

Acute Abdominal Pain

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Abdominal pain is the most common cause of hospital admission in the United States.¹ It accounts for 5% to 10% of all emergency department visits.² In 35% to 40% of all hospital admissions for abdominal pain, the pain is nonspecific.³ In some cases, surgical intervention may be required. Symptoms suggesting the need for surgical correction include a pain duration of less than 48 hours and pain followed by vomiting. Similarly suggestive signs include rebound tenderness and involuntary guarding on physical examination.³

This article describes the signs and symptoms of common causes of acute abdominal pain. The epidemiology of acute abdominal pain is discussed, as are necessary elements of history taking and physical examination.

EPIDEMIOLOGY

Gastroenteritis is the most common cause of abdominal pain not requiring surgery,² whereas appendicitis is the most common cause for which surgery is necessary.³ In patients age 60 years or older, biliary disease and intestinal obstruction are the most common causes of acute abdominal pain that is surgically correctable. In contrast, in patients younger than 60 years, acute appendicitis is the most common surgically correctable cause, accounting for approximately 25% of cases.⁴ In children, acute appendicitis is the leading cause of acute abdominal pain; it accounts for 32% of children with acute abdominal pain admitted to the hospital.⁵ Common causes of acute abdominal pain are listed in [Table 1](#).

PATIENT HISTORY

The term “acute abdomen” implies the sudden onset of abdominal pain for which a surgically correctable cause is likely. Besides the age of the patient, key elements of patient history include time of pain onset, location and character of the pain, and pattern of pain radiation. Additionally, the presence and tim-

ACUTE ABDOMINAL PAIN

Key Historical Data

Age of patient
Time of pain onset
Location of pain
Character of pain
Radiation of pain

ing of nausea and vomiting and of changes in bowel habits should be determined, as should menstrual history in female patients.

Age

The age of the patient is crucial; the differential diagnosis of abdominal pain in a child is quite different from that in an elderly patient. There are, of course, common conditions that cause acute abdominal pain in most age groups (eg, acute appendicitis).^{3,5} Intestinal obstruction and incarcerated hernias can similarly occur in persons of all ages. However, intussusception is the most likely cause of intestinal obstruction in children,⁵ whereas adhesions are the more likely cause in adults.² In elderly patients, pain from a myocardial infarction can be referred to the upper abdomen.²

Time of Onset

Pain that is sudden in onset or awakens the patient from sleep suggests a perforated viscus.⁶ Knowing the timing of associated nausea and vomiting is essential to narrowing the diagnostic possibilities.¹ Pain usually

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Table 1. Common Causes of Acute Abdominal Pain

Upper abdominal pain

- Acute cholecystitis
- Acute pancreatitis
- Perforated ulcer

Midabdominal pain

- Intestinal obstruction
- Mesenteric ischemia

Lower abdominal pain

- Acute appendicitis
- Sigmoid diverticulitis
- Gynecologic causes
- Urologic causes

precedes vomiting when abdominal pain is from surgically correctable causes, whereas the reverse is true for medical conditions such as gastroenteritis.

Location

The abdomen is divided into 4 quadrants, which are further divided (with some overlap) into the epigastric, periumbilical, and suprapubic regions (**Figure 1**).¹ Right upper quadrant pain is often reported by patients with duodenal ulcers, acute pancreatitis, acute cholecystitis, and acute hepatitis. Left upper quadrant pain is reported frequently by patients with gastritis, gastric ulcer, acute pancreatitis, and splenic infarct or rupture. Right lower quadrant pain is typically reported by patients with acute appendicitis, and left lower quadrant pain by patients with diverticulitis. Gynecologic and urologic causes of acute abdominal pain can also present with lower quadrant abdominal pain.

Character

The term “character” implies all the features of the pain and usually can be determined by asking the patient to describe the quality of the pain. The pain is most often described as being sharp or dull and may also be described as being cramping (ie, colicky). Colicky pain is defined as a rhythmic pain resulting from intermittent spasms.⁷ Colicky abdominal pain is most commonly associated with biliary disease, nephrolithiasis, and intestinal obstruction.¹ Pain that begins as a dull, poorly localized ache and progresses to a constant, well-localized sharp pain indicates a surgically correctable cause. A classic example is the pain of acute appendicitis, in which the pain initially begins as a poorly defined

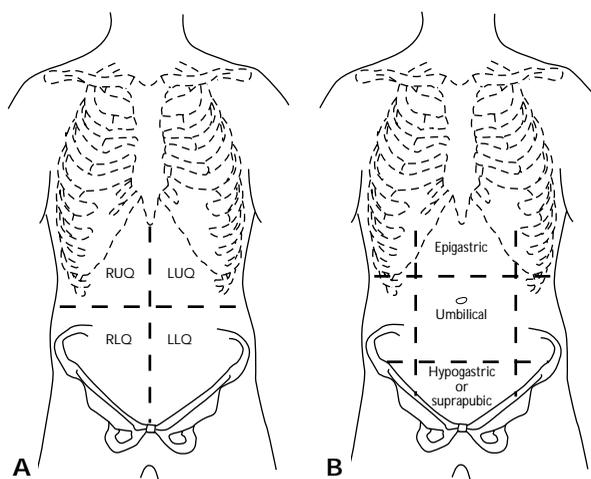


Figure 1. Abdominal sections. (A) The 4 abdominal quadrants. (B) The epigastric, umbilical, and suprapubic (hypogastric) regions. LLQ = left lower quadrant; LUQ = left upper quadrant; RLQ = right lower quadrant; RUQ = right upper quadrant.

dull pain in the periumbilical region and progresses to a sharp, severe pain in the right lower quadrant.

PHYSICAL EXAMINATION

Inspection

The physical examination of patients with acute abdominal pain should begin with general observation.⁷ A patient writhing in agony likely has colicky abdominal pain caused by ureteral lithiasis. On the other hand, a patient lying very still is more likely to have peritonitis, and a patient who is leaning forward to relieve the pain may have pancreatitis. The examiner should also inspect the abdominal wall for surgical scars and evidence of trauma, distention, masses, and hernias. The abdominal wall is a commonly overlooked source of abdominal pain. Other parts of the body also should be inspected. For example, the eyes should be inspected for evidence of scleral icterus, which may indicate hepatobiliary disease.

Auscultation

Auscultation of the abdomen is useful in assessing peristalsis. Bowel sounds are widely transmitted throughout the abdomen. Therefore, it is not necessary to listen in all 4 quadrants. It is recommended, however, that auscultation should last at least 1 minute. Bowel sounds are typically high pitched, so the diaphragm of the stethoscope should be used.

Bowel sounds are classified as normal, hyperactive, or hypoactive.⁸ Hypoactive bowel sounds are associated with ileus, intestinal obstruction, and peritonitis. Intestinal obstruction can produce hyperactive bowel sounds,

which are high-pitched tinkling sounds occurring at brief intervals; they are very audible. Auscultation should precede percussion and palpation.

Percussion

The technique of percussion is performed by firmly pressing the index finger of one hand on the abdominal wall while striking the abdominal wall with the other index finger. The percussion note that is heard may be described as dull, resonant, or hyperresonant. Percussion over the liver will generate a dull note, whereas percussion over the gastric region will generate a hyperresonant note because of the usual presence of a gastric air bubble. The technique of percussion also can be used to determine liver span. Percussion has likewise been advocated as a more humane method of eliciting signs of peritonitis.⁹

Generalized percussion is a useful method for detecting the presence of ascites or intestinal obstruction in a distended abdomen. In the setting of ascites, a dull percussion note would be generated; in the setting of intestinal obstruction, a hyperresonant note would be heard. If ascites is suspected, then a test for shifting dullness can be performed. Because ascites typically sinks with gravity, percussion of the flanks generates a dull note and percussion of the periumbilical region generates a resonant note in a supine patient. The test for shifting dullness involves having the patient shift to a lateral decubitus position and then performing percussion again; the area of resonance should shift upward.

Palpation

Before palpating the abdomen, the examiner should ask the patient to point directly to the area that hurts most and then avoid palpating that area until absolutely necessary. Palpation may be difficult in a patient who has guarding, defined by spasms of the abdominal muscles.¹ Guarding can be voluntary or involuntary. Voluntary guarding occurs when there is conscious elimination of muscle spasms, and involuntary guarding is reported when the spasm response cannot be eliminated, which usually indicates diffuse peritonitis. Rebound tenderness is elicited by pressing the abdominal wall deeply with the fingers and then suddenly releasing the pressure.¹ Pain on this abrupt release of steady pressure is known as Blumberg's sign and indicates the presence of peritonitis. Asking the patient to cough is another method of eliciting signs of peritonitis.¹⁰

SPECIFIC DISORDERS

Upper Abdominal Pain

Common causes of acute abdominal pain in the

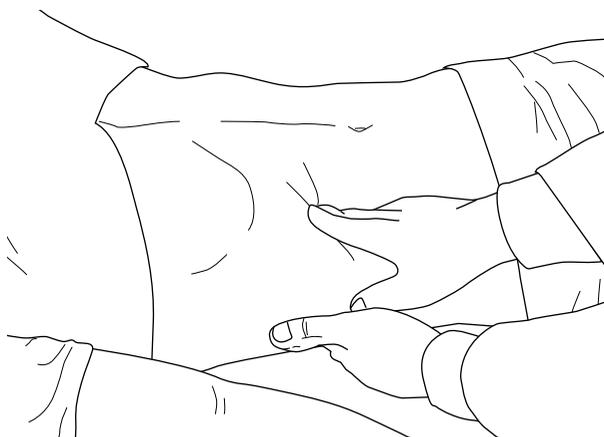


Figure 2. Illustration of how Murphy's sign is elicited.

upper abdomen include acute cholecystitis, acute pancreatitis, and perforated ulcers. Pain usually overlaps the left and right upper quadrants.

Acute cholecystitis. Cholecystitis results from bile stasis secondary to obstruction of the cystic duct. Cholelithiasis and cholecystitis are considered diseases of adulthood. Women are more likely to develop cholelithiasis than are men.¹¹ Although acute cholecystitis is an acute inflammatory process, bacterial infection is not a cause in approximately half of cases.¹¹ When bacterial invasion does occur, ascending cholangitis can result. Charcot's triad of right upper quadrant abdominal pain, fever, and jaundice is common in patients with ascending cholangitis.¹¹ In patients with cholecystitis, Murphy's sign can be elicited by having the patient take a deep breath while the right subcostal area is palpated (Figure 2).¹¹ Abrupt cessation of inspiration secondary to pain is considered a positive Murphy's sign.

Acute pancreatitis. Pancreatitis results from autodigestion of pancreatic tissue by proteolytic enzymes released into the pancreatic parenchyma. Initially, the pancreas becomes edematous. In more severe cases of hemorrhagic pancreatitis, there is parenchymal necrosis and hemorrhage. Retroperitoneal dissection of blood can result in bluish discoloration of the flanks (ie, Turner's sign) or of the periumbilical region (ie, Cullen's sign).¹¹

Biliary pancreatitis secondary to cholelithiasis is most commonly encountered in women age 50 years and older in a community hospital setting, whereas alcoholic pancreatitis is most commonly seen in men age 30 to 45 years in an urban hospital setting.¹¹ Patients most commonly report epigastric pain, nausea, and vomiting; the pain is constant and boring in nature. Bowel sounds are decreased, and there is lack of rigidity or rebound tenderness.



Figure 3. Radiograph of a patient with a perforated peptic ulcer showing free air under both diaphragms.

Perforated peptic ulcer. Patients with perforated peptic ulcers commonly experience sudden onset of severe epigastric pain, which becomes generalized after a few hours to involve the entire abdomen.^{6,7} Perforated peptic ulcers have a perioperative mortality rate of 23%.⁴ Observation typically reveals a patient lying quietly and breathing shallowly. The abdomen is rigid and board-like. Guarding is maximal at the site of perforation. Upright chest radiography is the most appropriate study for the detection of free intraperitoneal air, an indication of a perforated viscus (**Figure 3**).^{6,7}

Midabdominal Pain

Common causes of midabdominal pain include intestinal obstruction, mesenteric ischemia, and early appendicitis. The pain of early appendicitis eventually migrates to the right lower quadrant and so will not be discussed here.

Intestinal obstruction. Intestinal obstruction can be either mechanical or nonmechanical.¹² Mechanical obstruction results from gallstones, adhesions, hernias, volvulus, intussusception, or tumors, whereas nonmechanical obstruction results from intestinal infarction or occurs after surgery as a paralytic ileus. Obstruction high in the small intestine results in severe abdominal pain in the epigastric or umbilical region with bilious vomiting. Distention of the abdomen is not an early feature. Obstruction located lower in the small intestine results in



Figure 4. Abdominal radiograph showing dilated loops of small intestine indicative of an obstruction.

less severe abdominal pain. Vomiting is a late feature and may be feculent. The differential diagnosis of obstruction of the small intestine includes strangulated hernia, volvulus, mesenteric thrombus, and gallstone ileus. An abdominal radiograph of a distal obstruction of the small intestine will show a dilated loop (**Figure 4**).

Obstruction of the large intestine often has an insidious onset. Pain is less severe than in the small intestine, and vomiting is infrequent. Distention of the abdomen is common. The main causes of obstruction of the large intestine leading to midabdominal pain are cancer of the colon, diverticulitis, and volvulus. Change in bowel habits, weight loss, abdominal pain, and rectal bleeding are highly suggestive of colon cancer. Diverticulitis, which will be discussed more fully as a cause of lower abdominal pain, presents as a fixed and tender left lower quadrant mass. Sigmoid volvulus is the most common type of colonic volvulus; symptoms begin gradually and include cramping abdominal pain, followed by obstipation.

Mesenteric ischemia. Mesenteric ischemia presents with acute diffuse midabdominal pain, vomiting, decreased bowel sounds, and distention resulting from intestinal obstruction. The abdominal pain of acute mesenteric ischemia is out of proportion to physical examination findings.² Abdominal distention is a late

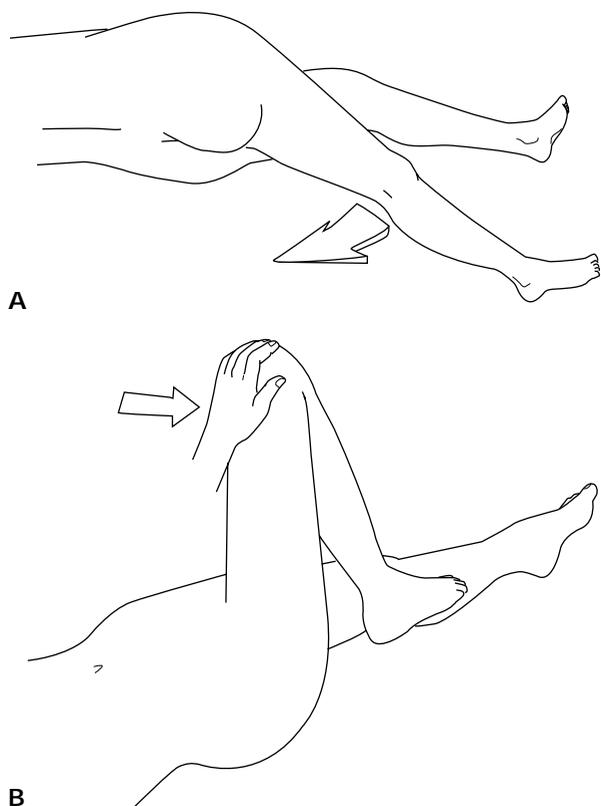


Figure 5. Illustration of how the psoas sign is typically elicited. (A) Standard method. (B) Alternate method.

sign indicative of gangrene. Signs of peritoneal irritation also indicate gangrene.

Lower Abdominal Pain

Common causes of lower abdominal pain include sigmoid diverticulitis, acute appendicitis, and gynecologic and urologic causes. Diverticulitis typically presents as left lower quadrant pain, and appendicitis typically presents as right lower quadrant pain.

Diverticulitis. Diverticulitis is an acute inflammation of a colonic diverticulum, which is a small saclike out-pouching of the mucosa through the colonic muscle. Diverticulitis typically presents as left lower quadrant pain. The pain is usually described as a cramping sensation. There may be associated fever.

Appendicitis. The peak incidence of appendicitis occurs in the second decade of life.¹³ The differential diagnosis is broad, and errors in diagnosis are common. The diagnostic error rate can reach 23% in men and 42% in women.¹³ Patients who are seen within the first few hours of pain onset report poorly defined constant pain in the periumbilical region. As the disease progresses, the pain shifts from the periumbilical

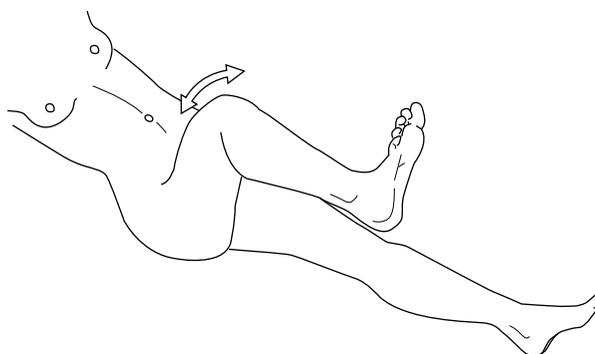


Figure 6. Illustration of how the obturator sign is typically elicited.

region to the right lower quadrant in a region known as McBurney's point, which is located two thirds of the distance along a line drawn from the umbilicus to the right anterior superior iliac spine.¹⁴ The pain is relieved somewhat when patients assume a right lateral decubitus position with slight hip flexion.

Abdominal tenderness is the most likely physical finding. Voluntary guarding in the right lower quadrant is common. Rovsing's sign can be elicited by palpating deeply in the left iliac area and observing for referred pain in the right iliac fossa. When present, the psoas and obturator signs also are helpful in establishing a diagnosis of appendicitis.¹³ The psoas sign is pain elicited by extending the right hip while the patient is in the left lateral decubitus position (Figure 5A).¹³ Alternatively, while in the supine position, the patient can lift the right thigh against the examiner's hand, which is placed above the knee (Figure 5B).¹³ The obturator sign is pain elicited by flexing the patient's right thigh at the hip with the knee flexed and then internally rotating the hip (Figure 6).¹³ Right-sided rectal tenderness may also be elicited on rectal examination of patients with acute appendicitis.

Other Causes of Abdominal Pain

Abdominal aortic aneurysm. Rupture of an abdominal aortic aneurysm most commonly produces symptoms of abdominal pain and backache; hypotension is also typically present. There is a 71% perioperative mortality rate associated with rupture of these aneurysms.⁴ Physical examination of the abdomen must be performed to detect a pulsatile mass.

Nephrolithiasis. Ureteral colic accounts for approximately 4% of patients who develop acute abdominal pain.^{3,4} Colicky pain begins in the upper lumbar region and radiates laterally around the abdomen to the inguinal region. The patient is often writhing in pain. Findings of a normal appetite, short duration of pain,

Table 2. Signs in Patients with Acute Abdominal Pain

Sign	Description	Clinical Correlation
Guarding	Spasms of the abdominal muscle	Peritonitis (ruptured viscus)
Voluntary	Conscious elimination of spasms possible	
Involuntary	Conscious elimination of spasms not possible	
Blumberg's sign (rebound tenderness)	Elicited by pressing the abdominal wall deeply and then suddenly releasing and observing for pain	Peritonitis (ruptured viscus)
Murphy's sign	Elicited by having the patient take a deep breath while the right subcostal area is palpated and observing for abrupt cessation of inspiration because of pain	Cholecystitis
Turner's sign	Retroperitoneal dissection of blood resulting in bluish discoloration of the flanks	Pancreatitis
Cullen's sign	Retroperitoneal dissection of blood resulting in bluish discoloration of the periumbilical region	Pancreatitis
Psoas sign	Elicited by extending the right hip while the patient is in the left lateral decubitus position and observing for pain	Appendicitis
Obturator sign	Elicited by flexing the patient's right thigh at the hip with the knee flexed and then internally rotating the hip and observing for pain	Appendicitis
Rovsing's sign	Elicited by palpating deeply in the left iliac area and observing for referred pain in the right iliac fossa	Appendicitis

lumbar tenderness, and hematuria are highly suggestive of acute ureteral colic.¹⁵

SUMMARY

In most cases, taking a careful history and performing a thorough physical examination can elicit the exact cause of acute abdominal pain. For abdominal pain correctable by surgery, symptoms generally include a pain duration of less than 48 hours and pain followed by vomiting. Pertinent signs include involuntary guarding and rebound tenderness on physical examination. Certain specific clinical signs (**Table 2**) detected on physical examination can aid in narrowing the differential possibilities.

HP

REFERENCES

- Martin RF, Rossi RL. The acute abdomen. An overview and algorithms. *Surg Clin North Am* 1997;77:1227–43.
- Sanson TG, O'Keefe KP. Evaluation of abdominal pain in the elderly. *Emerg Med Clin North Am* 1996;14:615–27.
- Brewer BJ, Golden GT, Hitch DC, et al. Abdominal pain. An analysis of 1,000 consecutive cases in a university hospital emergency room. *Am J Surg* 1976;131:219–23.
- Irvin TT. Abdominal pain: a surgical audit of 1190 emergency admissions. *Br J Surg* 1989;76:1121–5.
- Bell R. Diagnosing the causes of abdominal pain in children. *Practitioner* 1996;240:598–601, 602.
- al-Musawi D, Thompson J. The important signs in acute abdominal pain. *Practitioner* 2000;244:312–4, 316–8, 320.
- Murtagh J. Acute abdominal pain: a diagnostic approach. *Aust Fam Physician* 1994;23:358–61, 364–74.
- Interpreting abnormal abdominal sounds. *Nursing* 2000;30:28.
- Silen W. Cope's early diagnosis of the acute abdomen. 20th ed. New York: Oxford University Press; 2000.
- Bennett DH, Tambour LJ, Campbell WB. Use of coughing test to diagnose peritonitis. *BMJ* 1994;308:1336.
- Moscato RM. Cholelithiasis, cholecystitis, and pancreatitis. *Emerg Med Clin North Am* 1996;14:719–37.
- Sheridan JL. Obstructions of the intestinal tract. *Nurs Clin North Am* 1975;10:147–55.
- Graffeo CS, Counselman FL. Appendicitis. *Emerg Med Clin North Am* 1996;14:653–71.
- Kozol RA, Farmer DL, Tennenberg SD, Mulligan M. *Surgical pearls*. Philadelphia: FA Davis; 1999.
- Eskelinen M, Ikonen J, Lipponen P. Usefulness of history-taking, physical examination and diagnostic scoring in acute renal colic. *Eur Urol* 1998;34:467–73.

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