The role of surgery in the management of Crohn disease has undergone a dramatic evolution over the past 50 years. Currently, surgical treatment of Crohn disease is seldom performed in the emergency setting; it is nearly always performed after failed medical therapy. The decision to proceed with operative management is based on careful patient evaluation, with full awareness of the potential complications and ramifications of treatment. In particular, attention must be paid to the risk of recurrent disease, the possible surgical sequelae, and the side effects of medical therapy.

Classification

There are many systems for classifying Crohn disease. One of the simplest is the classification developed by Farmer and associates,1 which categorizes the disease on the basis of disease location alone (ileocolic, purely colonic, small bowel, and perianal). A more elaborate system is the Vienna classification, which categorizes the disease on the basis not only of location but also of age of onset and disease behavior.2 In this system, there are four categories for disease location: terminal ileum (L1), colon (L2), terminal ileum and colon (L3), and any location proximal to the terminal ileum (L4). There are two categories for age of onset: less than 40 years of age (A1) and 40 years of age or older (A2). Finally, there are three categories for disease behavior: nonstructuring and nonpenetrating (B1), structuring (B2), and penetrating (B3).

Given that there are as many types and combinations of Crohn disease as there are patients with this condition, the most sensible approach is probably to use some combination of these two classification schemes. Careful evaluation of the specifics of each case will yield the best treatment results; however, general classification of the disease can help guide therapy. Broadly speaking, Crohn disease of the small bowel has the highest recurrence rate. Because of the important function of the small bowel in digestion, surgeons tend to emphasize conserving small bowel length during operative treatment of Crohn disease. Currently, however, there is an increasing focus on colon conservation with the aims of maintaining water absorption in patients and delaying (or perhaps eliminating) the need for a stoma.

Roles of Medical Therapy and Surgical Therapy

In planning treatment of Crohn disease, it is important not to make the use of medical therapy or surgical therapy an either-or issue. Just as one tool cannot be expected to fill every household need, operative management cannot be expected to solve every problem related to Crohn disease. Overall, careful use of medical therapy, appropriately combined with surgical therapy, provides the best treatment of Crohn disease. Single-minded reliance on either therapy to the exclusion of the other often leads to inadequate patient care.

Generally speaking, except in the case of a free perforation, cancer, or dysplasia, one should not operate on a patient with Crohn disease without first attempting medical therapy. With the dramatically improved medical treatment options currently available, surgery can be avoided in many cases. This is often a desirable result, given the known risk of disease recurrence after surgical treatment of Crohn disease and the significant associated operative morbidity. In one single-center study, the reoperation rate for Crohn disease was 34% at 10 years.3 The agents used to treat Crohn disease can be divided into several broad groups: probiotics, antibiotics, anti-inflammatory drugs, immunosuppressive drugs, and biologic agents. These can be used alone or in combination to treat disease, as well as to maintain remission [see Table 1]. Few good studies have been done on the cost-effectiveness of medical or surgical therapy4,5 versus that of timely surgery followed by maintenance medical therapy. There is clearly a need for such studies. The use of potent and expensive immunomodulator therapy (e.g., maintenance infliximab) for simple ileocolic disease is questionable, especially in the light of studies indicating that such treatment is not at all innocuous.6,7

CHANGING CONCEPTS IN SURGERY FOR CROHN DISEASE

Although first described in the beginning of the 19th century, Crohn disease was not recognized as a discrete clinical entity until the first part of the 20th century.8 At one point, it was treated surgically in much the same way as cancer, with frozen-section margins obtained at the time of resection. This approach did not yield any substantial reduction in the recurrence rate.9 In fact, overzealous resections often resulted in Crohn patients’ requiring lifelong parenteral nutritional support.10 Accordingly, conservative surgery is now the rule: only gross macroscopic disease is resected into palpably normal margins (in particular, a palpably normal mesenteric border of the bowel).

General Indications for Surgical Treatment

SIDE EFFECTS OF MEDICAL THERAPY

Significant side effects of medical therapy include those associated with failure to wean from prednisone (e.g., cataract forma-
tion, aseptic necrosis of the femoral head, and weight gain). Side effects of antimetabolite therapy include pancreatitis, neutropenia, and opportunistic infections.

**COMPLICATIONS OF DISEASE**

*Lack of Response to Medical Therapy*

Many patients with so-called toxic colitis do not respond satisfactorily to medical treatment. In severe cases of refractory disease, if surgery is not performed, colonic perforation, peritonitis, and multiple organ failure may ensue. Such cases are much less frequent now than they once were.

*Obstruction*

In many patients with Crohn disease, the behavior of the disease changes over time, from a more inflammatory and edematous process to one characterized more by fibrosis and scarring. Whereas anti-inflammatory drugs are ideal for treating the former, surgery is frequently necessary for the latter. Failure to refer for surgical treatment of obstruction is, unfortunately, a common error among gastroenterologists. Severe abdominal pain is always a warning sign of obstruction and should be taken seriously [see 5:1 Acute Abdominal Pain and 5:4 Intestinal Obstruction]. The importance of this point is illustrated by a case from my experience, involving a patient who had obstructing ileocolic Crohn disease with gross proximal distention of the terminal ileum [see Figure 1]. This patient lost 20 lb, was experiencing severe abdominal pain, and was treated for more than a year with 6-mercaptopurine before being referred for operative management. Ileocolic resection led to rapid resolution of the symptoms.

*Symptomatic Fistulas*

Enteric fistulas, by themselves, are no longer considered an absolute indication for operation in the absence of other complicating factors. Symptomatic fistulas, such as those associated with obstruction or those associated with disabling symptoms (e.g., rectovaginal fistulas or enterocutaneous fistulas [see Figure 2]), may have to be treated surgically. Ileosigmoid fistulas, which effectively bypass the entire colon, may be associated with profound and refractory diarrhea (i.e., ≥ 20 bowel movements/day) and may also have to be treated operatively.

*Abscess Formation*

Abscesses are particularly common with ileocolic Crohn disease. If they cannot be controlled by means of computed tomography-guided drainage, surgical therapy may be indicated.

*Cancer or Dysplasia*

The risk of colorectal cancer is approximately three times higher in patients with Crohn disease than in the general population.11-13

*Failure to Grow*

In children, failure to grow and develop normally is one of the main indications that medical therapy for Crohn disease has been unsuccessful. Timely surgical therapy will permit normal development. On occasion, when bone age lags significantly behind chronological age, treatment with recombinant human growth hormone is required.

**Special Considerations**

**PREGNANCY**

Persons who have Crohn disease may be less fertile than healthy age-matched persons. One possible explanation for this difference is that feeling ill may result in reduced sexual desire or decreased sexual activity. Another is that pelvic inflammation caused by Crohn disease or by scarring and adhesion formation resulting from surgery may impair fertility. To reduce the chances of the latter, hyaluronic acid sheets may be placed around the tubes and ovaries; alternatively, the ovaries may be tacked to the undersurface of the anterior abdominal wall with absorbable sutures and thereby prevented from entering the pelvis.

*Figure 1* Shown is an example of stenotic ileocolic Crohn disease resulting in obstructive symptoms that were not relieved by medical therapy.

*Figure 2* Shown is an enterocutaneous fistula that persisted for more than 1 year after an ileocolic resection (arrow). The choice of parallel incisions by the previous surgeon made selection of a temporary stoma site much more difficult.
There is no evidence that pregnancy exacerbates Crohn disease; however, there are some specific concerns that apply to pregnant patients with this condition. Because patients with Crohn disease often have more-liquid bowel movements, they have a particular need for a well-functioning anal sphincter. If there is any chance of an obstetrics-related injury (e.g., from a large baby in a primagravida or from a breech presentation), a cesarean section is advisable to minimize the risk of sphincter trauma. The same is true in the presence of severe perianal Crohn disease. During pregnancy, prednisone and 5-aminosalicylic acid (5-ASA) medications are safe, whereas drugs such as metronidazole are not. If imaging studies are needed, magnetic resonance imaging and ultrasonography are the modalities of choice.

MARKING OF STOMA SITES AND CHOICE OF INCISION

When a patient with Crohn disease is expected to need an ileostomy [see 5:30 Intestinal Stomas], it is extremely important to mark the site preoperatively. What looks flat when the patient is on the operating table may not be flat when he or she is upright. The patient must be asked to sit and lean over to confirm that the marked stoma site is in an area without folds, creases, or previous incisions. Stoma appliances do not adhere well to areas of previous scarring, and these should be avoided whenever possible.

Patients with Crohn disease do not react to intra-abdominal infection in a typical fashion. It is not unusual to find unsuspected abscesses that were not revealed by preoperative CT scans and other imaging studies. If there is even a remote chance of an unsuspected abscess (particularly in cases of obstructing ileocolic Crohn disease), the possibility of a temporary stoma should be raised with the patient and the proposed stoma site marked preoperatively. What looks flat when the patient is on the operating table may not be flat when he or she is upright. The patient must be asked to sit and lean over to confirm that the marked stoma site is in an area without folds, creases, or previous incisions. Stoma appliances do not adhere well to areas of previous scarring, and these should be avoided whenever possible.

A key point is the necessity of planning for the future. Many patients with Crohn disease will eventually require a stoma. Operating through a midline abdominal incision preserves all four quadrants for possible future stoma sites (if needed).

LAPAROSCOPY

Laparoscopic surgical techniques have gained acceptance in the treatment of Crohn disease. In performing a laparoscopic operation for Crohn disease, it is essential to adhere to the same technical standards that apply to corresponding open procedures. Careful intraoperative exploration of the abdomen is important, in that many patients have multifocal disease. Without such exploration, patients may experience persistent postoperative symptoms as a consequence of persistent proximal pathologic states that were not addressed. As with other treatment modalities, there are some circumstances in which laparoscopy is particularly useful and others in which it should not be used. For example, a laparoscopic approach is ideal for fecal diversion in patients with perianal Crohn disease.

Ileocolic resection for Crohn disease also lends itself well to a laparoscopic-assisted approach; compared with open resection, laparoscopic resection has been reported to result in shorter hospital stays and reduced costs.\(^{14,15}\) The ileocolic vessels originate centrally, and they only lie over the retroperitoneum. Once the lateral peritoneal attachments are divided, the colon and the small bowel mesentery can be exteriorized, and the mesentery can be divided and the anastomosis performed extracorporeally.

Many studies have shown that even fistulizing Crohn disease can be safely addressed laparoscopically, depending on the skill of the surgeon. A hand-assisted approach is often useful with cases of dense fixation, in which fistulas are common and finger dissection may facilitate definition of the anatomy. If in doubt, one should not hesitate to convert to an open procedure. Typically, most areas that feel fibrotic or contain fibrotic adhesions are actually areas of fistulizing disease and should be treated as such until proved otherwise. In one study, patients with recurrent disease, those older than 40 years, and those with an abdominal mass were more likely to require conversion to an open procedure.\(^{16}\)

Surgical Management of Crohn Disease at Specific Sites

**ESOPHAGEAL, GASTRIC, AND DUODENAL DISEASE**

Crohn disease of the upper alimentary tract can be difficult to diagnose, largely because it is relatively uncommon. Obstructing strictures due to Crohn disease in this area are unusual; the unsuspected finding of noncaseating granulomas in biopsies of erythematous areas in a patient with Crohn disease in other locations is diagnostic.

Occasionally, a patient with Crohn disease of the distal esophagus requires dilatations, but this is uncommon. Surgical treatment for Crohn disease of the upper alimentary tract is almost exclusively reserved for disease affecting the duodenum. Diagnosis of duodenal Crohn disease can be difficult and requires a certain amount of suspicion. Frequently, the diagnosis is not made until relatively late, because diagnostic imaging tends to focus on endoscopy and because the degree of duodenal obstruction is often not evident except on barium studies. The rigidity and luminal narrowing of the second portion of the duodenum is typically much more readily apparent on contrast studies than on endoscopy. Duodenal Crohn disease can lead to gastric outlet obstruction. In children, it can be mistaken for annular pancreas.

When duodenal Crohn disease does not respond to medical therapy, gastrojejunostomy with vagotomy is the preferred surgical treatment.\(^{17,18}\) Failure to perform a vagotomy may result in marginal ulcer formation and obstruction. Some surgeons have performed duodenal strictureplasty to treat duodenal Crohn disease. The results have been conflicting;\(^{19,20}\) the feasibility of this operative approach is limited by the pliability of the duodenum. Many patients experience prompt and full recovery of normal gastric emptying after operation, but some patients with long-standing gastric outlet obstruction continue to experience impaired emptying. The latter may benefit from administration of a prokinetic agent (e.g., metoclopramide or erythromycin).

**JEJUNOILEAL DISEASE**

**Short Bowel Syndrome**

Although Crohn disease of the small bowel is not common and accounts for a relatively small proportion of all cases, disease in this area is associated with one of the highest overall recurrence rates. Resection of large portions of the small bowel can result in short bowel syndrome. For this reason, before proceeding with any type of small bowel or ileocolic resection, one should measure the length of the existing small bowel to determine the patient’s “bowel resource.” One naturally would more readily perform a resection in a patient who has 400 cm of normal small bowel than in one who has only 200 cm.

**Resection versus Strictureplasty**

The major advance in the surgical treatment of Crohn disease over the past quarter-century has been the technique of small bowel strictureplasty, first proposed by Lee and subsequently popularized by Williams, Fazio, and others.\(^{17,18}\) Currently, the two most prevalent strictureplasty techniques are Heineke-Mikulicz
strictureplasty [see Figure 3] and Finney strictureplasty [see Figure 4]. The former is best suited for strictures up to 5 to 7 cm long [see Figure 5], the latter for strictures up to 10 to 15 cm long. The side-to-side strictureplasty described by Michelassi is suitable for longer areas of stricture; however, this technique involves longer suture lines and is mainly considered for patients who already have, or are at high risk for, short bowel syndrome.

The short, isolated strictures characteristic of diffuse jejunoileal Crohn disease are more frequently described in patients with long-standing Crohn disease. It has been postulated that over time, Crohn disease progresses from an edematous condition to a more fibrotic, stricturing condition. It is the fibrotic strictures characteristic of the later stage of the disease that are amenable to treatment with strictureplasty. Patients with these short fibrotic strictures typically have obstructive symptoms and often are unable to tolerate solid food, experiencing dramatic weight loss as a result. Although strictureplasty leaves active disease in situ, it usually leads to prompt resolution of obstructive symptoms, regaining of lost body weight, and restoration of normal nutritional status.

A significant concern with strictureplasty is the possibility that small bowel adenocarcinoma may develop; several cases have been reported. I have treated a patient in whom a poorly differentiated jejunal adenocarcinoma developed at the site of a strictureplasty that had been performed 10 years earlier. Accordingly, many surgeons advocate routine biopsy of the active ulcer on the mesenteric side of the bowel at the time of strictureplasty [see Figure 6]. Another concern has to do with the number of strictureplasties that can safely be performed in a single patient in the course of a single operation. As many as 19 strictureplasties have been performed during one procedure without increased morbidity.

Strictureplasty can be performed with either a single-layer or a double-layer anastomosis. It should not be performed in the presence of an abscess, a phlegmon, or a fistula; and like any other anastomosis, it should not be performed proximal to an existing obstruction that is not treated at the time of operation.

Areas of small bowel Crohn disease that are too long to be treated with strictureplasty can be treated with segmental resection.

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**Figure 3** Heineke-Mikulicz strictureplasty. Stay sutures are placed parallel to each other on the antimesenteric border of the bowel over the area of the stricture. (a) The antimesenteric border of the bowel is then opened with the electrocautery over the area of the stricture, and the opening is extended for approximately 1 to 2 cm on either side of the stricture. (b, c) Traction is placed on the stay sutures, and the original longitudinal enterotomy is closed in a horizontal fashion in one or two layers.

**Figure 4** Finney strictureplasty. (a) This procedure is suitable for longer areas of stricture (up to 10 to 15 cm). (b) The strictured bowel is bent into the shape of an inverted U. Stay sutures are placed at the apex of the U, which is at the midpoint of the stricture, and at the far ends, which lie 1 to 2 cm proximal and distal to the stricture. A longitudinal enterotomy is made on the antimesenteric border of the bowel with the electrocautery. A side-to-side anastomosis is then performed, with the posterior wall done first. (c) Shown is the completed anastomosis.
The area to be resected should be as short as possible. There is no need to obtain frozen-section margins to determine the extent of resection; doing so leads to unnecessary loss of small bowel length. The resection should extend into palpably normal areas of small bowel. The easiest way of determining the area to be resected is to feel the mesenteric margin of the bowel until palpably normal tissue is reached. Because Crohn disease is generally more severe on the mesenteric side of the bowel, palpation in this area gives the most accurate impression of the intraluminal character of the bowel. Because it is not uncommon for patients to have multifocal Crohn disease, the entire small bowel should always be inspected at the time of operation. Operating on one area of disease while failing to treat a more proximal lesion is clearly not in the patient’s interest.

Because of the high rate of recurrence in patients with isolated small bowel disease, postoperative chemoprophylaxis should be strongly considered. In these patients, I prefer to use a more potent agent, such as an antimetabolite, rather than a 5-ASA agent.

ILEOCOLIC DISEASE

Approximately half of those diagnosed with Crohn disease have ileocolic disease. Ileocolic resection is, in fact, the operation most frequently performed to treat Crohn disease. Currently, there is a trend toward more aggressive medical management of Crohn disease; at the same time, surgeons are seeing more complicated disease at the time of operation. These developments have implications for management. An easy ileocolic resection is an experience that a patient generally tolerates well and recovers from very quickly; however, delaying operative management with years of aggressive medical therapy can lead to more complicated disease associated with enterocerotic fistulas, which can be difficult to treat. Ileosigmoid fistulas are among the most common fistulas associated with ileocolic Crohn disease, along with fistulas between the terminal ileum and the ascending colon and fistulas between the terminal ileum and adjacent loops of small bowel.

Disease recurrence is common after ileocolic resection. Colonoscopy is the most accurate modality for postoperative surveillance and the easiest to use; it is more sensitive than either small bowel follow-through or air-contrast barium enema. For this reason, I favor an end-to-end anastomosis after ileocolic resection. In the event of recurrent disease, an end-to-side, side-to-end, or side-to-side anastomosis may be difficult to intubate. There is some evidence in the literature to suggest that the postoperative recurrence rate may be lower with a wider anastomosis. The anastomosis can be performed in either one or two layers. If the bowel is thicker, a handsewn anastomosis is preferred to a stapled one.

The incidence of reoperation for recurrent disease after ileocolic resection is high and increases with the number of resections. Postoperative chemoprophylaxis with mesalamine can significantly reduce the recurrence rate. Patients who smoke should be strongly encouraged to stop: the rate and severity of recurrence are increased in smokers.

Special Circumstances

Ileocolic Crohn disease is often associated with intra-abdominal abscesses or fistulas. If an associated abscess is known to be present, CT-guided drainage should be done preoperatively so that a single-stage procedure can then be performed. If an unsuspected abscess is identified at the time of operation, the safest approach is to proceed with bowel resection, perform the posterior wall of the anastomosis, and exteriorize the anastomosis as a loop ileostomy. This loop ileostomy can then be safely closed, often without a formal laparotomy, 8 weeks after operation if there are no signs of ongoing sepsis. If the abscess or the terminal ileal loop is adherent to the sigmoid colon, an ileosigmoid fistula may be present. The decision whether to resect the sigmoid colon is dictated by the appearance and feel of the sigmoid in the involved areas. If only a portion of the anterior colon wall is involved, that portion can be excised in a wedgellike fashion and the excision site closed primarily. If the entire circumference of the sigmoid colon at that point is indurated and woody feeling, a short segmental resection with anastomosis is the best option.
COLONIC DISEASE

Colonic involvement is present in 29% to 44% of patients with Crohn disease.\(^3\) One of the challenges in treating colonic Crohn disease is obtaining the correct diagnosis. Whereas Crohn disease of the small bowel is fairly easy to diagnose, colonic disease is often not. Because granulomas are not present in most cases of colonic Crohn disease and because this condition can look very similar to ulcerative colitis both endoscopically and macroscopically, differentiation between Crohn colitis and ulcerative colitis can be difficult in the absence of small bowel or anal disease. Colonic Crohn disease appears to be more frequently associated with cutaneous manifestations (e.g., pyoderma gangrenosum) [see Figure 7].

Indications for Surgical Treatment

The main indications for operative management of colonic Crohn disease are stricture [see Figure 8], malignancy, side effects of medical therapy, and failure of medical therapy. In children, failure to recognize and treat this condition promptly may result in growth retardation. It is important to monitor both bone age and insulinlike growth factor–1 levels. If these are abnormal, timely institution of human growth hormone therapy, operative management of inflammatory bowel disease, or both may still permit normal growth and development.

Side effects of medical therapy can be substantial. They may include such varied complications as aseptic necrosis of the femoral head and cataract formation (both related to steroid use), as well as an increased incidence of opportunistic infections (from immunosuppression secondary to antimetabolite therapy).

Failure of medical therapy can refer to continuing severe disease activity or, at worst, to so-called toxic megacolon. The term toxic megacolon is actually a misnomer, in that not all patients with this condition actually have a true megacolon [see Figure 9a]. In common usage, the term toxic megacolon refers to any condition associated with colitis that is severe enough to result in sloughing of the colonic mucosa; such sloughing permits endotoxins to enter the circulatory system and evoke a septic response. The signs and symptoms of toxic megacolon include those characteristic of sepsis—leukocytosis, fever, tachycardia, and hypoalbuminemia. These patients are very ill and often manifest ileus, which is an ominous development that frequently signals impending perforation. Emergency surgical intervention is required. At operation, the colon is often distended, and when the specimen is opened, the colon may appear almost autolytic [see Figure 9b]. In this state, the bowel frequently does not hold staples well; accordingly, it is often helpful to sew the distal Hartmann stump between the left and right halves of the anterior inferior rectus fascia at the lower abdominal incision and then to close the skin over it.\(^3\) Thus, if the staple line is disrupted, the result is essentially a surgical site infection that can be opened and drained, rather than the pelvic abscess [see Figure 9c] that could develop if the rectal stump were located deep within the pelvis.

Types of Disease

Segmental disease In a 2003 review of 92 consecutive cases of patients with Crohn colitis, the number of patients with segmental colonic Crohn disease and the number of those with pancolonic disease were nearly equal.\(^3\) Approximately 63% of those with segmental colitis had other disease involvement as well (e.g., jejunoileal, ileocolic, or perianal), compared with only 12% of those with pancolitis. The recurrence rate, however, was higher in patients with segmental colitis than in those with pancolitis. In addition, the risk of recurrence was higher in patients who had granulomatous disease than in those who did not.

Pancolonic disease In cases of pancolonic Crohn disease with associated perianal, jejunoileal, or ileocolic involvement, diagnosis is not difficult. However, most patients with Crohn pancolitis do not have other sites of disease involvement, nor do they have granulomas.\(^3\) Consequently, differentiation of Crohn pancolitis...
from ulcerative colitis can be very difficult. Many patients with Crohn disease have been inappropriately subjected to colectomy with ileal pouch–anal anastomosis (IPAA) because they were initially presumed to have ulcerative colitis.

**Operative Procedures**

**Total proctocolectomy with end ileostomy** The traditional procedure for colonic Crohn disease is total proctocolectomy with end ileostomy, which is associated with an 8% to 15% rate of recurrence in the bowel proximal to the stoma. This operation remains the best choice in patients with severe rectal and anal Crohn disease (e.g., those with so-called watering-can perineum [see Figure 10]) and carries the lowest risk of disease recurrence. In contrast to the approach taken in patients with rectal cancer, which involves excising the external anal sphincter and a large portion of the levator muscles, the approach taken in those with colonic Crohn disease is intersphincteric, with dissection performed in the plane between the internal and external anal sphincters to reduce the size of the perineal wound and facilitate healing. Even with the intersphincteric approach, delayed healing of the perineal wound is common, occurring in as many as 30% of patients.

**Subtotal colectomy with ileorectal or ileosigmoid anastomosis** Because many patients with Crohn disease are young, surgeons have long been interested in operations that do not involve an ileostomy. In the absence of significant rectal and anal disease, subtotal colectomy with ileorectal or ileosigmoid anastomosis is an option. Unfortunately, this operation is associated with high recurrence rates (up to 70%) however, with the advent of more effective immunosuppressive and biologic therapy, it is hoped that these rates can be reduced. As much palpably normal distal rectum and colon as possible should be spared. The anastomosis can be stapled, though if the bowel wall is thickened, many surgeons would feel more secure with a handsewn anastomosis in either one or two layers.

**Segmental resection** Currently, more surgeons are advocating colon-sparing procedures [see 5:34 Segmental Colon Resection] for Crohn disease. Although this is a relatively new approach,
there have already been some reports documenting the safety of segmental resection in cases of limited disease. In patients with colonic strictures resulting in obstruction, segmental resection into palpably normal areas of the bowel yields prompt resolution of symptoms. Because the colon performs an important water-absorbing function, many patients with a limited amount of small bowel can still live without intravenous supplementation if a significant segment of the colon is left in situ. However, patients with segmental Crohn disease appear to have a higher recurrence rate than those with pancolitis, as do patients with granulomas. Surgical treatment of Crohn disease continues to undergo reevaluation and reassessment of results on the basis of the availability of newer medical therapies.

**Colectomy with IPAA** Although colectomy with IPAA [see 5:33 Procedures for Ulcerative Colitis] is not an operation that one would knowingly perform in a patient with Crohn disease, every year there are many such patients who undergo this procedure as treatment of colonic inflammatory bowel disease that initially is incorrectly presumed to be ulcerative colitis but later is diagnosed as Crohn disease (on the basis of either final pathologic analysis of the resected specimen or the disease's clinical behavior). Generally speaking, in the absence of fistulizing disease, most of these patients are able to maintain their pouch, but they require medical therapy for disease control.

**ANAL DISEASE**

**Types of Disease**

**With stenosis** For patients with anal strictures that are not regularly dilated, the outlook is poor. Such strictures pose functional obstructions and typically lead to continuing problems with fistulas and suppurative disease. They frequently become more and more fibrotic over time and often extend proximally. Most of these patients eventually require fecal diversion. Management generally involves self-dilation, which can often be done with Hegar dilators. If the stenosis is not dealt with, all other treatment of the Crohn disease is doomed to failure; obstruction at the level of the anal canal inevitably results in the persistence of anorectal disease.

**Without stenosis** Anal Crohn disease without stenosis is much easier to treat medically. Long-term oral metronidazole therapy is often helpful; other medications (e.g., anti–tumor necrosis factor antibody) may be useful as well. Broad fissures are usually asymptomatic. Surgical treatment should be avoided unless the lesions are causing symptoms. Because they tend to have more liquid bowel movements, patients with Crohn disease need an optimally functioning anal sphincter; hence, fistulotomies, which divide portions of the sphincter, should be avoided if at all possible. Placement of setons through fistula tracts can often prevent abscess formation, provide drainage, and thereby prevent perianal pain while minimizing sphincter trauma. Silk sutures, vessel loops, or Penrose drains also can be used as setons [see Figure 11]. Rectovaginal fistulas pose a particular challenge. In the presence of active Crohn disease, advancement flap repair of such fistulas has a low success rate. Laparoscopic-assisted loop ileostomy improves the success rate, but unfortunately, the fistulas may recur when intestinal continuity is reestablished.

**Postoperative Management**

**CHEMOPROPHYLAXIS**

In 1995, a prospective, randomized study showed that patients who underwent ileocolic resection and were given mesalamine postoperatively had a significant reduction in both the symptomatic and the endoscopic rate of recurrence. Not all of the work done since then has confirmed these results, but several studies and a meta-analysis have indicated that mesalamine does reduce the postoperative recurrence rate of Crohn disease. Many patients undergoing surgical treatment of Crohn disease are advised to take some type of postoperative preventive medical therapy—either a 5-ASA derivative (e.g., mesalamine) or a stronger immunosuppressive agent (e.g., 6-mercaptopurine or azathioprine). Better studies are required to document the efficacy of the latter agents in preventing recurrence. It is hoped that chemoprophylaxis will reduce the anticipated recurrence rates by 30% to 40%.
SURVEILLANCE

At present, there are no clear guidelines for surveillance after operative treatment of Crohn disease. In my opinion, however, given the increased risk of colorectal cancer in this setting, patients with Crohn disease who retain some colon should undergo colonoscopy every 2 years, not only to detect any development of colonic neoplasia but also to identify any recurrence of disease in a timely manner. If recurrent Crohn disease is detected, appropriate medical therapy should be promptly instituted, with the aim of avoiding subsequent operation if possible.

References

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Acknowledgment

Figures 3 and 4: Tom Moore.