13]. The common indications for subsequent surgery are similar to that for initial surgery: failure of medical treatment, bowel obstruction or perforation, fistulae and abscesses [16]. (See "Surgical management of Crohn disease", section on 'Surgical approaches'.)

Late recurrence — Patients with initial endoscopic remission remain at risk for developing late recurrence (ie, disease recurrence beyond one year after surgery). In a study including 86 patients with history of ileocecal resection for CD and no recurrence at baseline postoperative colonoscopy, 35 patients (41 percent) had late recurrence with a median time to recurrence after baseline colonoscopy of 14 months (interquartile range 6 to 25 months) [17]. Disease recurrence was defined as a composite endpoint of at least one of the following: clinical recurrence, IBD-related hospitalization, bowel complication (eg, fistula), balloon dilation of the anastomosis, or repeat surgery. However, no risk factors for late postoperative recurrence were identified. This study supports continuing endoscopic surveillance for patients without recurrence at baseline colonoscopy after surgery. (See 'Lower-risk patients' below.)

RISK FACTORS FOR RECURRENCE

Identification of risk factors for recurrence can help determine if the patient should begin medical therapy soon after surgery (ie, two to eight weeks postoperatively) or if the patient can be monitored for disease recurrence. (See 'Risk stratification' below.)

Risk factors can be classified as patient-, disease- or surgery-related.

- **Patient-related risk factors**
  - **Smoking** – Several studies have suggested that smoking increases the risk of clinical, endoscopic, and surgical recurrence [18-21]. A meta-analysis of 16 studies demonstrated that smokers have higher rates of both postoperative clinical recurrence (OR 2.2, 95% CI 1.4-3.3) and surgical recurrence (OR 2.6, 95%CI 1.8-3.8) at 10 year follow-up [22]. (See "Definitions, epidemiology, and risk factors for inflammatory bowel disease", section on 'Smoking' and 'Smoking cessation' below.)

- **Genetics** – Whether genetic factors predict disease recurrence has not been well studied. One report found that patients with the NOD2/CARD15 mutation had a higher rate of postoperative recurrence and required surgery earlier compared with patients without the mutation [23]. (See "Immune and microbial mechanisms in the pathogenesis of inflammatory bowel disease", section on 'Genetic susceptibility'.)

- **Disease-related risk factors**

  - **Disease duration** – Shorter preoperative disease duration is associated with an increased rate of recurrence [24,25]. One study showed that the risk of recurrence at five years was greater for patients with CD duration of less than 10 years compared with CD duration of greater than 10 years (65 versus 23 percent) [24]. The relative risk for recurrence was 1.5 for patients with disease for two years versus 10 years prior to the initial surgery.

  - **Disease extent** – The presence of proximal gastrointestinal (duodenum or jejunum) and diffuse disease that involves the colon has been associated with clinical and endoscopic recurrence [26-29]. In a population based cohort study, patients with disease involving the small bowel or continuous ileocolonic disease were at increased risk for recurrence compared with patients with only colonic involvement (OR 1.8, 95% CI 1.2-1.6, and OR 1.5, 95%CI 1.1-2.0, respectively) [28].

  - **Prior surgery for CD** – While the number of surgeries has not been systematically studied as a risk factor for postoperative recurrence of CD, it is conventionally listed as a risk factor [29,30].

  - **Penetrating or fistulizing disease** – A meta-analysis demonstrated that postoperative patients with perforating or fistulizing CD were more likely to have recurrence that required reoperation compared with patients with nonperforating CD (HR 1.5, 95% CI, 1.2-1.9) [30]. One study suggested an increased risk of recurrence in patients with fistulizing disease (OR 4.1, 95%CI 1.3-12.7) [31]. In general, patients with a history of fistula have a worse prognosis [32].

  - **Stricturing disease** – Short stricturing disease is considered lower risk for recurrence compared with fistulizing or penetrating disease. One series found that recurrence after conservative surgery, which included small bowel resections and strictureplasty, was more likely in younger patients (HR 2.4, 95%CI 1-5.4) and in the setting of stricturing disease (HR 2.2, 95%CI 1.1-4.1) [33]. Another series found no cases of recurrence within three years in 12 patients with stricturing disease compared with 12 of 22 patients (55 percent) who had penetrating disease [34].

- **Surgery-related risk factors** – Surgical technique can affect the risk of recurrence. Side to side anastomosis of an ileocolic resection is associated with lower recurrence rates compared with end to end anastomosis [35]. The presence of an ileorectal anastomosis following colectomy is associated with a higher recurrence rate (58 percent) at 10 years compared with the creation of an end ileostomy following both proctocolectomy (37 percent) and subtotal colectomy (24 percent) [36]. (See "Surgical management of Crohn disease", section on 'Anastomotic technique'.)

POSTOPERATIVE MONITORING

The presentation of postoperative CD follows a natural progression from histologic to endoscopic to clinical and finally, to surgical recurrence [37]. Thus, endoscopic monitoring may allow earlier diagnosis of recurrence, earlier treatment, and better prognosis.

Ileocolonoscopy — Endoscopic recurrence precedes clinical recurrence, providing an opportunity for medical intervention prior to development of symptoms or complications. We recommend an ileocolonoscopy 6 to 12 months following surgery in all patients, including those who are receiving postoperative medical therapy.

The benefit of endoscopic monitoring, even in the setting of postoperative medical prophylaxis, has been demonstrated. A randomized clinical trial of 174 postoperative patients receiving at least one prophylactic medication evaluated the outcome of endoscopic assessment (ie, 'active management') at six months versus no endoscopic monitoring [38]. If endoscopic recurrence was identified at six months, step up therapy was provided. At 18 months, endoscopic recurrence was detected less frequently in the active management group versus the group without endoscopic monitoring (49 versus 67 percent). The risk, cost, and burden (ie, possible discomfort, need for bowel preparation, time away from work or school) of colonoscopy should be balanced with the benefit of lowering the risk of recurrent CD by initiating or adjusting therapy based on the endoscopic assessment. (See "Overview of colonoscopy in adults", section on 'Adverse events'.)

An endoscopic scoring system predicts clinical recurrence based on the endoscopic findings [13,39,40]. The neo-terminal ileum is assessed during the initial postoperative endoscopy and scored by the following scale:

- i0: no lesions, normal appearing neo-terminal ileum
- i1: <5 aphthous ulcers in the neo-terminal ileum
- i2: >5 aphthous ulcers in the neo-terminal ileum with normal intervening mucosa

- i3: diffuse aphthous ileitis with diffusely inflamed mucosa
- i4: diffuse inflammation with large ulcers, nodules and/or narrowing.

Endoscopic remission is defined as a score of i0 or i1; less than 5 percent of these patients progress to clinical recurrence at three years [13,39]. Endoscopic recurrence is defined as a score of i2, i3 or i4, and patients with an endoscopic score of i3 or i4 were most likely to develop clinical relapse and have significant progressive disease requiring medical or surgical intervention.

Whether the severity of endoscopic findings correlates with the clinical course is uncertain. While some studies have found that severe radiologic or endoscopic findings (such as stricture, deep ulceration, cobblestoning, or fistulization) predicted symptomatic recurrence, others have shown poor correlation between symptoms, endoscopy, and repeat surgery [13,41-44].

Clinical follow-up — Patients are followed closely for development of clinical symptoms which prompt further evaluation and initiation of or step up of medical therapy. Clinical recurrence is based upon signs and symptoms of disease.

We obtain fecal calprotectin and C-reactive protein as surrogate, noninvasive markers of disease activity at six month intervals for two years after surgery and annually thereafter. An abnormal fecal calprotectin is usually followed up with colonoscopy after which medications can be adjusted accordingly. (See 'Higher-risk patients' below and "Medical management of low-risk adult patients with mild to moderate ulcerative colitis", section on 'Health maintenance'.)

Measuring fecal lactoferrin, another noninvasive marker, is an alternative to fecal calprotectin. We typically measure the stool marker that correlated well with the patient's disease activity preoperatively, if that information is available. In addition, CT or magnetic resonance (MR) enterography may complement the endoscopic evaluation for patients with postsurgical anatomy that limits visualization of neoterminal ileum or with disease involving the more proximal small bowel.

The Crohn disease activity index (CDAI) has been used to provide a more objective measure of clinical activity, although the CDAI is not a highly reliable instrument in the postoperative setting (calculator 1). (See 'Clinical recurrence' above.)

MEDICAL PROPHYLAXIS

Prevention of postoperative recurrence of CD requires determining which patients will benefit from early medical therapy and which patients should be monitored clinically, thereby avoiding

the risks of therapy (algorithm 1).

Risk stratification — Patients can be stratified into lower- and higher-risk groups based on risk factors [40]. (See 'Risk factors for recurrence' above.)

Lower-risk patients — Patients with the following characteristics are at lower risk for recurrence:

- Nonsmokers
- Older patients (age over 50 years)
- First operation for CD
- Short stricturing CD (ie, less than 10 to 20 cm)
- Long standing history of CD (greater than 10 years)

Because of the potential for adverse effects of long-term immunosuppressive therapy, we reserve its use for patients at higher risk of disease recurrence. (See 'Higher-risk patients' below.)

We suggest a three month course of imidazole antibiotic therapy (ie, metronidazole) for lower-risk patients, if there are no contraindications (algorithm 1). Some lower-risk patients may decline a course of antibiotics, and an alternative approach is to monitor these patients clinically, particularly in the setting of intolerance to metronidazole [29,45]. (See 'Antibiotics' below and 'General care for patients after surgery' below.)

At 6 to 12 month follow-up, these patients undergo ileocolonoscopy. If endoscopic recurrence is found, medical therapy is recommended as discussed in the following section. (See 'Medications' below and 'Higher-risk patients' below.)

If the ileocolonoscopy shows endoscopic remission, patients undergo subsequent surveillance colonoscopy in one to three years.

If lower-risk patients develop symptoms of CD recurrence prior to follow-up colonoscopy, we suggest an evaluation and treatment approach for flare of CD similar to that in patients who have not had surgery.

Higher-risk patients — The following characteristics are risk factors for recurrence:

- Lack of response to biologic therapy prior to surgery
- Tobacco use
- Patients younger than age 30 years
- Perforating/penetrating/fistulizing/long segment inflammatory disease

- History of ≥2 surgeries for CD
- Shorter disease duration prior to surgery

Individual risk factors may have different impact on prognosis; thus, while tobacco use would be considered higher risk for disease recurrence following surgery, shorter duration of disease prior to surgery might be considered a high-risk feature only in combination. Despite the identification of risk factors, optimal approaches and patient selection have not been clearly defined. The risks and benefits of each medical treatment, the baseline risk of recurrence, individual patient preferences and cost all warrant careful consideration and a shared decision-making approach is recommended.

For most patients at higher risk, we initiate postoperative immunosuppressive therapy with an anti-TNF agent alone or in combination with an immunomodulator (eg, azathioprine). An anti-TNF agent is first-line biologic therapy for most patients in this setting. However, for nonresponders to preoperative anti-TNF therapy (ie, patients who required surgical resection for active inflammation), we switch to a different biologic agent or we escalate the previous drug regimen by optimizing the dose or adding an immunomodulator. In contrast, patients who undergo resection of fibrotic strictures without active inflammation usually resume the same medical regimen after surgery.

For patients who cannot tolerate anti-TNF therapy postoperatively because of infectious complications, a three-month course of imidazole antibiotic therapy (ie, metronidazole) is an option for short-term prophylaxis until biologic therapy can be safely administered. (See 'Lower-risk patients' above.)

The efficacy and safety of anti-TNF therapy alone or in combination with an immunomodulator are discussed in more detail separately. (See "Medical management of moderate to severe Crohn disease in adults" and "Tumor necrosis factor-alpha inhibitors: An overview of adverse effects".)

Medication adjustments for patients with loss of response to anti-TNF agents are discussed in detail separately. (See "Treatment of Crohn disease in adults: Dosing and monitoring of tumor necrosis factor-alpha inhibitors", section on 'Patients with active disease despite maintenance therapy'.)

Data from clinical trials suggested that postoperative therapy with an anti-TNF agent or an immunomodulator reduced the risk of clinical recurrence. (See 'Anti-tumor necrosis factor agents' below and 'Immunomodulators' below.)

While the use of immunosuppressive therapy in the postoperative period may be a concern, a review of perioperative safety profiles of drugs commonly administered for CD found evidence of adverse effects on wound healing only for glucocorticoids, but not for anti-TNF agents or immunomodulators [46].

Ileocolonoscopy is performed at 6 to 12 months and if endoscopic recurrence is found despite medical therapy, treatment can be intensified with the following options:

- Increasing the dose of the anti-TNF agent, guided by therapeutic drug monitoring
- Adding an immunomodulator (eg, azathioprine) to the anti-TNF regimen, if not done previously, or
- Switching to a different biologic agent (eg, anti-IL 12/23 agent)

If the ileocolonoscopy at 6 to 12 months after surgery shows no endoscopic recurrence (ie, Rutgeerts score i0 or i1), the patient can be monitored clinically on this regimen and surveillance ileocolonoscopy is performed in one to three years [40]. (See 'General care for patients after surgery' below.)

Medications

Anti-tumor necrosis factor agents — Data from clinical trials suggested that prophylaxis with an anti-TNF agent reduced the risk of both clinical and endoscopic recurrence following surgical resection compared with no prophylaxis (OR 0.51, 95% CI 0.28-0.94, and OR 0.24, 95% CI 0.15-0.39, respectively) [29,47,48]. In addition, in an analysis of individual patient data from six trials including 645 participants, postoperative use of an anti-TNF agent resulted in lower risk of clinical and endoscopic recurrence compared with thiopurine monotherapy (relative risk [RR] 0.50, 95% CI 0.26-0.96 and RR 0.52, 95% CI 0.33-0.80, respectively) [49].

The risk of adverse effects must be weighed against the potential benefits of anti-TNF agents as the use of anti-TNF prophylaxis results in endoscopic recurrence rates ranging from 10 to 20 percent after one year [49-51]. In two trials of anti-TNF agents in CD patients after surgical resection, there were no differences in adverse event rates (including infection rates) in the anti-TNF group versus either the placebo or immunomodulator groups [47,52]. Adverse effects of these agents are discussed in detail separately. (See "Treatment of Crohn disease in adults: Dosing and monitoring of tumor necrosis factor-alpha inhibitors" and "Tumor necrosis factor-alpha inhibitors: An overview of adverse effects" and 'Infection risk' below.)

Infliximab — Infliximab has been demonstrated to lower endoscopic and possibly clinical recurrence rates in postoperative CD. In a randomized study (PREVENT trial) of 297 patients with postsurgical CD, endoscopic recurrence rates before or at week 76 were lower in patients

receiving infliximab compared with placebo (31 versus 60 percent, absolute risk reduction with infliximab, 29.4 percent; 95% CI: 18.6 to 40.2) [47]. Clinical recurrence rates were also reduced but the difference was not statistically significant (13 versus 20 percent), absolute risk reduction with infliximab 7.1 percent (95% CI: -1.3 to 15.5). These results were similar to those in a previous smaller trial [48]. In an open label, follow-up study of the smaller trial, patients were given the option to continue, stop, or start infliximab [53]. At five years, endoscopic recurrence was higher in patients who had not used infliximab compared with those who had (96 percent versus 22 percent), suggesting a long-term benefit of infliximab.

Adalimumab — Adalimumab also appears effective in preventing endoscopic and clinical recurrence in patients with CD [52,54-56]. In a randomized trial, 51 patients with CD were assigned to receive adalimumab, azathioprine, or mesalamine two weeks after ileocolonic resection [54]. At two-year follow-up, endoscopic recurrence rates were significantly lower in patients treated with adalimumab as compared with azathioprine and mesalamine (6, 65, and 83 percent, respectively). In addition, a significantly lower proportion of patients treated with adalimumab experienced clinical recurrence as compared with patients treated with azathioprine or mesalamine (13, 65, and 50 percent, respectively). (See "Medical management of moderate to severe Crohn disease in adults".)

Limited data from retrospective studies suggest that infliximab and adalimumab have similar efficacy for the prevention of postoperative recurrence of CD [57,58].

Other biologics — Evidence is lacking for biologic agents with other mechanisms of action in the postoperative setting. Ustekinumab, risankizumab, and vedolizumab have each demonstrated efficacy in other clinical contexts, but their role in postoperative maintenance is not yet clear. We reserve the use of ustekinumab, risankizumab, or vedolizumab for patients who have failed anti-TNF therapy or in whom we are restricted by specific contraindications to anti-TNF agents that do not impact use of other biologic agents. (See "Medical management of moderate to severe Crohn disease in adults".)

Immunomodulators — Postoperative therapy with an immunomodulator (eg, azathioprine [AZA], 6-mercaptopurine [6-MP]) resulted in decreased risk of clinical recurrence according to a meta-analysis of three trials including 408 patients who had undergone surgery for CD and were followed for one to three years [59]. Compared with placebo, patients treated with AZA/6-MP had a lower risk of clinical recurrence (RR 0.79, 95% CI 0.67-0.92), while the risk of endoscopic recurrence was not significantly lower (RR 0.85, 95% CI 0.64-1.13). The rates of adverse effects were not significantly different for patients treated with AZA/6-MP compared with placebo (14 versus 10 percent) [59].

The benefit of AZA may be increased by combining it with a three month course of metronidazole [60,61]. In one trial, rates of endoscopic recurrence were lower in patients on metronidazole for three months and AZA for 12 months versus metronidazole alone for three months (44 versus 69 percent). (See 'Antibiotics' below.)

Antibiotics — Treatment with antibiotics is generally safe but side effects may limit their use. Studies have shown that disease recurrence develops only when the mucosa is re-exposed to luminal contents, thus indicating that bacteria may have a role in recurrence; this provides a rationale for the use of antibiotics [6,7].

Data suggest a modest benefit from the short-term use of nitroimidazole antibiotics in preventing postoperative recurrence during the first year after resection in patients with ileal or ileocolonic disease [9,29,62,63]. A summary of three trials of antibiotic therapy (2-metronidazole; 1-ciprofloxacin) showed an uncertain but potentially substantial reduction in clinical recurrence and endoscopic recurrence (OR 0.52, CI 95% 0.27-1.02 and OR 0.46, CI 95% 0.21-0.99, respectively) [29]. In a trial of 60 patients with CD after ileal resection, metronidazole therapy compared with placebo resulted in a lower rate of total (52 versus 75 percent) and severe (13 versus 43 percent) endoscopic recurrence at three months and a lower clinical recurrence rate at one year (4 versus 25 percent) [9]. The majority of study dropouts were due to a metallic taste and gastrointestinal upset. Paresthesias and peripheral neuropathy were self-limited after discontinuation of the drug and overall side effects were less common than have been reported with metronidazole use in other settings. (See "Metronidazole: An overview", section on 'Toxicity'.)

Mesalamine — Data suggest that mesalamine prophylaxis is associated with a modest benefit in preventing relapse. A meta-analysis of nine randomized controlled trials found that mesalamine agents were more effective than placebo for preventing relapse following surgery (OR 0.7, 95% CI, 0.5-0.9) [64]. The number needed to treat to prevent one recurrence was approximately 16 to 19. In the setting of quiescent CD, a meta-analysis of 13 randomized trials for maintenance of remission of CD showed no benefit of 5-ASA agents compared with placebo (relapse rate 56 versus 57 percent) [65]. (See "Overview of the medical management of mild (low risk) Crohn disease in adults".)

A study of 206 patients compared the effect of high-dose mesalamine (4 grams daily) versus low dose (2.4 grams daily) with placebo for one year following resection. The rate of any endoscopic recurrence at one year was greater in the low-dose group than in the high-dose group (62 versus 46 percent), yet there was no significant difference in the rate of severe endoscopic recurrence between the two doses [66].

Although there remains uncertainty about its efficacy, mesalamine is generally safe and well-tolerated and, thus, it is a reasonable option in some patients. Such patients include those who appear to benefit from mesalamine prior to resection or those unwilling to consider agents with more side effects. (See 'Infection risk' below.)

GENERAL CARE FOR PATIENTS AFTER SURGERY

Smoking cessation — All patients with CD who use tobacco should receiving counseling in smoking cessation. Smoking is associated with higher risk of postoperative disease recurrence. (See "Overview of smoking cessation management in adults" and 'Risk factors for recurrence' above.)

Health maintenance — It is important to address health maintenance, including screening and prevention of other diseases as well as monitoring for side effects of therapy in patients with inflammatory bowel disease (IBD). A clinical guideline issued by the American College of Gastroenterology addresses preventive care in IBD and those recommendations are discussed separately. (See "Medical management of low-risk adult patients with mild to moderate ulcerative colitis", section on 'Health maintenance'.)

Screening for metabolic bone disease — Osteoporosis is common in IBD and patients who are at risk for bone loss fracture can be identified through clinical evaluation which is discussed separately. (See "Metabolic bone disease in inflammatory bowel disease".)

Infection risk — Treatment with immunomodulators or biologics confers an increased risk of bacterial, fungal, and viral infection and infection risk is discussed separately. (See "Tumor necrosis factor-alpha inhibitors: Bacterial, viral, and fungal infections" and "Risk of mycobacterial infection associated with biologic agents and JAK inhibitors".)

Nutrition — Nutritional status should be assessed in all patients with CD including those in postoperative remission. Nutritional assessment and interventions in adults with IBD are discussed separately. (See "Nutrition and dietary management for adults with inflammatory bowel disease".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Crohn disease in adults".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Crohn disease in adults (The Basics)")
- Beyond the Basics topics (see "Patient education: Crohn disease (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- **Background** – Surgery does not cure Crohn disease (CD). Although clinical remission is often achieved, most patients eventually relapse. Recurrent disease can manifest by histologic or endoscopic findings or with clinical symptoms. Many patients will require subsequent surgery. (See 'Postoperative recurrence rates' above.)
- **Risk factors for recurrence** – Identification of risk factors for recurrence can help determine if the patient should begin medical therapy soon after surgery or if the patient can be monitored for disease recurrence. Smoking is a modifiable patient-related risk factor. Examples of disease-related risk factors for recurrence are a shorter disease duration prior to the initial operation, history of surgery for CD, and penetrating/fistulizing disease. (See 'Risk factors for recurrence' above.)
- **Postoperative monitoring** – Endoscopic recurrence precedes clinical recurrence, providing an opportunity for medical intervention prior to development of symptoms or complications. We perform ileocolonoscopy 6 to 12 months following surgery in all patients, including those who are receiving postoperative medical therapy (algorithm 1). (See 'Ileocolonoscopy' above.)

- **Preventive strategies:**

  - **Lower risk patients** – For lower-risk patients, we suggest a three-month course of imidazole antibiotic therapy (ie, metronidazole) (**Grade 2B**). An alternative approach is to monitor lower-risk patients clinically without prophylactic medical therapy initially, particularly in the setting of intolerance to metronidazole. (See 'Risk stratification' above.)

  - **Higher-risk patients** – For higher-risk patients, we suggest immunosuppressive prophylaxis after surgery (**Grade 2B**). We typically begin immunosuppressive prophylaxis within eight weeks after surgical resection. Postoperative therapy with an anti-tumor necrosis factor (TNF) agent alone or in combination with an immunomodulator (eg, azathioprine) reduces the risk of clinical recurrence. (See 'Anti-tumor necrosis factor agents' above.)

    For treatment-naive patients, we begin an anti-TNF-based regimen.

    For patients who had active bowel inflammation despite preoperative anti-TNF therapy, we switch to another biologic agent or escalate the previous anti-TNF regimen by increasing the dose or adding an immunomodulator. (See 'Higher-risk patients' above.)

    For patients with contraindications to postoperative anti-TNF therapy (eg, postsurgical infectious complications), a three-month course of metronidazole is an option for short-term prophylaxis until biologic therapy can be safely administered.

- **General measures** – Routine health maintenance in the postoperative setting includes screening for other diseases and monitoring for side effects of therapy in patients with inflammatory bowel disease. All patients with CD who use tobacco should receive counseling in smoking cessation. (See 'General care for patients after surgery' above.)

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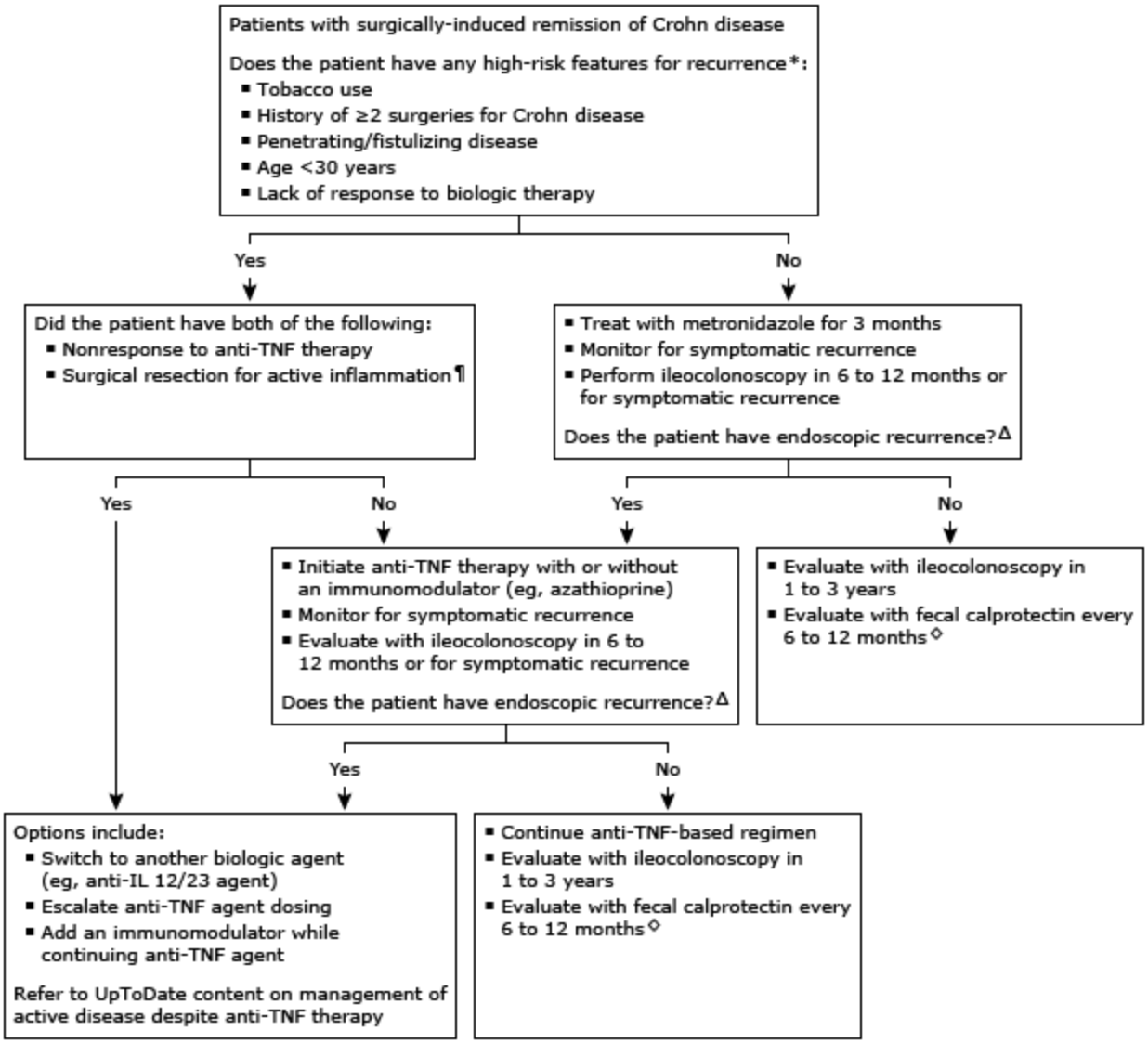
Topic 4084 Version 37.0

GRAPHICS

Initial approach to medical therapy for Crohn disease after surgical resection



This algorithm summarizes the general approach to medical therapy following surgical resection for Crohn disease. This algorithm is intended for use in conjunction with other UpToDate content. Refer to UpToDate content on postsurgical management of Crohn disease including the evidence supporting the efficacy of these therapies.

IL: interleukin; TNF: tumor necrosis factor.

* While individual risk factors may have a different impact on prognosis, most patients can be stratified into higher- and lower-risk groups. Clinical features associated with lower risk of recurrence include long-standing Crohn disease, short stricture, no tobacco use, and no prior surgeries for Crohn disease.

¶ Surgical resection for a fibrotic stricture is not regarded as anti-TNF treatment failure. Patients who undergo resection of fibrotic stricture(s) may resume the same medical regimen after surgery. Refer to UpToDate content on maintenance therapy for Crohn disease for details.

Δ The neoterminal ileum is assessed endoscopically, and a score of i2 or greater indicates recurrence. Endoscopic findings consistent with i2 are >5 aphthous ulcers in the neoterminal ileum with normal intervening mucosa. Refer to UpToDate content on endoscopic scoring systems for additional details.

◇ Measuring fecal lactoferrin is an alternative to fecal calprotectin. We typically measure the stool marker that correlated well with the patient's disease activity preoperatively.

Graphic 113707 Version 3.0

Contributor Disclosures

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