DIVERTICULAR DISEASE

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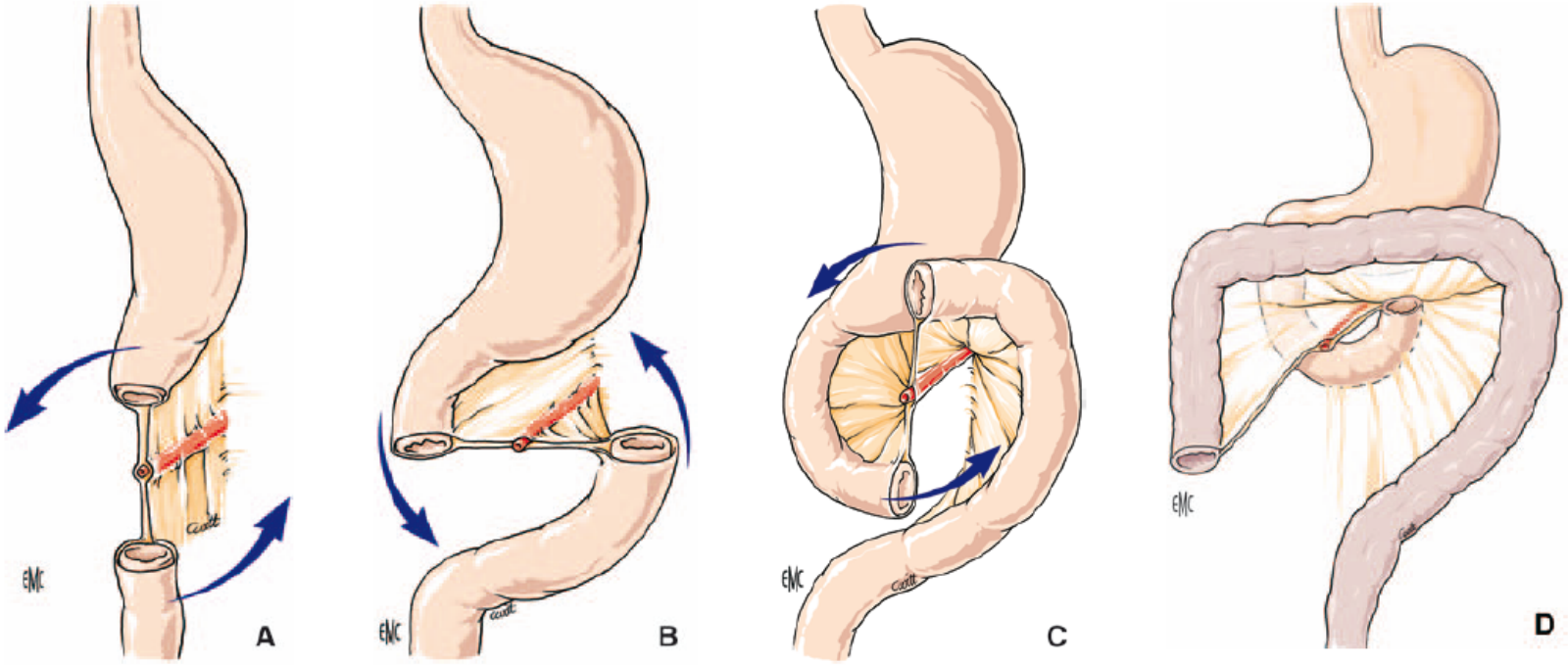
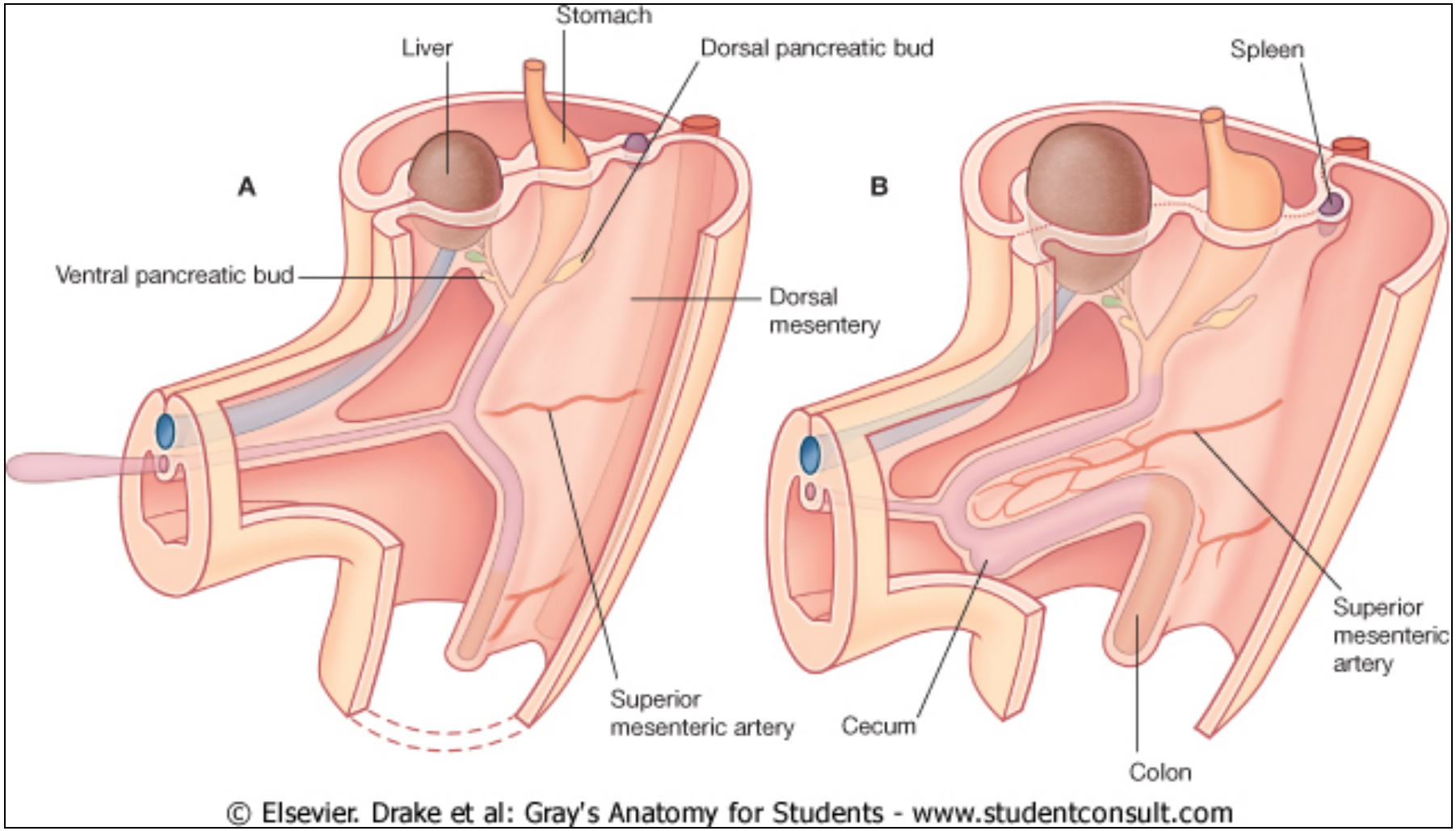
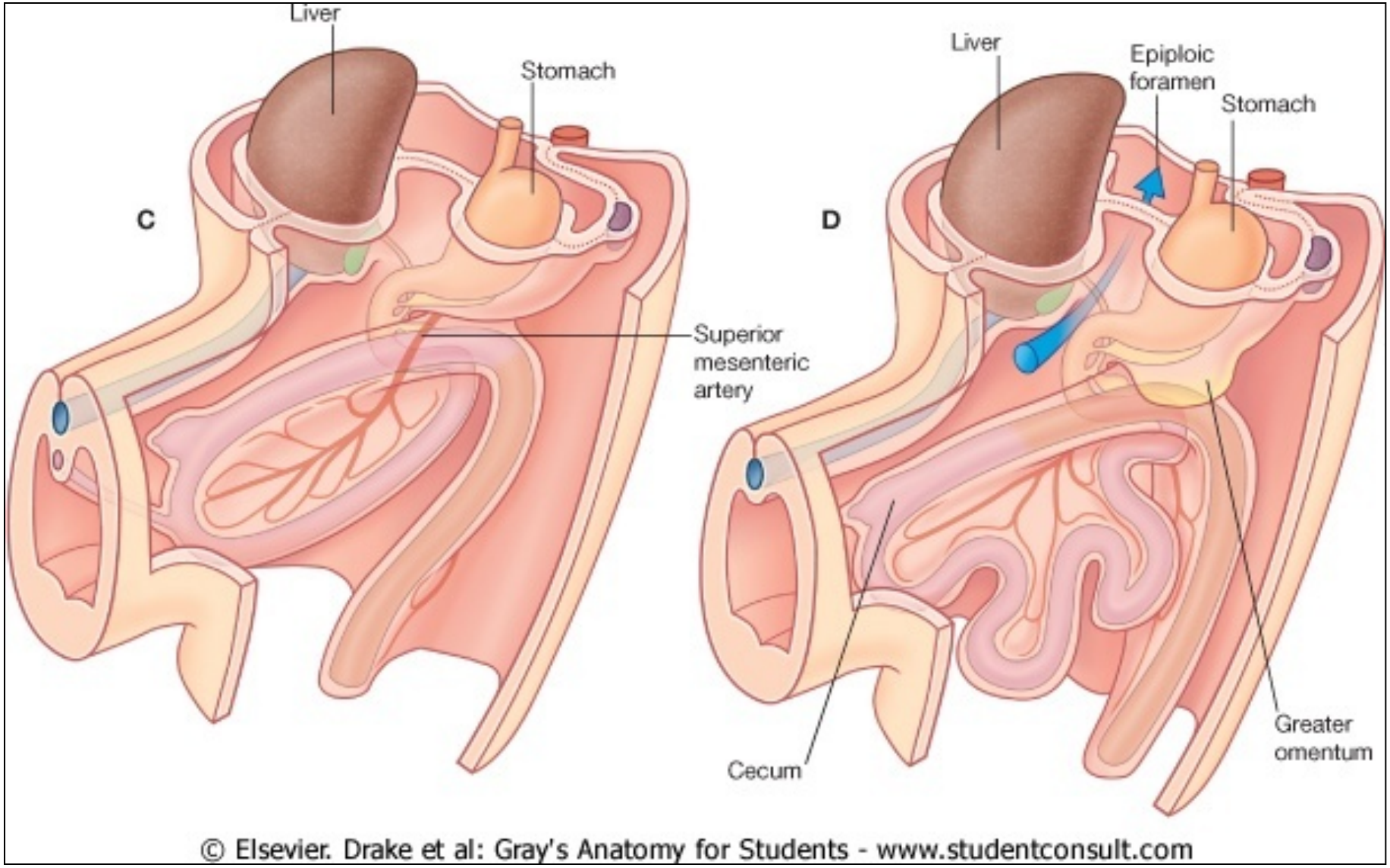
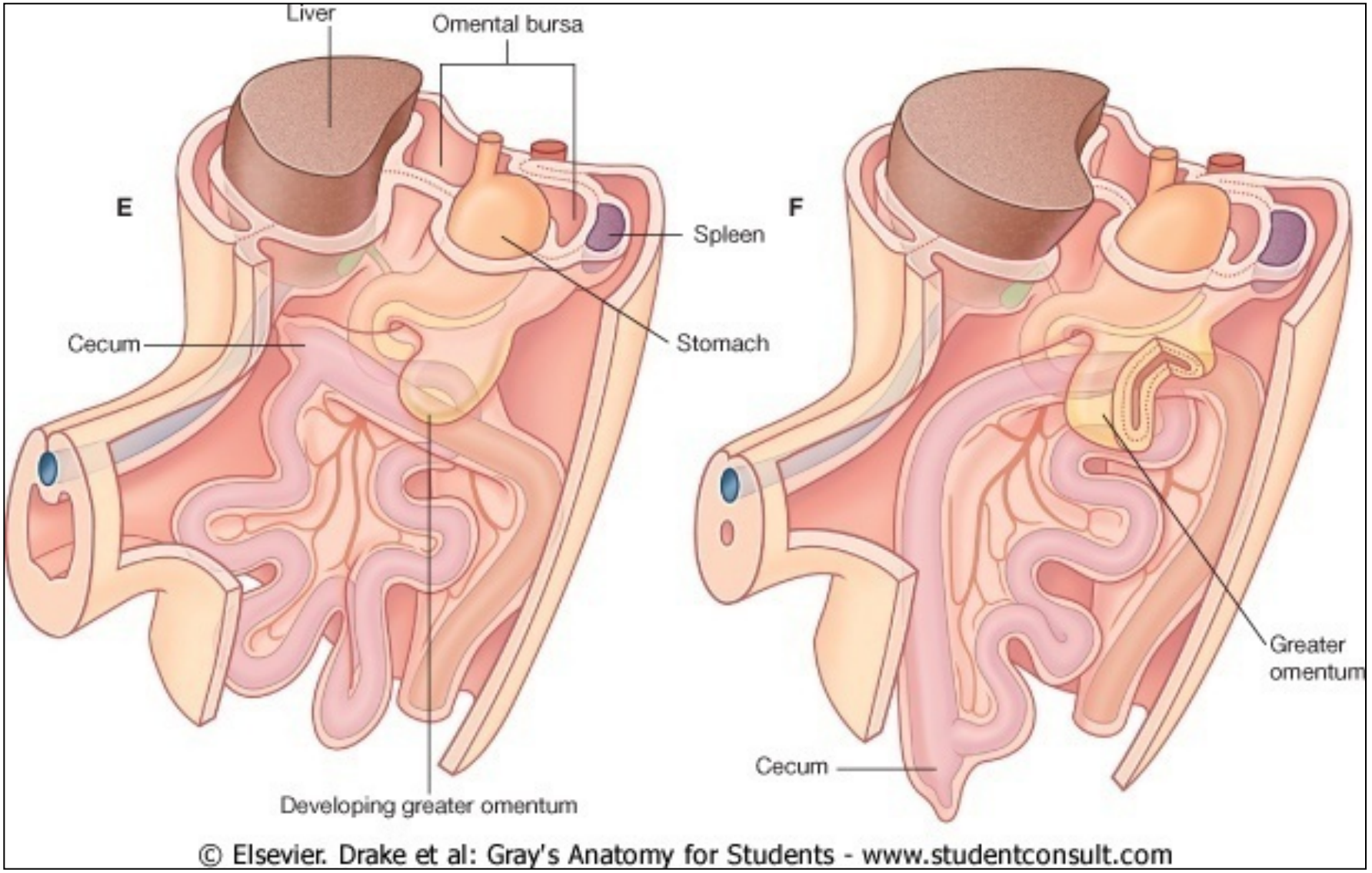
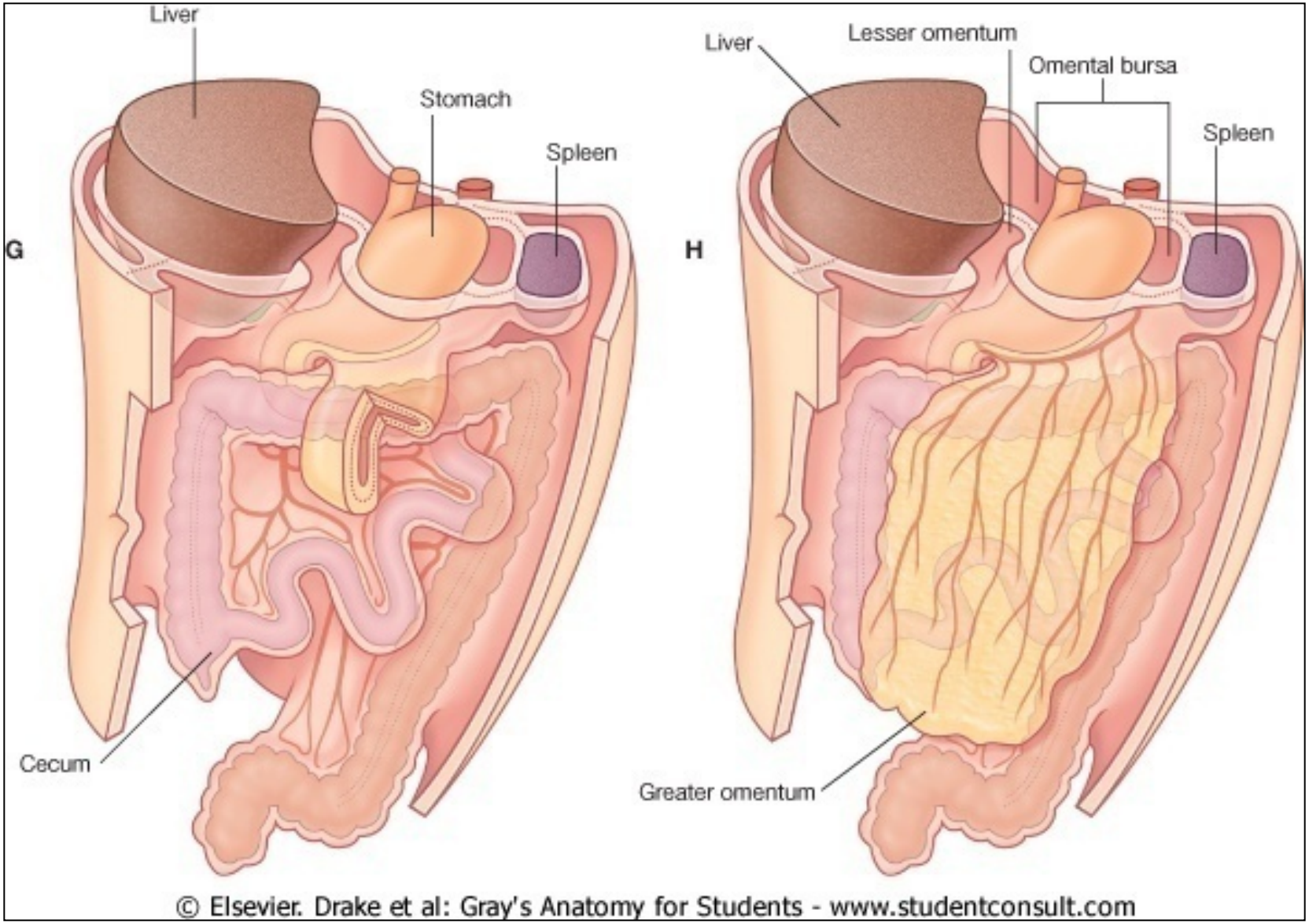


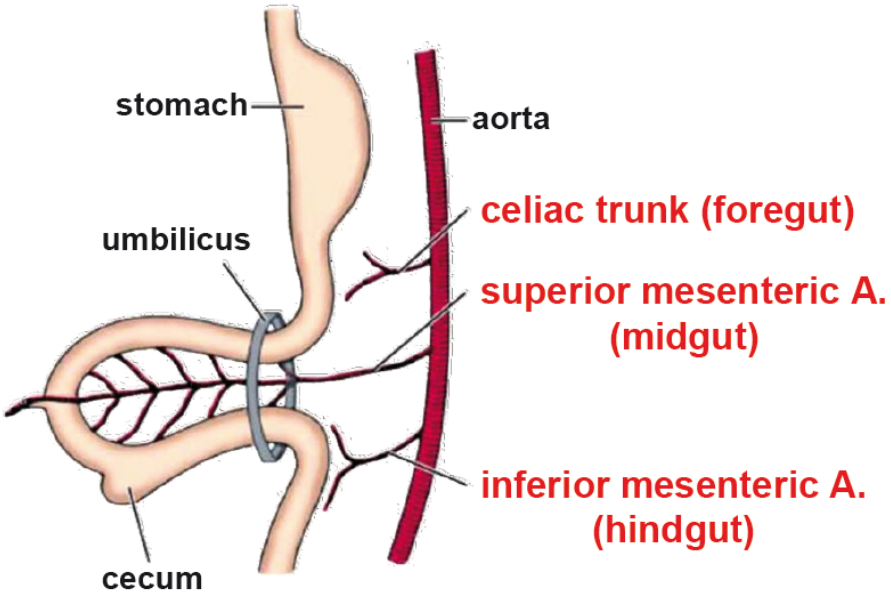
Figura 4.
A, B, C, D. Sviluppo e rotazione dell'ansa intestinale primitiva.



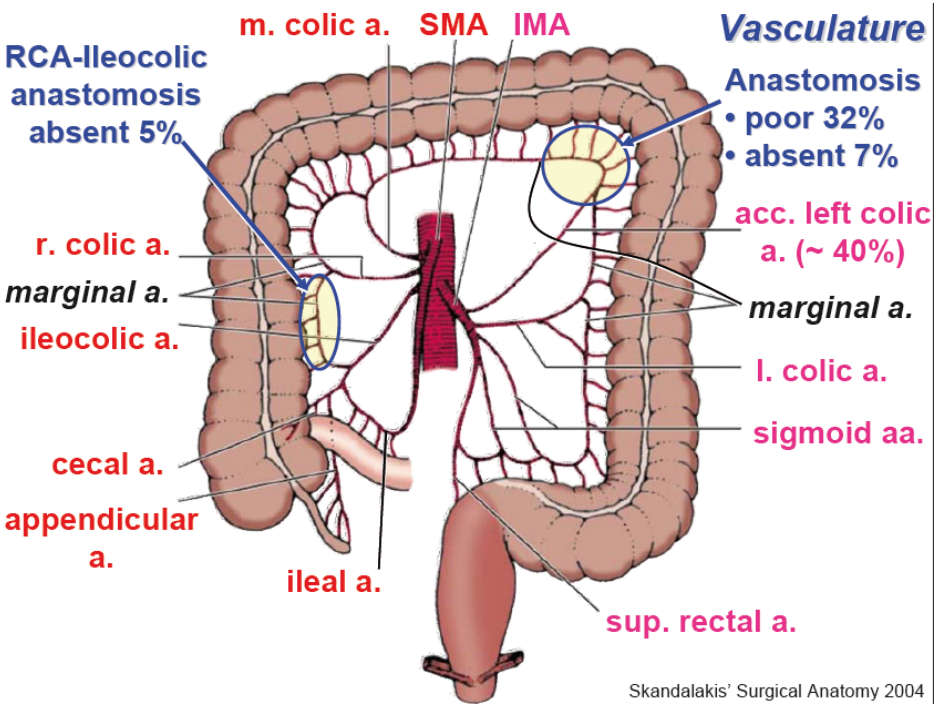








Skandalakis' Surgical Anatomy 2004



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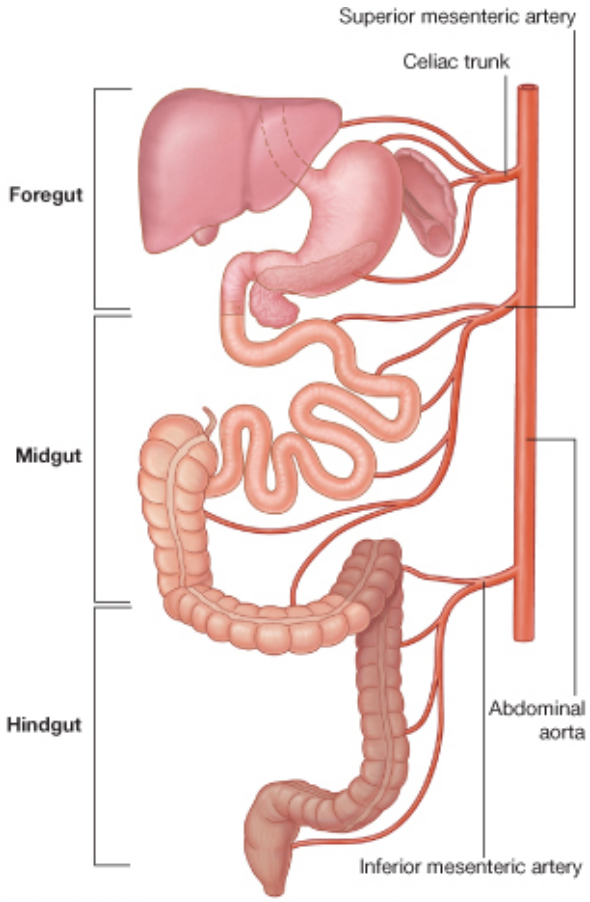
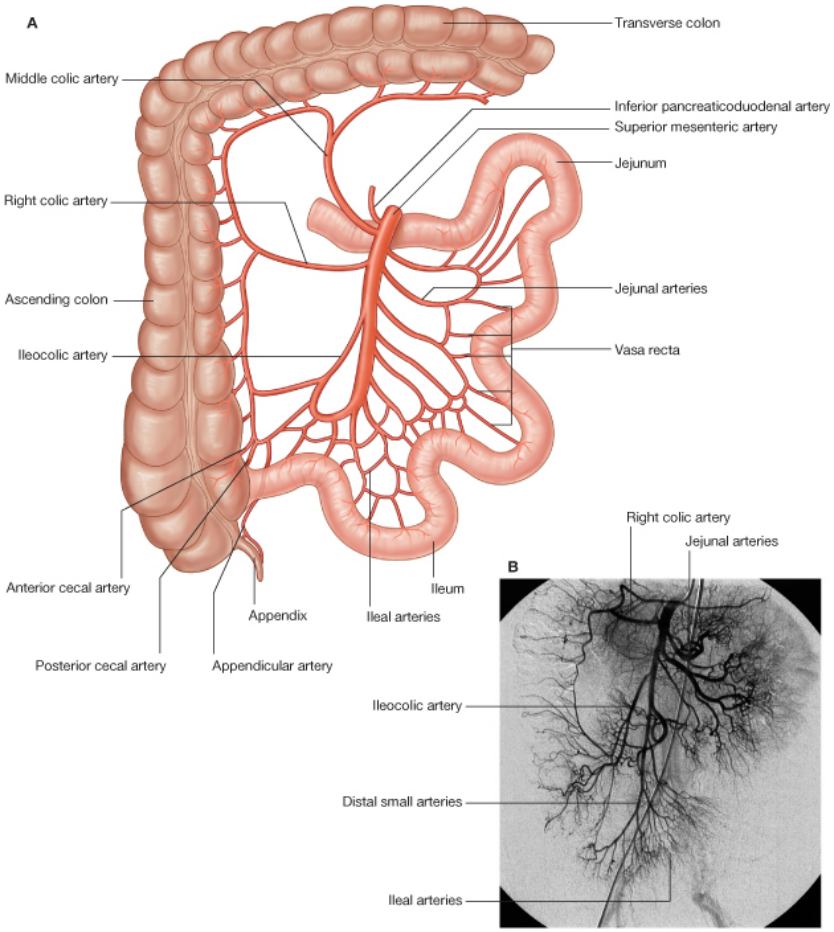
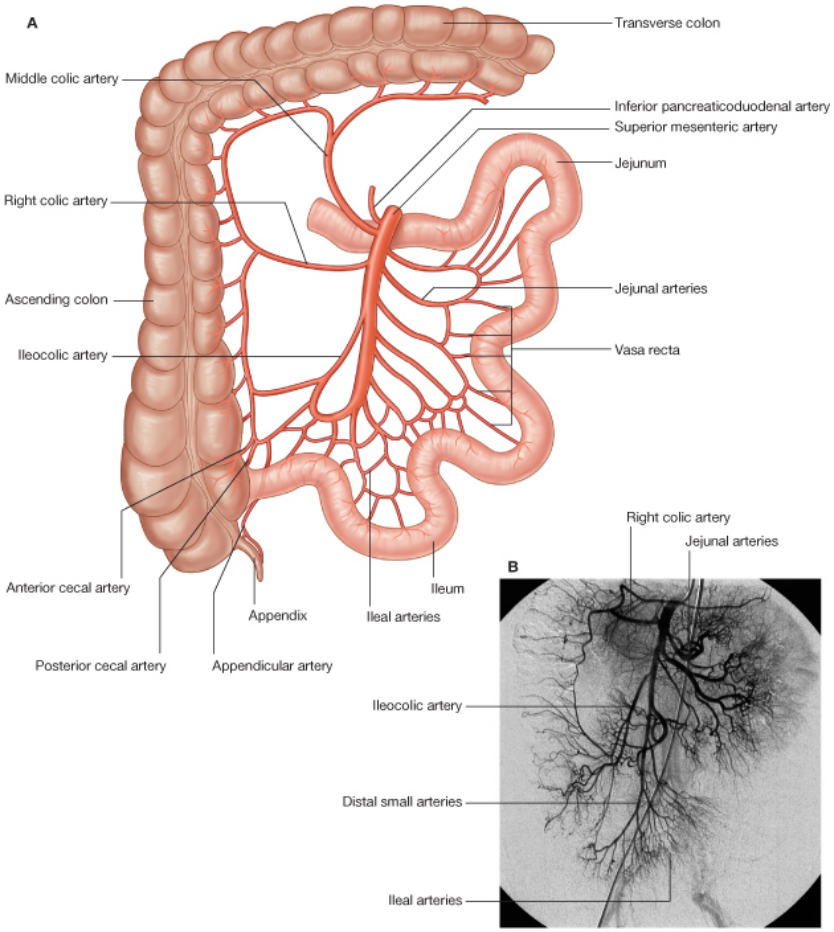
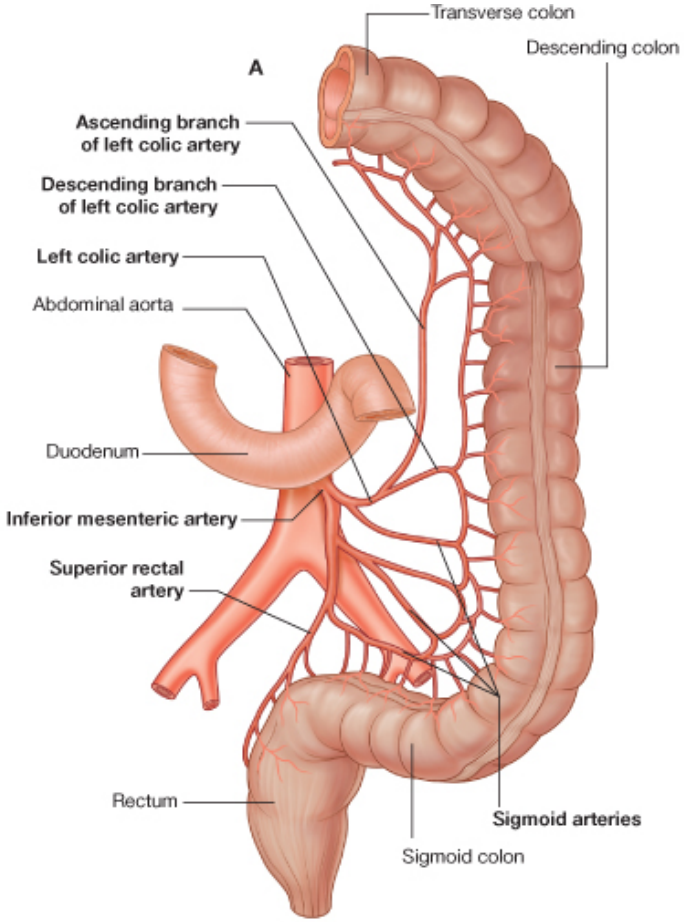
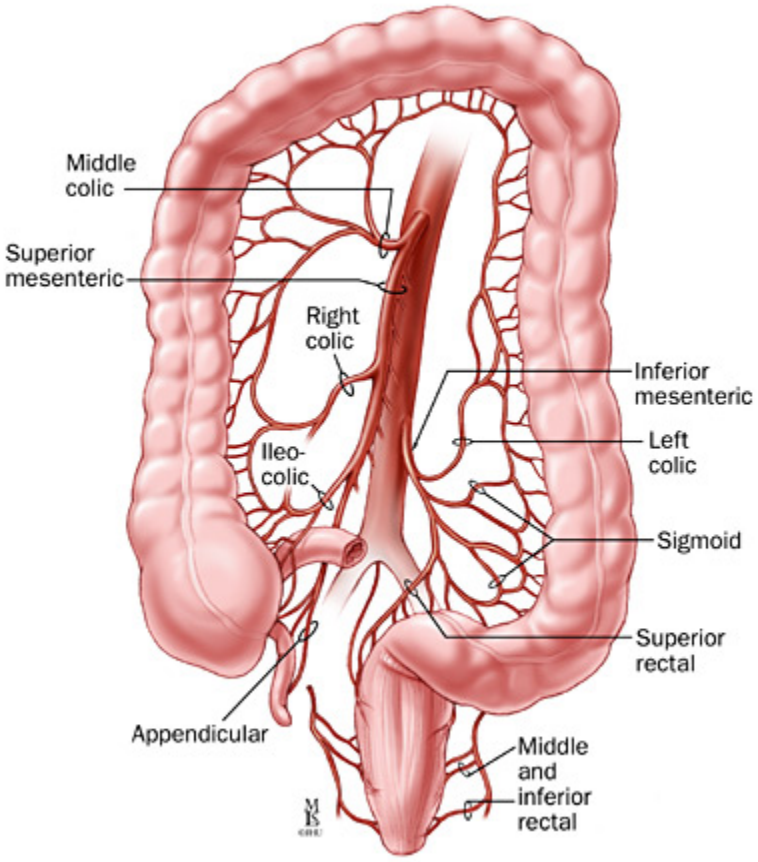
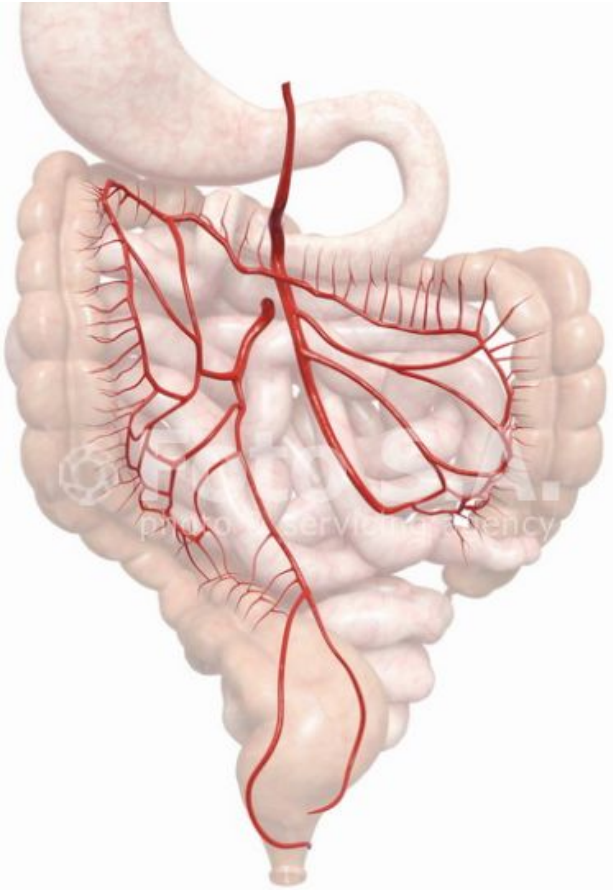






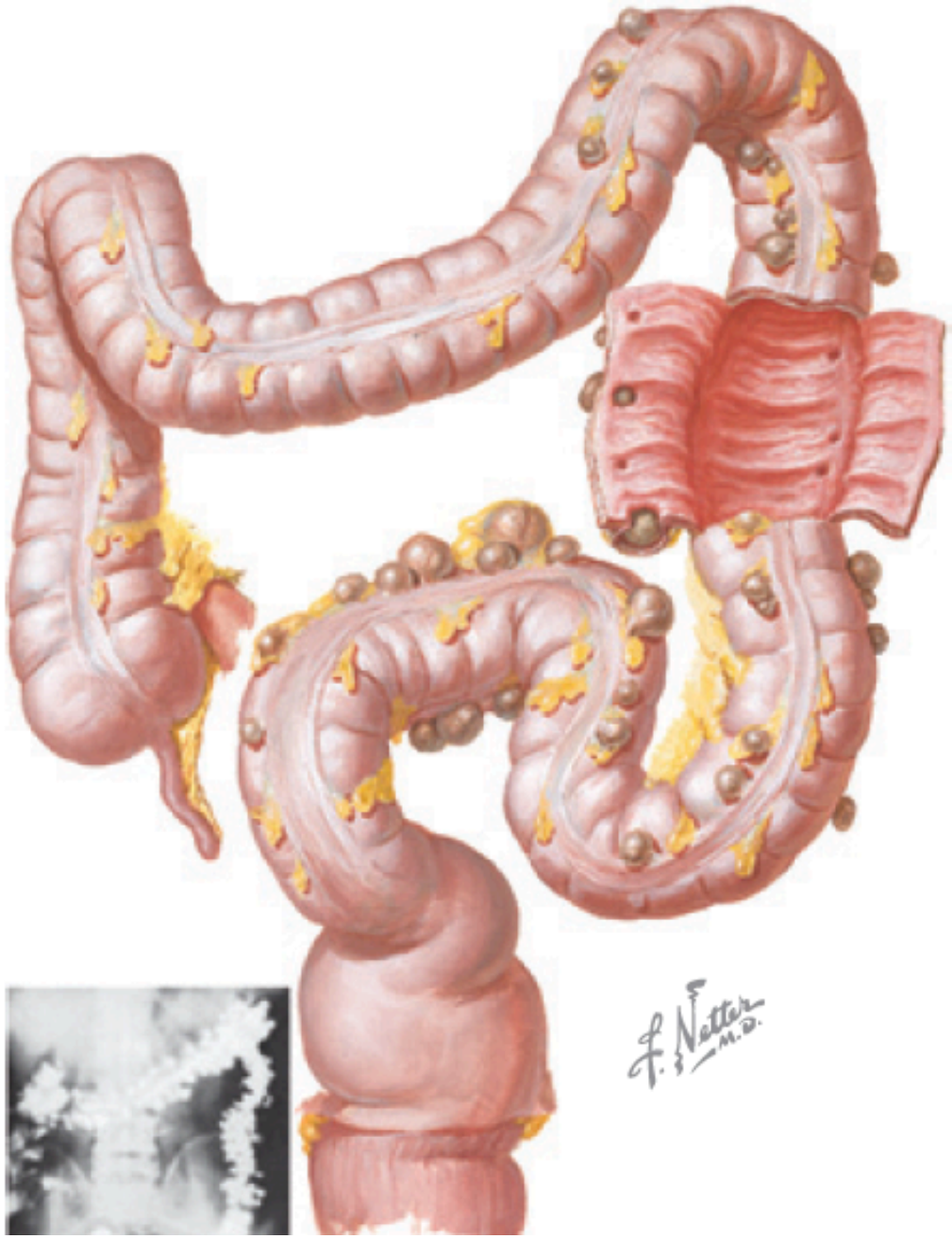



Middle colic
Superior mesenteric
Right colic
Ileo-colic
Appendicular
Inferior mesenteric
Left colic
Sigmoid
Superior rectal
Middle and inferior rectal



DIVERTICULAR DISEASE

- **Definition:** a **diverticulum** is an abnormal **sac or pouch protruding from the wall of a hollow organ**
- A **true diverticulum** is composed of all layers of the intestinal wall
- A **false diverticulum**, or pseudodiverticulum, lacks a portion of the normal bowel wall
- The diverticula that occur in the colon are **protrusions of mucosa through the muscular layers** of the intestine
    - Because these mucosal herniations **are devoid of the normal muscular layers**, they are **pseudodiverticula**


F. Netter M.D.

DIVERTICULAR DISEASE

- **Diverticulosis and diverticular disease** are terms used to indicate the presence of colonic diverticula
- **Diverticulosis** is a common condition of Western society
- **Specimen absent** in anatomic or medical museums in Europe that were archived before the Industrial Revolution
- The decreased consumption of **unprocessed cereals** and **increased consumption of sugar and meat** are responsible for the appearance of diverticulosis

DIVERTICULAR DISEASE

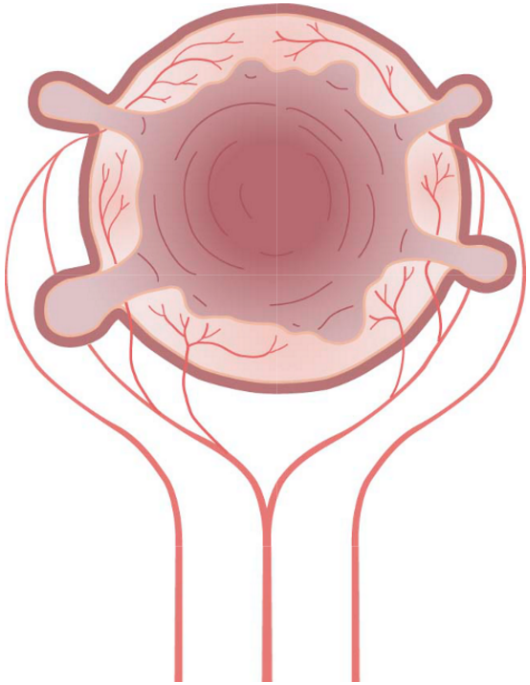
- During the past 80 years the **amount of fiber consumed** in North America and Western Europe has decreased, **whereas the prevalence of diverticulosis has increased significantly**

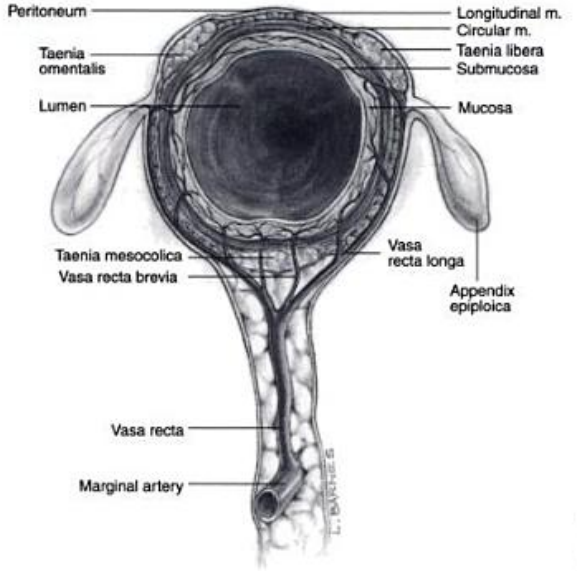
- **Diverticulosis is rare in sub-Saharan African blacks** who consume a high-fiber diet

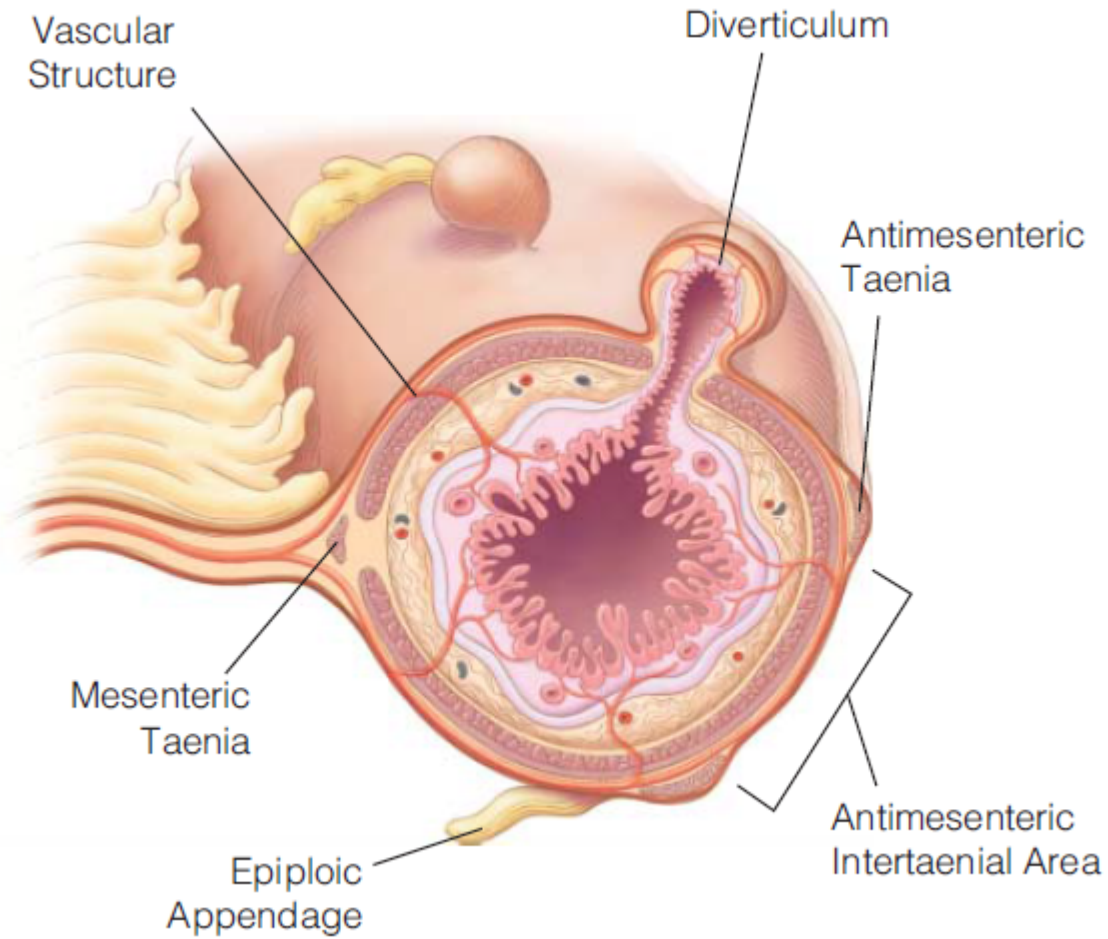
- Diverticula **are rare in individuals younger than 30** years, but at least 2/3 of Americans will have developed colonic diverticula by the age of 80 years

PATHOGENESIS

- Diverticula are **herniations of mucosa** at sites of **penetration of the muscular wall by arterioles**, on the mesenteric side of the antimesenteric taeniae

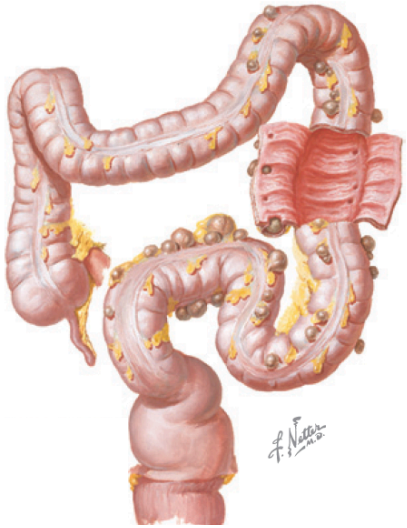






mesenteric side of the antimesenteric taeniae

DIVERTICULAR DISEASE



PATHOGENESIS

- **Sigmoid: in approximately 50% of patients** with diverticulosis
- **Descending: colon in 40%**
- **Entire colon:** in **5% to 10%**

- **Large volume of fiber**: the **contractile pressure** required to propel the feces forward **is low**

- **Decreased amount of fiber**: **increased colonic pressures**

- **High intraluminal pressure** is responsible for the **herniations**

There is often hypertrophy of the muscular layers of the colonic wall associated with diverticulosis

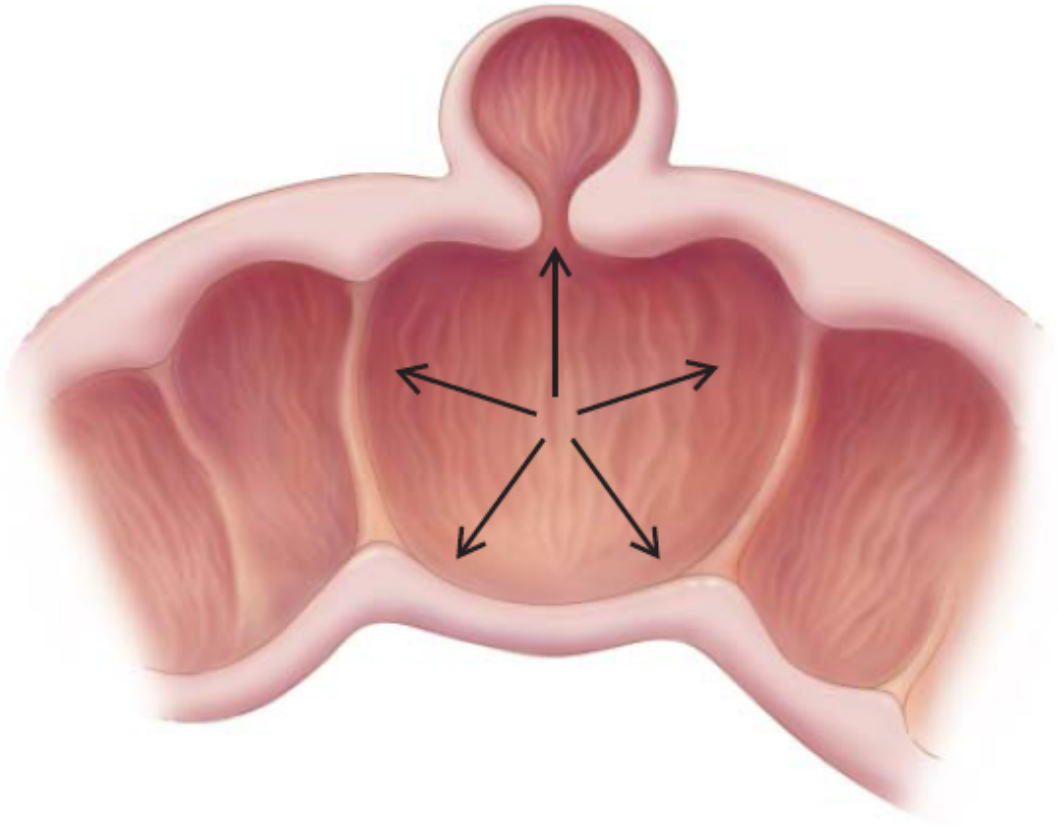
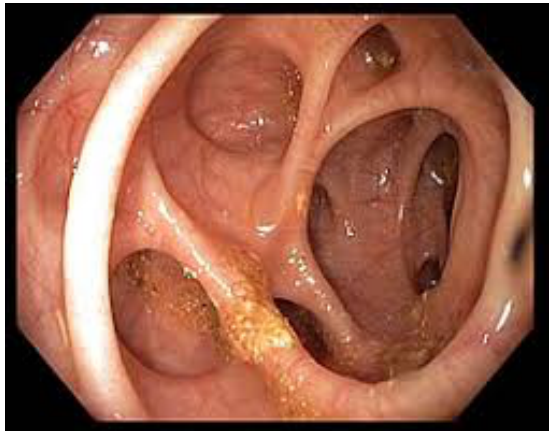
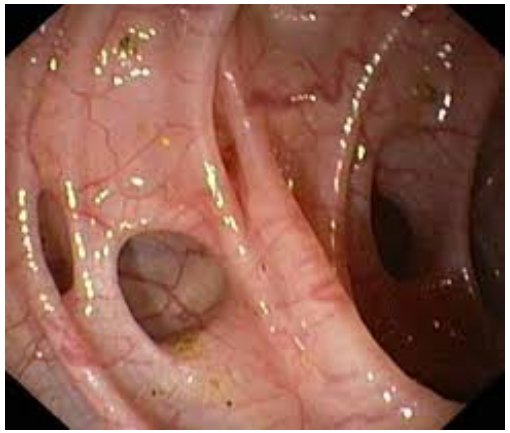
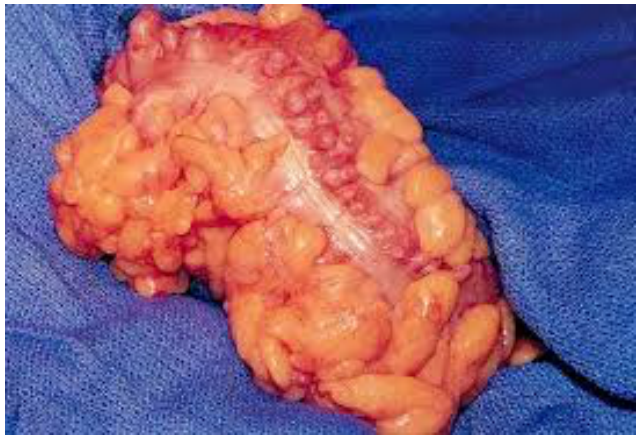
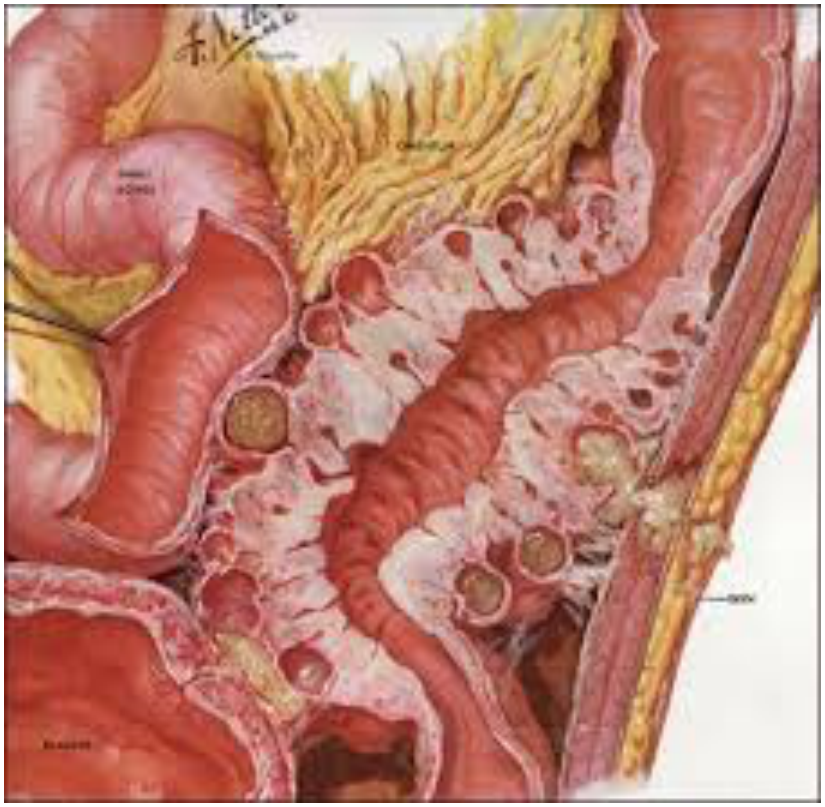


Figure 2 A schematic representation of the process termed segmentation in the colon. It has been theorized that high-pressure compartments lead to the development of diverticula.[230]


DIVERTICULITIS

- **Diverticulitis** is the result of **inflammation and/or perforation of a colonic diverticulum**
- It is an **extraluminal pericolic infection** caused by the **extravasation of feces** through the perforated diverticulum
- **Peridiverticulitis would actually be the term that more appropriately describes the infectious process**
- The **sigmoid colon** has the **highest incidence of diverticula** and it is the most frequent site for involvement with **diverticulitis**

DIVERTICULITIS

- Symptoms: **left lower quadrant abdominal pain** that my **radiate** to the **suprapubic area, left groin, or back**

The most common physical finding are:

- **tenderness of the left lower abdomen**
- **alterations in bowel habits**
- **fever**
- **chills**
- **urinary urgency**

Rectal **bleeding is not usually associated**

The physical findings are dependent on

- **the site of perforation**
- **amount of contamination**
- **presence or absence of secondary infection of adjacent organs**

DIVERTICULITIS

- There may be **voluntary guarding,** and a **tender mass** in the LLQ is suggestive of a **phlegmon or abscess**

- **Abdominal wall distention** if there is **ileus or small bowel obstruction** secondary to the inflammatory process

- **A rectal or vaginal examination** may reveal a **tender fluctuant mass** typical of a pelvic abscess

- **Sigmoid diverticulitis: needs to be distinguished from cancer**

DIVERTICULITIS

- The **surgical approach to diverticulitis** is **significantly different** than that required for a perforated **sigmoid cancer**

- **Sigmoidoscopy**: air **should not** be insufflated through the endoscope because of the possibility that **increased colonic pressure** could **force more bacteria through the perforation** into the peritoneal cavity

- The **diagnosis of diverticulitis** can often be **presumed** by a **careful history and physical examination**

- It is reasonable to begin treatment with **antibiotics** on this evidence alone

However, if the diagnosis is in doubt, 4 diagnostic tests can be considered

- **computed tomography (CT) of the abdomen**
- **magnetic resonance imaging (MRI)**
- **abdominal ultrasound**
- **water-soluble contrast enema**

CT and MRI provide essentially the **same information** and advantages and reveal:

- the **location** of the infection
- **extent** of the inflammatory process
- presence and location of an **abscess**
- **involvement of other organs**, such as **ureteral obstruction** or a **fistula** to the bladder

- An abscess detected by CT may often be **drained by a percutaneous approach**

DIVERTICULAR DISEASE

- **Ultrasound** (as CT) offers the possibility of **percutaneous drainage** of an abscess

- **The selection among CT, MRI, and ultrasound** examinations varies considerably among institutions

- **Contrast enema**: an enema carries the risk of increasing the **colonic pressure** and causing **further extravasation of feces** through the perforated diverticulum. The **contrast should be water-soluble**

    - Water-soluble contrast enemas do not carry the risk for **barium fecal peritonitis**

DIVERTICULAR DISEASE

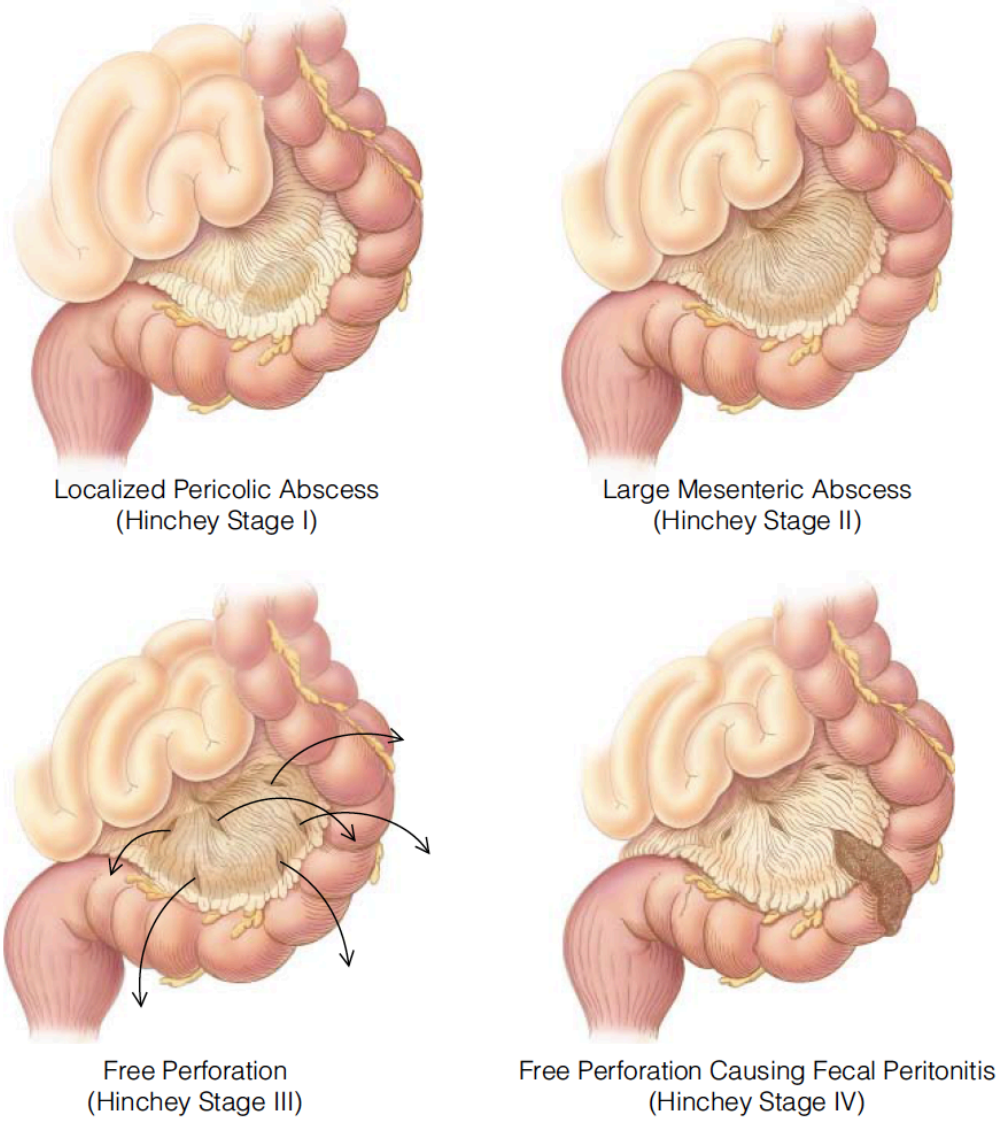
- Diverticulitis has a **broad spectrum of severity** (single episode, repeated episodes or fulminant complicated disease characterized by life-threatening sepsis)

- **Hinchey et al.** have described a practical classification system:

  - **Stage I: Pericolic or mesenteric abscess**
  - **Stage II: Walled-off pelvic abscess**
  - **Stage III: Generalized purulent peritonitis**
  - **Stage IV: Generalized fecal peritonitis**

Appropriate treatment must be individualized based on the severity of the disease

The **American Society of Colon and Rectal Surgeons** has published **practice guidelines** for the treatment of diverticulitis



- Stage I: Pericolic or mesenteric abscess
- Stage II: Walled-off pelvic abscess
- Stage III: Generalized purulent peritonitis
- Stage IV: Generalized fecal peritonitis

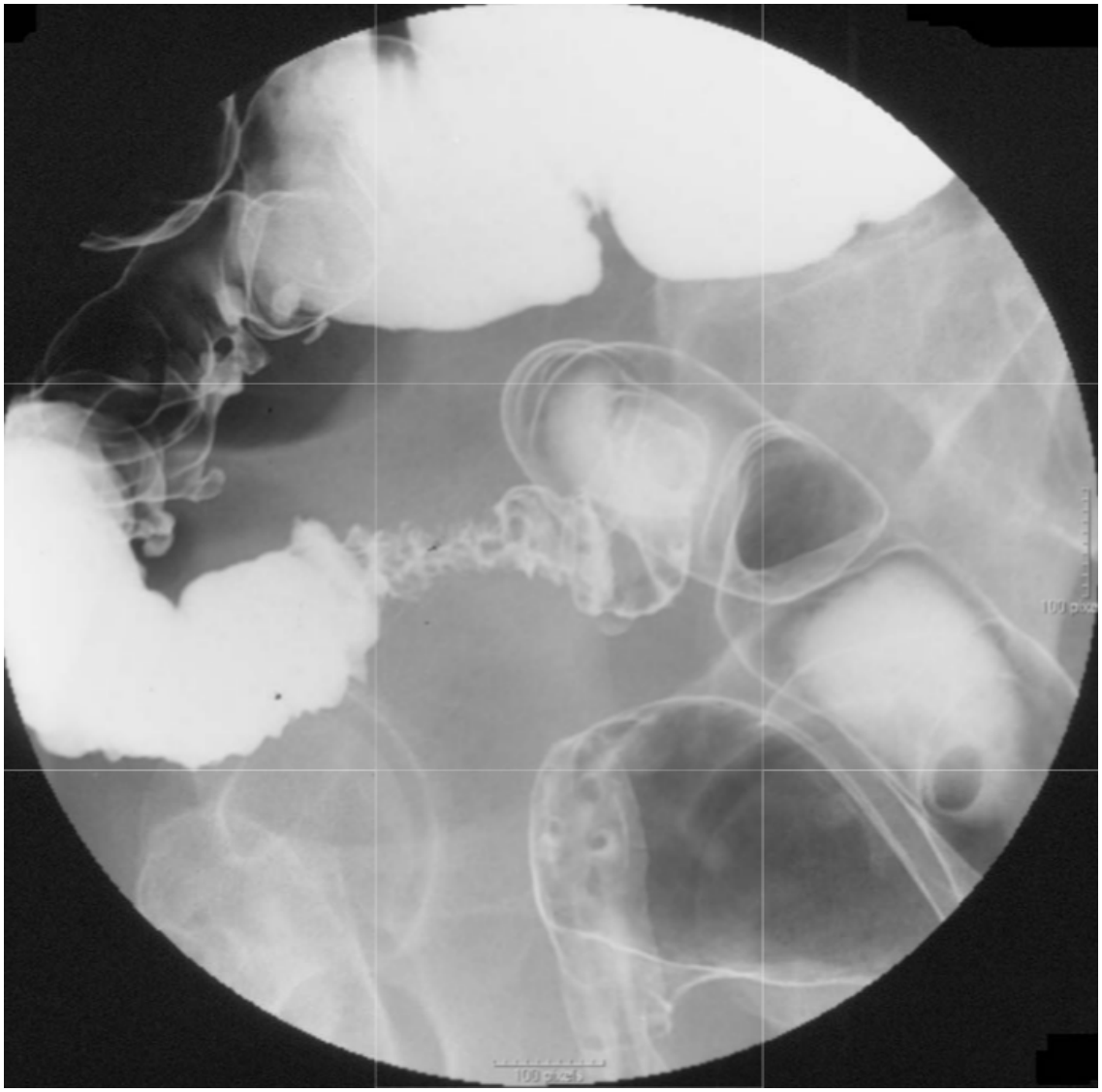
Figure 5 **The Hinchey classification divides diverticular perforations into four stages. Mortality increases significantly in stages III and IV.[28]**

UNCOMPLICATED DIVERTICULITIS

- Disease **not associated** with **free intraperitoneal perforation, fistula formation, or obstruction**
- **Antibiotics on an outpatient basis**
- If localized peritonitis: **hospitalization and IV antibiotics**
- Avoid **use of morphine (**increased intracolonic pressure)
- **Meperidine decreases intraluminal pressure** and is a more appropriate analgesic
- **Uncomplicated diverticulitis** usually **respond promptly to antibiotic treatment**, with improvement in symptoms **within 48 hours**

UNCOMPLICATED DIVERTICULITIS

- After the symptoms have subsided for **at least 3 weeks, investigative studies** should be conducted to establish the presence of diverticula and to exclude cancer
  - **Colonoscopic examination**
  - **A barium enema** can demonstrate the **extent of the diverticular disease**, but a sigmoid cancer may be hidden



UNCOMPLICATED DIVERTICULITIS

- **A first attack of uncomplicated diverticulitis** that responds to **antibiotic therapy** is generally treated **nonoperatively** by the introduction of a **high-fiber diet**
- The chances of a second attack: <25%
- If a patient suffers **recurrent attacks** of diverticulitis**, surgical treatment should be considered**
- **Sigmoidectomy** should be offered **after two uncomplicated attacks** to prevent a future complicated episode that would require emergency operation or a colostomy
- **Pts <45 years with 1 episode of uncomplicated diverticulitis**: some surgeons suggest **elective sigmoidectomy** following recovery (controversial)

UNCOMPLICATED DIVERTICULITIS IN THE IMMUNOCOMPROMISED HOST

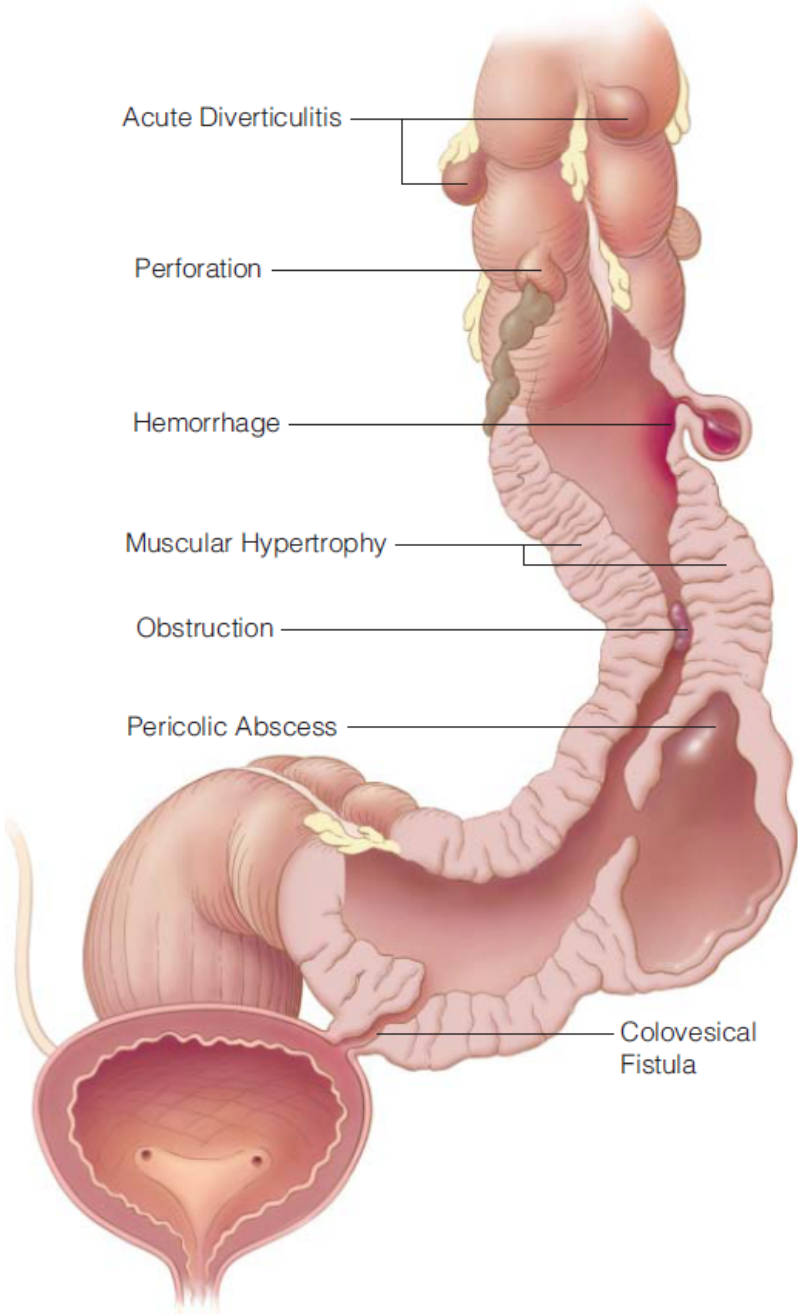
- **Selective sigmoidectomy after a single attack** of diverticulitis should be considered in these patients because of their diminished ability to combat infection

- **Mortality rates** after surgery are **higher** than those in patients not immunocompromised

UNCOMPLICATED DIVERTICULITIS

- **Laparoscopic approach:**
  - hospital length of stay **2 to 3 days shorter** compared with patients receiving open approach

COMPLICATED DIVERTICULITIS



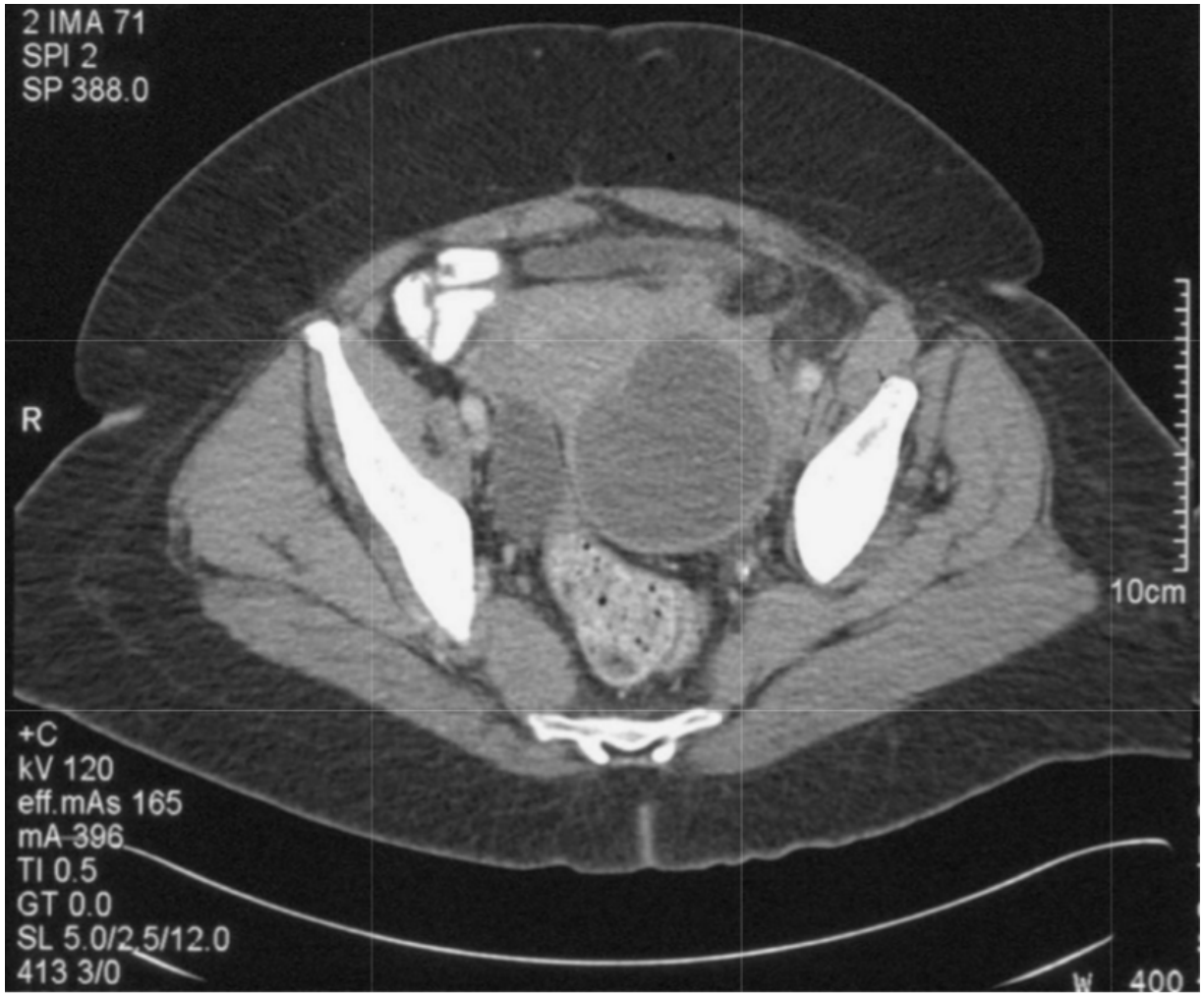
COMPLICATED DIVERTICULITIS

ABSCESS

- It is usually confined to the pelvis
- **Significant pain, fever, and leukocytosis**
- The **abdominal, pelvic, or rectal examination** may detect a **tender, fluctuant mass**
- **CT scan, MRI, or ultrasound** will confirm the diagnosis and location
- **Abscesses > 2 cm should be drained, with CT or ultrasound guided percutaneous approach**
- **Percutaneos drainage is better than laparotomy**, which **risks spreading the contents** of the abscess throughout the peritoneal cavity

ABSCESS

- **Adequate drainage of the abscess**, accompanied by the administration of IV antibiotics**, usually results in a rapid clinical improvement**



ABSCESS

- **Perform elective surgery** after the pt has completely **recovered** from the infection, **6 weeks after drainage**
- **At that time,** it is possible to fashion an **anastomosis avoiding a colostomy**
- **Remove all the colon that is abnormally thickened:** this avoid recurrent diverticulitis

FISTULA

- A fistula to the **skin, bladder, vagina, or small bowel** is relatively frequent
- It forms when an **abscess is drained into** an adjacent organ or onto the skin
- The perforated diverticulum (source of infection) continues to **supply the fistula** (excising the diseased sigmoid colon to stop it)
- Symptoms: **pneumaturia** (passage of air through the urethra**), fecaluria**, and **recurring urinary tract infections**
- The most reliable test is **CT**, which may demonstrate air in the bladder.
- The **barium enema** will fail to reveal a fistula 50% of the time
- **Cystoscopy** usually reveals **cystitis and bullous edema** at the site of the fistula; it is **helpful to rule out cancer**

FISTULA

Initial treatment: **control the infection** and **reduce inflammation**

- **Antibiotics**

- **Colonoscopy** examines the sigmoid mucosa and **exclude colon cancer or Crohn's disease**

- **Rule out cancer**

- Treatment: **take down the fistula and excise the sigmoid colon**, and then fashioning an anastomosis between the descending colon and rectum

- Use of **ureteral stents** pre-op can facilitate identification of the ureters

GENERALIZED PERITONITIS

Causes:

- **diverticulum perforates into the peritoneal cavity** and the perforation is not sealed: peritoneal cavity is contaminated with feces
- **abscess that suddenly bursts** into the unprotected peritoneal cavity (pus contains enteric bacteria)
- **they both require urgent operation**

GENERALIZED PERITONITIS

Signs and Symptoms

- **diffuse abdominal tenderness, with voluntary and involuntary guarding over the entire abdomen**
- **↑ WBC, fever, tachycardia, and hypotension**

- Plain Xray or CT scans may reveal **intraperitoneal free air**

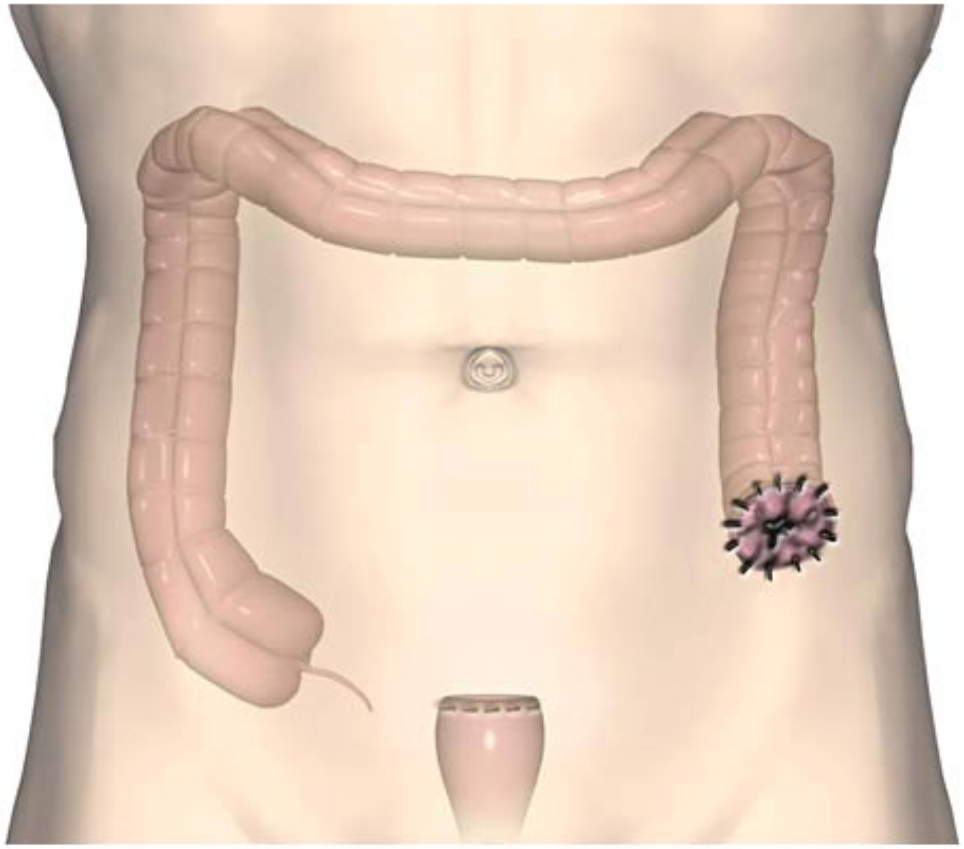
- **Excise the segment** of colon containing the perforation
- **It is not safe to restore intestinal continuity because an intestinal anastomosis will not heal in an infectious enviroment**

GENERALIZED PERITONITIS

Proper surgical procedure: Hartmann's operation:

Henri Hartmann, the French surgeon who described this technique in 1921

- resect the diseased sigmoid colon
- construct a colostomy using noninflamed descending colon
- suture the divided end of the rectum closed



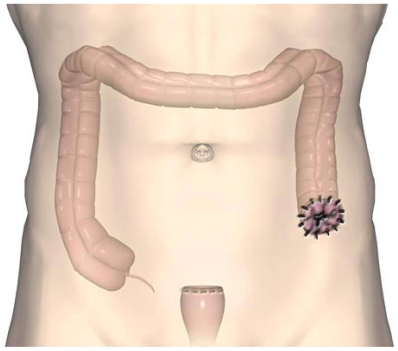
GENERALIZED PERITONITIS

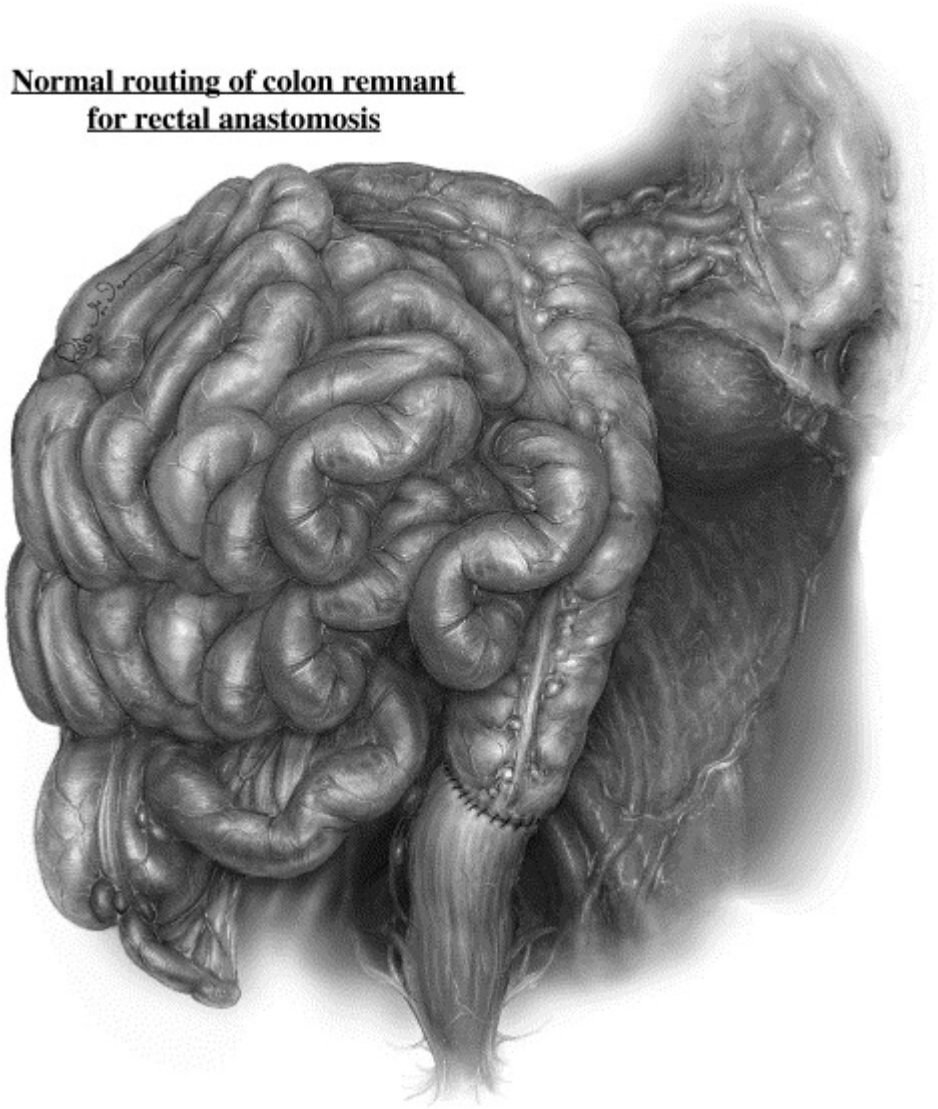
- **Eliminating the source of infection** by excising the **perforated sigmoid colon, colostomy, irrigating the peritoneal cavity and administering IV antibiotics,** along with nutritional support**,** should result in **resolution of the infection**

- After complete recovery (at least 10 weeks) **take down the colostomy** and fashion the anastomosis (restore intestinal continuity)

- There have been recent reports of successful treatment of acute complicated diverticulitis by **laparoscopic lavage and IV antibiotics**, **without resecting the diseased colon**

- However, **resection of the perforated segment seems the safest approach**





Restoration of intestinal continuity after Hartmann's Procedure

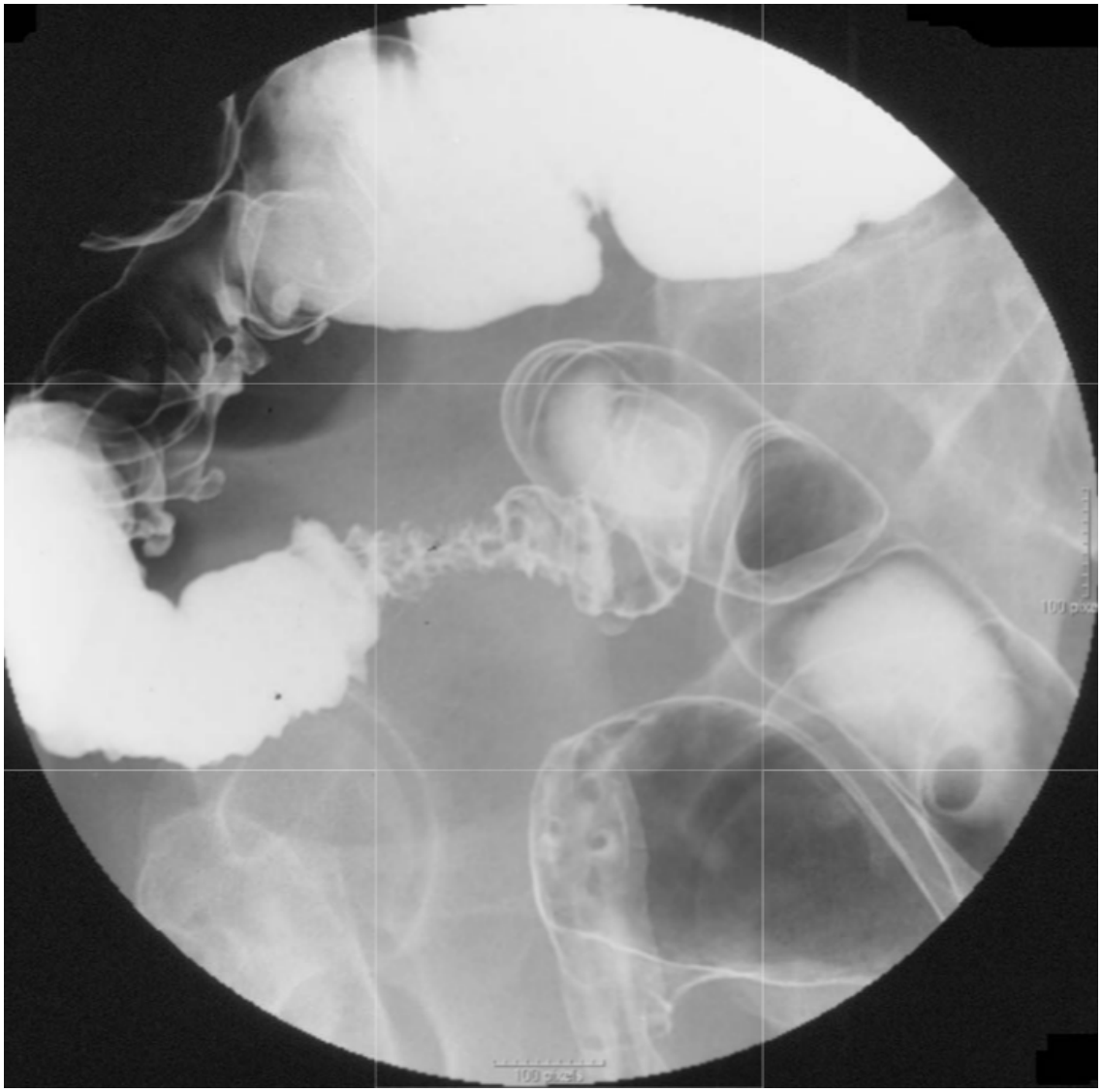
OBSTRUCTION: it has 2 causes

1. **Narrowing of the sigmoid** because of the **muscular hypertrophy** of the bowel wall
   - **sigmoidectomy may be the only remedy if cancer cannot be ruled out**

2. **Small bowel obstruction** associated with the infectious and inflammatory aspect of diverticulitis

   - The **small bowel may become adherent to the phlegmon or abscess**, with obstruction caused by the infectious process

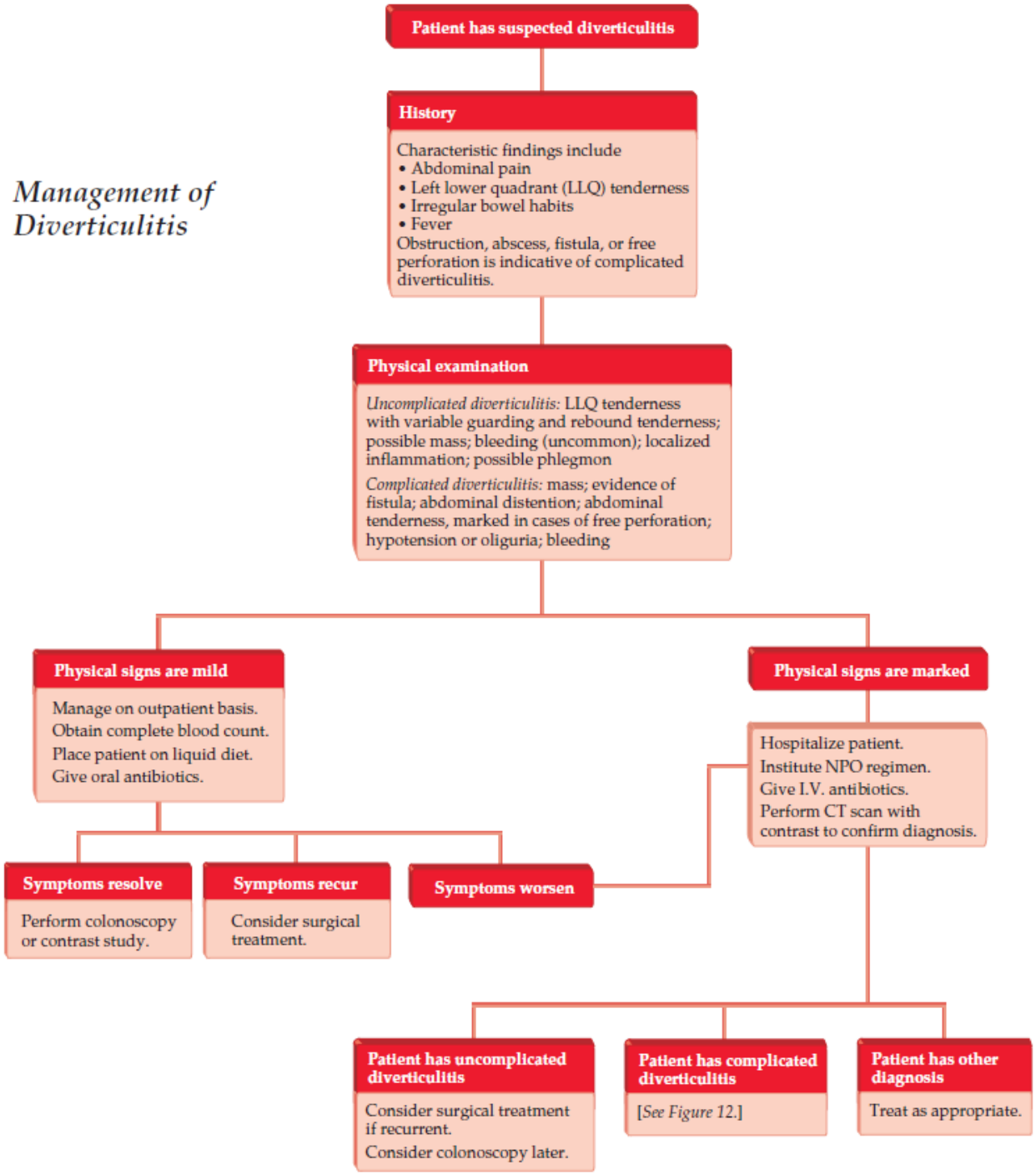
   - NGT, NPO, antibiotics, percutaneous drainage of the abscess



DIVERTICULAR-ASSOCIATED COLITIS

- Relatively **unusual entity**
- P**rolapse of the mucosa** associated with **diverticula and hyperplasia of the glands**
- **Clinical features: tenesmus, hematochezia, and diarrhea**
- **Endoscopic diagnosis:** focal erythema, submucosal ecchymosis, erosions, and ulcers
- **Pathologic findings**: inflammation that could be consistent with ulcerative colitis or Crohn's disease in areas of diverticular disease
- It is a **distinct clinical entity** that presents with segmental colitis and has a variety of clinical and pathologic features

Management of Diverticulitis



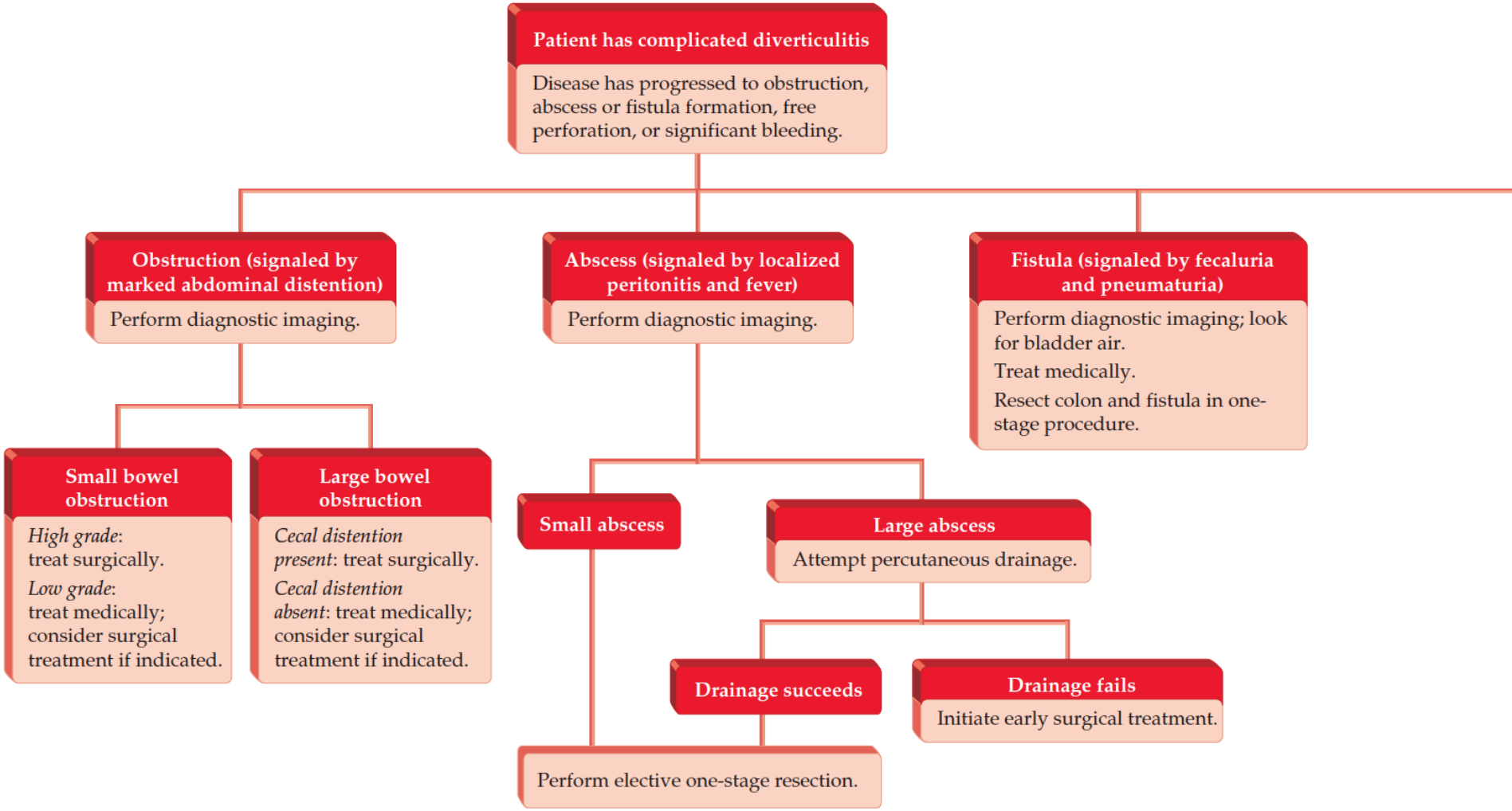


Figure 12 **Algorithm outlining treatment options for complicated diverticulitis. GI = gastrointestinal; RBC = red blood cell.**

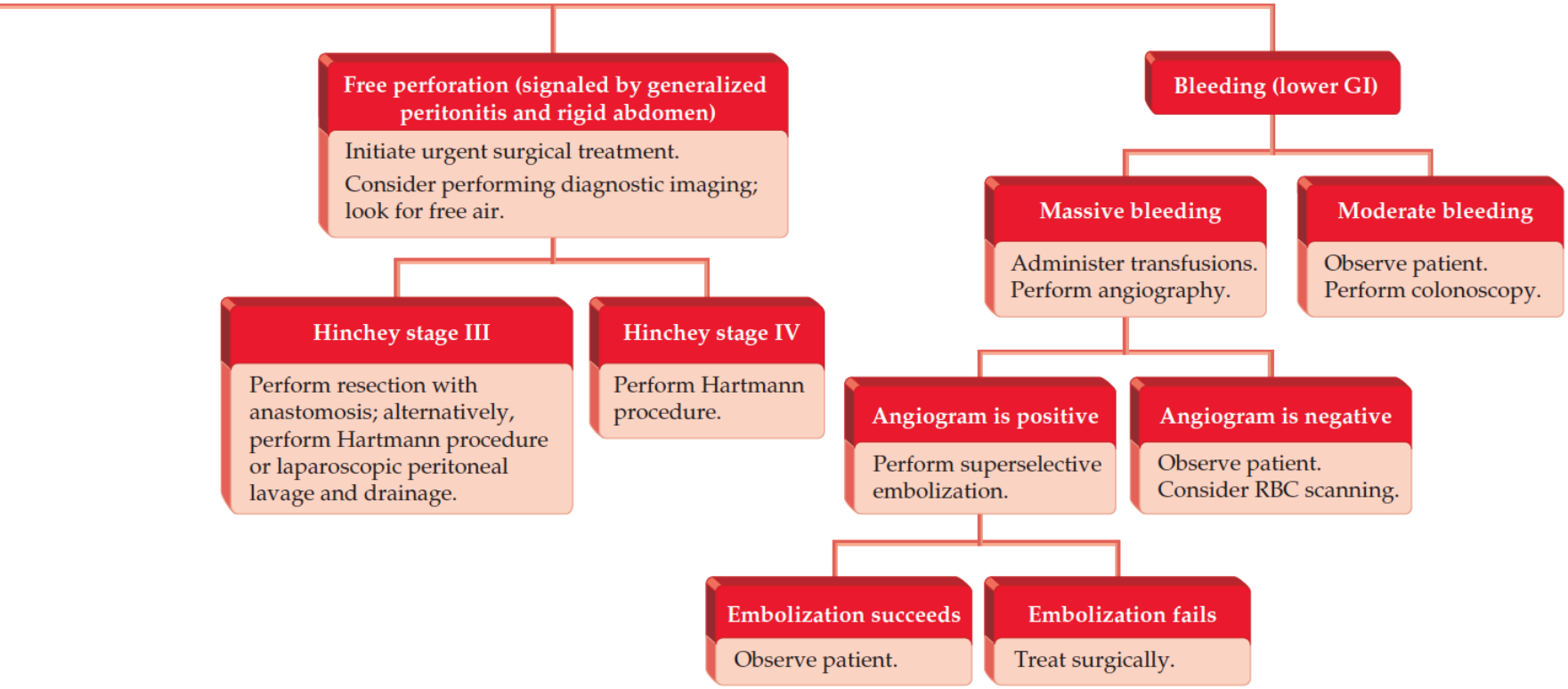


Figure 12 **Continued from previous page.**

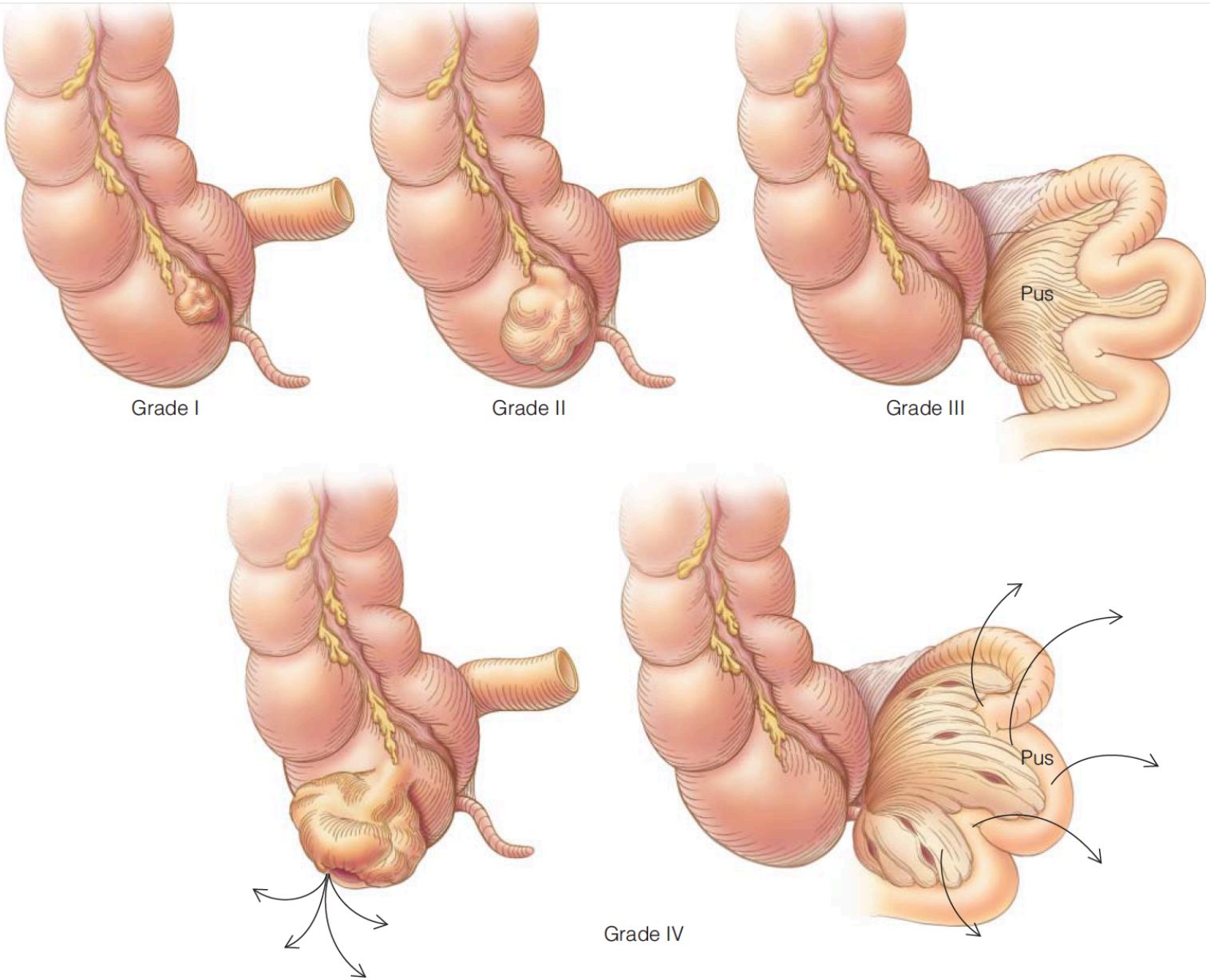


Figure 16 **Proposed classification of pathologic types of cecal diverticulitis. Grade I is a specific inflamed diverticulum; grade II is a cecal mass; grade III is characterized by a localized abscess or fistula; and grade IV represents a free perforation or a ruptured abscess with peritonitis.[137]**

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