Fulminant ulcerative colitis is a potentially life-threatening disorder that requires expert management to allow for optimal outcomes. Once associated with very high mortality, the medical and surgical treatment of fulminant ulcerative colitis has greatly improved such that mortality from fulminant ulcerative colitis currently is less than 3%. Optimal management necessitates coordination between medical and surgical therapy; hence, multidisciplinary strategies are required.

**Disease Definition**

The most commonly applied classification for the severity of ulcerative colitis was described by Truelove and Witts, who identified clinical parameters to categorize mild, moderate, and severe colitis. The Truelove-Witts classification, however, does not specify a unique category for fulminant disease. Hanauer modified this classification scheme to include the designation of fulminant colitis [see Table 1]. There is, however, no universally agreed-upon distinction between severe and fulminant ulcerative colitis. Some authors use the terms “severe” and “fulminant” interchangeably, whereas others, concerned over the lack of a clear definition, recommend that the term “fulminant ulcerative colitis” be avoided. This recommendation aside, the term “fulminant ulcerative colitis” is an established component of the medical vernacular even if the term itself is not clearly defined. Fulminant ulcerative colitis is certainly a severe condition associated with systemic deterioration related to progressive ulcerative colitis. Most would agree that a flare of ulcerative colitis can be considered fulminant if it is associated with one or more of the following: high fever, tachycardia, profound anemia requiring transfusion, dehydration, low urine output, abdominal tenderness with distention, and profound leukocytosis with left shift, severe malaise, or prostration. Patients with these symptoms should be hospitalized for aggressive resuscitation while clinical assessment and treatment are initiated.

**Clinical Assessment**

Patients admitted with severe or fulminant ulcerative colitis require a complete history and physical examination. Fulminant ulcerative colitis is rarely the initial presentation of ulcerative colitis, and most patients will have a prior diagnosis. The abdominal examination should focus on signs of peritoneal irritation that may suggest perforation or abscess formation. Any patients admitted with severe ulcerative colitis may have already received substantial doses of corticosteroids, which can mask the physical findings of peritonitis. Initial laboratory studies should include a complete blood count with differential, a coagulation profile, and a complete metabolic profile with assessment of nutritional parameters such as the serum albumin. Abdominal films and an upright chest x-ray should be obtained to assess for colonic distention indicating toxic megacolon and to assess for the presence of pneumoperitoneum indicating perforation. Infectious agents should be ruled out by multiple stool specimens sent for *Clostridium difficile*, cytomegalovirus, and *Escherichia coli* O157:H7. It is important to identify the presence of opportunistic infections, particularly *C. difficile*, even in patients with an established diagnosis of ulcerative colitis, as superinfection with *C. difficile* in ulcerative colitis patients is common. Assessment with endoscopic examination of the

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**Table 1 Criteria for Evaluating the Severity of Ulcerative Colitis**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mild Disease</th>
<th>Severe Disease</th>
<th>Fulminant Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stools (no./day)</td>
<td>&lt; 4</td>
<td>&gt; 6</td>
<td>&gt; 10</td>
</tr>
<tr>
<td>Blood in stool</td>
<td>Intermittent</td>
<td>Frequent</td>
<td>Continuous</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>Normal</td>
<td>&gt; 37.5</td>
<td>&gt; 37.5</td>
</tr>
<tr>
<td>Pulse (beats/ min)</td>
<td>Normal</td>
<td>&gt; 90</td>
<td>&gt; 90</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>Normal</td>
<td>&lt; 75% of normal value</td>
<td>Transfusion required</td>
</tr>
<tr>
<td>Erythrocyte sedimentation rate (mm/hr)</td>
<td>≤ 30</td>
<td>&gt; 30</td>
<td>&gt; 30</td>
</tr>
<tr>
<td>Colonic features on radiography</td>
<td>—</td>
<td>Air, edematous wall, thumb printing</td>
<td>Dilatation</td>
</tr>
<tr>
<td>Clinical signs</td>
<td>Abdominal tenderness</td>
<td>Abdominal distention and tenderness</td>
<td></td>
</tr>
</tbody>
</table>

Red text is tied to a SCORE learning objective.
Management of Fulminant Ulcerative Colitis

Patient has severe or fulminant ulcerative colitis
Perform history and physical examination. Abdominal examination focuses on peritoneal signs (sometimes masked by corticosteroid therapy).
Order investigative studies:
- Laboratory tests: Complete blood count with differential, coagulation profile, metabolic profile, stool testing (for Clostridium difficile, Cytomegalovirus, Escherichia coli).
- Imaging: Abdominal films, chest x-ray, colonoscopy (for minimum necessary distance).

Colitis responds to IV corticosteroid therapy
Switch to oral regimen, then gradually wean patient from steroids.
Initiate maintenance therapy with purine analogues or immunosalicylates.

Immunosuppressive therapy is not contraindicated
Infliximab 5 mg/kg IV infusion. Induction dose at 0, 2, and 6 weeks with 5 mg/kg every 8 weeks afterwards.
Cyclosporine Initiate IV therapy, initially 4 (or 2) mg/kg/day IV, adjusted as necessary.

Colitis responds to IV immunosuppressive therapy
Continue current treatment.
Consider maintenance therapy with 6-mercaptopurine or azathioprine.

Colitis does not respond to IV corticosteroid therapy within 5–7 days
Further immunosuppressive therapy is contraindicated (e.g., because of renal insufficiency, hypocholesterolemia, sepsis, or patient refusal)

Patient is stable and has no indications for emergency surgery
Initiate intravenous (IV) corticosteroid therapy (e.g., methylprednisolone, 40–60 mg/day IV).

Colitis does not respond to IV immunosuppressive therapy within 4–5 days or complete remission is not achieved within 10–14 days
Initiate surgical treatment. Consider laparoscopic-assisted approach as an option (except in cases of toxic megacolon).

Patient has perforation, peritonitis, or sepsis
Perform a staged procedure (abdominal colectomy with ileostomy, followed later by proctectomy with ileoanal anastomosis).

Patient is unstable or has indication for emergency surgery (e.g., findings suggestive of perforation, massive gastrointestinal bleeding, or toxic megacolon)
Hospitalize patient.
Give blood products to treat anemia or coagulopathy.
correct metabolic derangements.
Optimize nutritional status (e.g., via bowel rest and total parenteral nutrition).

Patient is healthy enough to undergo full procedure at once
Perform proctocolectomy with ileoanal anastomosis.

Patient does not have obvious perforation, peritonitis, or sepsis but may not be healthy enough to undergo full procedure at once
Choose all-at-once or staged approach on the basis of experience and clinical judgment. Most patients who do not respond to maximal medical therapy are probably best treated with a staged procedure.
colon and rectum in the face of fulminant ulcerative colitis is controversial.\textsuperscript{14–16} Colonoscopy with biopsy can provide useful diagnostic information. Reports indicate that in experienced hands, colonoscopy can be performed in patients with severe colitis with little risk.\textsuperscript{14,15} In general, however, it is recommended that endoscopic examination be limited to the minimum distance necessary to confirm severe colitis. If an endoscopic examination is to be performed, it is important to minimize the amount of air insufflation as overdistention of the colon may lead to perforation or the development of megacolon. Typical endoscopic findings in fulminant ulcerative colitis are severe inflammation, ulcerations, and mucosal sloughing. Colitis typically is worst in the rectum and continues proximally in a contiguous fashion. Occasionally, the distal rectum may be spared secondary to the use of topical medications such as steroid suppositories. Although these findings help differentiate ulcerative colitis from Crohn disease and indeterminate colitis, the differentiation is probably not important in the setting of fulminant disease, where maximal medical therapy or surgical treatment with subtotal colectomy will be the same regardless of diagnosis. Beyond the diagnostic information, endoscopy can provide useful prognostic information. Carbonell and colleagues noted that the presence of deep extensive colonic ulcerations indicates a low probability for successful medical treatment of fulminant ulcerative colitis, with less than 10% of patients with deep ulcers responding to medical treatment.\textsuperscript{14} Such an endoscopic finding thus may assist in the decision to proceed with early surgery if medical therapy does not show rapid and significant improvement [see Figure 1].

**General Care**

All patients with fulminant ulcerative colitis require hospitalization. Blood products should be administered to treat significant anemia or coagulopathy. Metabolic derangements should be corrected.\textsuperscript{17} Patients with perforation or massive lower gastrointestinal hemorrhage need emergent operative treatment. More stable patients are initially managed with medical therapy. Narcotics, antidiarrheal agents, and other anticholinergic medications should be avoided as they can precipitate toxic dilation of the colon. Bowel rest typically reduces the volume of diarrhea, but it is not yet clearly established if bowel rest affects the clinical course of the fulminant colitis.\textsuperscript{18,19} McIntyre and colleagues reported no significant change in outcome in patients with acute flares of ulcerative colitis managed with total parenteral nutrition (TPN) and bowel rest compared to patients taking enteral nutrition.\textsuperscript{19} This study, however, involved varying degrees of severity of colitis such that only a small number of patients with fulminant ulcerative colitis appear to have been included in the study. Conversely, Mikkola and Jarvinen reported a potential clinical advantage to bowel rest and TPN in patients suffering from fulminant ulcerative colitis.\textsuperscript{18} The most common approach is to initially place these patients on bowel rest with hyperalimentation. Oral feedings are initiated once symptoms of the fulminant attack begin to improve. Whether patients are maintained on bowel rest or given oral feeds, each patient should always receive adequate nutritional support; hence, TPN should be maintained until the patient is tolerating full enteral feedings.

**Medical Therapy**

The main standard medical therapy for fulminant ulcerative colitis involves the induction of remission with intravenous (IV) corticosteroids or biologics followed by long-term maintenance treatment in the form of purine analogues or biologics for those patients who achieve remission. Cases that are unresponsive to IV steroids are considered for IV cyclosporine and, more recently, infliximab.

**Steroids**

Steroid treatment has been the frontline therapy for acute flares of ulcerative colitis for almost 50 years. Response rates for cases of fulminant ulcerative colitis fall in the range of 50 to 60% when steroids are given over a 5- to 10-day course of treatment.\textsuperscript{20,21} Methylprednisolone in a dose of 40 to 60 mg per day, given as a continuous IV infusion, is a common regimen.\textsuperscript{5,22–24} The duration of treatment to allow for response from IV steroid therapy has been controversial. Truelove and Witts in 1955 recommended urgent surgery after 5 days if the patient has not responded to IV steroid therapy.\textsuperscript{4} This 5-day rule has been widely adopted, but experience suggests that courses up to 7 to 10 days can be safely administered under careful observation to allow for further time for response.\textsuperscript{15} Patients who respond to IV steroid therapy are converted to oral steroids, typically prednisone. Corticosteroids, however, should never be used as a long-term maintenance therapy.\textsuperscript{5,25} The toxic effects of corticosteroids are related to both the dose and duration of treatment. Severe complications, including diabetes, osteoporosis, mood

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**Figure 1** Sigmoidoscopy demonstrating deep ulcerations in a patient suffering from fulminant ulcerative colitis.
disturbances, and weight gain, are common with extended use of even modest doses of steroids. Patients should be slowly but completely weaned from steroid therapy. Because recurrence of symptomatic colitis occurs in between 40 and 50% of initial responders to IV therapy, maintenance therapy with either purine analogues, immunosalicylates, or biologics should be administered. Unfortunately, dependency on corticosteroids is often encountered in patients with ulcerative colitis. In these cases, the dose of steroids cannot be tapered without an increase in disease activity and symptoms. When such patients cannot be taken off steroids within 3 to 6 months, then surgical treatment is indicated.

**Cyclosporine**

Nonresponders to IV steroid treatment, once universally referred for surgery, may be treated with IV cyclosporine. Cyclosporine is an immunosuppressant macrolide that suppresses the production of interleukin-2 by activated T cells through a calcineurin-dependent pathway. Originally applied as a means of preventing tissue rejection following transplantation, cyclosporine has become the standard for the treatment of steroid-refractory severe ulcerative colitis. The first report of the use of cyclosporine for the treatment of ulcerative colitis was by Gupta and colleagues in 1984. It was not until 10 years later that a randomized placebo-controlled trial of cyclosporine for steroid-refractory ulcerative colitis by Lichtiger and colleagues demonstrated the effectiveness of this agent. This revealed a response rate of 82% with 4 mg/kg of cyclosporine in patients with steroid-refractory ulcerative colitis compared to zero response with continued IV steroid therapy alone. Since this initial report, response rates of 56 to 91% have been reported in the medical literature, confirming cyclosporine as a major advance in the treatment of severe and fulminate ulcerative colitis. Dosing and monitoring of cyclosporine are complicated and cumbersome for both physicians and patients, limiting its use. In addition, recurrence of disease after initial remission with cyclosporine is high, with as many as 60% of patients developing recurrent disease. Recurrence rates can be substantially lowered with maintenance therapy with mercaptopurine or azathioprine. With appropriate maintenance therapy, early recurrence of symptoms after successful IV cyclosporine treatment have been recorded as low as 22%. Even if disease activity recurs and surgery is necessary, cyclosporine therapy can allow for elective surgical management when the patient is in better general health. This is a clear advantage as urgent surgery for ulcerative colitis carries a much higher risk for complications when compared with surgery performed in a more elective setting.

Major side effects associated with cyclosporine treatment include renal insufficiency, opportunistic infections, and seizures. The risk for seizures appears to be highest in patients with hypocholesterolemia. As such, patients with significant (less than 100 mg/dL) hypocholesterolemia should not receive cyclosporine treatment. Hypomagnesemia is commonly seen in patients with fulminant ulcerative colitis undergoing cyclosporine treatment; hence, serum magnesium levels should be closely followed.

Dosing regimens for cyclosporine vary, but patients are typically started on 4 mg/kg per day of IV cyclosporine, with the dose then adjusted to achieve a whole blood level between 150 and 400 ng/mL as measured by high-performance liquid chromatography or radioimmunoassay. Higher levels up to 800 ng/mL in whole blood have been cited as acceptable by some investigators. If the patient does not show any improvement within 4 to 5 days or if complete remission is not achieved by 10 to 14 days, surgery is then advised. Most of the side effects from cyclosporine are dose dependent, and some studies have shown that an initial dose of 2 mg/kg per day of IV cyclosporine can also be effective in achieving a remission.

**Infliximab**

Infliximab is a chimeric monoclonal antibody directed against human tumor necrosis factor (TNF). Infliximab has been used to treat Crohn disease for over 10 years. It was not until 2005, however, that infliximab was approved for use in patients with ulcerative colitis. Potential adverse effects from infliximab include activation of tuberculosis, infusion reactions, hypersensitivity reactions, the development of lymphoma, and infectious complications. Additionally, recent accumulating data suggest that infliximab may significantly increase the risk for postoperative infection and healing complications following surgery for ulcerative colitis.

The use of infliximab therapy in the setting of fulminant colitis is controversial. Whereas the data supporting infliximab in the treatment of moderate to moderately severe disease are convincing, the data demonstrating safety and efficacy in the setting of fulminant colitis are limited. Based on the current data, some experts have supported the initiation of infliximab treatment in patients with fulminant colitis who have failed IV steroid therapy. On the other hand, others have advocated the avoidance of infliximab therapy in patients with fulminant colitis. With wider use of anti-TNF therapy for ulcerative colitis, a greater percentage of patients admitted to the hospital with fulminant colitis are likely to already be on infliximab therapy; hence, the decision whether or not to initiate therapy is often moot. Because of the risk of severe complications, infliximab therapy should not be given in combination with cyclosporine therapy.

Because of the increased risk for anastomotic leak and pelvic sepsis in patients undergoing the ileoanal procedure while on anti-TNF therapy, patients with fulminant or severe ulcerative colitis should have a staged abdominal colectomy prior to the ileoanal procedure if they are being treated with infliximab. The negative effect of infliximab on wound healing and infection is prolonged and appears to persist beyond 3 to 4 months after the last dose given.

The prolongation of medical therapy in patients with severe disease who have already received high doses of corticosteroids has caused concerns that those patients who fail both steroid and subsequent cyclosporine or infliximab therapy may be at high risk for perioperative morbidity and mortality. Current experience, however, has not identified an increased risk for perioperative complications in patients who fail to respond to cyclosporine therapy and thus does not appear to compromise surgical results. Yet recent data on infliximab...
in ulcerative colitis do demonstrate a trend toward increased number and severity of septic complications.\(^\text{42,43,46}\)

**Surgical Therapy**

**INDICATIONS FOR SURGERY**

The indications for surgery in a patient suffering from fulminant ulcerative colitis are listed in Table 2. When the options for appropriate medical treatment have been exhausted, surgery will, of course, be required. Because most patients suffering from fulminant ulcerative colitis will respond to aggressive medical therapy, an attempt at medical treatment is warranted in almost all cases. Care must be exercised, however, not to overtreat the patient with fulminant ulcerative colitis who is unresponsive or shows minimal response to medical treatment. The immunosuppressive effects of high-dose corticosteroids and IV cyclosporine or infliximab, along with the debilitation of prolonged severe disease, can place the patient at high risk for perioperative complications. If the patient fails to show significant improvement with IV steroids in 5 to 7 days, then the patient should be started on IV cyclosporine or infliximab or referred for surgery.\(^\text{17}\)

For patients who fail to show improvement on second-line medications within 4 days or fail to achieve remission of major symptoms by 2 weeks, surgery should be undertaken. If symptoms progress during the course of IV therapy or if no sign of improvement occurs, then the patient should be considered for early surgery. Additionally, patients known to have deep longitudinal ulcerations may also be referred for early surgery, given that these patients are more likely to fail IV medical therapy. The decision when best to abandon medical therapy in favor of surgery for patients with fulminant ulcerative colitis is difficult and requires experience and special expertise. Thus, patients with fulminant ulcerative colitis are best managed in a center specializing in inflammatory bowel disease.

Patients with perforation or severe bleeding require urgent surgery.\(^\text{47}\)

Debilitation from disease and immunosuppression from intensive medical therapy can mask the signs and symptoms of sepsis and peritonitis associated with perforation. When perforation occurs, the risk for perioperative mortality is up to 10 times greater compared to cases of fulminant colitis without perforation.\(^\text{48}\)

For these reasons, patients with high fever, marked leukocytosis, and persistent tachycardia should be referred for early surgery, independent of other indications of perforation or peritonitis.

Toxic megacolon is an uncommon complication of severe ulcerative colitis. Associated with impending colonic perforation, toxic megacolon requires aggressive management. Two specific parameters are required to confirm the diagnosis of toxic megacolon.\(^\text{49}\)

First, there must be colonic dilatation. Second, the patient should appear “toxic.” Patients with mild symptoms of ulcerative colitis can experience colonic dilatation, perhaps associated with a colonic ileus. This is distinctly different from patients with fulminant ulcerative colitis, some degree of generalized toxicity, and colonic dilatation. Patients with fulminant ulcerative colitis should have an abdominal x-ray to assess for colonic dilatation [see Figure 2]. Additionally, patients with fulminant ulcerative colitis who develop abdominal distention or have a sudden decrease in the number of bowel movements without signs of significant clinical improvement should also be assessed radiographically for colonic dilatation.

As noted, patients with toxic megacolon should be treated aggressively. Individuals who are otherwise stable may undergo a brief trial of conservative management consisting of eliminating narcotics and anticholinergic agents. Changing the patient’s position from side to side, supine to prone, and into the knee-elbow prone position is thought to assist in the expulsion of colonic gas.\(^\text{50}\) Patients should be kept NPO, and broad-spectrum IV antibiotics are advocated. Attempts at endoscopic decompression are to be avoided, and blind placement of rectal tubes is ineffective and may be harmful. Patients with

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**Table 2** Indications for Operation

<table>
<thead>
<tr>
<th>Indication</th>
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<tbody>
<tr>
<td>Perforation</td>
</tr>
<tr>
<td>Peritonitis</td>
</tr>
<tr>
<td>Progressive signs of sepsis</td>
</tr>
<tr>
<td>Failure to respond to medical treatment</td>
</tr>
<tr>
<td>Inability of tolerate medical treatment</td>
</tr>
<tr>
<td>Severe hemorrhage</td>
</tr>
<tr>
<td>Toxic megacolon</td>
</tr>
</tbody>
</table>

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![Figure 2](Abdominal radiograph of a patient with toxic megacolon. Printed with permission of University of Chicago Department of Surgery Archives.)
toxic megacolon who do not rapidly respond to conservative management and those who show signs of peritonitis are otherwise unstable and should undergo urgent surgery.31

PREPARATION FOR SURGERY

Patients with fulminant ulcerative colitis who are stable but not responding to medical therapy may have time to prepare for surgery. Patients who are not NPO should be maintained on clear liquids and then kept NPO for 6 to 8 hours prior to surgery. Usually, these patients do not require any form of bowel preparation as they have multiple bloody, liquid bowel movements and will require an emergent colectomy with diversion. If used, bowel preparations may be limited to a rectal washout at the time of surgery. If time allows, patients should be provided with a consultation with an experienced enterostomal therapist and an optimal site for the ostomy should be marked on the abdomen. Prophylactic antibiotics should be given prior to the creation of the surgical incision, and appropriate stress-dose steroids should also be administered.

SURGICAL STRATEGIES

The operative strategies for the treatment of fulminant ulcerative colitis are controversial. Ultimately, almost all patients will end up with a restorative proctocolectomy and an ileoanal anastomosis. Most patients with fulminant ulcerative colitis, however, will have the final surgical goal achieved in multiple steps. The safety of performing an extensive resection with a prolonged and delicate reconstructive procedure in an acutely ill patient is questionable. It has thus been the practice of many to first perform a total abdominal colectomy with an ileostomy, leaving the rectum as a stapled stump or a mucous fistula.37,46 This approach allows the patient to recover from the acute illness, to wean off the immunosuppressive agents, and to improve the nutritional status. Although the remaining rectal stump will be affected by ulcerative colitis, the activity of disease is greatly diminished with the fecal diversion, and almost all patients can be completely weaned from steroids and other immunosuppressive medications. A subsequent restorative proctectomy with ileoanal anastomosis can then be performed in a more controlled situation.

The benefits of undergoing a staged procedure may be multiple; some studies have demonstrated a reduced risk of anastomotic leak, but findings are not universal. Ziv and colleagues reported excellent long-term results and acceptable short-term morbidity in 12 patients undergoing immediate restorative proctocolectomy with ileal pouch-anal anastomosis.52 The authors used a liberal definition for fulminant colitis that included patients who may not have been as acutely ill and represent an extraordinarily small proportion of the total number of ileoanal procedures performed at their institution. Harms and colleagues reported on 20 patients undergoing restorative proctocolectomy with ileal pouch-anal anastomosis for the urgent treatment of ulcerative colitis and also reported excellent long-term results and exceptional perioperative morbidity.53 However, Heyvaert and colleagues reported on 12 patients also undergoing urgent restorative proctocolectomy with ileal pouch procedure for ulcerative colitis and noted a 41% anastomotic leak rate compared to an 11% leak rate in patients undergoing ileoanal anastomosis under more controlled conditions.54 Based on these results, Heyvaert and colleagues counseled against ileoanal anastomosis in the urgent setting. Fukushima and colleagues also noted a higher risk for anastomotic leak (36%) in patients undergoing urgent restorative proctocolectomy with ileoanal anastomosis.55 This group likewise advised against performing an ileoanal anastomosis in the urgent setting.

Precise parameters under which it is best to stage the procedure with an initial abdominal colectomy have not been clearly defined. It is universally accepted that patients with perforation, peritonitis, or sepsis require a staged procedure. Any patient with suspicion of Crohn colitis or indeterminate colitis should undergo subtotal colectomy to allow for further diagnostic evaluation prior to creation of ileal pouch-anal anastomosis. Beyond this, there is no clear consensus. The available studies addressing this issue unfortunately involve a small number of patients, do not clearly define what is meant by “fulminant” colitis, or do not directly compare results between the two alternative strategies of staged colectomy versus immediate ileoanal anastomosis. Clearly, there is a small subset of patients with symptoms severe enough to require hospitalization who are healthy enough to safely undergo a primary ileoanal anastomosis. On the other end of the spectrum, severely ill patients, that is, most patients with fulminant colitis, should have a staged procedure. Because specific criteria to quantify the risk have not been defined, the decision to stage or not to stage ultimately rests with the clinical judgment of the experienced surgeon. It has been the author’s experience, however, that a large majority of patients who fit the criteria of fulminant colitis as noted in Table 1 and have failed maximal medical therapy are best managed with a staged approach.

If the procedure is staged and the proctectomy delayed, there are several advantages to the patient in terms of having time to fully consider lifestyle and reproductive options. Living with an ileostomy for 2 to 4 months ensures that the patient understands the relationship between the timing and quality of oral intake and the frequency and consistency of ileostomy output. This knowledge is extremely helpful to the patient in affecting the frequency, timing, and consistency of bowel movements after completion of all stages associated with a restorative proctectomy and ileoanal pouch procedure. Further, it gives the patient confidence that life with an ileostomy is manageable, a notion that may be important if complications of an ileoanal procedure escalate to the point of considering reversal.

All patients who undergo proctectomy face the risk of decreased fertility and sexual function postoperatively, and consideration of timing of surgery is appropriate. If the rectum is acutely inflamed, dissection may be more difficult and injuries to pelvic nerves and formation of adhesions and abscesses may be greater. As a large percentage of the population with ulcerative colitis are in their reproductive prime, preoperative consideration of issues is appropriate.

In males, erectile dysfunction appears to be altered after damage to the parasympathetic nerves, whereas ejaculatory dysfunction results from sympathetic nerve injury. It is estimated that between 0 and 10% of males experience some
degree of sexual dysfunction postoperatively.\textsuperscript{56,57} Although studies demonstrate that dysfunction may be transient and relieved with pharmaceutical agents such as sildenafil, this is a significant consideration for males in the peak of their reproductive years.\textsuperscript{58} Subtotal colectomy has not been associated with decreased function; therefore, males in need of an urgent procedure may defer the proctectomy to a later time and consider cryopreservation prior to the removal of the rectum.

In women, causes of sexual dysfunction are more difficult to determine, but infertility rates are significantly elevated following proctocolectomy. Fecundity rates, or the percentage of women who become pregnant per unit time, are reduced to one third of baseline populations after proctectomy for ulcerative colitis.\textsuperscript{59,60} Adhesions and occlusion of fallopian tubes have been noted in a large number of postoperative patients obstructing normal ovulation and fertilization.\textsuperscript{61,62} Although it would be simple to blame surgery alone, patients requiring ileal pouch-anal anastomosis for familial adenomatous polyposis do not experience this radical decrease in fertility postoperatively.\textsuperscript{63} Although in vitro fertilization has been highly successful in this group, consideration of postponement of proctectomy for family planning may be reasonable in these patients.\textsuperscript{64}

\textbf{Surgical Technique}

Surgical exploration can be performed with a midline or transverse incision. The abdomen should be carefully examined with particular attention given to the small intestine looking for signs of Crohn disease. The colon often shows the changes of colitis with serosal hyperemia, corkscrew vessels, and edema [see Figure 3]. Colectomy can be performed in the standard fashion with mesenteric division occurring at a convenient distance from the bowel. Wide mesenteric resection is not necessary.

If a staged colectomy is performed, an ileostomy is created in the standard fashion at the site selected as least inconvenient for the patient preoperatively, and the rectum is left behind either stapled or brought up to the abdominal wall as a mucous fistula. When stapled, it is important that the stump be of the appropriate length. Too short of a pouch can lead to a very difficult proctectomy at the next stage of the procedure sequence. Too long of a stump can run the risk of complications related to persistent disease in the rectum, including bleeding, discharge, and tenesmus. In most cases, the rectum can be safely stapled at the level of the sacral promontory [see Figure 4]. When performing the colectomy, the sigmoid branches of the inferior mesenteric artery are divided, whereas the terminal branches of the inferior mesenteric artery are preserved. This will ensure a good blood supply to the remaining rectal stump and aid in the healing of the stapled closure. Preservation of the terminal branches of the inferior mesenteric artery and the superior rectal artery also simplifies the subsequent proctectomy by keeping the pelvic sympathetic nerves free of surrounding scar tissue and by providing a key anatomic landmark that will assist in the location of the appropriate presacral dissection plane at the time of the proctectomy. To staple the proximal rectum safely, the mesenteric and pericolonic fat are removed from the bowel wall. Approximately 2 cm of bowel is prepared in such a manner, and the bowel is then closed with a transverse anastomosis stapler (TIA stapler) using 4.8 mm staples. The bowel is then divided proximal to the staple line. It is important to closely examine the staple line to ensure that the staples are formed properly into two rows of well-formed “B’s.” The staple line should also be examined to make sure that individual staples are not cutting into the muscularis propria of the bowel. To provide extra assurance against dehiscence, the staple line can be oversewn with interrupted Lembert sutures [see Figure 4]. If used, these sutures should be carefully placed so that the anterior and posterior serosal surfaces are approximated without undue tension. In a well-constructed rectal pouch, placement of pelvic drains is not necessary and can be harmful as their placement close to the suture line may promote dehiscence.

In some cases, the colon at the level of the sacral promontory will be affected by deep ulcerations and severe inflammation such that the closure of the rectum at this level may be at high risk for dehiscence [see Figure 5]. If the severity of the disease precludes safe closure of the rectal stump, then creation of a mucous fistula should be considered. The mucous fistula does require a longer segment of bowel and thus is
associated with a greater risk of bleeding from the retained segment. Additionally, a mucous fistula is unsightly and often generates a very foul odor. As a compromise approach, some surgeons have advocated stapling the rectosigmoid and placing the proximal end of the stump through the fascia at the lower edge of the midline incision. The end of the stump is then left buried in the subcutaneous tissue. The benefit of this approach is that should dehiscence of the staple line occur, then sepsis should be limited to the subcutaneous space rather than result in an intra-abdominal or pelvic abscess.

If attempts to fashion a secure rectal closure fail, and the remaining rectal stump is too short to bring out as a mucous fistula, then two options remain: an additional inch or two of proximal rectum can be resected and closure of the rectal stump performed lower, sometimes just below the peritoneal reflection. In this situation, closed suction drains should be placed in the deep pelvis and, if possible, the peritoneum closed over the rectal stump. Such a short rectal stump, however, will make finding it during subsequent completion restorative proctectomy and ileoanal anastomosis more difficult. Alternatively, a large Malecot drain, inserted through the lower abdominal wall, can be placed in the proximal rectum and the opening of the rectum can be synched around it with a purse-string suture. In this case, as well as in any case where the closure of the rectal stump seems precarious, transanal placement of a rectal tube to drain rectal secretions and blood may be beneficial in reducing the risk of intra-abdominal spillage of rectal contents or of dehiscence of the stapled rectal stump.

LAPAROSCOPY

Experience with laparoscopic-assisted approaches has demonstrated that abdominal colectomy can be performed safely in patients suffering from ulcerative colitis using these minimally invasive approaches. Mobilization of the colon and division of the mesentery can be accomplished laparoscopically with the specimen being removed through a small Pfannenstiel incision [see Figure 6]. An end ileostomy is also fashioned with the aid of inspection through the Pfannenstiel incision. Alternatively, the Pfannenstiel incision can be made early on in the procedure and used as a hand assist port and the colon removed using a hand-assisted laparoscopic approach. The clinical advantages of a laparoscopic-assisted approach in the management of fulminate ulcerative colitis have not been fully defined. However, increasing experience with this approach indicates that laparoscopic-assisted colectomy is a safe and reasonable alternative that may well result in shorter hospital stays, decreased postoperative pain, decreased complication rates, and possible reduced adhesions. The laparoscopic-assisted approach thus appears to be a reasonable option for most patients suffering from fulminant ulcerative colitis.

Patients suffering from toxic megacolon, however, should be managed with an open surgical approach as the laparoscopic instruments used to grasp the bowel are likely to cause perforation in the severely thinned walls of the dilated colon.

Summary

The optimal management of fulminate ulcerative colitis is challenging. Most patients will respond to medical therapy such that long-term control of disease can be achieved or at least surgery can be undertaken at later, safer, elective conditions. Surgical strategies must be tailored to account for each individual patient’s overall physical condition, with most patients who fail medical therapy requiring an abdominal colectomy as the first step in a staged surgical approach.

Financial Disclosures: None Reported
References


41. Oresland I, Palmblad S, Ellström M, et al. Gynaecological and sexual function related to anatomical changes in the female pelvis after...