Ulcerative colitis (UC) was first described in the 1800s by Samuel Wilks. Along with Crohn disease, it falls under the category of idiopathic inflammatory bowel disease (IBD). Ulcerative colitis is characterized by continuous colonic mucosal inflammation that extends proximally from the rectum. It is a chronic disease that typically presents in the second or third decade of life with bloody diarrhea and abdominal cramps. The natural history of the disease is one of periods of remission and flares. Although the disease can be cured with total proctocolectomy, medical therapies are the mainstay of treatment.

**EPIDEMIOLOGY**

Worldwide, UC is more common than Crohn disease. Both diseases are more common in the industrialized world, particularly North America and Western Europe, although the incidence is increasing in Asia. The overall incidence is reported as 1.2 to 20.3 cases per 100,000 persons per year, with a prevalence of 7.6 to 245 cases per 100,000 per year. The exact pathogenesis of UC is unknown, although there are a number of genetic and environmental factors that have been found to increase the risk of the disease.

**RISK FACTORS**

Risk factors for the development of UC appear to be related to alterations of the gut microbiome or disruption in the intestinal mucosa.

**MEDICATIONS AND INFECTIONS**

Gastrointestinal infections, nonsteroidal anti-inflammatory drugs, and antibiotics have all been implicated in the development of IBD. The association between enteric infection and development of IBD has been seen most commonly within 1 year of illness with *Salmonella* or *Campylobacter*. One recent study that used the Nurses Health Registry found that women who used nonsteroidal anti-inflammatory drugs for at least 15 days were at an increased risk of developing IBD. Those women taking higher doses of nonsteroidal anti-inflammatory drugs for a longer time were at the highest risk of IBD. Antibiotic exposure, particularly to tetracyclines, is also associated with a higher risk of UC. Other risk factors may include hormone replacement therapy and oral contraceptives. Although isotretinoin...
Ulcerative colitis is a chronic condition characterized by continuous mucosal inflammation that starts in the rectum and extends proximally.

Natural history of the disease is one of remission and episodic flares.

Typical symptoms include bloody diarrhea, abdominal pain, urgency, and tenesmus.

Diagnosis is made in the right clinical setting via endoscopic evaluation and confirmation on pathologic specimens.

Treatment is determined on the basis of severity of symptoms and is classically a step-up model starting with 5-aminosalicylates and corticosteroids as needed for inducing remission, followed by steroid-sparing agents with thiopurines, anti-tumor necrosis agents, or adhesion molecule inhibitors.

Primary care physicians are critical in optimizing the overall care of these patients and limiting potential complications.

Ulcerative colitis is more common in patients of Jewish origin compared with non-Jews and is less frequently seen in African Americans or Hispanics. Genetic risk factors are still being elucidated. HLA-DqA1 variants appear most strongly associated with UC. Other genetic pathways involve epithelial barrier function, such as CHD1 and LAMB1, and those that encode cytokines and inflammatory markers, such as TNFRSF15, TNFRSF9, IL1R2, IL8RaIRB, and IL7R.

Cigarette smoking has a protective effect against UC, and cessation of cigarette smoking has been associated with an increased risk of developing the disease. However, given the complications associated with cigarette smoking, patient should be counseled to stop smoking. The role of diet has been evaluated in numerous studies, but no specific diet has been consistently linked to an increased risk of UC.

FAMILY HISTORY AND GENETICS

Although family history portends an increased risk, only 10% to 25% of patients with IBD have a first-degree relative with the disease.

Ulcerative colitis is more common in patients of Jewish origin compared with non-Jews and is less frequently seen in African Americans or Hispanics. Genetic risk factors are still being elucidated. HLA-DqA1 variants appear most strongly associated with UC. Other genetic pathways involve epithelial barrier function, such as CHD1 and LAMB1, and those that encode cytokines and inflammatory markers, such as TNFRSF15, TNFRSF9, IL1R2, IL8RaIRB, and IL7R.

MISCELLANEOUS

Cigarette smoking has a protective effect against UC, and cessation of cigarette smoking has been associated with an increased risk of developing the disease. However, given the complications associated with cigarette smoking, patient should be counseled to stop smoking. The role of diet has been evaluated in numerous studies, but no specific diet has been consistently linked to an increased risk of UC.

SIGN AND SYMPTOMS

Classically, UC presents with bloody diarrhea, abdominal pain, urgency, and tenesmus. Rarely, patients may present with weight loss or other systemic symptoms, such as a low-grade fever. The disease typically starts gradually and progresses for several weeks.

EXTRAINTESTINAL MANIFESTATIONS OF DISEASE

Ulcerative colitis is associated with a number of extraintestinal manifestations that can primarily affect the skin, joints, eyes, and liver. Erythema nodosum and pyoderma gangrenosum are the 2 most common immunologic skin lesions. Erythema nodosum follows the activity of the luminal disease, whereas pyoderma gangrenosum is more often independent. Arthritis is the most common extraintestinal manifestation and can be peripheral or axial. The peripheral arthropathies can be subdivided into type 1 and type 2 arthritis. Type 1 is acute, is pauciarticular (<6 joints), and usually flares with the colitis. This type of arthritis is most often self-limited. Type 2 is more chronic and involves more than 6 joints, especially the metacarpophalangeal joints. The symptoms are often migratory, with synovitis that lasts for months. In addition, colitis-associated arthritis is different from rheumatoid arthritis and osteoarthritis in that it is seronegative and nonerosive. It is usually worse in the morning and improves throughout the day. Axial arthritis includes ankylosing spondylitis and sacroiliitis. These conditions can be very debilitating and result in limited spinal flexion. The symptoms are usually stiffness and pain that are relieved with exercise.

Primary sclerosing cholangitis is also associated with UC. Primary sclerosing cholangitis is slightly more common in males and those with more extensive colonic involvement. It can be a progressive disease, resulting in portal hypertension and cirrhosis, and is a risk factor for cholangiocarcinoma and colon cancer. Its course does not parallel that of the luminal disease. Multiple other conditions have also been associated with UC, including uveitis, scleritis, optic neuritis, osteoporosis, psoriasis, depression, Sweet syndrome, aphthous stomatitis,
primary biliary cirrhosis, autoimmune hepatitis, pancreatitis, myopathy, and impaired growth in children.¹⁹-²²

SEVERITY AND LOCATION OF DISEASE

The severity of UC can be characterized as mild, moderate, severe, or fulminant.²,¹⁸,²⁷,²⁸ Mild disease consists of fewer than 4 stools per day (with or without blood) without systemic signs of toxic effects and normal inflammatory markers. Moderate disease is defined as 4 or more bloody stools per day with minimal signs of toxic effects. Severe disease is classified as more than 6 bloody stools per day with evidence of systemic toxic effects, including fevers, tachycardia, anemia, or elevated inflammatory markers. Fulminant disease is characterized by having more than 10 bloody bowel movements and clinical signs of toxic effects, including abdominal distention, blood transfusion requirements, and colonic dilation on imaging.²,¹⁸,²⁷ In addition, UC can be categorized on the basis of the extent of the disease: proctitis (limited to rectum), proctosigmoiditis (rectum and sigmoid colon), left sided (does not extend beyond splenic flexure), or extensive colitis (beyond the splenic flexure).²,¹⁸,²⁷

DIAGNOSIS

The diagnosis of UC is made on the basis of the typical symptoms and endoscopic evidence of continuous colonic inflammation, which almost always begins in the rectum. In some cases of proctitis, proctosigmoiditis, or left-sided colitis, an area of isolated inflammation may be present in the cecum (often around the appendiceal orifice), which is termed a cecal patch. This “skip area” does not change the diagnosis to Crohn disease.²⁹ Biopsy specimens are confirmatory, rather than diagnostic, and typically reveal chronic active colitis (Figure, A-E). Histologically, the disease is limited to the mucosal layers, with varying degrees of infiltrates from lymphocytes, plasma cells, and granulocytes. Other histologic findings include distortion of the crypt architecture with shortening and disarray of the crypts, crypt atrophy, crypt abscesses, and crypt branching. In addition, the presence of Paneth cell metaplasia is indicative of a chronic inflammatory process.²⁹,³⁰ It is critical to exclude other possible causes of colitis, including infection.²,¹⁸,³¹ Many studies have evaluated the utility of serologic markers in the diagnosis of UC,³²,³³ but no serologic marker or panel of markers alone are sensitive or specific enough to establish a diagnosis of UC.

LABORATORY TESTING

Stool studies should always be obtained to rule out other causes of diarrhea.²,¹⁸,²⁷ Laboratory abnormalities are more common with increasing severity and extent of disease.³⁴ Inflammatory markers, including erythrocyte sedimentation rate and/or C-reactive protein, may be elevated, but normal levels do not rule out disease activity.³⁴ Other tests, including fecal calprotectin or fecal lactoferrin, may be more sensitive and specific markers of intestinal inflammation.³⁵ However, none of these tests are specific for IBD, and results can be elevated with intestinal inflammation or infection of any cause.²⁷,³⁴

TREATMENT

The severity of disease and patient preference dictate the appropriate treatment options.²,¹⁸,²⁷ The initial treatment strategy in UC typically follows the traditional step-up approach. For definitions of severity of disease, see the section on severity and location of disease. In cases of mild to moderate disease, 5-aminosalycilates (5-ASAs) are the treatment of choice. 5-ASAs can be administered orally, rectally, or in combination. The combination of oral and rectal 5-ASA is most effective.³⁶ When symptoms persist despite therapy, remission may be induced with corticosteroids followed by transitioning patients to steroid-sparing agents, typically a thiopurine and/or an anti–tumor necrosis factor (TNF).³⁷,³⁸ Patients who present with moderate to severe symptoms are likewise often treated with corticosteroids to induce remission followed by a thiopurine to maintain remission. Anti-TNF therapies can be used to induce and maintain remission in those patients who have a contraindication to corticosteroids, in those in whom oral corticosteroid therapy is failing, in those in whom thiopurine therapy has failed, or in lieu of thiopurines. Recent data suggest that the combination of infliximab and azathioprine is more effective than either agent alone.³⁹ In May 2014 vedolizumab was approved to treat moderate to severe ulcerative colitis (UC) once standard therapy (prednisone, thiopurine, or anti-TNF) has failed. However, it is too early to know where it will be used in the treatment paradigm. Early, it is likely to be used for patients...
with a primary or secondary loss of response or intolerance to anti-TNF. Patients with severe-fulminant colitis require hospitalization for close monitoring and treatment with intravenous (IV) steroids. Similarly, patients who continue to have moderate to severe symptoms despite treatment with oral prednisone should be hospitalized for a trial of IV steroids.\textsuperscript{27,41} Most hospitalized patients will respond to IV corticosteroids.\textsuperscript{42} For the one-third of patients who do not respond, options include rescue therapy with infliximab, IV cyclosporine, or surgery.

**FIGURE.** A, Transverse computed tomogram of the abdomen showing slight indistinctness of the serosa predominantly along the mesenteric side of the cecum and descending colon consistent with active colitis. B, Coronal computed tomogram of the abdomen and pelvis showing pan-colonic mural thickening (black arrow) of colon filled with oral contrast. C, Sigmoid colon with erythema, friability, edema, scattered erosions, and exudates. D, Rectosigmoid biopsy specimen shows basal lymphoplasmacytosis, Paneth cell metaplasia, and crypt architectural distortion with crypt shortening and branching, as well as reduced number of crypts, indicating a chronic component to the colitis. In addition, scattered neutrophils are present within the crypt epithelium, indicating an active component to the colitis. E, High-powered view showing crypt neutrophils.
The goal of medical therapy is to induce and maintain clinical remission, prevent complications, and improve the patient’s quality of life. Recently, there has been much interest in achieving both clinical and endoscopic remission (deep remission). There is some exciting but preliminary data to suggest that endoscopic healing is associated with a decreased risk of flare and colectomy. There may also be a lesser risk of colorectal cancer if the colonic inflammation is fully controlled. These data are mostly indirect, and currently achieving a steroid-free clinical remission remains the standard of care. However, the ultimate goal would be to definitively alter the natural history of disease. For typical medication doses, complications, and screening recommendations, see the Table.

5-AMINOSALICYLATES
The typical initial treatment for mild to moderate disease is a 5-ASA, which can be administered orally or topically in the form of suppositories or enemas. When the disease is limited to left-sided colon, topical therapy with enemas and/or suppositories is very effective in inducing remission in upward of 90% of cases and highly effective at maintaining remission. However, many patients prefer oral 5-ASA over the topical formulations for ease of administration. In patients with more extensive disease, oral 5-ASAs are used for induction and maintenance of remission. Even for extensive disease, the overall efficacy is further improved when topical a 5-ASA is added to oral therapy. Multiple formulations of oral 5-ASA exist that deliver the medication to the colon via various mechanisms. Symptoms usually improve within 2 to 4 weeks of initiation. Once induction of remission is accomplished, 5-ASA should be continued to maintain remission. In rare (<5%) cases, patients may develop a paradoxical reaction to 5-ASAs, resulting in increased diarrhea. In such cases, use of the drug should be discontinued, and a different class of drugs should be used. If 5-ASAs fail to maintain remission or if a patient is unable to taper off steroids, escalation of therapy to a thiopurine or anti-TNF agent should be discussed.

CORTICOSTEROIDS
Steroids are effective in inducing remission but are not acceptable as a means to maintain remission. If the disease is limited to proctitis or proctosigmoiditis, steroid enemas can be effective in improving symptoms. For mild to moderate flares of disease, a colonic release formulation of budesonide (Budesonide MMX) was recently approved and is associated with minimal systemic absorption and fewer adverse effects. Systemic corticosteroids, typically prednisone, are required for more significant flares of disease. If symptoms fail to respond to oral corticosteroids, then anti-TNF therapy or hospitalization for IV steroids is warranted. The IV steroids are effective in inducing remission in up to 70% of patients. However, steroids are associated with significant complications and are not used to maintain remission. Any patient who is treated with steroids should be bridged to a medication proven to maintain remission.

THIOPURINES
Thiopurines (azathioprine and mercaptopurine) have been found to be effective in maintaining remission. A meta-analysis revealed that when compared with placebo, the number needed to treat to maintain remission was 5 patients. A more recent review noted a benefit in maintaining remission in quiescent disease but not in inducing remission. This may be due to their slow onset of action, which is typically 6 to 12 weeks. Typically, steroids are used to induce remission with bridging to a thiopurine to maintain remission.

Before initiating therapy, thiopurine methyltransferase enzymatic activity should be assessed to determine how well the patient will metabolize the drug. The usual starting dose of mercaptopurine is 1 to 1.5 mg/kg, whereas azathioprine is 2 to 2.5 mg/kg. If a patient has intermediate thiopurine methyltransferase enzymatic activity, then the initial dose should be lower by 25% to 50% to avoid toxicity. For the 0.3% of the population who lack thiopurine methyltransferase activity, thiopurines should be avoided. If there is a question of adherence, a patient fails to respond, or a patient has signs of toxic effects (low white blood cell count or elevated liver test results), thiopurine metabolites can be assessed.

ANTI-TNF AGENTS
Anti-TNF agents are effective alone or in combination with thiopurines in inducing and maintaining remission. Currently, 3 anti-TNF agents
are approved by the Food and Drug Administration for the treatment of moderate to severe UC: infliximab, adalimumab, and golimumab.\(^5\)\(^9\)\(^6\)\(^3\) Infliximab is a chimeric anti-TNF antibody that is administered intravenously. Both adalimumab and golimumab are fully humanized anti-TNF antibodies that are administered by self-injection subcutaneously. The 3 anti-TNF agents appear to have similar efficacy and safety profiles.\(^2\)\(^9\)\(^6\)\(^4\) One meta-analysis suggests that infliximab may be better at inducing remission than adalimumab.\(^6\)\(^5\) Another meta-analysis indicates that in patients with moderate to severe UC, the number needed to treat to achieve remission with an anti-TNF is 4.\(^4\)\(^9\)\(^5\)

Before starting anti-TNF therapy, patients must undergo testing to rule out latent tuberculosis and chronic hepatitis B infection.\(^6\)\(^7\) If either is detected, referral to a specialist is recommended before starting anti-TNF therapy. There have not been any head-to-head comparison trials of the 3 anti-TNF agents; therefore, physician preference, patient preference, and insurance company approval usually dictate which anti-TNF agent is used. An initial effect of the drug may be seen within days after the first dose (ie, infliximab) but may take 6 to 12 weeks to see a full effect. If symptoms develop or recur during anti-TNF treatment, infliximab and adalimumab drug concentrations and antibodies to the drug can be checked.\(^6\)\(^8\) This approach has been reported to be more cost-effective than empiric dose escalation. To minimize this risk of antibody development, anti-TNF combination therapy with a thiopurine is advocated by some.\(^6\)\(^1\)\(^6\)\(^2\) Thiopurines are effective in increasing the anti-TNF drug level and decreasing the risk of antibody development.\(^4\)\(^0\)\(^6\)\(^9\) In addition, the combination of infliximab and thiopurines has been found to improve steroid-free clinical remission and mucosal healing.\(^6\)\(^0\)

**CALCINEURIN INHIBITORS**

Cyclosporine is no longer routinely used to treat UC. The oral formulation is not an effective long-term maintenance option and requires close monitoring for toxic effects. It has proven to be effective in patients hospitalized with a severe flare of UC in whom IV corticosteroids have failed.\(^7\)\(^0\)\(^7\)\(^1\) However, infliximab was recently found to be as effective as cyclosporine in this setting and has become the preferred agent.\(^7\)\(^2\)

Tacrolimus is rarely used because studies have been equivocal regarding its efficacy in UC. It may have a role in achieving clinical remission in hospitalized patients with severe colitis, but its efficacy in maintaining remission or avoiding surgery is limited.\(^7\)\(^3\)\(^7\)\(^4\)

**SELECTIVE ADHESION MOLECULE INHIBITORS**

In May 2014, the Food and Drug Administration approved vedolizumab, the first selective adhesion molecule inhibitor for use in moderate to severe UC when the standard therapy has failed. Vedolizumab is a humanized monoclonal antibody that inhibits adhesion molecule \(\alpha_4\beta_7\)-heterodimer, blocks leukocyte migration and resultant gut inflammation, and has been found to be effective in inducing and maintaining remission in moderate to severe UC.\(^7\)\(^3\)\(^7\)\(^6\) A similar agent, natalizumab, used in the treatment of Crohn disease and multiple sclerosis, blocks the \(\alpha_4\)-integrin and carries a rare risk of progressive multifocal leukoencephalopathy, a viral brain infection that results in severe disability and death. In phase 1 to 3 studies, no cases of progressive multifocal leukoencephalopathy have been reported with vedolizumab.\(^7\)\(^5\) In addition, there did not appear to be an increased risk of serious adverse events or serious infections with vedolizumab. Early, this drug is likely to be used in patients who are primary or secondary nonresponders to anti-TNF therapy.\(^7\)\(^5\)

**PROBIOTICS**

VSL-3 has been evaluated in a number of studies. It appears to be efficacious in inducing remission in mild to moderate disease. However, data on its use as maintenance therapy are poor.\(^7\)\(^7\)\(^7\)\(^8\) The data on other probiotics are quite limited.\(^7\)\(^9\)\(^8\)\(^0\)

**SURGERY**

Surgery is indicated in patients with toxic megacolon, perforation, uncontrollable hemorrhage, failed medical therapy (or corticosteroid dependence), or colonic dysplasia or cancer. Approximately 10% to 15% of patients will require surgical management of their disease.\(^2\)\(^7\)\(^7\)\(^1\) The recommended surgery in the acute setting of severe-fulminant UC is total colectomy with a Hartman pouch. This can later be converted to a total proctocolectomy with end-ileostomy or ileal pouch—anal anastomosis. Most patients...
<table>
<thead>
<tr>
<th>Drug Type</th>
<th>Drug Name</th>
<th>Available Routes</th>
<th>Efficacy</th>
<th>Induction Dose</th>
<th>Maintenance Dose</th>
<th>Routine Testing Recommended</th>
<th>Adverse Events to Be Aware of (Not All Inclusive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Adenosylmethionine</td>
<td>Mesalamine Balsalazide Sulfasalazine</td>
<td>Oral Rectal</td>
<td>Induction and maintenance</td>
<td>Mesalamine: 2-4.8 g (oral) Mesalamine: 4 g (enema) Mesalamine: 1 g (suppository) Balsalazide: 6.75 g Sulfasalazine: 2-4 g</td>
<td>Mesalamine: 1.6-2.4 g (enema) Mesalamine: 1 g (suppository) Balsalazide: 6.75 g Sulfasalazine: 2-4 g</td>
<td>BUN, positive or negative Cr result, urinalysis, CBC, LFTs&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Headache, nausea, diarrhea, paradoxical worsening of symptoms, interstitial nephritis, hemolytic anemia,&lt;sup&gt;b&lt;/sup&gt; leukopenia,&lt;sup&gt;b&lt;/sup&gt; and hepatitis&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Prednisone Budesonide Methylprednisolone</td>
<td>Oral Rectal IV</td>
<td>Induction only</td>
<td>Prednisone: 40-60 mg Budesonide: 9 mg Methylprednisolone: 40-60 mg total daily dose</td>
<td></td>
<td>Consider checking hemoglobin A1c and vitamin D If prolonged steroids: DEXA scan and ophthalmology evaluation</td>
<td>Osteopenia/porosis, avascular necrosis, infection, weight gain, insomnia, mood changes, delirium, cataracts, glaucoma, striae, delayed wound healing, adrenal insufficiency</td>
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<tr>
<td>Thiopurines</td>
<td>Azathioprine Mercaptopurine</td>
<td>Oral</td>
<td>Induction and maintenance&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Azathioprine: 2-2.5 g/kg Mercaptopurine: 1-1.5 g/kg</td>
<td>Azathioprine: 2-2.5 g/kg Mercaptopurine: 1-1.5 g/kg</td>
<td>TPMT before initiation CBC, LFTs Skin examinations Yearly Pap smear</td>
<td>Nausea, vomiting, hepatitis, bone marrow suppression, pancreatitis, infection, non-Hodgkin lymphoma, nonmelanoma skin cancer, abnormal Pap smear result</td>
</tr>
<tr>
<td>Anti-TNF</td>
<td>Infliximab Adalimumab Golimumab</td>
<td>IV Subcutaneous</td>
<td>Induction and maintenance</td>
<td>Infliximab: 5 mg/kg every 8 weeks Adalimumab: 40 mg every 2 weeks Golimumab: 100 mg every 4 weeks</td>
<td>Latent TB and hepatitis B before initiation CBC, LFTs Skin examinations</td>
<td>Infusion/injection site reaction, infection, non-Hodgkin lymphoma (combination with thiopurine) HSTC-L (combination with thiopurine), melanoma, reactivation of latent TB and hepatitis B, drug-induced lupus, demyelinating disease, psoriasisiform reactions, worsening of CHF</td>
<td></td>
</tr>
<tr>
<td>Calcineurin inhibitor</td>
<td>Cyclosporine Tacrolimus</td>
<td>IV Oral</td>
<td>Induction only</td>
<td>Cyclosporine: 2-4 mg/kg daily (dose to trough level, 200-400 ng/mL) Tacrolimus: 0.2 mg/kg (dose to trough level, 10-15 ng/mL)</td>
<td>Magnesium and total cholesterol before initiation Cyclosporine/tacrolimus levels, CBC, BUN, Cr, LFTs</td>
<td>Hypertension, hypertrichosis, nephrotoxicity, hyperkalemia, infection, lymphoma, skin cancer, hepatitis, seizures, diabetes mellitus&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Adhesion molecule inhibitor</td>
<td>Vedolizumab</td>
<td>IV</td>
<td>Induction and maintenance</td>
<td>300 mg weeks 0, 2, and 6 300 mg every 8 weeks</td>
<td>CBC</td>
<td>Infusion reactions, infection (nasopharyngeal)</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>BUN = blood urea nitrogen; CBC = complete blood cell count; CHF = congestive heart failure; Cr = creatinine; DEXA = dual-energy x-ray absorptiometry; HSTC-L = hepatosplenic T-cell lymphoma; IV = intravenous; LFT = liver function test; Pap = Papanicolaou; TB = tuberculosis; TPMT = thiopurine methyltransferase.

<sup>b</sup>Sulfasalazine only.

<sup>c</sup>Slow onset of action.

<sup>d</sup>Tacrolimus.
prefer the ileal pouch—anal anastomosis because it maintains the flow of stool through the anus and avoids a permanent ostomy.  

Overall, the procedure is well tolerated in most individuals. However, approximately 50% of patients will develop an episode of pouchitis, and 10% to 15% will develop chronic pouchitis. Typically, patients with an ileal pouch—anal anastomosis will have 4 to 6 bowel movements during the day and 1 to 2 bowel movements overnight. The number of bowel movements can often be reduced with the use of loperamide and fiber wafers.

**DISEASE COMPLICATIONS**

Ulcerative colitis is associated with an increased risk of colorectal cancer. Colorectal cancer is increased in patients with left-sided and extensive disease. In contrast, patients with proctitis and proctosigmoiditis do not have significantly higher rates of colorectal cancer compared with the general population. Therefore, these patients do not require any heightened screening for colorectal cancer. The classically reported incidence of colorectal cancer is 5% to 10% at 20 years and 12% to 30% after 30 to 35 years of disease. More recent studies, however, have indicated that the risk may be substantially lower and more similar to the general population risk. Multiple factors have been found to increase the risk of colorectal cancer in UC, the most significant of which is primary sclerosing cholangitis. In addition, the diagnosis of UC before the age of 15 years, duration of disease, and extent of colitis raise the risk of developing colorectal cancer. Similarly, a family history of colorectal cancer increases the risk an additional 2- to 3-fold. Other risk factors include numerous pseudopolyps, ongoing inflammation, male sex, shortened colon, and strictures.

Current guidelines from the American Gastroenterological Association recommend initiating screening for all patients with UC starting 8 years after diagnosis. Subsequent screening colonoscopy is recommended for those patients with at least left-sided disease (one-third of colon) every 1 to 3 years with segmental biopsies throughout the colon. The interval is determined by the risk factors for colorectal cancer described above. In particular, patients with concomitant primary sclerosing cholangitis should undergo yearly colonoscopies from the time of diagnosis. Some experts advocate using chromoendoscopy, which involves spraying the colon mucosa with indigo carmine or methylene blue. Chromoendoscopy has been reported in multiple studies to be more effective at detecting dysplasia than white-light colonoscopy with random biopsies.

**QUALITY MEASURES IN UC AND THE ROLE OF THE PRIMARY CARE PHYSICIAN**

Ulcerative colitis can be associated with significant morbidity, and the medications used to treat the disease may also cause significant complications. Primary care physicians are critical in optimizing the overall care of these patients and limiting potential complications. In 2011, the American Gastroenterological Association developed a list of 10 quality measures to improve the care of patients with IBD. Measures that are applicable to all primary care physicians caring for patients with IBD include the following: screening for tobacco abuse and counseling patients to quit if they are smoking, yearly influenza vaccination, and pneumococcal vaccination. In addition, any patient exposed to the equivalent of prednisone of 10 mg/d or more for 60 days or more should be assessed for bone loss with a bone density scan. Aside from these quality measures, in our practice, we advise our patients to discuss with their primary care physician their immunizations status for tetanus, diphtheria, acellular pertussis, human papillomavirus, varicella, zoster vaccination after 50 years of age (for those not taking prednisone, immunomodulators, or biologics), and hepatitis A vaccination. In addition, patients taking thiopurines or anti-TNF agents should see a dermatologist yearly given the increased risks of skin cancer. Recent data have also suggested that optimizing vitamin D levels may be beneficial in preventing flares and cancer.

**CONCLUSION**

Ulcerative colitis is a chronic inflammatory disease that is typically medically managed, although 10% to 15% of patients will require a colectomy. The goals of care are to induce and maintain remission, reduce the risk of complications, and improve quality of life. Primary care physicians play a key role in managing these patients to reduce their risk of complications. Being aware of the preventive interventions and the potential complications...
of the pharmacotherapy is critical to optimizing the health care of patients with UC.

ACKNOWLEDGMENT

Special thanks to Dr Martin Smith for providing the computed tomographic images and to Dr Salwan Almashat for providing the pathologic images.

Abbreviations and Acronyms: 5-ASA = 5-aminosalicylate; IBD = inflammatory bowel disease; IV = intravenous; TNF = tumor necrosis factor; UC = ulcerative colitis

Potential Competing Interests: Dr Cheifetz received consulting fees or grants from the following: Abbott Laboratories, Janssen Pharmaceuticals, Warner-Chilcott, Given Imaging, Prometheus Labs, and Pfizer.

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