INTRODUCTION

As the population over age 65 has increased so has the attitude towards surgery in older patients. At least 50% of patients in most general surgical practices are over age 65. Geriatric surgery itself is fast becoming a separate specialty. Surgery in older adults commonly involves the gastrointestinal tract.

Common surgical problems involving the gastrointestinal tract in older adults include:

1. Diverticular disease
2. Gastrointestinal bleeding
3. Gastrointestinal cancer
4. Intestinal obstruction
5. Ischemic bowel disease
6. Inflammatory bowel disease
7. Appendicitis
8. Gastroesophageal reflux disease and acid peptic disease

DIVERTICULAR DISEASE

The term diverticular disease refers to a spectrum of diseases associated with colonic diverticula. Diverticulosis is the presence of diverticular disease, and can be symptomatic or asymptomatic. Diverticulitis is diverticulosis with clinical symptoms and evidence of inflammation.

There is a strong correlation between the prevalence of diverticular disease and increasing age. The incidence of diverticular disease is as high as 30% in individuals older than 50 years, and 66% in individuals over 85 years (1).

There is a difference in anatomic distribution of diverticula depending on the geographic location. In industrialized Western countries, sigmoid involvement occurs in 99% of cases, where as in Asian populations, right-sided colonic involvement is far more prevalent (2).

It has been hypothesized that diverticular disease results from a low-residue diet. Although the relationship between low dietary fiber and diverticular disease is well known, the mechanism is less clear. In general, it is believed that prolonged colonic transit time and decreased stool volume, characteristic features of a western diet, results in increased intraluminal pressure, predisposing to diverticular herniation. By LaPlace’s law, intraluminal pressure is equivalent to wall tension divided by radius (P = T/R); the sigmoid colon has the highest pressure across the colonic wall due to its smaller radius.
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Table 1
Hinchey’s grading system for perforated diverticular disease of the colon (5).

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tbody>
<tr>
<td>I</td>
<td>Confined pericolic abscess</td>
</tr>
<tr>
<td>II</td>
<td>Distant abscess (retroperitoneal and pelvic)</td>
</tr>
<tr>
<td>III</td>
<td>Generalized peritonitis caused by rupture of a pericolic or pelvic abscess, noncommunicating with the bowel lumen because of obliteration of the diverticular neck by inflammation</td>
</tr>
<tr>
<td>IV</td>
<td>Fecal peritonitis caused by free perforation of a diverticulum (communicating)</td>
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</table>

Clinical Course
More than 80% of patients with diverticulosis remain asymptomatic. Of the remaining patients about 75% present with painful diverticular disease and 25% with a wide spectrum of complications, i.e., diverticulitis, abscess, peritonitis, fistula or hemorrhage.

Symptomatic Diverticular Disease
Recurrent attacks of colicky left lower quadrant abdominal pain with or without alteration of bowel habits is the classic presentation. Because of the high prevalence of diverticular disease in the elderly, it is important that other causes of abdominal pain be considered before concluding that diverticular disease is responsible for symptoms. Diverticular disease may mimic other diseases, such as: irritable bowel syndrome, colorectal cancer, ischemic colitis, acute appendicitis and gallbladder disease.

Although traditionally, barium enema was the standard investigation in patients with symptomatic colonic disease, colonoscopy is rapidly becoming the gold standard. Given the relative safety of colonoscopy and the exponential increase in prevalence of colorectal cancer in patients older than age 70, few would argue against performing colonoscopy in elderly patients who present for the first time with painful diverticular disease (3).

Management of symptomatic diverticular disease includes pain control and dietary modification to encourage a high fiber diet (4).

Diverticulitis
Diverticulitis is the most common complication of diverticular disease and occurs in the sigmoid colon in more than 90% of patients. It is thought to develop when microperforation of one or more diverticula occurs. Hinchey et al (5) described a grading system for acute diverticulitis reflecting the degree of perforation. (Table 1). Symptoms are most commonly referable to the left lower quadrant; however the clinical presentation is variable depending on the location of the perforation and the extent of infection. One must be particularly careful not to underestimate the severity of disease on the basis of minimal symptoms or a normal laboratory evaluation. It is wise to examine these patients carefully over days so that deterioration is detected early.

Although the initial radiological studies usually are upright and supine abdominal x-ray and erect chest x-ray, the investigation of choice is Computed Tomography (CT) scanning. The sensitivity of CT is around 97% (6).

Management depends on whether the diverticulitis is complicated or uncomplicated. The uncomplicated group can be managed by bed rest, bowel rest, and broad-spectrum antibiotics. This can be on an out patient basis, if symptoms are mild, peritoneal signs are absent, and the patient is able to take oral fluids and has a supportive home network. Complicated diverticulitis generally requires surgery in addition to intravenous broad-spectrum antibiotics, i.e. cephalosporins or quinolones and metronidazole, bowel rest, and intravenous fluids.

Most patients hospitalized for acute diverticulitis respond to conservative medical therapy, but it has been estimated that 15% to 30% require surgery during the admission. Recurrent diverticulitis is less likely to respond to medical management. It is generally recommended that elective surgery be considered after the second attack. However, recently Salem and associates have suggested that it is preferable to perform colectomy after the fourth rather than the second episode (7). Immunosuppressed patients may require surgery after the first episode of diverticulitis. It is appropriate to perform colonoscopy to rule out an occult neoplasm prior to surgery.

Complications of Diverticulitis

Abscess
Clinical signs of abscess include persistent fever, leukocytosis, or a tender mass on physical examination.
Diagnosis is by CT scanning. Management is individualized. Small pericolic abscesses (stage I) can be treated by a conservative approach with antibiotics and bowel rest, whereas distant abscesses and unresolved pericolic abscesses should be drained, preferably by percutaneous (CT-guided), or transvaginal route if possible, followed by elective surgical resection.

Traditional management includes surgery either by single stage with primary anastomosis or a two-stage procedure (Hartmann), when performance of an anastomosis is not safe in the presence of severe infection. More recently, successful laparoscopic resections to treat diverticular abscesses have been described.

**Fistula**
The incidence of fistula caused by diverticulitis is approximately 10%. Colovesical fistulas are the most common variety. Symptoms include urinary frequency, dysuria, pneumaturia and fecaluria. Colovaginal fistula may be accompanied by vaginal discharge of pus or stool. Although cystoscopy and barium enema are helpful in diagnosis, CT is superior in planning subsequent surgery. Air in the urinary bladder is highly suggestive of colovesical fistula. Although a single-stage operative resection with fistula closure and primary anastomosis can be performed in approximately 75% of patients, expectant management may be the preferred alternative in an elderly patient with high operative risk.

**Obstruction**
Incidence of intestinal obstruction is around 2%. Small bowel obstruction can occur with peridiverticular adhesions from the recurrent inflammation. Recurrent attacks can lead to stricture formation from progressive fibrosis of the colonic wall. It is important in the older adults to distinguish a diverticular stricture from a neoplastic one. If malignancy cannot be excluded, surgery is the best option otherwise endoscopic dilatation techniques (balloon, bougienage etc.) can be used.

**Free Perforation**
Free perforation with generalized peritonitis, although uncommon, carries a high mortality rate (35%) and requires urgent surgical intervention.

**Diverticular Hemorrhage**
This is the most common cause of major lower gastrointestinal bleeding in the elderly. Diverticular hemorrhage is arterial, usually abrupt in onset and painless. Bleeding stops spontaneously in 70% of patients. The rate of rebleeding is 22% and the rate of recurrent bleeding after a second bleed is 50% (8).

After excluding upper gastrointestinal bleeding, anoscopy and proctoscopy help to exclude hemorrhoidal bleeding. The next step in many centers is selective mesenteric arteriography, especially when the bleeding appears profuse (at least 1mL/min). When bleeding is slow or intermittent, a technetium-99m tagged red blood cell scan is more sensitive in detecting bleeding compared to arteriography. Emergency colonoscopy after colon cleansing is also well accepted as a diagnostic and therapeutic procedure. (9).

Because spontaneous resolution is common, older patients should be managed conservatively, particularly in light of the increased risk of surgery, especially in patients with comorbid illnesses. If the site of bleeding is located by either arteriography or tagged cell scanning, interventional radiologic techniques, such as transcatheter superselective embolization with coils or absorbable gelatin sponge (Gel foam), or intra-arterial infusion of vasopressin can be used to control bleeding.

Surgery is usually reserved for failure of medical, endoscopic, or angiographic therapies. Segmental colonic resection is performed most commonly if the bleeding site is known. Subtotal colectomy with ileorectal anastomosis is an option if the bleeding site is not identified by angiography or endoscopy.

**GASTROINTESTINAL BLEEDING**
Gastrointestinal bleeding in the elderly is associated with a higher rate of morbidity and mortality than in the young. The topic will be discussed in detail in another article in this series by Trivedi, et al.

**Upper Gastrointestinal Bleeding**
More than half of all cases of acute upper gastrointestinal bleeding in patients older than age 60 result from peptic ulcer disease. The presentation is hematemesis (50%), a combination of hematemesis
and melena (20%) or melena alone (30%) (10). The clinical presentation is often clouded by impaired visual and cognitive ability in the elderly; hematemesis and hemoptysis are often confused with each other (Table 2).

Older patients with gastrointestinal bleeding experience substantially more morbidity than younger patients, including cardiac, neurologic and renal complications, sepsis, and adverse effects from medications and transfusions. There is also a slightly increased risk of rebleeding in the elderly.

**Lower Gastrointestinal Bleeding**

In older adults lower gastrointestinal bleeding is more common than upper gastrointestinal bleeding and generally follows a less severe course compared to upper gastrointestinal bleeding. Colonic diverticula, ischemic bowel disease and inflammatory bowel disease are common causes of lower gastrointestinal bleeding; (discussed elsewhere in this manuscript).

Angiodysplasia are responsible for 3% to 12% of cases of lower gastrointestinal bleeds and are usually located in the right colon. Bleeding stops spontaneously in more than 90% of cases. (11) Colonoscopy is the most sensitive and specific way of detecting angiodysplasia as “cherry-red spots” on the mucosa and can eradicate the lesions by electrocoagulation.

NSAIDs have been implicated as a cause of non-specific colitis and in the exacerbations of idiopathic inflammatory bowel disease as well as diverticular bleeding. Infectious causes and radiation proctocolitis account for 5% to 7% of acute lower gastrointestinal bleeding whereas hemorrhoidal bleeding accounts for 2% to 9% of cases. The treatment options for hemorrhoids include surgical excision and endoscopic band ligation. Neoplasms account for nearly 10% of major lower gastrointestinal bleeding. Postpolypectomy bleeding accounts for approximately 5% of cases; the incidence has become lower with advances in endoscopic coagulation techniques.

**Management of Gastrointestinal Bleeding**

Initial evaluation of gastrointestinal bleeding comprises of focused history and identifying the cause of bleeding. After resuscitation, endoscopy is the initial method of approach for diagnosis and also for therapeutic control of bleeding. Some studies have also shown that recurrent bleeding can be controlled by repeat endoscopy, especially in high-risk patients (12).

Angiographic therapy should be reserved for patients with severe persistent bleeding in whom endoscopic hemostatic therapy is unsuccessful or unavailable and for whom surgery poses a high risk.

**Role of Surgery**

Early surgery has been recommended for older adult patients with major ulcer bleeding and endoscopic findings that imply a high risk of rebleeding, particularly active spurting, because early elective surgery has lower morbidity and mortality rates than emergent surgery (Table 3) (13,14).

Surgery is generally considered for acute lower intestinal bleeding when the blood transfusion requirement is greater than 4 units during 24 hours or bleeding recurs.

Accurate preoperative localization of bleeding is important. Blind segmental resection of the colon and
The incidence of gastrointestinal cancers increases sharply in people in their 60s and 70s representing their most common serious health problem. Diagnosis is often made at an advanced stage in the elderly, because symptoms and signs associated with cancer are often ignored or interpreted wrongly.

GASTROINTESTINAL TRACT CANCER

The incidence of gastrointestinal cancers increases sharply in people in their 60s and 70s representing their most common serious health problem. Diagnosis is often made at an advanced stage in the elderly, because symptoms and signs associated with cancer are often ignored or interpreted wrongly.

Cancer of the Esophagus

Esophageal cancer is relatively uncommon in the United States, but has a poor 5-year survival rate of 5% to 8%. It is either squamous cell carcinoma (SCC) or adenocarcinoma (AC); the elderly are more prone to develop SCC. Risk factors include cigarette smoking and alcohol abuse (Table 4). Adenocarcinoma is increasing in incidence and its association with Barrett’s metaplasia of the esophagus has received much attention. It is not clear why it is more common in caucasian male patients. Clinical presentation includes pain, dysphagia and loss of weight (Table 5).

Barium esophagogram is the initial study of choice for a patient with dysphagia (especially when you suspect tracheoesophageal fistula) for location, length of tumor and the luminal size, which help in endoscopy. Endoscopy is safe, quick, and mandatory. Four to six biopsies with or without brush cytology results in a nearly 100% diagnostic yield.

(continued on page 114)
Computerized tomography (CT) scanning and endoscopic ultrasound (EUS) are useful for staging. EUS is accurate in assessing for local extension, while CT is good for metastases.

Most patients present with advanced disease and are incurable. Early esophageal cancers without nodal involvement can be treated with surgical resection with morbidity and mortality comparable to that of younger patients. The majority are treated with palliative methods. Self-expanding metallic stents are used increasingly to relieve dysphagia and especially for tracheoesophageal fistulas. Endoscopic laser therapy (ELT) is a preferred method for restoration of lumen in short exophytic tumors while photodynamic therapy (PDT) is useful for long tumors (>10 cm) especially proximal tumors.

Nutritional assessment is a part of management, and may entail insertion of feeding tubes for adequate nutrition.

Carcinoma of the Stomach

Although rare in the US, it is the second most common cancer worldwide; the incidence peaks after age 60 with overall survival rate of 11%; 95% of cancers are adenocarcinomas. Risk factors for adenocarcinoma are listed in Table 6.

Clinical features include weight loss, epigastric pain and anorexia. Often symptoms are vague and the disease is advanced. Physical signs (palpable lymph nodes or dilated stomach) may indicate incurable disease. Sometimes, presentation may be a paraneoplastic condition such as, acanthosis nigricans (pigmented dermal lesions) and Trousseau’s syndrome (superficial venous thrombosis).

High-risk patients and older adults with symptoms referable to the stomach, in association with bleeding or anemia, should have screening gastroscopy. Gastric ulcers should be biopsied and treated with antiulcer treatment for 8 weeks, and rebiopsied if the ulcer persists to exclude malignancy. Staging is through EUS and CT.

Surgical therapy is the only therapy with curative potential. Younger patients generally have an aggressive course and survival improves with age until very late in life, when the postoperative mortality rate increases due to comorbid conditions. Palliative surgical resection is appropriate in patients with advanced disease who have obstructive symptoms, and is better than bypass or nonsurgical options in relieving symptoms (16).

Colorectal Cancer

Colorectal cancer is the second leading cause of death, with incidence rising sharply with advancing age.

Risk factors are listed in Table 7.

Annual fecal occult blood testing, digital rectal examination plus flexible sigmoidoscopy every 3–5 years for all persons older than 50 years with average risk is inadequate. The preferred procedure of choice is full colonoscopy (17).

Clinical features depend on the location of the tumor. Change in bowel habits, rectal bleeding, ane-

<table>
<thead>
<tr>
<th>Table 6</th>
<th>Risk Factors for Gastric Adenocarcinoma</th>
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<td><strong>Precursor Conditions</strong></td>
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<tr>
<td>• Helicobacter pylori infection</td>
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<tr>
<td>• Pernicious anemia</td>
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<tr>
<td>• Gastric adenomatous polyps</td>
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<tr>
<td>• Chronic atrophic gastritis</td>
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<tr>
<td>• Partial gastrectomy for benign disease</td>
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<tr>
<td><strong>Other Factors</strong></td>
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<tr>
<td>• Consumption of salted, smoked, or poorly preserved foods</td>
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<tr>
<td>• Blood type A</td>
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<tr>
<td>• Family history of gastric adenocarcinoma</td>
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<td>• Cigarette smoking</td>
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<td>• Low socioeconomic status</td>
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<table>
<thead>
<tr>
<th>Table 7</th>
<th>Risk Factors for Colorectal Cancer</th>
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<tbody>
<tr>
<td>• Age &gt;50</td>
<td></td>
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<tr>
<td>• High-fat, low-fiber diet</td>
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<tr>
<td>• Inflammatory bowel disease</td>
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<tr>
<td>– Chronic ulcerative colitis</td>
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<td>– Long-standing Crohn’s disease</td>
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<tr>
<td>• Familial adenomatous polyposis</td>
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<td>• Hereditary nonpolyposis colorectal cancer</td>
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<tr>
<td>• Peutz-Jeghers syndrome</td>
<td></td>
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<tr>
<td>• Family history of colorectal cancer</td>
<td></td>
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<tr>
<td>• Personal history of colorectal adenomas, breast, ovarian cancers</td>
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mial, weight loss and palpable abdominal mass are some manifestations.

Dukes and TNM staging methods are commonly used. Surgical resection is the initial treatment of choice and may be the only modality providing cure. Mortality in the elderly is comparable to the young (18).

Palliative resection is an option to control bleeding and to relieve obstructive symptoms. Placement of enteral stents can relieve symptoms and signs of colorectal obstruction, an option in the very elderly with comorbid conditions (19).

Age should not be the only parameter considered when addressing the treatment of a gastrointestinal malignancy. Management decisions in the elderly should follow similar principles as those in the young.

### INTESTINAL OBSTRUCTION

#### Mechanical Obstruction

Mechanical obstruction is a total or partial physical obstruction of the lumen of the small or large bowel, resulting in failure of the intestinal contents to pass distally beyond the obstruction. The agent that physically obstructs the bowel may be within its lumen, in the wall of the bowel, or outside the bowel (Table 8).

Adhesions cause about two-thirds of the episodes of small bowel obstruction, followed by hernia (about 20%), and tumor (e.g., cancer of the cecum, about 15%). Adhesions are the result of prior abdominal surgery and usually do not cause obstruction of the large intestine due to its large lumen.

Volvulus or twisting of the bowel is more likely to occur when the bowel is redundant and attached to the posterior abdominal wall with a short-based mesentery. The twist of loop at its base occludes blood supply to the bowel with resultant early ischemia. Volvulus can occur in the small intestine but in older adults usually involves the sigmoid colon and rarely cecum. Sigmoid volvulus causes a massively distended sigmoid loop, seen as a “bent inner tube sign” on plain x-ray and characteristic “bird’s-beak” appearance at the site of torsion on contrast enema. When recognized early it can be reduced by using a sigmoidoscope or colonoscope to induce untwisting of the base of the colon. If operative intervention is needed because the bowel is thought to be ischemic, resection with colostomy is the procedure of choice. Neoplastic basis should always be ruled out when an older adult presents with intestinal obstruction.

The clinical presentation is pain, vomiting, constipation, and abdominal distention. Pain is colicky in nature, usually in the mid-abdominal region. Vomiting occurs early in proximal small bowel obstruction and is late and feculent in distal small bowel and colonic obstruction. Similarly distention is pronounced if the lesion is located more distally. Constipation becomes obstipation (flatus+feces) when the contents of the bowel beyond the point of obstruction have passed and there is no further passage of flatus or feces.

Bowel ischemia and gangrene can complicate all types of intestinal obstruction and interventions should be timed to prevent this. Unrelenting abdominal pain with or without peritoneal signs is an indication for surgical intervention.

Diagnosis is made on the basis of the clinical history and physical examination. A plain radiograph of the abdomen shows characteristic findings confirming the diagnosis. It is diagnostic in gallstone ileus with visualization of gallstone and air in the biliary tree. A contrast enema using barium or Gastrografin or a CT scan with contrast will outline an obstructing tumor of the distal bowel, as well as a sigmoid or cecal volvulus and allow for planning surgery and possibly a colostomy.

Management of bowel obstruction may be entirely nonsurgical, particularly when an adhesion is the basis. Treatment includes intravenous fluids, replacement

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**Table 8**

<table>
<thead>
<tr>
<th>Causes of Small and Large Bowel Mechanical Obstruction</th>
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<tr>
<td><strong>Intraluminal</strong></td>
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<tr>
<td>• Bezoar</td>
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<td>• Foreign body</td>
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<tr>
<td>• Gallstone</td>
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<td>• Intussusception</td>
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<td>• Inspissated stool</td>
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<tr>
<td>• Meconium</td>
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<tr>
<td>• Tumor</td>
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<tr>
<td><strong>Intramural</strong></td>
</tr>
<tr>
<td>• Tumor</td>
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<td>• Inflammation</td>
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<td>• Fibrosis</td>
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<td>• Hematoma</td>
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<td>• Intussusception</td>
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<td><strong>Extramural</strong></td>
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<tr>
<td>• Hernia</td>
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<td>• Volvulus</td>
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<td>• Adhesion</td>
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electrolytes, and nasogastric tube decompression of stomach. Failure to resolve the obstruction on this regimen in a certain time frame (usually 24-48 hrs) or development of signs of ischemia is an indication for surgery. The threshold for operation in older adults should be low with earlier rather than late intervention.

**Paralytic Ileus**

Paralytic ileus is a non-motile intestine without mechanical obstruction, and involves a small segment or the whole intestine. The usual causes are postoperative, localized or generalized peritonitis, trauma and bowel ischemia. The extent of bowel paralysis is related to the amount of operative trauma to which the patient was subjected.

Paralytic ileus is differentiated from mechanical obstruction based on clinical and radiological findings, and managed by a conservative approach with intravenous fluids and nasogastric tube decompression.

**Pseudo-obstruction**

Pseudo-obstruction refers to recurrent symptoms and signs of intestinal obstruction without detectable mechanical obstruction, caused by markedly abnormal intestinal motility from smooth muscle dysfunction or uncoordinated motility. Causes include collagen diseases such as scleroderma and systemic lupus erythematoses, neurological diseases and medications; diagnosis is by exclusion of mechanical causes.

Pseudo-obstruction is characterized by (a) massive gaseous distention of the cecum and variable distention of the distal colon to a “cut-off-point”; (b) lack of fluid filled colon; (c) normal sigmoidoscopy, and barium enema, which rules out mechanical obstruction. If the diameter of the cecum is less than 12 cm, conservative therapy is indicated but persistence of the distention or cecal diameter of more than 12 cms is an absolute indication for cecostomy. Perforation must be treated by cecostomy or colectomy (20,21).

**ISCHEMIC BOWEL DISEASE**

Reduction in blood flow to the intestine may reflect inadequate systemic perfusion, as in cardiogenic shock, local structural or functional changes in the mesenteric vascular bed. The end result of ischemia is damage to the bowel ranging from completely reversible functional alterations to total hemorrhagic necrosis. Colonic ischemic, the most common manifestation of ischemic injury to the gastrointestinal tract in older adults may be broadly categorized as:

1. Acute mesenteric ischemia (AMI)
2. Chronic mesenteric ischemia (CMI) (intestinal angina)
3. Colonic ischemia (CI)

**Acute Mesenteric Ischemia**

AMI can be caused by a superior mesenteric artery embolus or thrombus; nonocclusive mesenteric ischemia, with resulting low-flow rates and associated vasoconstriction; or mesenteric venous thrombosis (MVT) (22). Superior mesenteric artery embolus is the most common cause of AMI and accounts for approximately 50% of cases.

Whatever the etiology, AMI is an intra-abdominal catastrophe almost as lethal today as it was 50 years ago, with mortality ranging from 59% to 93% in various series (22). Making a diagnosis before intestinal infraction ensues is the most important factor that improves outcome.

Early diagnosis of AMI depends on the identification of persons at risk and recognizing the disparity between the severity of abdominal pain and the absence of significant abdominal findings. Reluctance to undertake early diagnostic angiography in critically ill patients is a primary cause of the continuing high mortality rate for AMI.

Apart from severe abdominal pain with paucity of significant abdominal signs, leukocytosis of more than 15,000 cells/mm³ occurs in approximately 75% of patients with AMI; metabolic acidosis is present in half the patients. CT scanning is useful in the detection of superior mesenteric vein thrombosis but non-specific in embolic arterial occlusions.

Treatment begins with resuscitation of the patient and correction of predisposing or precipitating causes. Correction of plasma volume deficits, decompression of the gastrointestinal tract, and parenteral antibiotics are essential before radiologic studies are obtained.

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The need for angiography is controversial, but many believe that angiography is crucial in management. It is not only diagnostic in demonstrating the site and cause of occlusion, it is also therapeutic for thrombolytic therapy.

Laparotomy is performed to restore intestinal blood flow obstructed by an embolus or thrombus or to resect necrotic bowel. Assessments of bowel color, presence of pulsations, bleeding, and peristalsis are criteria for assessing tissue viability. Bowel that is clearly necrotic is resected at the time of surgery and a primary anastomosis is performed. If there is any question regarding the viability of unresected intestine, a planned re-exploration, or second-look operation, may be performed within 12 to 24 hours.

Mesenteric venous thrombosis (MVT) is relatively rare—seen in 5% to 10% of patients with AMI. It can be idiopathic (30%), or secondary to conditions like hypercoagulable state, intrabdominal sepsis (cholangitis, diverticulitis), or rarely, following abdominal trauma or splenectomy.

The presentation is vague and less acute with non-specific symptoms; abdominal pain is the commonest symptom and present in nearly 90% of patients, followed by vomiting, diarrhea and occult blood in the stool. The absence of reliable specific symptoms, signs, or laboratory studies makes the diagnosis difficult. Contrast-enhanced CT scan may show a thrombus within the superior mesenteric vein, thickening of the bowel wall, collateralization, or ascites and is useful in making the diagnosis of MVT in more than 90% of cases.

In symptomatic patients, when the diagnosis of MVT has been made by CT or angiography, treatment depends on the presence or absence of peritoneal signs. In the absence of peritoneal signs, some patients may be treated with anticoagulation, followed by clinical observation. In those with signs of peritonitis, laparotomy is indicated, and short segments of nonviable bowel are resected; surgery is followed by prompt anticoagulation. The mortality rate of MVT varies from 2% to 50%.

Chronic Mesenteric Ischemia
Chronic mesenteric ischemia (CMI), also known as intestinal angina, results from recurrent acute episodes of insufficient blood flow to the bowel during periods of increased metabolic demand associated with digestion. The pain is usually crampy in nature and occurs 10 to 15 minutes after eating, gradually increases in severity, reaches a plateau and slowly abates during 1 to 3 hours. Physical findings are limited and nonspecific; a systolic bruit is heard in the upper abdomen in approximately half of the patients.

No specific or reliable test confirms the diagnosis which is based on the typical clinical symptoms and arteriographic demonstration of an occlusive process of the splanchnic vessels as well as exclusion of other gastrointestinal diseases. In CMI, angiography shows stenosis or occlusion of at least 2 major vessels but, by itself, does not establish the diagnosis of arterial insufficiency or intestinal angina.

Surgical revascularization has been the mainstay of therapy for patients with CMI (23). Success rates are greater than 90%, with low operative mortality and recurrence rates of less than 10%. Good surgical candidates should have an attempt at surgical revascularization. Patients at higher surgical risk may be appropriate candidates for percutaneous transluminal mesenteric angioplasty with or without stenting (22).

Colonic Ischemia
Colonic ischemia (CI) is the most common ischemic disorder of the intestines in the elderly. The spectrum of CI includes reversible ischemic colonopathy, reversible ischemic colitis, ischemic colonic stricture, colonic gangrene, and fulminant ischemic colitis.

The critical issue in managing these patients is to differentiate CI from AMI (Table 9).

Differential diagnosis of CI includes infectious colitis, inflammatory bowel disease, diverticulitis, and colonic carcinoma.

Typically, CI presents with the sudden onset of mild crampy left lower quadrant abdominal pain, usually accompanied by bloody diarrhea or bright red blood per rectum. Normally, blood loss is minimal; hemodynamically significant bleeding should prompt consideration of other diagnosis, such as diverticular bleeding.

Physical examination shows mild to severe abdominal tenderness over the involved colon segment, which is usually splenic flexure, descending colon, and sigmoid colon. Persistent peritoneal signs...
indicate transmural necrosis and infarction, prompting surgical exploration.

Colonoscopy or gentle barium enemas are the investigations of choice. Over distention of the colon should be avoided. Thumbprints, or pseudotumors seen in KUB or barium enema examination are the major radiologic findings representing submucosal and mucosal hemorrhage and edema.

Management includes stabilization of the patient, optimization of cardiac function, and bowel rest. Most of the patients recover with medical management. If the abdominal examination, fever, and leukocytosis suggest deterioration or if the patient experiences diarrhea or bleeding for more than 2 weeks, irreversible damage is likely, and surgical resection is indicated.

**INFLAMMATORY BOWEL DISEASE IN THE ELDERLY**

The incidence of Crohn’s disease (CD) and ulcerative colitis (UC) in the elderly is approximately 10% to 15%. Contrary to previous reports the prognosis of inflammatory bowel disease (IBD) is favorable in these people (24).

The presentation and course of UC in older patients are similar to those in the young. Diarrhea and bleeding are the hallmarks of the disease, more likely with left-sided disease or proctitis. Elderly patients with UC have a limited extent of disease; the first attack is usually severe, and glucocorticoids are used frequently (25).

The presentation of CD is similar in both age groups. Frequency and severity of diarrhea, weight loss, and rectal bleeding are similar. Abdominal pain and cramps are less frequent; incidence of ileal disease is lower in older adults.

The diagnosis of IBD is difficult in older adults as they present with fewer abdominal symptoms and the lower index of suspicion on the part of the physician. The differential diagnosis includes gastrointestinal infection, ischemic colitis, diverticular disease, radiation enterocolitis and intestinal lymphoma.

The principles of treatment are similar. Mild flares of IBD are managed best by aminosalicylates delivered topically or orally. Aminosalicylates are the drugs of choice for maintaining remission. Severe disease requires oral glucocorticoids; 6-mercaptopurine (6-MP) and azathioprine are used less frequently in older adults (even though they are well tolerated) due to the fear of complications. Infliximab, a monoclonal antibody directed against tumor necrosis factor-alpha, is a new drug effective in inducing remission in moderate to severe CD (26).

Older adults with IBD are at increased risk for the development of osteoporosis and fractures. This should be taken into consideration when starting steroids and necessitates prophylactic calcium and vitamin supplements.

The most important predictors of adverse postoperative outcomes are the patient’s pre-existing health, coexisting medical conditions, severity of their acute attack, and need for emergent surgery (24). Age alone does not appear to be associated with increased mortality from surgery in elderly patients with IBD. Total proctocolectomy with ileal pouch-anal anastomosis has become the standard for many patients requiring definitive surgical treatment for ulcerative colitis (27). In con-

**Table 9**

<table>
<thead>
<tr>
<th>Acute Mesenteric Ischemia</th>
<th>Colonic Ischemia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute Mesenteric Ischemia</strong></td>
<td><strong>Colonic Ischemia</strong></td>
</tr>
<tr>
<td>Usual age &gt; 50 years</td>
<td>Usually &gt; 60 years</td>
</tr>
<tr>
<td>Acute precipitating cause; Myocardial infarction, CHF, cardiac arrhythmias</td>
<td>Acute precipitating cause rare</td>
</tr>
<tr>
<td>Predisposing lesion uncommon</td>
<td>Associated predisposing lesion; stricture, carcinoma in 10% of cases</td>
</tr>
<tr>
<td>Patients usually appear ill</td>
<td>Patients do not appear ill</td>
</tr>
<tr>
<td>Pain more severe; abdominal findings minimal early in course but pronounced later</td>
<td>Mild abdominal pain with tenderness and guarding usual</td>
</tr>
<tr>
<td>Rectal bleeding and diarrhea uncommon</td>
<td>Moderate rectal bleeding or bloody diarrhea common</td>
</tr>
<tr>
<td>First diagnostic procedure is plain film or CT; if negative, angiography</td>
<td>First diagnostic procedure should be gentle barium enema or colonoscopy</td>
</tr>
</tbody>
</table>
Gastrointestinal Surgery in Older Adults

GERIATRIC GASTROENTEROLOGY, SERIES #15

In contrast, in CD, the goal of surgery is to conserve bowel, as there is a high recurrence rate up to 50% within 5 years following resection. Only grossly involved bowel is resected; strictureplasty instead of resection may be performed to relieve obstruction. Ileal pouch anal anastomosis is contraindicated because of the high incidence of anal disease and recurrent bowel disease in the pouch.

In summary, 15% of all patients with IBD first develop symptoms after age 65, a pattern more likely to increase as the population gets older. In general, the broad differential diagnosis of colitis in the elderly can make a definitive diagnosis more difficult.

APPENDICITIS

The presentation of appendicitis is different in the elderly compared to the young. They usually present with minimal discomfort, less fever, and leukocytosis, explained by the depressed immune response of elderly individuals. Even though it is estimated currently that only 5% to 10% of all appendicitis occurs in the geriatric age group, the elderly account for more than 50% of deaths associated with appendicitis. Delays in presentation, diagnosis, and eventual treatment result in higher associated morbidity and mortality rates. There is also some evidence that appendiceal inflammation proceeds to perforation much more rapidly in the elderly (28). Early diagnosis and aggressive intervention is therefore important.

GASTROESOPHAGEAL REFLUX DISEASE AND ACID PEPTIC DISEASE

Gastroesophageal reflux disease (GERD) is common, affecting 35% of the elderly and increasing in prevalence with aging (29). Symptomatology can vary from occasional mild heartburn to severe chest pain, bleeding or perforation due to ulceration, or eventually carcinoma if Barrett’s esophagus develops. Elderly patients may have less severe symptoms, particularly heartburn, yet more severe mucosal disease and a higher prevalence of Barrett’s esophagus develops. Elderly adults with significant or recurrent complications of reflux esophagitis should be evaluated for surgical intervention. Surgery is reserved for severe, refractory disease or respiratory complications, such as recurrent aspiration pneumonia, laryngitis, or asthma. Only those patients who respond to a course of PPI are eligible for surgery. Lack of response indicates a disease other than GERD. Para esophageal hernia is more often an indication for surgery because of the increased complication of strangulation. Criteria for surgical intervention in esophageal disease do not change with age.

(30) Laparoscopic Nissen fundoplication is an effective antireflux procedure that carries a morbidity rate of 8% to 20% and mortality rate of less than 1%, which is comparable to that in the young (31,32,33).

The clinical picture of peptic ulcer disease has changed dramatically in the past decade. In the elderly, peptic ulcer disease is considered more serious than in the young because older adults have more risk factors for gastric and duodenal ulcers and higher complications and mortality. Most of the ulcers are a result of NSAID use and they are asymptomatic while causing profound anemia (34). Classic symptoms of peptic ulcer are frequently absent or if present, are either subtle or atypical. Even when older patients present with complications, the symptoms may be nonspecific and nonlocalizing. Physical findings associated with peritonitis, including fever and leukocytosis, may be diminished or completely absent (35). This confusing clinical picture often leads to a delay in diagnosis and perhaps contributes to the greater mortality rate of complicated peptic ulcer in the geriatric population. Concomitant diseases, such as coronary artery disease, diabetes, and chronic obstructive pulmonary disease, may manifest as vague upper abdominal symptoms, similar to peptic ulcer in the elderly. With an expanded differential, the diagnosis of peptic disease can be delayed in these patients.

The incidence of gastric ulcers and gastric erosive disease increases with age. Giant gastric ulcers are frequent in this age group and associated with the high rate of complications and mortality. Although the incidence of malignancy is low, as many as 6% of apparently benign ulcers may be malignant. Duodenal ulcers are likewise common in older men.

The approach to the diagnosis of peptic ulcer in older adults should be the same as for any disease in the elderly, high suspicion and low threshold. The diagnosis of peptic ulcer disease (PUD) is highly dependent on the use of endoscopic modalities. Numerous studies have demonstrated excellent tolerance for routine diagnostic

(continued on page 122)
endoscopy (34,36). Testing for Helicobacter pylori should be performed in any patient with endoscopic findings consistent with Helicobacter pylori, including duodenitis, duodenal ulcer, antral gastritis, and antral nodularity.

Prevention of PUD in the elderly using NSAIDS is important. The efficacy of a proton pump inhibitor is as good as misoprostol and it is advisable to prescribe a dose of proton pump inhibitor to all elderly patients on chronic NSAID use (37).

The treatment of peptic ulcer disease in the elderly is directed at gastric acid suppression to heal the ulcer; elimination of causative factors, including Helicobacter pylori (antibiotic therapy) and NSAIDS (drug discontinuation or cotherapy); and maintenance therapy depending on the cause of the ulcer. The most common complication of peptic ulcer, both gastric and duodenal, is hemorrhage, followed by perforation, both more common in the elderly than young. Complication and mortality rates in the elderly are higher as a result of atypical presentations of peptic ulcer disease, delay in diagnosis, and the presence of comorbid conditions.

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