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Item 1 of 40
Question Id: 2209
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A 58-year-old man comes to the office due to yellowish discoloration of the skin, anorexia, and unintentional weight loss of 6 kg (13.2 lb) over the past 3 months. He also reports dark urine and pale stools. The patient has had no fever, abdominal pain, constipation, or diarrhea. He has a history of hypertension and hyperlipidemia. The patient does not use tobacco, alcohol, or illicit drugs. Vital signs are within normal limits. BMI is 32 kg/m$^2$. Scleral icterus is present. An enlarged, nontender gallbladder is palpated below the right costal margin. There is no ascites. Abdominal imaging in this patient is most likely to reveal which of the following findings?

A. Cystic lesion at the tail of the pancreas
B. Gallstone obstructing the cystic duct
C. Intra- and extra-hepatic biliary duct dilation
D. Multiloculated hypoechoic hepatic lesions
E. Peripancreatic fluid collection
F. Thrombus within the portal vein

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Item 1 of 40
Question Id: 2209

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A 58-year-old man comes to the office due to yellowish discoloration of the skin, anorexia, and unintentional weight loss of 6 kg (13.2 lb) over the past 3 months. He also reports dark urine and pale stools. The patient has had no fever, abdominal pain, constipation, or diarrhea. He has a history of hypertension and hyperlipidemia. The patient does not use tobacco, alcohol, or illicit drugs. Vital signs are within normal limits. BMI is 32 kg/m$^2$. Scleral icterus is present. An enlarged, nontender gallbladder is palpated below the right costal margin. There is no ascites. Abdominal imaging in this patient is most likely to reveal which of the following findings?

A. Cystic lesion at the tail of the pancreas (8%)
B. Gallstone obstructing the cystic duct (6%)
✓ C. Intra- and extra-hepatic biliary duct dilation (66%)
D. Multiloculated hypoechoic hepatic lesions (6%)
E. Peripancreatic fluid collection (10%)
F. Thrombus within the portal vein (1%)

Omitted
Correct answer
C

66%
Answered correctly

05 mins, 01 sec
Time Spent

06/17/2020
Last Updated

Explanation

## Pancreatic and biliary duct system

Common

TUTOR

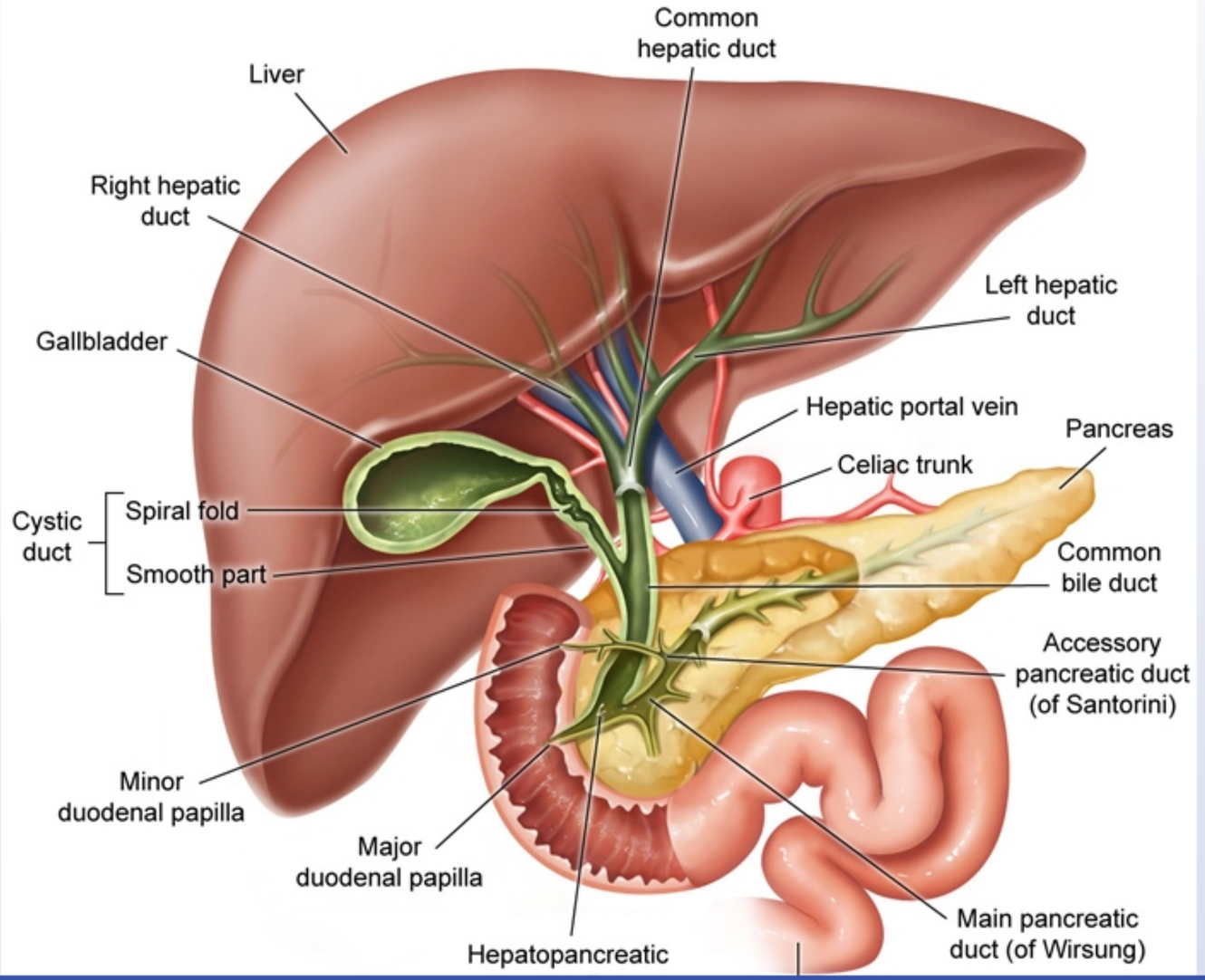
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Item 1 of 40
Question Id: 2209
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## Pancreatic and biliary duct system




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This patient with painless jaundice, weight loss, anorexia, and a palpable gallbladder most likely has **pancreatic cancer**. Most (60%-70%) pancreatic tumors occur in the head of the pancreas, which is in close proximity to the biliary tree. As these tumors expand, they can compress the common bile duct (CBD), resulting in backup of bile with subsequent **intra- and extrahepatic biliary duct dilation**. When the tumor also compresses the pancreatic duct, a double duct sign (ie, dilation of both the common bile duct and the pancreatic duct) can be seen radiographically, which is further suggestive of advanced neoplasia.

Symptoms of pancreatic cancer occurring at the head of the pancreas include **painless jaundice** (eg, yellowish skin, pruritus, pale stools, dark urine) and a **nontender, distended gallbladder** at the right costal margin (Courvoisier sign). In contrast, cancers in the body or tail of the pancreas usually present with abdominal pain but without jaundice since they do not typically obstruct the biliary system.

**(Choice A)** Pancreatic cystic lesions are usually asymptomatic. Jaundice is unexpected in a pancreatic tail lesion due to the distance from the biliary tree.

**(Choice B)** Gallstone obstruction of the cystic duct can cause biliary colic (ie, intermittent right upper quadrant [RUQ] pain) or cholecystitis (ie, RUQ pain, leukocytosis, fever). However, because the CBD is not obstructed, jaundice does not occur. In addition, gallbladder tenderness is expected, and weight loss would be atypical.

**(Choice D)** Pyogenic liver abscesses are identified radiographically as multiloculated, hypoechoic hepatic lesions that present with jaundice and weight loss. However, fevers and leukocytosis are expected, and an enlarged gallbladder would be atypical.

**(Choice E)** Encapsulated peripancreatic fluid collections (eg, pseudocysts) occur in patients with a history of pancreatitis and are usually asymptomatic but can cause epigastric pain and early satiety. Pseudocysts are almost never located close enough to the biliary tree cause obstruction; therefore, jaundice and gallbladder enlargement are unexpected.

**(Choice F)** Portal vein thrombosis (PVT) is most often associated with cirrhosis. Acute PVT usually presents with abdominal pain, whereas chronic PVT most often presents with variceal bleeding. This patient's weight loss, jaundice, and palpable gallbladder is more consistent with pancreatic cancer.

**Educational objective:**
Tumors in the head of the pancreas can present with weight loss, jaundice, and a nontender, distended gallbladder (eg, Courvoisier sign) on examination. Imaging can demonstrate dilation of both the intra- and extrahepatic bile ducts as well as the pancreatic duct (ie, double duct sign).

Symptoms of pancreatic cancer occurring at the head of the pancreas include **painless jaundice** (eg, yellowish skin, pruritus, pale stools, dark urine) and a **nontender, distended gallbladder** at the right costal margin (Courvoisier sign). In contrast, cancers in the body or tail of the pancreas usually present with abdominal pain but without jaundice since they do not typically obstruct the biliary system.

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**References**

- Imaging diagnosis of pancreatic cancer: a state-of-the-art review.

Surgery  Gastrointestinal & Nutrition  Pancreatic cancer

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**(Choice B)** Gallstone obstruction of the cystic duct can cause biliary colic (ie, intermittent right upper quadrant [RUQ] pain) or cholecystitis (ie, RUQ pain, leukocytosis, fever). However, because the CBD is not obstructed, jaundice does not occur. In addition, gallbladder tenderness is expected, and weight loss would be atypical.

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Tumors in the head of the pancreas can present with weight loss, jaundice, and a nontender, distended gallbladder (eg, Courvoisier sign) on examination. Imaging can demonstrate dilation of both the intra- and extrahepatic bile ducts as well as the pancreatic duct (ie, double duct sign).

**References**


- Imaging diagnosis of pancreatic cancer: a state-of-the-art review.


| Surgery | Gastrointestinal & Nutrition | Pancreatic cancer |
|---|---|---|
| Subject | System | Topic |

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A 19-year-old man comes to the office due to a change in bowel habits. Six months ago, the patient began having loose, watery stools with increased frequency to approximately 5 times daily. In addition, he has had crampy, intermittent abdominal pain that usually improves after defecation. No nausea, vomiting, melena, fevers, night sweats, or weight loss has occurred. The patient vacationed in South America 12 months ago. He does not use tobacco or alcohol. Temperature is 37.4 C (99.3 F), blood pressure is 138/87 mm Hg, pulse is 75/min, and respirations are 12/min. The patient appears comfortable and is not in acute distress. There is no conjunctival pallor, scleral icterus, or palpable lymphadenopathy. Cardiopulmonary examination is unremarkable. The abdomen is nontender and nondistended. Rectal examination reveals scant blood in the stool but no hemorrhoids or fissures. Laboratory results are as follows:

Complete blood count

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| Hemoglobin | 11.7 g/dL |
| Platelets | 435,000/mm$^3$ |
| Leukocytes | 7,000/mm$^3$ |

Immunologic and rheumatologic studies

| | |
|---|---|
| C-reactive protein | 12.1 mg/L (<3 mg/L) |

Stool studies are negative for ova and parasites as well as *Clostridioides* (formerly *Clostridium*) *difficile*. Which of the following is the best next step in management?

A. Check fecal calprotectin
B. Check serum tissue transglutaminase
C. Obtain a barium enema
D. Obtain a colonoscopy

Complete blood count

| | |
|---|---|
| Hemoglobin | 11.7 g/dL |
| Platelets | 435,000/mm$^3$ |
| Leukocytes | 7,000/mm$^3$ |

Immunologic and rheumatologic studies

| | |
|---|---|
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Stool studies are negative for ova and parasites as well as *Clostridioides* (formerly *Clostridium*) *difficile*. Which of the following is the best next step in management?

A. Check fecal calprotectin
B. Check serum tissue transglutaminase
C. Obtain a barium enema
D. Obtain a colonoscopy
E. Obtain a CT of the abdomen and pelvis
F. Prescribe a course of azithromycin
G. Recommend loperamide and a low FODMAP diet

Submit

Complete blood count

| | |
|---|---|
| Hemoglobin | 11.7 g/dL |
| Platelets | 435,000/mm$^3$ |
| Leukocytes | 7,000/mm$^3$ |

Immunologic and rheumatologic studies

| | |
|---|---|
| C-reactive protein | 12.1 mg/L (<3 mg/L) |

Stool studies are negative for ova and parasites as well as *Clostridioides* (formerly *Clostridium*) *difficile*. Which of the following is the best next step in management?

- A. Check fecal calprotectin (11%)
- B. Check serum tissue transglutaminase (15%)
- C. Obtain a barium enema (1%)
- ✓ D. Obtain a colonoscopy (55%)
- E. Obtain a CT of the abdomen and pelvis (4%)
- F. Prescribe a course of azithromycin (1%)
- G. Recommend loperamide and a low FODMAP diet (9%)

Omitted
Correct answer

55%
Answered correctly

03 secs
Time Spent

01/09/2020
Last Updated

| | Crohn disease | Ulcerative colitis |
|---|---|---|
| **Involvement** | • Anywhere mouth to anus (mostly ileum & colon)<br>• Perianal disease with rectal sparing<br>• Skip lesions | • Rectum (always) & colon<br>• Continuous lesions |
| **Microscopy** | • Noncaseating granulomas | • No granulomas |
| **Gross findings** | • Transmural inflammation<br>• Linear mucosal ulcerations<br>• Cobblestoning, creeping fat | • Mucosal & submucosal inflammation<br>• Pseudopolyps |
| **Clinical manifestations** | • Abdominal pain (often RLQ)<br>• Watery diarrhea (bloody if colitis) | • Abdominal pain (varying locations)<br>• Bloody diarrhea |
| **Intestinal complications** | • Fistulae, abscesses<br>• Strictures (bowel obstruction) | • Toxic megacolon |

RLQ = right lower quadrant.

This patient's presentation is most consistent with **inflammatory bowel disease** (IBD), which encompasses 2 disorders: Crohn disease (CD) and ulcerative colitis (UC). Both CD and UC present with **chronic diarrhea**, **abdominal pain**, **anemia**, and elevated inflammatory markers (eg, C-reactive protein, erythrocyte sedimentation rate). Although not universally true, pain is predominant in CD, whereas hematochezia is more common in UC. Severe manifestations of CD include fistulas, strictures, and abscesses; uncontrolled UC can lead to toxic megacolon.

Diagnosing IBD and distinguishing between CD and UC requires **colonoscopy with biopsies**. **CD** is characterized grossly by a cobblestone appearance, **skip lesions** (eg, areas of normal-appearing bowel between inflamed segments), and deep serpiginous ulcers. On the other hand, **UC** demonstrates **continuous**, shallow ulcerations and pseudopolyps. On histology, chronic inflammation in **CD** extends beyond the submucosa and is often **transmural**; noncaseating granulomas may be present. In UC, inflammation is usually limited to the mucosa, although it occasionally extends into the submucosa.

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**(Choice A)** Fecal calprotectin, a stool marker for inflammatory diarrhea, is typically elevated in patients with IBD. However, it is not specific for IBD and is not used to make the initial diagnosis of IBD; it is sometimes used in patients with established CD who have symptoms of a flare. An elevated fecal calprotectin would not distinguish between CD and UC.

**(Choices B and G)** Tissue transglutaminase is a marker of celiac disease, whereas loperamide and the low FODMAP (**F**ermentable **O**ligosaccharides, **D**isaccharides, **M**onosaccharides, **A**nd **P**olyols) diet represent initial steps in the management of irritable bowel syndrome (IBS). Neither celiac disease nor IBS presents with an elevated C-reactive protein or bloody stool on rectal examination.

**(Choice C)** A barium enema can be used to characterize colonic inflammation; however, it is less accurate than a colonoscopy for diagnosing IBD.

**(Choice E)** CT findings (eg, fat stranding, intestinal wall thickening) in IBD are identical to those of other types of colitis (eg, infectious, ischemic) and are therefore too nonspecific to be used for initial diagnosis.

**(Choice F)** Azithromycin is used to treat travelers' diarrhea, which causes abdominal cramps and self-limited watery or bloody diarrhea. This patient's travel history is too remote to be related to his clinical presentation; travelers' diarrhea typically presents within 2 weeks of initial infection.

**Educational objective:**
Both Crohn disease and ulcerative colitis present with chronic diarrhea, abdominal pain, anemia, and elevated inflammatory markers. Colonoscopy with biopsies is the test of choice for diagnosis because it can distinguish between characteristic findings of Crohn disease (eg,

and is often **transmural**; noncaseating granulomas may be present. In UC, inflammation is usually limited to the mucosa, although it occasionally extends into the submucosa.

**(Choice A)** Fecal calprotectin, a stool marker for inflammatory diarrhea, is typically elevated in patients with IBD. However, it is not specific for IBD and is not used to make the initial diagnosis of IBD; it is sometimes used in patients with established CD who have symptoms of a flare. An elevated fecal calprotectin would not distinguish between CD and UC.

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**Educational objective:**
Both Crohn disease and ulcerative colitis present with chronic diarrhea, abdominal pain, anemia, and elevated inflammatory markers. Colonoscopy with biopsies is the test of choice for diagnosis because it can distinguish between characteristic findings of Crohn disease (eg, cobblestone appearance, skip lesions, deep ulcerations, transmural inflammation, granulomas) and those of ulcerative colitis (eg, continuous, shallow ulcerations limited to the mucosa/submucosa, pseudopolyps).

| Surgery | Gastrointestinal & Nutrition | Inflammatory bowel disease |
|---|---|---|
| Subject | System | Topic |

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An 82-year-old man is brought to the emergency department due to fever and confusion. Yesterday, he experienced abdominal pain, nausea, vomiting, and rigors in the nursing home where he lives. Earlier today, he was found to be lethargic. Medical history includes hypercholesterolemia, type 2 diabetes mellitus, and Alzheimer dementia. The patient quit smoking 30 years ago and does not drink alcohol. Temperature is 39.1 C (102.4 F), blood pressure is 105/55 mm Hg, pulse is 110/min, and respirations are 20/min. He is lethargic but arousable to strong stimuli. On examination, the mucous membranes are dry. Scleral icterus is present. No cardiac murmurs are heard. The lungs are clear to auscultation. There is marked tenderness in the right upper quadrant and epigastrium but no distension, rebound, or guarding. Laboratory results are as follows:

| | |
|---|---|
| Complete blood count | |
| Hemoglobin | 14.8 g/dL |
| Platelets | 420,000/mm$^3$ |
| Leukocytes | 18,500/mm$^3$ |
| Neutrophils | 90% |
| Eosinophils | 2% |
| Lymphocytes | 7% |
| Liver function studies | |
| Total bilirubin | 2.5 mg/dL |
| Alkaline phosphatase | 215 U/L |
| Aspartate aminotransferase (SGOT) | 68 U/L |
| Alanine aminotransferase (SGPT) | 95 U/L |
| Lipase | 520 U/L (normal: 5-70) |

| | |
|---|---|
| Eosinophils | 2% |
| Lymphocytes | 7% |

Liver function studies

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An abdominal ultrasound reveals multiple gallstones and a dilated common bile duct. The gallbladder wall is not thickened. In addition to aggressive intravenous hydration and antibiotics, which of the following is the best next step in management of this patient?

A. CT scan of the abdomen
B. Emergent cholecystectomy
C. Endoscopic retrograde cholangiopancreatography
D. HIDA scan
E. No additional intervention

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|---|---|
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| Lymphocytes | 7% |

Liver function studies

| | |
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| Alkaline phosphatase | 215 U/L |
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| Lipase | 520 U/L (normal: 5-70) |

An abdominal ultrasound reveals multiple gallstones and a dilated common bile duct. The gallbladder wall is not thickened. In addition to aggressive intravenous hydration and antibiotics, which of the following is the best next step in management of this patient?

- A. CT scan of the abdomen (10%)
- B. Emergent cholecystectomy (12%)
- ✓ C. Endoscopic retrograde cholangiopancreatography (72%)
- D. HIDA scan (1%)
- E. No additional intervention (3%)

Omitted
Correct answer

72%
Answered correctly

03 secs
Time Spent

04/12/2020
Last Updated

Explanation

This patient's presentation suggests **gallstone pancreatitis** complicated by acute cholangitis. Gallstone pancreatitis develops when a gallstone passes through the biliary tree and obstructs the ampulla or flow from the pancreatic duct, allowing bile to reflux into the pancreas. In addition to the classic manifestations of pancreatitis (eg, **abdominal pain**, nausea/vomiting, **elevated serum lipase** or amylase), patients with obstruction of the ampulla may also demonstrate cholestatic liver function studies (eg, elevated bilirubin, alkaline phosphatase, transaminases).

If the stone remains in the biliary tract, the resultant bile stasis can allow bacteria to ascend from the duodenum, leading to **acute cholangitis**. In addition to cholestatic liver function studies (due to stasis and obstruction), the presence of Charcot triad (**right upper quadrant pain**, jaundice, **fevers**) suggests the diagnosis, and **altered mental status** and hypotension (ie, Reynolds pentad) indicate particularly severe disease. **Common bile duct dilation** (as seen in this patient) or choledocholithiasis on a right upper quadrant ultrasound further support the diagnosis.

Management includes aggressive intravenous hydration and antibiotics. **Endoscopic retrograde cholangiopancreatography** (ERCP) is indicated to relieve the biliary obstruction, during which a sphincterotomy, stone extraction, and/or biliary stent placement can be performed.

**(Choice A)** Although a CT scan can help diagnose pancreatitis, the combination of acute abdominal pain and elevated serum lipase is sufficient for diagnosis. In addition, a CT scan is less sensitive than an ultrasound for detecting changes associated with cholangitis (eg, common bile duct dilation) and may miss gallstones, which are frequently radiolucent.

**(Choices B and D)** A HIDA scan is used to diagnose cholecystitis in patients with equivocal ultrasound findings; however, in addition to fevers and right upper quadrant pain, cholecystitis results in gallbladder wall thickening and edema visible on ultrasound, whereas biliary dilation suggests cholangitis. An elective cholecystectomy to prevent further complications of gallstone disease should be deferred until after the current complications have resolved.

**(Choice E)** The presence of cholangitis requires ERCP to relieve the biliary obstruction; failure to remove the obstructive gallstone may result in septic shock and death.

**Educational objective:**
Acute cholangitis should be suspected in a patient with gallstone pancreatitis who also has fevers, right upper quadrant pain, jaundice, altered mental status, and hypotension. Endoscopic retrograde cholangiopancreatography is required to relieve the biliary obstruction and prevent serious infectious complications.

If the stone remains in the biliary tract, the resultant bile stasis can allow bacteria to ascend from the duodenum, leading to **acute cholangitis**. In addition to cholestatic liver function studies (due to stasis and obstruction), the presence of Charcot triad (**right upper quadrant pain**, jaundice, **fevers**) suggests the diagnosis, and **altered mental status** and hypotension (ie, Reynolds pentad) indicate particularly severe disease. **Common bile duct dilation** (as seen in this patient) or choledocholithiasis on a right upper quadrant ultrasound further support the diagnosis.

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| Surgery | Gastrointestinal & Nutrition | Cholangitis |
|---|---|---|
| Subject | System | Topic |

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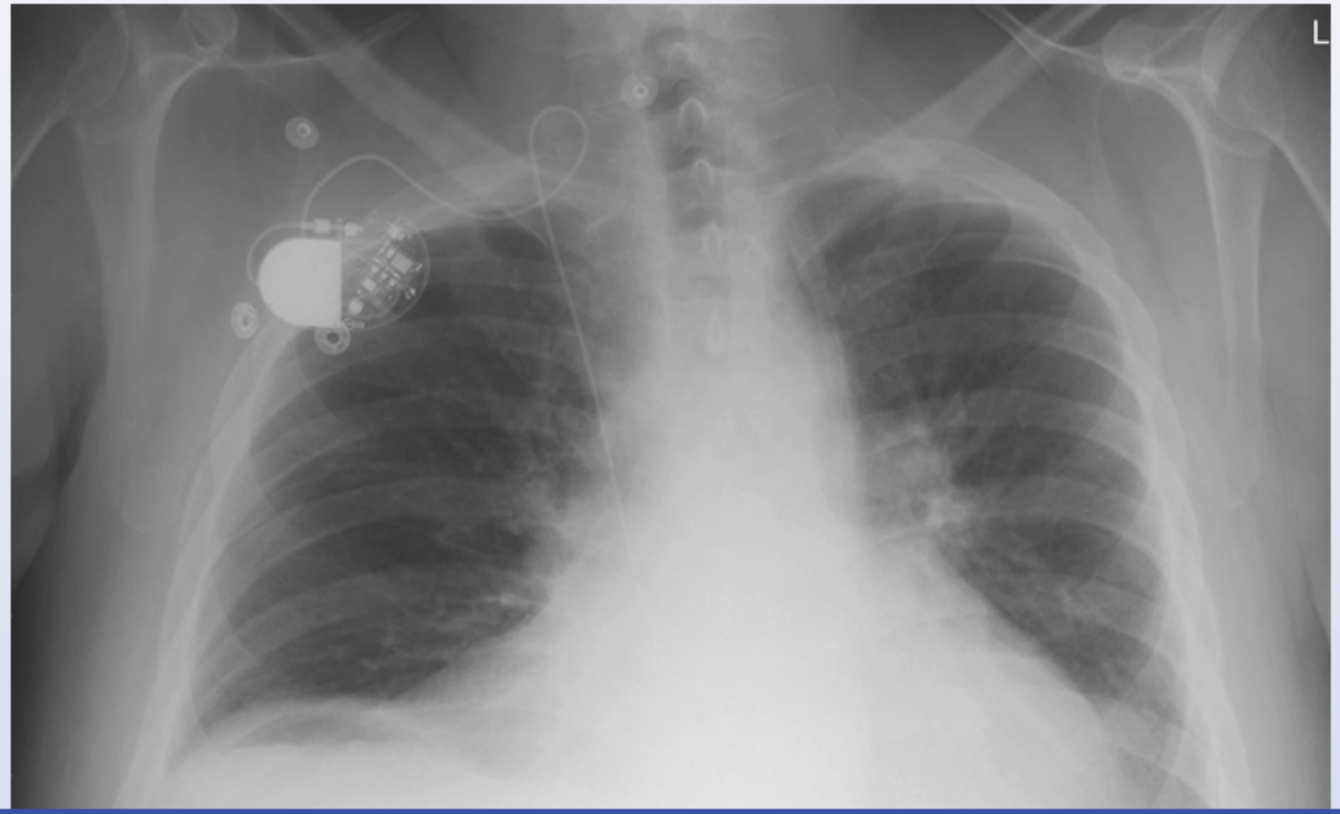
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Item 4 of 40
Question Id: 3178

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A 68-year-old man comes to the emergency department due to sudden onset of severe epigastric pain 2 hours ago, accompanied by nausea and an episode of vomiting. The patient has had intermittent abdominal discomfort over the past several months, and an abdominal ultrasound performed 2 weeks ago revealed several small gallstones. Other medical conditions include hypertension, type 2 diabetes mellitus, coronary artery disease, and heart failure with reduced ejection fraction. The patient has a 30-pack-year smoking history and drinks 1 or 2 beers occasionally. Temperature is 38 C (100.4 F), blood pressure is 150/92 mm Hg, pulse is 112/min, and respirations are 26/min. Auscultation reveals normal lung and heart sounds. There is marked upper abdominal tenderness with guarding. ECG reveals no acute ST-segment or T-wave changes. Chest x-ray is shown in the image below:




TUTOR

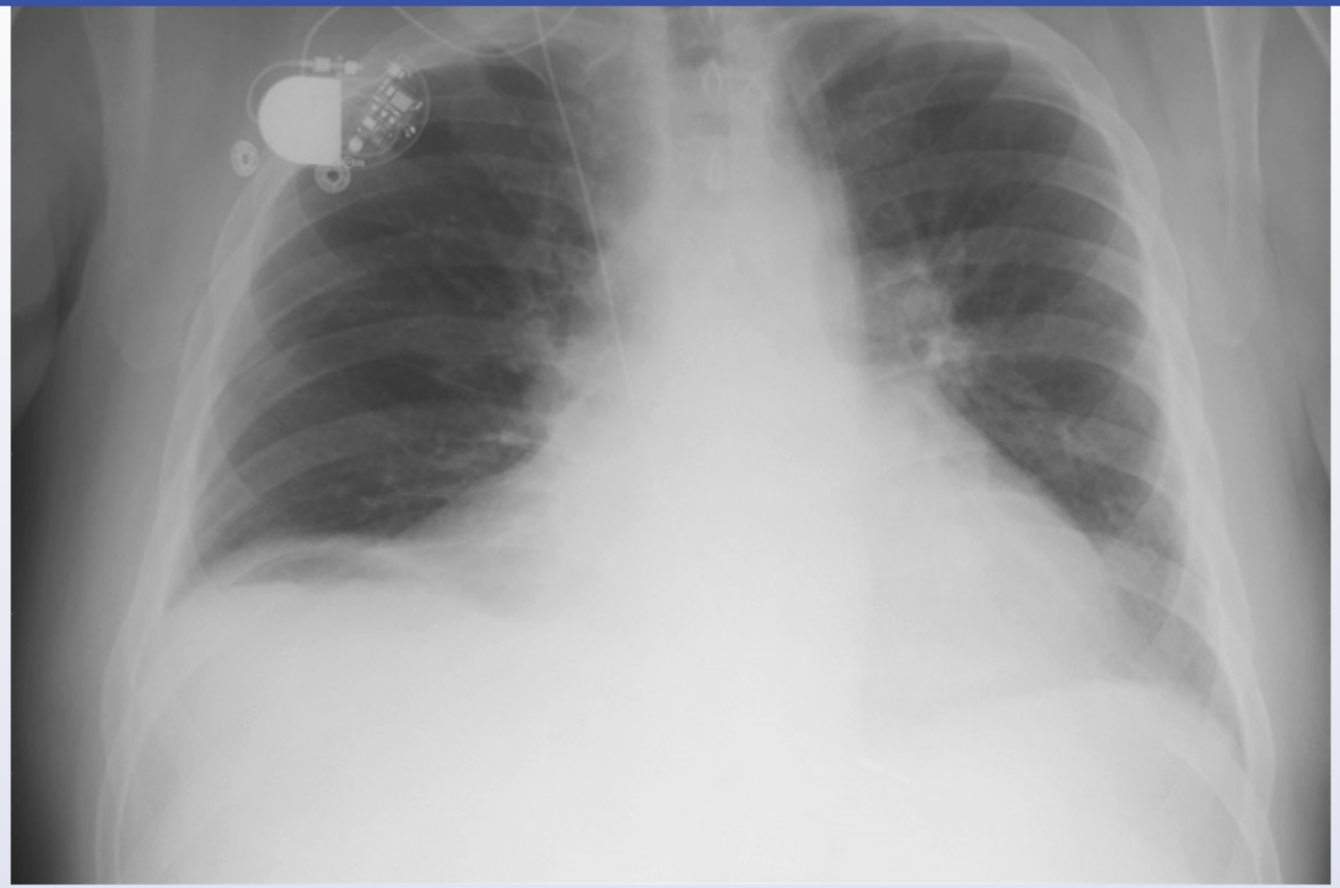
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Item 4 of 40
Question Id: 3178

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Which of the following is the most likely cause of this patient's current symptoms?

A. Acute cholecystitis

B. Acute gallstone pancreatitis

C. Aortic dissection

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Item 4 of 40
Question Id: 3178

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Which of the following is the most likely cause of this patient's current symptoms?

A. Acute cholecystitis
B. Acute gallstone pancreatitis
C. Aortic dissection
D. Biliary colic
E. Perforated peptic ulcer

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Item 4 of 40
Question Id: 3178

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Which of the following is the most likely cause of this patient's current symptoms?

A. Acute cholecystitis (6%)
B. Acute gallstone pancreatitis (13%)
C. Aortic dissection (6%)
D. Biliary colic (0%)
✓ E. Perforated peptic ulcer (72%)

Omitted
Correct answer

72%
Answered correctly

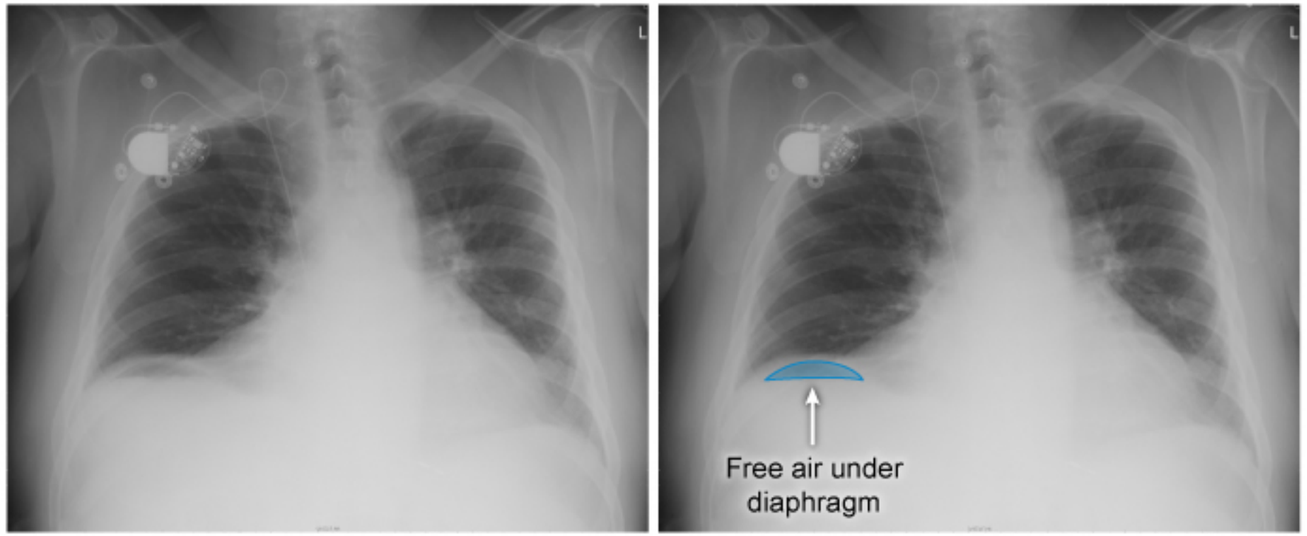
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Last Updated

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## Pneumoperitoneum on upright chest x-ray




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This patient with clinical manifestations (eg, months of intermittent abdominal pain) and risk factors (eg, likely aspirin use) for peptic ulcer disease (PUD) now has sudden-onset, severe abdominal pain with a chest x-ray showing **subdiaphragmatic free air** (ie, pneumoperitoneum). This presentation is highly concerning for **perforated viscus** due to PUD. Full-thickness erosion of a peptic ulcer through the stomach or duodenal wall releases both air and caustic (ie, pH ~1-2) gastric secretions/contents into the peritoneal cavity. This quickly results in chemical **peritonitis** (eg, marked abdominal tenderness with guarding) and an early systemic inflammatory response (eg, fever, tachycardia) that can progress to sepsis and shock if left untreated.

Patients with free perforation causing gross spillage of gastrointestinal contents (vs microperforation with little to no spillage) can often note the precise time the perforation occurred. **Sudden, severe pain** is typical. Demonstration of intraperitoneal free air (eg, on upright x-ray) confirms the diagnosis and should prompt **immediate surgical consultation**, since many patients require surgical intervention and delay increases mortality (which is up to 30%, even with treatment).




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This patient with clinical manifestations (eg, months of intermittent abdominal pain) and risk factors (eg, likely aspirin use) for peptic ulcer disease (PUD) now has sudden-onset, severe abdominal pain with a chest x-ray showing **subdiaphragmatic free air** (ie, pneumoperitoneum). This presentation is highly concerning for **perforated viscus** due to PUD. Full-thickness erosion of a peptic ulcer through the stomach or duodenal wall releases both air and caustic (ie, pH ~1-2) gastric secretions/contents into the peritoneal cavity. This quickly results in chemical **peritonitis** (eg, marked abdominal tenderness with guarding) and an early systemic inflammatory response (eg, fever, tachycardia) that can progress to sepsis and shock if left untreated.

Patients with free perforation causing gross spillage of gastrointestinal contents (vs microperforation with little to no spillage) can often note the precise time the perforation occurred. **Sudden, severe pain** is typical. Demonstration of intraperitoneal free air (eg, on upright x-ray) confirms the diagnosis and should prompt **immediate surgical consultation**, since many patients require surgical intervention and delay increases mortality (which is up to 30%, even with treatment).

**(Choice A)** Acute cholecystitis can cause epigastric pain, fever, nausea/vomiting, and focal peritonitis. However, pain onset is not typically as sudden, and peritoneal inflammation is usually isolated to the right upper quadrant. Gallbladder perforation can cause upper abdominal pain but typically only after several days of symptoms (vs 2 hours in this patient) and would not cause pneumoperitoneum because the gallbladder does not contain significant air. This patient likely has asymptomatic gallstones, which are common in the general population.

**(Choice B)** Acute gallstone pancreatitis can cause a sudden onset of severe epigastric pain, fever, and nausea/vomiting; however, pancreatitis does not cause subdiaphragmatic free air. Abdominal x-ray is often normal but may show gallstones or paralytic ileus due to surrounding inflammation.

**(Choice C)** Aortic dissection can present with sudden-onset abdominal pain but more commonly produces chest/back pain. Rather than pneumoperitoneum, it typically causes mediastinal widening.

**(Choice D)** Biliary colic can cause epigastric pain, but the pain is typically postprandial when the gallbladder contracts against a blocked (ie, gallstone) cystic duct in response to a fatty meal. In addition, biliary colic is typically associated with a benign abdominal examination and does not cause fever or pneumoperitoneum.

diagnosis and should prompt **immediate surgical consultation**, since many patients require surgical intervention and delay increases mortality (which is up to 30%, even with treatment).

**(Choice A)** Acute cholecystitis can cause epigastric pain, fever, nausea/vomiting, and focal peritonitis. However, pain onset is not typically as sudden, and peritoneal inflammation is usually isolated to the right upper quadrant. Gallbladder perforation can cause upper abdominal pain but typically only after several days of symptoms (vs 2 hours in this patient) and would not cause pneumoperitoneum because the gallbladder does not contain significant air. This patient likely has asymptomatic gallstones, which are common in the general population.

**(Choice B)** Acute gallstone pancreatitis can cause a sudden onset of severe epigastric pain, fever, and nausea/vomiting; however, pancreatitis does not cause subdiaphragmatic free air. Abdominal x-ray is often normal but may show gallstones or paralytic ileus due to surrounding inflammation.

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**(Choice D)** Biliary colic can cause epigastric pain, but the pain is typically postprandial when the gallbladder contracts against a blocked (ie, gallstone) cystic duct in response to a fatty meal. In addition, biliary colic is typically associated with a benign abdominal examination and does not cause fever or pneumoperitoneum.

**Educational objective:**
Sudden-onset, severe abdominal pain with peritonitis and subdiaphragmatic free air on upright chest x-ray is a classic presentation of perforated viscus (eg, perforated peptic ulcer).

**References**


- Pneumoperitoneum.
- Perforated peptic ulcer.
- Perforated peptic ulcer—an update.


Surgery  Gastrointestinal & Nutrition  Perforated viscus

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Item 5 of 40
Question Id: 17060

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A 20-year-old collegiate football player is brought to the emergency department due to severe right knee pain following a hard tackle. He cannot bear weight on the right leg. Blood pressure is 142/90 mm Hg, pulse is 108/min, and respirations are 18/min. The right knee is deformed, swollen, and bruised; the lower leg is warm and soft, with a palpable dorsalis pedal pulse. Lateral x-ray of the knee reveals a posterior dislocation, as shown in the exhibit. Immediate reduction is performed under sedation. Which of the following is the best next step in management of this patient?

A. Measure the ankle-brachial index
B. Perform knee arthrocentesis
C. Perform nerve conduction study
D. Perform posterior drawer test

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- A. Measure the ankle-brachial index (50%)
- B. Perform knee arthrocentesis (3%)
- C. Perform nerve conduction study (23%)
- D. Perform posterior drawer test (21%)

Omitted
Correct answer
A

50%
Answered correctly

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03/27/2020
Last Updated

Explanation

**Posterior knee dislocation**




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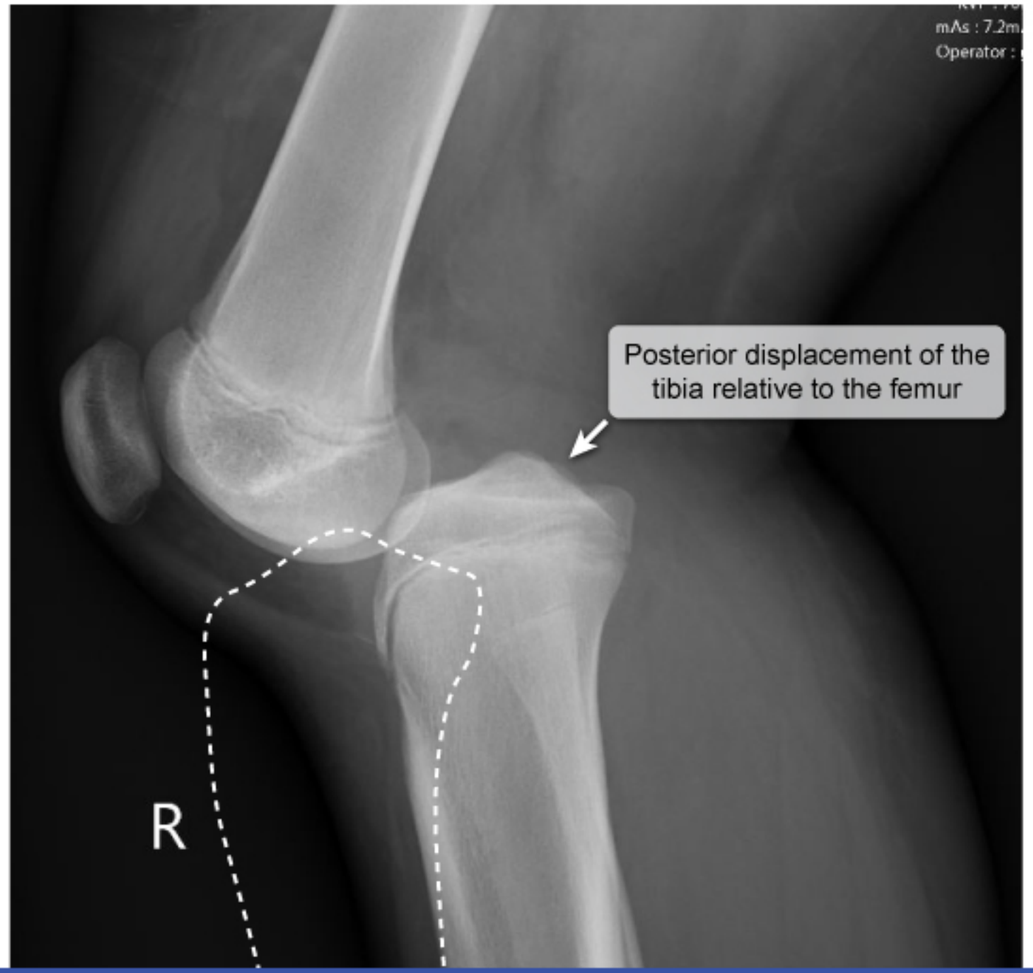
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Explanation

## Posterior knee dislocation




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## Exhibit Display

### Posterior knee dislocation




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This patient with severe knee pain and deformity after a hard tackle has a posterior **knee dislocation** (displacement of the proximal tibia posterior to the distal femur). This typically results from a direct blow to the proximal tibia and disrupts multiple ligaments (eg, cruciate, collateral), with **possible injury** to the neurovascular structures within the popliteal fossa. Injury to the popliteal artery is the most feared complication of any knee dislocation because the resulting lower leg **ischemia** can cause irreversible injury, requiring above-the-knee amputation.

Management begins with immediate reduction of the dislocated knee. Given the risk of vascular (eg, popliteal artery) injury, this should be followed by a **meticulous vascular examination** that includes:

- Palpation of the popliteal and distal pulses
- Measurement of the ankle-brachial index (ABI)
- Duplex ultrasonography (if available)

Because pulse examination alone is of limited accuracy in diagnosing vascular injury, obtaining and documenting the ABI are critical. The combination of normal pulses with an ABI >0.9 virtually excludes clinically significant vascular injury. Any signs (eg, diminished pulse, ABI ≤0.9) of vascular injury warrant emergency imaging (eg, CT angiography) and vascular consultation.

**(Choice B)** Arthrocentesis (ie, joint fluid aspiration) with synovial fluid analysis is commonly performed to evaluate for infection or crystals in an inflamed joint. It may also be performed for pressure relief of a severe effusion. Although this patient's knee is swollen from trauma, he has none of these indications for arthrocentesis.

**(Choice C)** Peroneal nerve injury occurs in 20%-25% of knee dislocations. When signs of injury (eg, foot drop) are present, nerve conduction studies may help determine injury severity and direct treatment. This patient has no such signs.

**(Choice D)** The posterior drawer test (ie, posterior force applied to the tibia while the knee is flexed) assesses the integrity of the posterior cruciate ligament (PCL), which typically prevents posterior displacement of the tibia relative to the femur. Because complete PCL disruption is required for posterior knee dislocation to occur, testing the PCL is unnecessary; the test would be positive and risks redislocating the knee.

**Educational objective:**
Knee dislocation can cause limb-threatening injury to the popliteal artery. Meticulous vascular examination, including measurement of the ankle-brachial index, is necessary for ruling out vascular injury.

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**References**


- Knee dislocation: a case report, diagnostic vascular work-up, and literature review.
- Can vascular injury be appropriately assessed with physical examination after knee dislocation?
- Acute management of traumatic knee dislocations for the generalist.


| Surgery | Rheumatology/Orthopedics & Sports | Knee dislocation |
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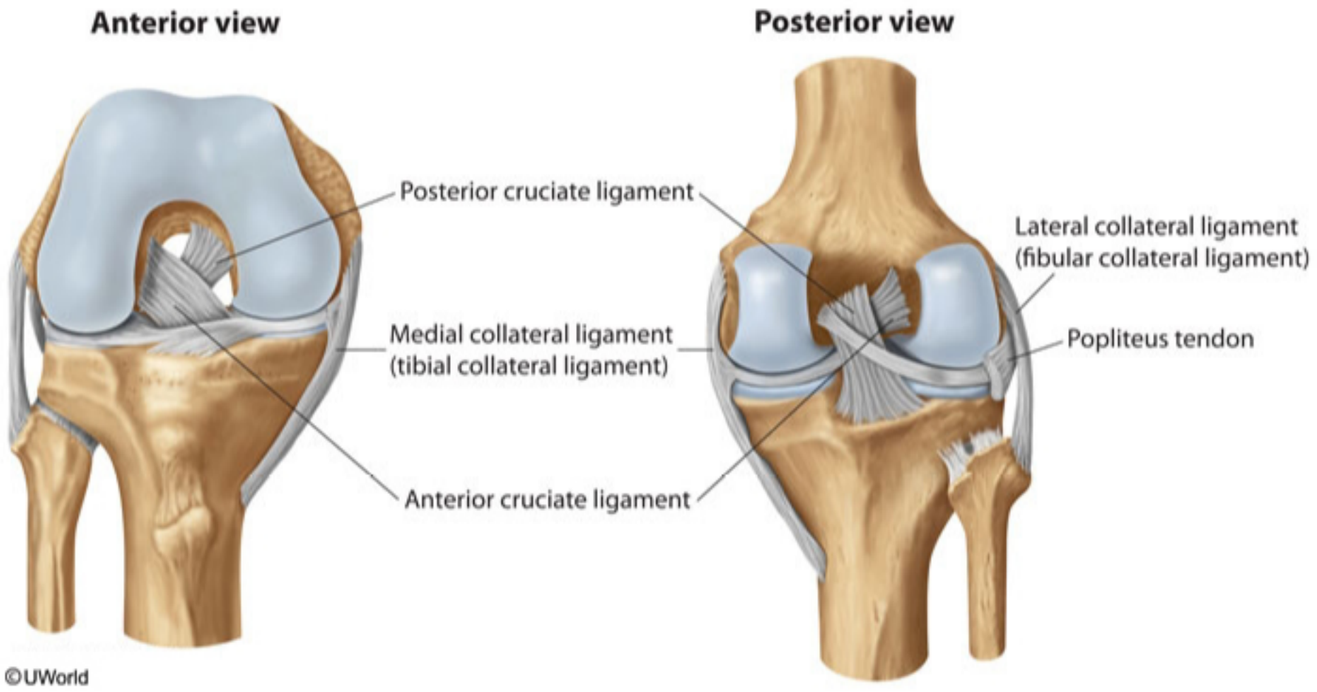
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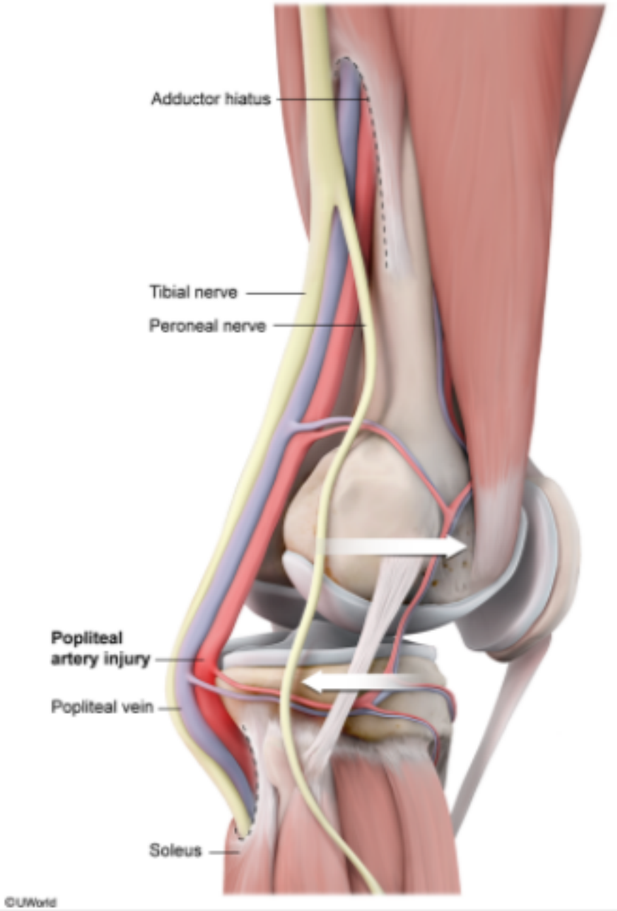
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## Exhibit Display

**Posterior knee dislocation**




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inflamed joint. It may also be performed for pressure relief of a severe effusion. Although this patient's knee is swollen from trauma, he has none

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Exhibit Display

| Ankle-brachial index (ABI) | |
|---|---|
| ABI = SBP of dorsalis pedis or posterior tibial artery ÷ SBP of brachial artery | |
| ≤0.9 | Diagnostic of peripheral artery disease |
| 0.91-1.3 | Normal |
| >1.3 | Suggests calcified & uncompressible vessels* |

*Other testing should be considered.
**SBP** = systolic blood pressure.

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**(Choice B)** Arthrocentesi h
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| Surgery | Rheumatology/Orthopedics & Sports | Knee dislocation |
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A 16-year-old boy comes to the emergency department due to sore throat and fever. He started having a mild sore throat after returning from summer camp about a week ago, and it has worsened in the last 2 days. The patient also has right neck pain and earache but no cough or shortness of breath. He does not use tobacco or illicit drugs and is not sexually active. Temperature is 38.8 C (102 F), blood pressure is 118/74 mm Hg, and pulse is 104/min. Enlarged and tender cervical lymph nodes are present. The patient is not able to fully open his mouth, but examination of the oral cavity shows pooling of saliva, a large right tonsil with swelling of the right soft palate, and deviation of the uvula to the left. Ear examination shows normal tympanic membranes. A rapid test for *Streptococcus pyogenes* is negative. Which of the following is the most likely diagnosis?

A. Acute epiglottitis
B. Acute tonsillitis
C. Adenoidal hypertrophy
D. Herpangina
E. Infectious mononucleosis
F. Peritonsillar abscess

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Item 6 of 40
Question Id: 2847

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A. Acute epiglottitis (2%)
B. Acute tonsillitis (9%)
C. Adenoidal hypertrophy (0%)
D. Herpangina (0%)
E. Infectious mononucleosis (10%)
✓ F. Peritonsillar abscess (75%)

Omitted
Correct answer
F

75%
Answered correctly

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Last Updated

Explanation

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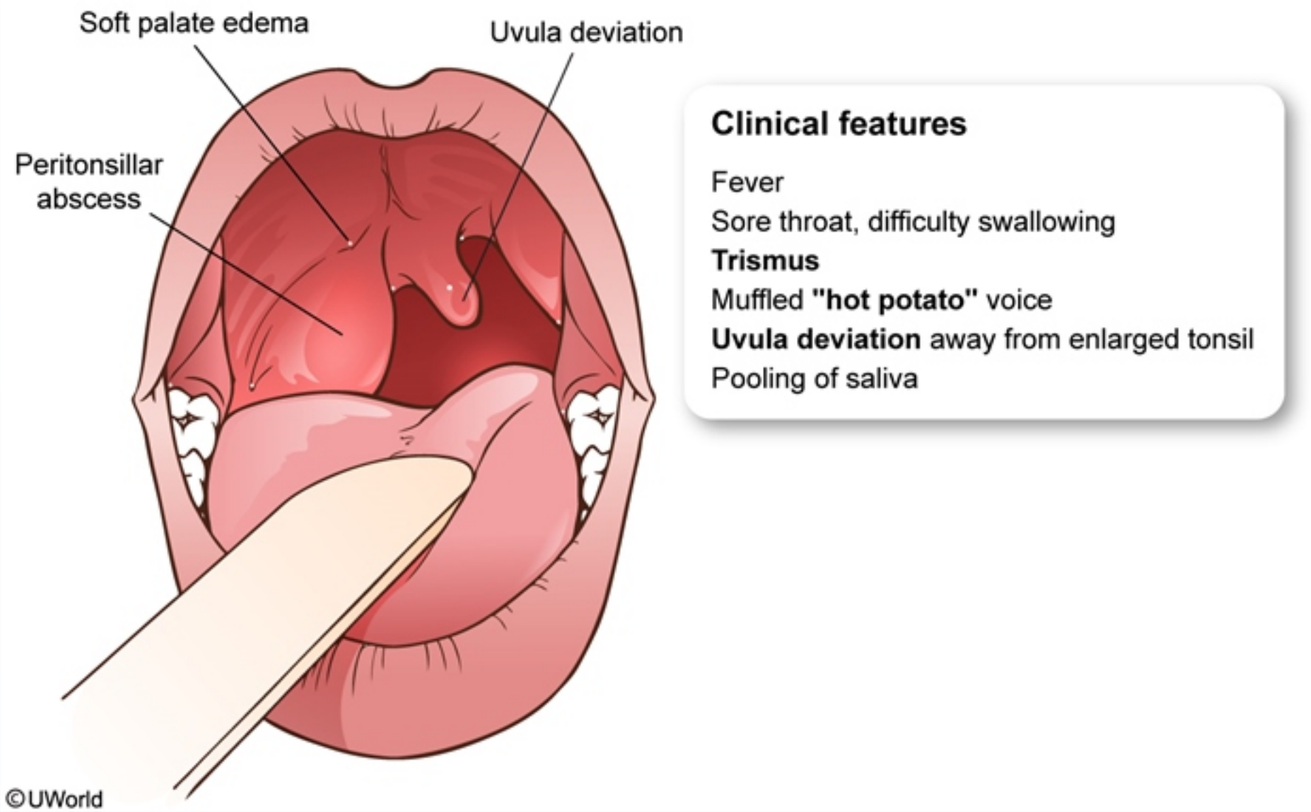
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Explanation

## Peritonsillar abscess




### Clinical features

Fever
Sore throat, difficulty swallowing
**Trismus**
Muffled **"hot potato"** voice
**Uvula deviation** away from enlarged tonsil
Pooling of saliva

This patient has fever, pharyngeal pain, and earache suggesting a possible **peritonsillar abscess** (PTA). PTA, also known as quinsy, is an acute bacterial infection of the region between the tonsil and the pharyngeal muscles. It begins as persistent tonsillitis/pharyngitis and progresses to cellulitis/phlegmon, with pus collecting into an abscess within a week of symptom onset. PTA is most common in older adolescents and young adults, and drug or alcohol use increases the risk.

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This patient has fever, pharyngeal pain, and earache suggesting a possible **peritonsillar abscess** (PTA). PTA, also known as quinsy, is an acute bacterial infection of the region between the tonsil and the pharyngeal muscles. It begins as persistent tonsillitis/pharyngitis and progresses to cellulitis/phlegmon, with pus collecting into an abscess within a week of symptom onset. PTA is most common in older adolescents and young adults, and drug or alcohol use increases the risk.

Examination findings in PTA can include spasm of the jaw muscles (trismus) (which often limits the physical examination), muffled "hot potato" voice, and swelling of peritonsillar tissues with deviation of the uvula to the contralateral side. Treatment involves **needle aspiration or incision and drainage** plus **antibiotic** therapy to cover Group A hemolytic streptococci and respiratory anaerobes.

**(Choice A)** Epiglottitis is characterized by high-grade fever, severe sore throat, and odynophagia that can rapidly progress to airway obstruction. Pharyngeal findings in epiglottitis are typically normal.

**(Choice B)** Uncomplicated tonsillitis is characterized by tonsillar erythema and exudates, often with tender anterior cervical nodes and palatal petechiae. However, trismus, pooling of saliva, and uvular deviation are more consistent with PTA.

**(Choice C)** Enlarged adenoids are usually seen in early childhood and regress with age. They are unlikely to cause symptoms in an adolescent but may occasionally obstruct the nasopharynx.

**(Choice D)** Herpangina is caused by the coxsackie A virus and presents with fever, sore throat, and odynophagia. It is most common in children and is characterized by vesicles on the tonsils and soft palate.

**(Choice E)** Infectious mononucleosis is characterized by the triad of fever, pharyngitis, and posterior cervical lymphadenopathy. Mononucleosis is not typically complicated by abscess formation.

**Educational objective:**
Peritonsillar abscess is characterized by fever, pharyngeal pain, and earache. Examination findings include trismus, muffled voice, and swelling of peritonsillar tissues with deviation of the uvula. Treatment involves needle aspiration or incision and drainage plus antibiotic therapy.

**References**

- Peritonsillar abscess

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A 34-year-old man is brought to the emergency department after being rescued from a burning building. His temperature is 36.9 C (98.6 F), blood pressure is 90/60 mm Hg, pulse is 100/min, and respirations are 28/min. Examination shows second and third degree burns over 15% of his body. His oropharynx shows erythema and scattered blisters. His lungs are clear to auscultation and his abdomen is soft and nondistended. His blood carboxyhemoglobin concentration is 20%. Which of the following is the best management for this patient?

A. High-dose corticosteroids
B. Endotracheal intubation
C. Broad-spectrum antibiotics
D. Fluid restriction
E. Acetylcysteine inhalation

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A 34-year-old man is brought to the emergency department after being rescued from a burning building. His temperature is 36.9 C (98.6 F), blood pressure is 90/60 mm Hg, pulse is 100/min, and respirations are 28/min. Examination shows second and third degree burns over 15% of his body. His oropharynx shows erythema and scattered blisters. His lungs are clear to auscultation and his abdomen is soft and nondistended. His blood carboxyhemoglobin concentration is 20%. Which of the following is the best management for this patient?

A. High-dose corticosteroids (3%)
✓ B. Endotracheal intubation (79%)
C. Broad-spectrum antibiotics (6%)
D. Fluid restriction (6%)
E. Acetylcysteine inhalation (4%)

Omitted
Correct answer
B

79%
Answered correctly

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Last Updated

Explanation

The initial management of **burn injuries** is identical to the management of all trauma patients: airway, breathing and circulation must always be secured first. Burn patients are at **high risk for respiratory compromise** because the supraglottic airway, which efficiently exchanges heat with inhaled air, is very susceptible to direct thermal injury and acute obstruction by edema and blistering. (In contrast, the subglottic airway is protected from injury by reflexive closure of the vocal cords upon exposure to extremely hot air.)

Clinical indicators of thermal and smoke inhalation injury include:

The initial management of **burn injuries** is identical to the management of all trauma patients: airway, breathing and circulation must always be secured first. Burn patients are at **high risk for respiratory compromise** because the supraglottic airway, which efficiently exchanges heat with inhaled air, is very susceptible to direct thermal injury and acute obstruction by edema and blistering. (In contrast, the subglottic airway is protected from injury by reflexive closure of the vocal cords upon exposure to extremely hot air.)

Clinical indicators of thermal and smoke inhalation injury include:

- Burns on the face
- **Singeing of the eyebrows**
- **Oropharyngeal inflammation**
- Blistering or carbon deposits
- Carbonaceous sputum
- Stridor
- Carboxyhemoglobin level **>10%**
- History of confinement in a **burning building**.

All burn victims should be treated initially with **high-flow oxygen** via a non-rebreather mask, although caregivers should maintain a **low threshold for intubation** in any patient with physical evidence of thermal damage to the upper airway. A key reason for early intubation is that **progressive airway edema** may preclude intubation later in the patient's clinical course, potentially necessitating an emergent surgical airway.

**(Choice A)** High-dose corticosteroids are not used in the acute treatment of burn wounds. The diabetogenic and immunosuppressive effects of systemic steroids make them contraindicated in severely burned patients, who are already at high risk for metabolic derangement and immunosuppression as a result of their injuries.

**(Choice C)** Prophylactic antibiotics are not indicated in the acute management of this patient. While burn patients are at high risk for infection, especially by *Pseudomonas aeruginosa*, treatment in the acute setting should focus on restoration of airway, breathing and circulation.

**(Choice D)** Fluid restriction is never indicated in burn patients. Following severe thermal burns, patients require significant volume replacement to compensate for fluid lost through their wounds as well as for a potential injury-related systemic inflammatory response (shock).

- History of confinement in a **burning building**.

All burn victims should be treated initially with **high-flow oxygen** via a non-rebreather mask, although caregivers should maintain a **low threshold for intubation** in any patient with physical evidence of thermal damage to the upper airway. A key reason for early intubation is that **progressive airway edema** may preclude intubation later in the patient's clinical course, potentially necessitating an emergent surgical airway.

**(Choice A)** High-dose corticosteroids are not used in the acute treatment of burn wounds. The diabetogenic and immunosuppressive effects of systemic steroids make them contraindicated in severely burned patients, who are already at high risk for metabolic derangement and immunosuppression as a result of their injuries.

**(Choice C)** Prophylactic antibiotics are not indicated in the acute management of this patient. While burn patients are at high risk for infection, especially by *Pseudomonas aeruginosa*, treatment in the acute setting should focus on restoration of airway, breathing and circulation.

**(Choice D)** Fluid restriction is never indicated in burn patients. Following severe thermal burns, patients require significant volume replacement to compensate for fluid lost through their wounds as well as for a potential injury-related systemic inflammatory response (shock).

**(Choice E)** N-acetylcysteine is the antidote for acetaminophen-induced hepatotoxicity. It is also used as a mucolytic agent in cystic fibrosis. There are case reports to suggest that this agent may also be of value in treating carbon monoxide poisoning, however this intervention would always come second to airway protection by intubation.

**Educational objective:**
In burn patients, clinical indicators of thermal inhalation injury to the upper airway and/or smoke inhalation injury to the lungs include burns on the face, singeing of the eyebrows, oropharyngeal inflammation/blistering, oropharyngeal carbon deposits, carbonaceous sputum, stridor, carboxyhemoglobin level >10%, or history of confinement in a burning building. The presence of ≥1 of these indicators warrants early intubation to prevent upper airway obstruction by edema.

| Surgery | Pulmonary & Critical Care | Thermal burn |
|---|---|---|
| Subject | System | Topic |

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A 40-year-old man comes to the office for follow-up of hypertension. He was diagnosed with mild hypertension 6 months ago and has had good control with regular exercise and weight loss. The patient feels well and takes no medications. He does not smoke and drinks a few glasses of wine per week. The patient's medical history is otherwise unremarkable. His mother has osteoporosis that is treated with oral alendronate. On examination, inspection and palpation of the neck show no masses. Laboratory results are as follows:

| | |
|---|---|
| Sodium | 140 mEq/L |
| Potassium | 4.0 mEq/L |
| Bicarbonate | 25 mEq/L |
| Chloride | 101 mEq/L |
| Calcium | 11.8 mg/dL |
| Albumin | 4.0 g/dL |
| Phosphorus | 2.2 mg/dL |
| Creatinine | 1.2 mg/dL |
| 25-hydroxyvitamin D | 38 ng/mL (normal: 25-80 ng/mL) |

Serum parathyroid hormone level is 814 pg/mL. Further testing shows a high 24-hour urine calcium excretion of 325 mg. DXA scan reveals normal bone mineral density. Renal ultrasound shows multiple small (<5 mm) stones in both kidneys. Which of the following is the most appropriate next step in management of this patient?

A. Initiate bisphosphonate therapy
B. Obtain CT scan of the chest, abdomen, and pelvis
C. Refer for parathyroid imaging and parathyroidectomy

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Serum parathyroid hormone level is 814 pg/mL. Further testing shows a high 24-hour urine calcium excretion of 325 mg. DXA scan reveals normal bone mineral density. Renal ultrasound shows multiple small (<5 mm) stones in both kidneys. Which of the following is the most appropriate next step in management of this patient?

A. Initiate bisphosphonate therapy
B. Obtain CT scan of the chest, abdomen, and pelvis
C. Refer for parathyroid imaging and parathyroidectomy
D. Repeat serum calcium measurement in 3-6 months
E. Start vitamin D supplementation

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Serum parathyroid hormone level is 814 pg/mL. Further testing shows a high 24-hour urine calcium excretion of 325 mg. DXA scan reveals normal bone mineral density. Renal ultrasound shows multiple small (<5 mm) stones in both kidneys. Which of the following is the most appropriate next step in management of this patient?

- A. Initiate bisphosphonate therapy (11%)
- B. Obtain CT scan of the chest, abdomen, and pelvis (21%)
- ✓ C. Refer for parathyroid imaging and parathyroidectomy (55%)
- D. Repeat serum calcium measurement in 3-6 months (9%)
- E. Start vitamin D supplementation (2%)

Omitted
Correct answer

55%
Answered correctly

05 secs
Time Spent

03/10/2020
Last Updated

| Primary hyperparathyroidism | |
|---|---|
| **Etiology** | • **Parathyroid adenoma** (most common), hyperplasia, carcinoma<br>• Increased risk in MEN types 1 & 2A |
| **Symptoms** | • **Asymptomatic** (most common)<br>• Mild, nonspecific symptoms (eg, fatigue, constipation)<br>• Abdominal pain, renal stones, bone pain, neuropsychiatric symptoms |
| **Diagnostic findings** | • **Hypercalcemia**<br>• **Elevated or inappropriately normal PTH**<br>• Elevated 24-hour urinary calcium excretion |
| **Indications for parathyroidectomy** | • Age <50<br>• Symptomatic hypercalcemia<br>• **Complications:** Osteoporosis (T-score <−2.5, fragility fracture), nephrolithiasis/calcinosis, CKD (GFR <60 mL/min)<br>• **Elevated risk of complications:** Calcium ≥1 mg/dL above normal, urinary calcium excretion >400 mg/day |

**CKD** = chronic kidney disease; **GFR** = glomerular filtration rate; **MEN** = multiple endocrine neoplasia; **PTH** = parathyroid hormone.

This patient has **hypercalcemia**, hypophosphatemia, and an **elevated parathyroid hormone** (PTH) level consistent with **primary hyperparathyroidism** (PHPT). PTH causes increased reabsorption of calcium from the distal tubule, but net urinary calcium excretion is increased due to excess resorption of calcium from bones. By contrast, familial hypocalciuric hypercalcemia is characterized by hypercalcemia with an elevated PTH but low urinary calcium excretion (often <100 mg/24 hr).

This patient has **hypercalcemia**, hypophosphatemia, and an **elevated parathyroid hormone** (PTH) level consistent with **primary hyperparathyroidism** (PHPT). PTH causes increased reabsorption of calcium from the distal tubule, but net urinary calcium excretion is increased due to excess resorption of calcium from bones. By contrast, familial hypocalciuric hypercalcemia is characterized by hypercalcemia with an elevated PTH but low urinary calcium excretion (often <100 mg/24 hr).

**Parathyroidectomy** is recommended for patients with **symptomatic hypercalcemia**. It is also recommended for patients, such as this one, with **complications** (eg, osteoporosis, nephrocalcinosis, **nephrolithiasis**, impaired renal function) or at significant **risk for complications** (eg, serum calcium ≥1 mg/dL above normal, urinary calcium excretion >400 mg/24 hr). In addition, younger patients (age <50) such as this one are likely to have complications during their lifetime and should be offered surgery.

This patient is relatively young and has nephrolithiasis (likely as a complication of PHPT); he should therefore be referred for parathyroidectomy. Parathyroid imaging (eg, sestamibi scan, ultrasonography) helps optimize the surgical approach by potentially determining the affected side and evaluating for the possibility of a minimally invasive intervention.

**(Choice A)** Parathyroidectomy is the treatment of choice for PHPT. However, bisphosphonate therapy can be used in patients who decline surgery and have osteopenia or osteoporosis.

**(Choice B)** Extended CT imaging would be indicated for suspected hypercalcemia of malignancy, which typically presents with severe, symptomatic hypercalcemia, low PTH, and elevated PTH-related protein. Imaging to evaluate for multiple endocrine neoplasia syndromes is recommended only if there is evidence of multiglandular hyperparathyroidism or additional endocrine tumors.

**(Choice D)** Continued observation is appropriate in older asymptomatic patients with near-normal calcium levels and normal bone density.

**(Choice E)** Vitamin D supplementation is not recommended in patients with PHPT who do not have overt vitamin D deficiency as it may exacerbate hypercalcemia and hypercalciuria. This patient has a normal vitamin D level.

**Educational objective:**
The most common presentation of primary hyperparathyroidism is asymptomatic hypercalcemia with an elevated parathyroid hormone level. Parathyroidectomy is recommended for patients with symptomatic hypercalcemia and those with complications (eg, nephrolithiasis) or at increased risk for complications. Younger patients (age <50) are likely to have complications during their lifetime and should be offered surgery.

**References**

This patient has **hypercalcemia**, hypophosphatemia, and an **elevated parathyroid hormone** (PTH) level consistent with **primary hyperparathyroidism** (PHPT). PTH causes increased reabsorption of calcium from the distal tubule, but net urinary calcium excretion is increased due to excess resorption of calcium from bones. By contrast, familial hypocalciuric hypercalcemia is characterized by hypercalcemia with an elevated PTH but low urinary calcium excretion (often <100 mg/24 hr).

**Parathyroidectomy** is recommended for patients with **symptomatic hypercalcemia**. It is also recommended for patients, such as this one, with **complications** (eg, osteoporosis, nephrocalcinosis, **nephrolithiasis**, impaired renal function) or at significant **risk for complications** (eg, serum calcium ≥1 mg/dL above normal, urinary calcium excretion >400 mg/24 hr). In addition, younger patients (age <50) such as this one are likely to have complications during their lifetime and should be offered surgery.

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**Educational objective:**
The most common presentation of primary hyperparathyroidism is asymptomatic hypercalcemia with an elevated parathyroid hormone level. Parathyroidectomy is recommended for patients with symptomatic hypercalcemia and those with complications (eg, nephrolithiasis) or at increased risk for complications. Younger patients (age <50) are likely to have complications during their lifetime and should be offered surgery.

**References**


- Primary hyperparathyroidism: an update.
- Guidelines for the management of asymptomatic primary hyperparathyroidism: summary statement from the third international workshop.
- Sestamibi (99mTc) scan as a single localization modality in primary hyperparathyroidism and factors impacting its accuracy.


| Surgery | Endocrine, Diabetes & Metabolism | Hyperparathyroidism |
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| Subject | System | Topic |

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Item 9 of 40
Question Id: 3435

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A 32-year-old man comes to the emergency room (ER) because of acute onset left flank pain, hematuria and vomiting. His pain is relieved with analgesics in the ER. He has a history of abdominal pain due to Crohn disease, but that pain was always in the right lower quadrant and was never this severe. His temperature is 36.8°C (98.2°F), blood pressure is 120/65 mm Hg, pulse is 110/min and respirations are 16/min. Chest auscultation is clear. Abdomen is soft and mildly tender over the left flank. He has no rebound or rigidity. Bowel sounds are decreased. A laparotomy scar is present in right lower quadrant. Which of the following is the most likely cause of his symptoms?

A. Increased recycling of bile salts and fatty acids
B. Increased absorption of oxalate
C. Increased absorption of calcium
D. Increased parathyroid hormone activity
E. Recurrent bacteria infection in the kidney

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Item 9 of 40
Question Id: 3435

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A. Increased recycling of bile salts and fatty acids (5%)
✓ B. Increased absorption of oxalate (64%)
C. Increased absorption of calcium (14%)
D. Increased parathyroid hormone activity (9%)
E. Recurrent bacteria infection in the kidney (6%)

Omitted
Correct answer
B

64%
Answered correctly

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03/18/2020
Last Updated

Explanation

The patient described is experiencing symptoms consistent with nephrolithiasis, which classically presents with flank pain and hematuria frequently accompanied by nausea and vomiting. Patients with Crohn disease, or any other small intestinal disorder resulting in fat malabsorption, are predisposed to hyperoxaluria. Oxalate is obtained from the diet and is a normal product of human metabolism. Symptomatic hyperoxaluria is classically the result of increased oxalate absorption in the gut. Under normal circumstances, calcium binds oxalate in the gut and prevents its absorption. In patients with fat malabsorption, calcium is preferentially bound by fat leaving oxalate unbound and free to be absorbed into the

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B

Explanation

The patient described is experiencing symptoms consistent with nephrolithiasis, which classically presents with flank pain and hematuria frequently accompanied by nausea and vomiting. Patients with Crohn disease, or any other small intestinal disorder resulting in fat malabsorption, are predisposed to hyperoxaluria. Oxalate is obtained from the diet and is a normal product of human metabolism. Symptomatic hyperoxaluria is classically the result of increased oxalate absorption in the gut. Under normal circumstances, calcium binds oxalate in the gut and prevents its absorption. In patients with fat malabsorption, calcium is preferentially bound by fat leaving oxalate unbound and free to be absorbed into the bloodstream. Failure to adequately absorb bile salts in states of fat malabsorption also cause decreased bile salt reabsorption in the small intestine. Excess bile salts may damage the colonic mucosa and contribute to increased oxalate absorption.

**(Choice A)** Bile salt recycling and fatty acid absorption are decreased in Crohn disease.

**(Choices C and D)** Hypercalciuria, which may be idiopathic or may result from hyperparathyroidism, excessive calcium and vitamin D ingestion, dehydration or prolonged immobilization, predisposes to calcium stone formation.

**(Choice E)** Recurrent urinary tract infections, particularly by Proteus species, predispose to struvite stone formation. Struvite stones may eventually grow to fill the entire renal pelvis, at which point they are known as "staghorn" calculi.

**Educational objective:**
Oxalate absorption is increased in Crohn disease and all other intestinal diseases causing fat malabsorption. Increased absorption is the most common cause of symptomatic hyperoxaluria and oxalate stone formation.

| Surgery | Renal, Urinary Systems & Electrolytes | Renal calculi |
|---|---|---|
| Subject | System | Topic |

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Item 10 of 40
Question Id: 15920

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A 76-year-old man comes for outpatient follow-up after recent coronary artery bypass grafting surgery. He has abundant, yellowish wound discharge from the lower part of the surgical midsternal wound. The patient has no chest pain, dyspnea, fevers, or abdominal swelling. He underwent uncomplicated coronary artery bypass grafting surgery for severe coronary artery disease 9 days ago, which included internal thoracic artery harvesting. Medical history also includes hypertension and type 2 diabetes mellitus. The patient is afebrile, and vital signs are within normal limits. On examination, the sternum appears stable to palpation. There is swelling and soft tissue separation at the lower part of the wound with copious discharge. Which of the following is the next best step in managing this patient?

A. Chest and sternal imaging
B. Intensive glucose control and observation
C. Oral, broad-spectrum antibiotics
D. Topical antibiotics
E. Wound culture and observation

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- ✓ A. Chest and sternal imaging (35%)
- B. Intensive glucose control and observation (9%)
- C. Oral, broad-spectrum antibiotics (27%)
- D. Topical antibiotics (3%)
- E. Wound culture and observation (23%)

Omitted
Correct answer
A

35%
Answered correctly

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Time Spent

03/28/2020
Last Updated

Explanation

This patient, who recently underwent **coronary artery bypass grafting** (CABG), has evidence of separation of the sternal wound (dehiscence). Wound dehiscence after CABG is a relatively common complication, and management is determined by the extent of tissue involvement.

- **Soft tissue dehiscence** occurs when only the superficial tissues (eg, skin, muscle) separate. There are no signs of sternal instability or

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- **Soft tissue dehiscence** occurs when only the superficial tissues (eg, skin, muscle) separate. There are no signs of sternal instability or systemic illness; local wound care or debridement followed by primary closure is indicated.
- **Sternal dehiscence** occurs with separation of the edges of the approximated sternum and may occur with or without soft tissue dehiscence. Sternal instability and nonunion is characterized by "clicking" or "rocking" on sternal palpation. It is a surgical emergency and requires sternal rewiring to prevent cardiac trauma.

A high-mortality complication of dehiscence is deep tissue infection **(mediastinitis)**, due to either contiguous spread of superficial infection or intraoperative deep tissue contamination. Although it classically presents with systemic symptoms (eg, fever, tachycardia), chest pain, chest wall edema/crepitus, and purulent wound discharge, atypical presentations can occur; therefore, any patient with significant **sternal wound drainage** should be evaluated with chest and sternal imaging (eg, mediastinal fluid collections or pneumomediastinum on **CT scan**). Management includes emergency surgical debridement, tissue cultures, and empiric intravenous antibiotics.

**(Choice B)** Patients with uncontrolled diabetes are more likely to develop postoperative wound complications; however, given the copious wound drainage, further investigation is warranted to exclude deep infection.

**(Choices C and D)** Topical and oral antibiotics do not have a role in the initial management of postoperative wound infection due to the risks of underlying deep tissue infection. Broad-spectrum intravenous antibiotics should be initiated if mediastinitis is suspected, but in this hemodynamically stable patient with no signs of sternal instability, imaging and cultures should be pursued first to confirm the diagnosis and guide management.

**(Choice E)** Wound cultures should be obtained to guide antibiotic therapy. However, observation without imaging would be inappropriate given the risk of substantial morbidity and mortality associated with mediastinitis.

**Educational objective:**
Mediastinitis is a complication of cardiovascular surgery characterized by infection of the deep tissues; it classically presents with systemic symptoms (eg, fever, tachycardia), chest pain, chest wall edema/crepitus, and purulent discharge; but it can also present atypically. Therefore,

A high-mortality complication of dehiscence is deep tissue infection **(mediastinitis)**, due to either contiguous spread of superficial infection or intraoperative deep tissue contamination. Although it classically presents with systemic symptoms (eg, fever, tachycardia), chest pain, chest wall edema/crepitus, and purulent wound discharge, atypical presentations can occur; therefore, any patient with significant **sternal wound drainage** should be evaluated with chest and sternal imaging (eg, mediastinal fluid collections or pneumomediastinum on **CT scan**). Management includes emergency surgical debridement, tissue cultures, and empiric intravenous antibiotics.

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**(Choice E)** Wound cultures should be obtained to guide antibiotic therapy. However, observation without imaging would be inappropriate given the risk of substantial morbidity and mortality associated with mediastinitis.

**Educational objective:**
Mediastinitis is a complication of cardiovascular surgery characterized by infection of the deep tissues; it classically presents with systemic symptoms (eg, fever, tachycardia), chest pain, chest wall edema/crepitus, and purulent discharge; but it can also present atypically. Therefore, any patient with copious drainage from the sternal wound should undergo chest imaging. Radiographic findings include fluid collections or pneumomediastinum.

**References**


- Deep sternal wound infection after cardiac surgery: a comparison of three different wound infection types and an analysis of antibiotic resistance.
- Deep sternal wound infection after cardiac surgery: evidences and controversies.


Surgery Cardiovascular System CABG

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A 50-year-old woman comes to the emergency department due to increasing right flank pain, nausea, and hematuria. The flank pain started 3 days ago and is constant, dull, and nonradiating. She reports no dysuria. The patient was diagnosed with pancreatic cancer a month ago and received the first cycle of chemotherapy 2 weeks ago. She has smoked a pack of cigarettes daily for 30 years but does not use alcohol. Temperature is 37 C (98.6 F), blood pressure is 130/90 mm Hg, pulse is 88/min, and respirations are 16/min. Examination shows right flank and costovertebral angle tenderness. Bowel sounds are present. Peripheral pulses are normal and there is no edema. Laboratory results are as follows:

| | |
|---|---|
| **Complete blood count** | |
| Hemoglobin | 13 g/dL |
| Platelets | 260,000/mm$^3$ |
| Leukocytes | 9,000/mm$^3$ |
| **Serum chemistry** | |
| Blood urea nitrogen | 14 mg/dL |
| Creatinine | 0.8 mg/dL |
| Calcium | 8.8 mg/dL |
| **Urinalysis** | |
| Protein | none |
| Blood | moderate |
| Glucose | negative |
| Leukocyte esterase | negative |

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Serum chemistry

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| Blood urea nitrogen | 14 mg/dL |
| Creatinine | 0.8 mg/dL |
| Calcium | 8.8 mg/dL |

Urinalysis

| | |
|---|---|
| Protein | none |
| Blood | moderate |
| Glucose | negative |
| Leukocyte esterase | negative |
| Nitrites | negative |
| Bacteria | none |
| White blood cells | 1-2/hpf |
| Red blood cells | 20-30/hpf |
| Casts | none |
| Crystals | none |

Abdominal ultrasound shows an enlarged right kidney and normal left kidney; there is no evidence of hydronephrosis. The pancreatic mass is unchanged from prior scans. Which of the following is the most likely diagnosis?

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|---|---|
| Protein | none |
| Blood | moderate |
| Glucose | negative |
| Leukocyte esterase | negative |
| Nitrites | negative |
| Bacteria | none |
| White blood cells | 1-2/hpf |
| Red blood cells | 20-30/hpf |
| Casts | none |
| Crystals | none |

Abdominal ultrasound shows an enlarged right kidney and normal left kidney; there is no evidence of hydronephrosis. The pancreatic mass is unchanged from prior scans. Which of the following is the most likely diagnosis?

A. Membranous nephropathy
B. Nephrolithiasis
C. Pyelonephritis
D. Renal infarction
E. Renal vein thrombosis

| | |
|---|---|
| Glucose | negative |
| Leukocyte esterase | negative |
| Nitrites | negative |
| Bacteria | none |
| White blood cells | 1-2/hpf |
| Red blood cells | 20-30/hpf |
| Casts | none |
| Crystals | none |

Abdominal ultrasound shows an enlarged right kidney and normal left kidney; there is no evidence of hydronephrosis. The pancreatic mass is unchanged from prior scans. Which of the following is the most likely diagnosis?

A. Membranous nephropathy (5%)
B. Nephrolithiasis (28%)
C. Pyelonephritis (2%)
D. Renal infarction (8%)
✓ E. Renal vein thrombosis (54%)

Omitted
Correct answer

54%
Answered correctly

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Explanation

| Renal vein thrombosis | |
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| **Risk factors** | • Hypercoagulability<br>  ◦ Nephrotic syndrome<br>  ◦ Malignancy (particularly renal)<br>  ◦ OCP<br>• Volume depletion (infants)<br>• Trauma |
| **Clinical features** | • Hematuria<br>• Flank or abdominal pain<br>• Elevated LDH, ± AKI<br>• Enlarged kidney on imaging |
| **Diagnosis** | • CT or MR angiography<br>• Renal venography |
| **Treatment** | • Anticoagulation<br>• Thrombolysis/thrombectomy (if AKI present) |

**AKI** = acute kidney injury; **LDH** = lactate dehydrogenase; **OCP** = oral contraceptive pills.

This patient likely has acute **renal vein thrombosis (RVT)**. RVT results in markedly increased glomerular pressure, leading to renovascular congestion, capsular stretch (manifesting as **flank pain**), and hematuria. RVTs most commonly occur in the setting of nephrotic syndrome (due to urinary loss of anticoagulant proteins and alteration of hemostatic balance) but can also occur with **acquired hypercoagulability** associated with malignancy (as in this patient) or trauma.

Laboratory analysis typically demonstrates **hematuria** (with an otherwise bland urinalysis) and **elevated lactate dehydrogenase** levels (possibly

This patient likely has acute **renal vein thrombosis (RVT)**. RVT results in markedly increased glomerular pressure, leading to renovascular congestion, capsular stretch (manifesting as **flank pain**), and hematuria. RVTs most commonly occur in the setting of nephrotic syndrome (due to urinary loss of anticoagulant proteins and alteration of hemostatic balance) but can also occur with **acquired hypercoagulability** associated with malignancy (as in this patient) or trauma.

Laboratory analysis typically demonstrates **hematuria** (with an otherwise bland urinalysis) and **elevated lactate dehydrogenase** levels (possibly related to necrosis in the setting of thrombosis); acute kidney injury (AKI) may occur but is more typical in the setting of bilateral RVTs. Renal ultrasound with Doppler and abdominal CT scan have a low sensitivity and may demonstrate only an **enlarged kidney**, although a Doppler ultrasound may show a reversal of diastolic flow. The diagnosis is confirmed by **CT or MR angiography** or renal venography. Management depends on the presence of AKI, which, if present, requires urgent clot removal (eg, thrombolysis, thrombectomy); otherwise, anticoagulation alone is appropriate.

**(Choice A)** In adults, membranous nephropathy, a common cause of nephrotic syndrome, is also an important risk factor for acute RVT. However, this patient does not have proteinuria, making nephrotic syndrome unlikely. In addition, membranous nephropathy alone would not explain the patient's enlarged right kidney or gross hematuria (microscopic hematuria can be seen).

**(Choice B)** Nephrolithiasis can cause flank pain and hematuria; however, it would not explain the enlarged right kidney without hydronephrosis, and the pain of nephrolithiasis is often paroxysmal rather than dull and constant.

**(Choice C)** Pyelonephritis presents with dysuria, fevers, hematuria, and flank pain. The absence of fevers, irritative urinary tract symptoms (eg, dysuria), and urinary leukocytes or nitrites make this diagnosis less likely.

**(Choice D)** There is significant overlap in the presentation of renal infarction and acute RVT; however, renal infarction most commonly occurs due to cardioembolic disease (eg, atrial fibrillation), resulting in incomplete infarction and a wedge-shaped area of ischemia on imaging. In addition, patients frequently report abdominal pain in addition to flank pain. An acute increase in blood pressure due to renin release is also common.

**Educational objective:**
Acute renal vein thrombosis presents with hematuria, renovascular congestion, and flank pain. The most common causes are nephrotic syndrome, malignancy, and trauma. Diagnosis can be confirmed by CT or MR angiography or renal venography.

depends on the presence of AKI, which, if present, requires urgent clot removal (eg, thrombolysis, thrombectomy); otherwise, anticoagulation alone is appropriate.

**(Choice A)** In adults, membranous nephropathy, a common cause of nephrotic syndrome, is also an important risk factor for acute RVT. However, this patient does not have proteinuria, making nephrotic syndrome unlikely. In addition, membranous nephropathy alone would not explain the patient's enlarged right kidney or gross hematuria (microscopic hematuria can be seen).

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**Educational objective:**
Acute renal vein thrombosis presents with hematuria, renovascular congestion, and flank pain. The most common causes are nephrotic syndrome, malignancy, and trauma. Diagnosis can be confirmed by CT or MR angiography or renal venography.

**References**


- The forgotten urinalysis: an integral part of unmasking thrombophilia.
- Adult idiopathic renal vein thrombosis mimicking acute pyelonephritis.


| Surgery | Renal, Urinary Systems & Electrolytes | Renal vein thrombosis |
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Item 12 of 40
Question Id: 16185

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A 42-year-old man is brought to the emergency department 35 minutes after being struck by a car while crossing the intersection. The paramedics found him hypotensive and intubated him in the field for respiratory distress. After resuscitation with 2 liters of normal saline, his blood pressure is 110/80 mm Hg and pulse is 90/min. There is diffuse bruising across the chest, and the right lower leg is visibly deformed. CT scan of the head, cervical spine, and abdomen are normal. CT scan of the chest reveals bilateral, mildly displaced rib fractures with underlying pulmonary contusions and a right-sided pneumothorax. A chest tube is placed. The patient undergoes open reduction and internal fixation of right tibial and fibular fractures and is extubated following surgery. One day later his chest tube is draining turbid, green fluid. Repeat chest-x ray shows resolution of the pneumothorax but there is a new right-sided pleural effusion. Which of the following is the most likely diagnosis?

A. Bronchopleural fistula
B. Diaphragmatic rupture
C. Esophageal perforation
D. Hemothorax
E. Pulmonary infarction

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- A. Bronchopleural fistula (20%)
- B. Diaphragmatic rupture (24%)
- ✓ C. Esophageal perforation (44%)
- D. Hemothorax (4%)
- E. Pulmonary infarction (6%)

Omitted
Correct answer
C

44%
Answered correctly

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Time Spent

02/09/2020
Last Updated

Explanation

| Esophageal perforation |
| --- |

| Esophageal perforation | |
|---|---|
| **Etiology** | • Instrumentation (eg, endoscopy), trauma<br>• Effort rupture (Boerhaave syndrome)<br>• Esophagitis (infectious/pills/caustic) |
| **Clinical presentation** | • Chest/back &/or epigastric pain, systemic signs (eg, fever)<br>• Crepitus, Hamman sign (crunching sound on auscultation)<br>• Pleural effusion with atypical (eg, green) fluid |
| **Diagnosis** | • Chest x-ray or CT scan: widened mediastinum, pneumomediastinum, pneumothorax, pleural effusion<br>• CT scan: esophageal wall thickening, mediastinal fluid collection<br>• **Esophagography with water-soluble contrast:** leak from perforation |
| **Management** | • NPO, IV antibiotics & proton pump inhibitors<br>• **Emergency surgical consultation** |

The injury pattern of pedestrians struck by motor vehicles often includes lower-extremity trauma (from bumper impact) accompanied by **thoracic trauma** (± head/upper extremity trauma from rolling onto the hood). Blunt thoracic trauma can rapidly increase **intraesophageal pressure** enough to rupture the esophagus. This patient has turbid **green drainage** (gastrointestinal contents) into his chest tube following blunt chest trauma, most consistent with **esophageal perforation (EP)**.

EP may present with severe chest pain (easily missed if attributed to concurrent chest injuries [eg, rib fractures]) and symptoms/signs related to leaked esophageal air (eg, **pneumothorax**, pneumomediastinum, subcutaneous emphysema) or gastrointestinal fluid (eg, **pleural effusion**). These manifestations may not be immediately evident until content (eg, pleural fluid) accumulation increases. If pleural fluid analysis is performed in the setting of EP, it typically shows low pH and high salivary amylase and may show food particles. Esophagography or CT scan with water-soluble oral contrast is the gold standard for confirming EP. Management includes **emergent surgical consultation**, restriction of all oral intake, and intravenous antibiotic and proton pump inhibitor administration.

**(Choice A)** Bronchopleural fistula can occur following chest trauma but is most common following lung resection. The abnormal flow of inhaled

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**(Choice A)** Bronchopleural fistula can occur following chest trauma but is most common following lung resection. The abnormal flow of inhaled air into the pleural space would cause persistent air leak into the chest tube drainage system rather than green fluid.

**(Choice B)** Diaphragmatic rupture can occur after blunt thoracoabdominal trauma due to a sudden and unequal increase in pressure. However, chest x-ray typically reveals elevated hemidiaphragm or migration of abdominal contents into the thoracic cavity rather than pleural effusion.

**(Choice D)** Blunt chest trauma may cause hemothorax if lung parenchyma or intercostal vessels (eg, rib fractures) are injured. Hemothorax appears on chest x-ray as a pleural effusion; however, drainage would be bloody, not green.

**(Choice E)** Trauma (especially lower extremity) and surgery increase risk of pulmonary embolism. Acute pulmonary embolism with pulmonary infarction can cause an inflammatory, exudative pleural effusion, but the fluid is not typically green.

**Educational objective:**
Blunt thoracic trauma can cause a sudden increase in intraesophageal pressure sufficient to rupture the esophagus. If gastrointestinal contents leak from the esophagus into the pleural space, pleural effusion results, and fluid analysis typically reveals unusual color (eg, green), low pH, and high amylase.

**References**

- Esophageal perforation.

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Item 13 of 40
Question Id: 16058

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A 12-year-old boy is brought to the office due to a left neck mass. One month ago, he had a fever and upper respiratory tract infection symptoms. A week later, he noticed a painful lump in the left side of his neck. He also has leakage of fluid from a hole below the mass. On examination, there is a cystic left neck mass and a small pit anterior to the sternocleidomastoid muscle that is leaking mucopurulent fluid. Which of the following is the most likely diagnosis of this lesion?

A. *Actinomyces* lymphadenitis
B. Branchial cleft cyst
C. Cystic hygroma
D. Laryngocele
E. Thyroglossal duct cyst

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Item 13 of 40
Question Id: 16058

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- A. *Actinomyces* lymphadenitis (31%)
- ✓ B. Branchial cleft cyst (48%)
- C. Cystic hygroma (8%)
- D. Laryngocele (3%)
- E. Thyroglossal duct cyst (7%)

Omitted
Correct answer
B

48%
Answered correctly

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Time Spent

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Last Updated

Explanation

| Pediatric neck masses | | |
|---|---|---|
| **Thyroglossal duct cyst** | Midline | • Tract between foramen cecum & base of anterior neck<br>• Cystic, moves with swallowing or tongue protrusion<br>• Often presents after upper respiratory tract infection |

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| Pediatric neck masses | | |
|---|---|---|
| **Thyroglossal duct cyst** | Midline | • Tract between foramen cecum & base of anterior neck<br>• Cystic, moves with swallowing or tongue protrusion<br>• Often presents after upper respiratory tract infection |
| **Dermoid cyst** | Midline | • Cystic mass with trapped epithelial debris<br>• Occurs along embryologic fusion planes<br>• No displacement with tongue protrusion |
| **Branchial cleft cyst** | Lateral | • Tract may extend to the tonsillar fossa (2nd branchial arch) or pyriform recess (3rd branchial arch)<br>• Anterior to the sternocleidomastoid muscle |
| **Reactive adenopathy** | Lateral | • Firm, often tender<br>• Multiple nodules |
| ***Mycobacterium avium* lymphadenitis** | Lateral | • Necrotic lymph node<br>• Violaceous discoloration of skin<br>• Frequent fistula formation |
| **Cystic hygroma** | Posterior | • Dilated lymphatic vessels |

This child with a **lateral**, cystic neck mass has a branchial cleft cyst (BCC). The branchial apparatus is an embryologic structure, composed of paired arches separated by clefts, which forms many face and neck structures. Abnormalities in the embryologic development of these structures can lead to cysts, sinuses, fistulae, and/or cartilaginous remnants along the paths of development.

Abnormalities most often arise from the second branchial arch, which forms structures in the face and upper neck. Therefore, BCCs are most often located between the internal and external carotid arteries, **anterior to the sternocleidomastoid muscle** and inferior to the mandible. **Surgical resection** of the entire cyst and any associated fibrous tract remnants is curative.

| | | |
|---|---|---|
| **Cystic hygroma** | Posterior | • Dilated lymphatic vessels |

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Similar to a thyroglossal duct cyst (TDC), which is also formed from incomplete involution of an embryologic remnant, a BCC is often detected when it becomes secondarily infected after an upper respiratory tract infection (URI), leading to erythema, tenderness, and sometimes drainage of fluid from a sinus tract. However, a TDC is located in the midline because the path of thyroid descent is from the base of tongue to its location in the midline lower neck **(Choice E)**.

**(Choice A)** *Actinomyces* lymphadenitis can present as a submandibular mass with a draining sinus tract. However, it typically occurs after dental infections or trauma in immunosuppressed patients and the sinus tracts drain sulfur granules.

**(Choice C)** A cystic hygroma is formed from dilated lymphatic vessels and presents as a lateral, cystic neck mass. However, it occurs most commonly in the posterior triangle of the neck and is typically diagnosed at birth or on prenatal ultrasound.

**(Choice D)** A laryngocele is an outpouching of the laryngeal mucosa that can be congenital or acquired. If it protrudes through the thyrohyoid membrane, it can present as a lateral neck mass. It characteristically enlarges with Valsalva maneuver due to inflation with air. Acquired laryngoceles are classically seen in glassblowers or trumpet players due to repeated, intense oropharyngeal pressure.

**Educational objective:**
A branchial cleft cyst is a congenital neck mass that often presents in later childhood after an upper respiratory tract infection. It is typically located inferior to the mandible and anterior to the sternocleidomastoid muscle.

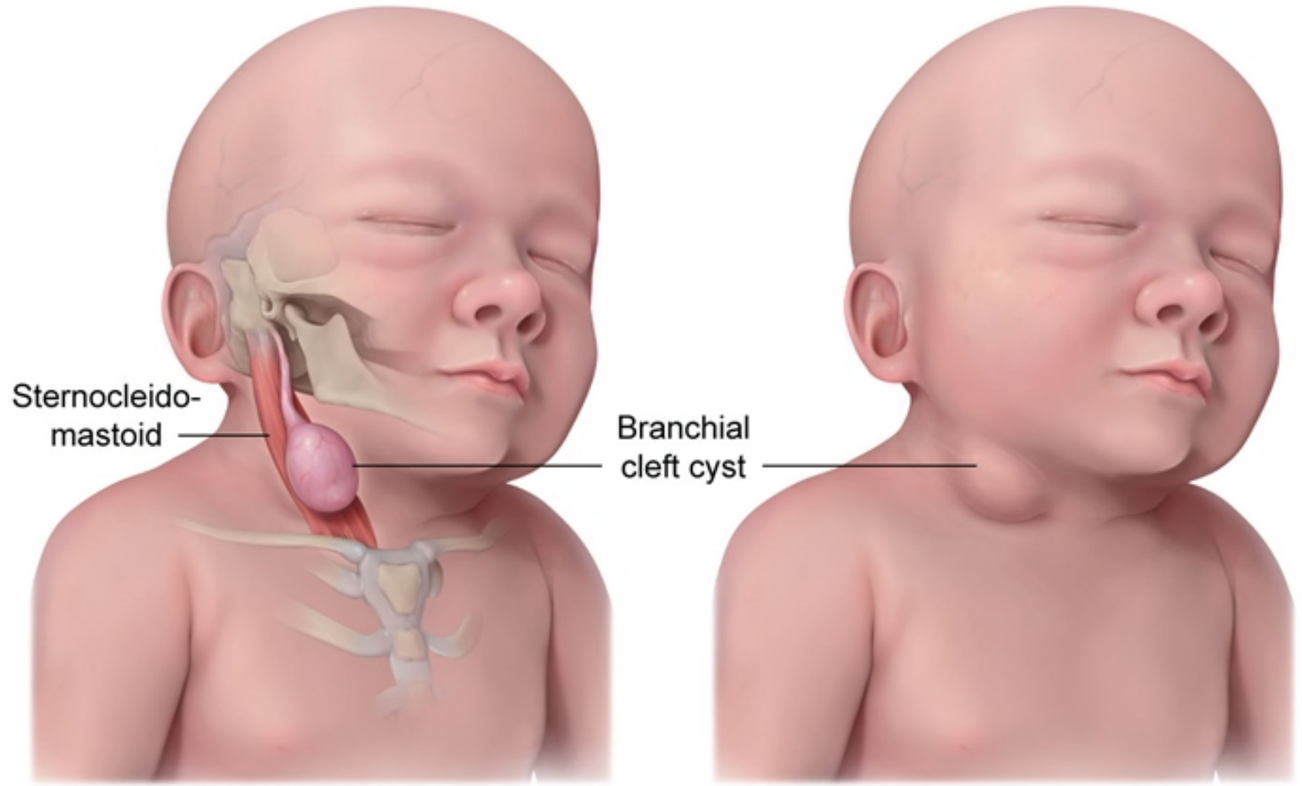
**References**


- Correlation between pre-operative diagnosis and post-operative pathology reading in pediatric neck masses—a review of 281 cases.

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| Cystic hygroma | Posterior | • Dilated lymphatic vessels |

Exhibit Display

## Branchial cleft cyst




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• Correlation between pre-operative diagnosis and post-operative pathology reading in pediatric neck masses—a review of 281 cases.

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| Cystic hygroma | Posterior | • Dilated lymphatic vessels |

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- Correlation between pre-operative diagnosis and post-operative pathology reading in pediatric neck masses—a review of 281 cases.

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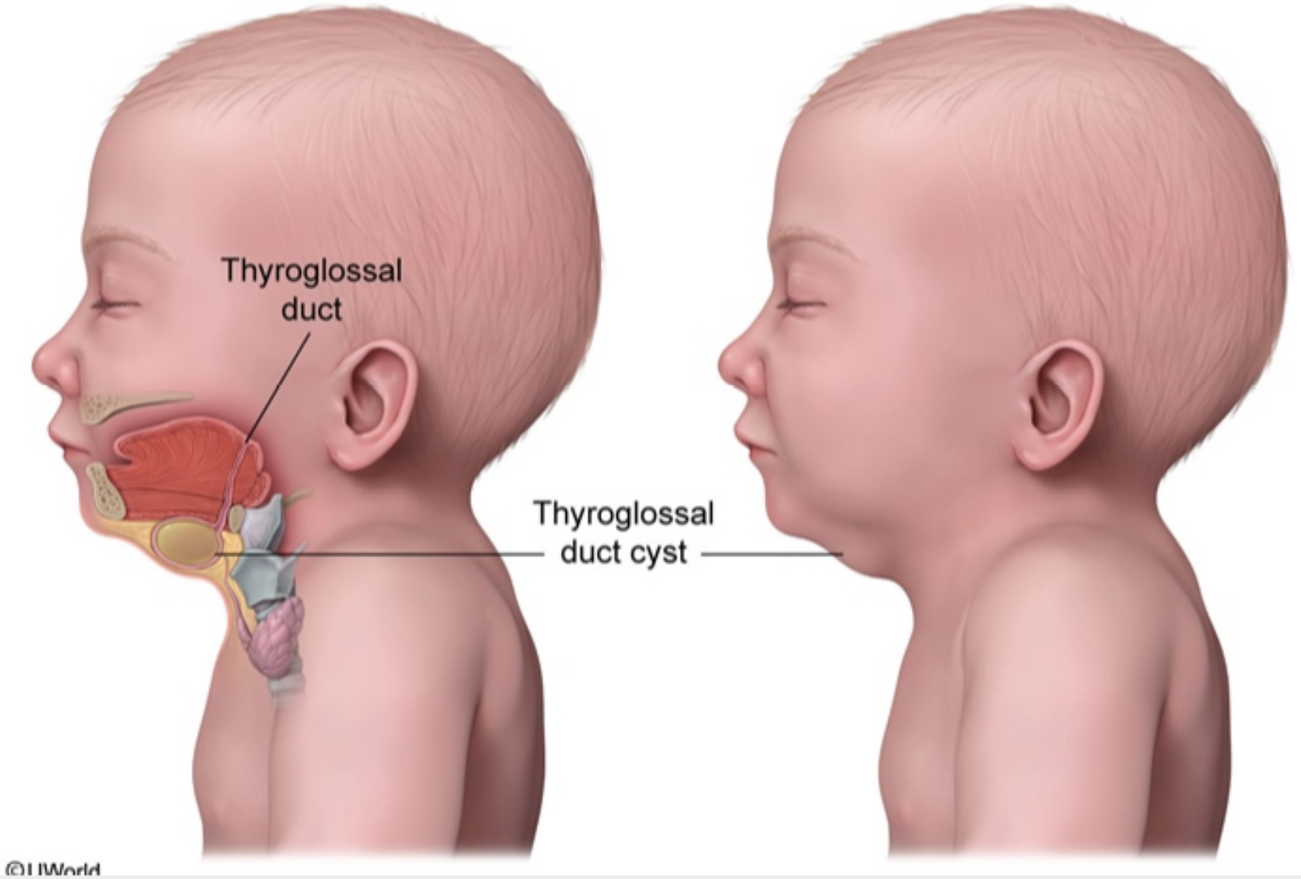
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Thyroglossal duct cyst




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• Correlation between pre-operative diagnosis and post-operative pathology reading in pediatric neck masses—a review of 281 cases.

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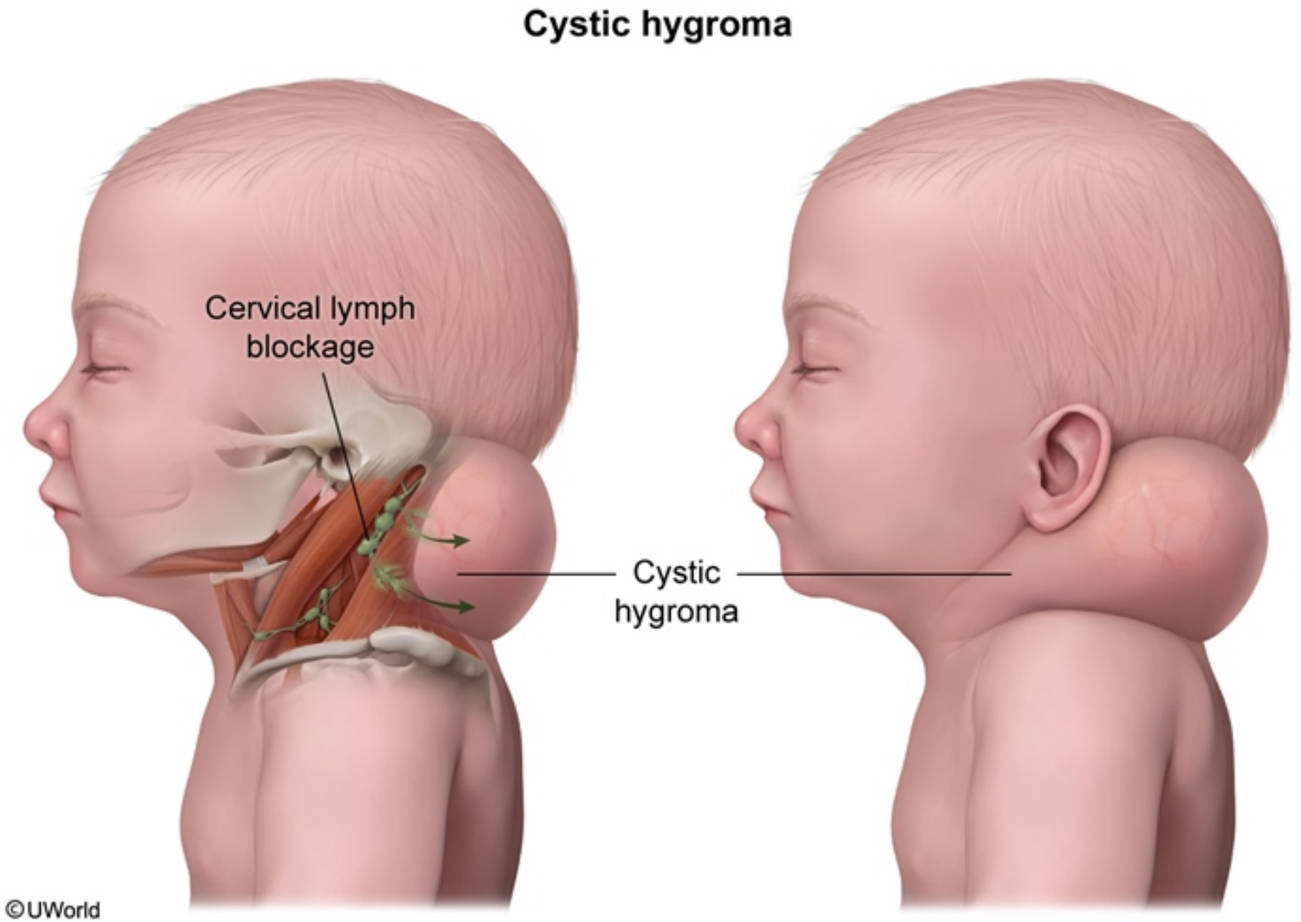
- Correlation between pre-operative diagnosis and post-operative pathology reading in pediatric neck masses—a review of 281 cases.

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| Cystic hygroma | Posterior | • Dilated lymphatic vessels |

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- Correlation between pre-operative diagnosis and post-operative pathology reading in pediatric neck masses—a review of 281 cases.

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Item 14 of 40
Question Id: 10152

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A 38-year-old man comes to the office due to painful nodular lesions under his arms. The problem began a year ago, but the symptoms have worsened over the last 3 months. He is beginning to notice a foul odor. The patient has a history of diabetes mellitus and hyperlipidemia. His medications include metformin and atorvastatin. Temperature is 36.1 C (97 F), blood pressure is 138/77 mm Hg, and pulse is 78/min. Skin examination shows tender, fluctuant nodules with subcutaneous fibrosis at the axillae bilaterally.



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Item 14 of 40
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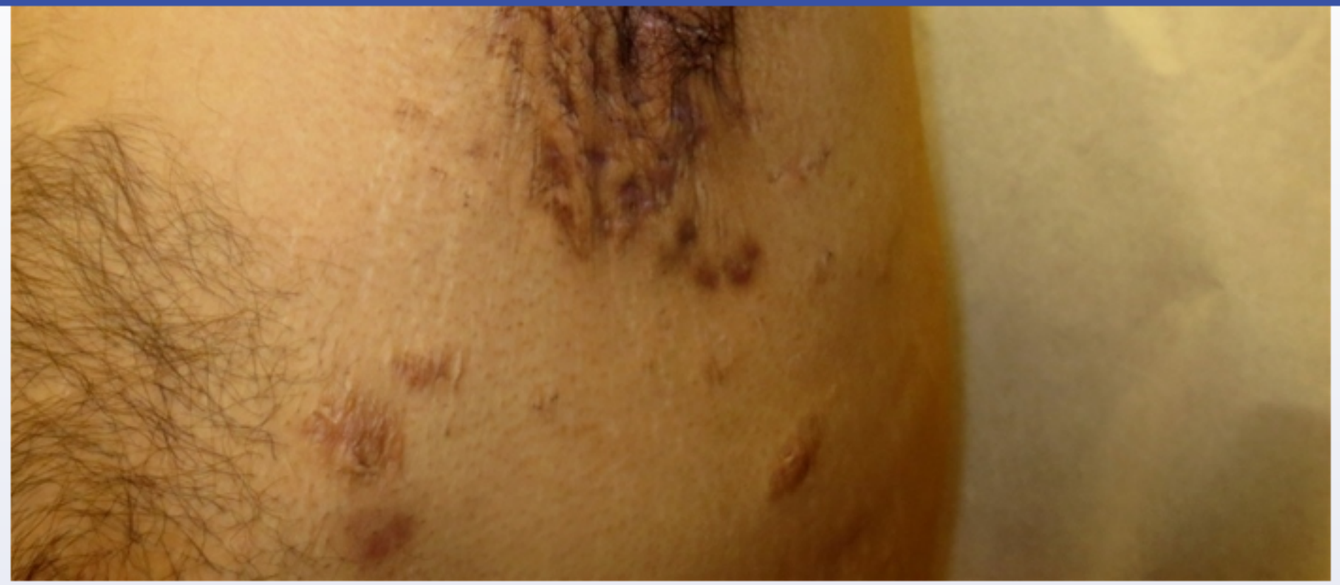
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Which of the following is the most likely diagnosis in this patient?

A. Acanthosis nigricans
B. Acne vulgaris
C. Furunculosis
D. Hidradenitis suppurativa
E. Intertrigo

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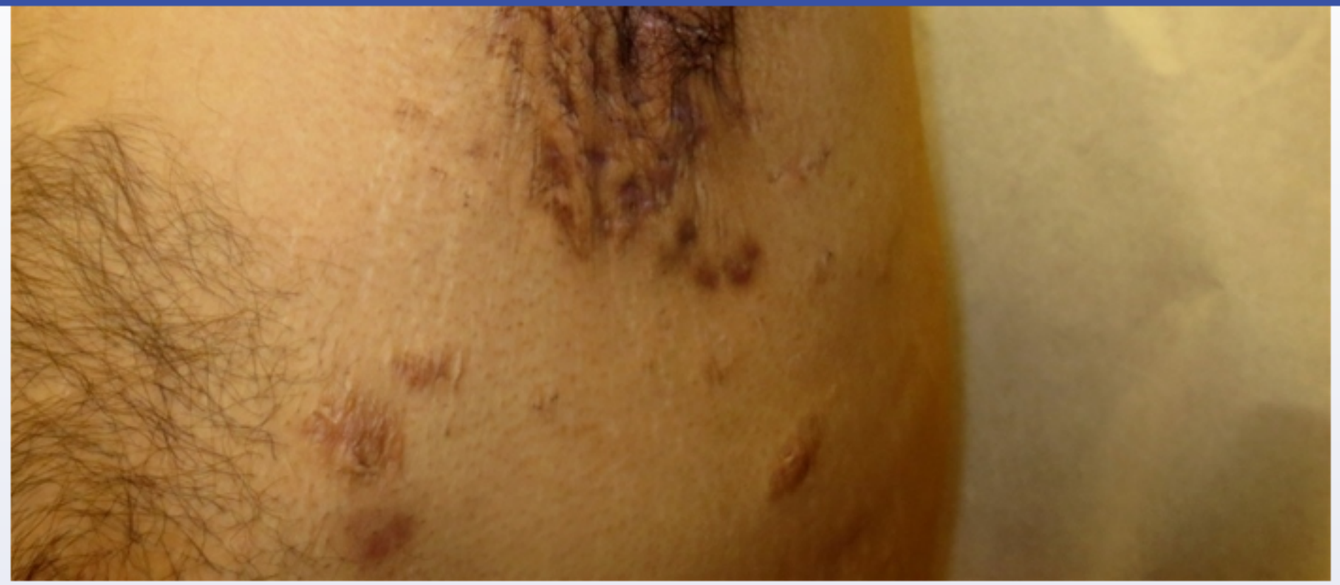
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Item 14 of 40
Question Id: 10152

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Which of the following is the most likely diagnosis in this patient?

A. Acanthosis nigricans (3%)
B. Acne vulgaris (0%)
C. Furunculosis (9%)
✓ D. Hidradenitis suppurativa (83%)
E. Intertrigo (3%)

Omitted
Correct answer

83%
Answered correctly

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06/16/2020
Last Updated

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Explanation

This patient has **hidradenitis suppurativa** (HS, also known as acne inversa). It most commonly occurs in **intertriginous** areas (eg, **axilla**; inguinal, perineal areas) but can occur in any hair-bearing skin. HS is due to chronic inflammatory occlusion of folliculopilosebaceous units, which prevents keratinocytes from properly shedding from the follicular epithelium. Risk factors include family history of HS, smoking, obesity, diabetes, and mechanical stress on the skin (eg, friction, pressure).

HS initially presents as solitary, painful, **inflamed nodules** that can last for several days to months. The nodules may regress or can progress to abscesses that open to the surface with purulent or serosanguineous drainage. Most patients have a **chronic, relapsing course**. Complications include **sinus tracts**, comedones, and scarring. Severe scarring can lead to dense, rope-like bands in the skin with strictures and lymphedema. The diagnosis of HS is usually made clinically without the need for biopsy or cultures.

**(Choice A)** Acanthosis nigricans presents as hyperpigmented plaques, often with associated skin tags. It is common in the axillae, groin, and neck, and is associated with obesity and diabetes. However, it does not cause painful nodules.

**(Choice B)** Acne vulgaris presents as closed or open comedones that can progress to inflammatory papules, pustules, and nodules. It most commonly affects the forehead, nose, and chin, although it can also involve the chest and back. However, it rarely involves the axilla.

**(Choices C and E)** A furuncle is a skin abscess, usually due to *Staphylococcus aureus*. It presents as a painful pustule or nodule, typically draining purulent material. Intertrigo is due to infection with *Candida* species and presents as well-defined, erythematous plaques with satellite vesicles or pustules in intertriginous and occluded skin areas. These disorders typically do not follow a chronic course or cause significant scarring.

**Educational objective:**
Hidradenitis suppurativa is a chronic, relapsing condition characterized by inflammatory occlusion of folliculopilosebaceous units. It most commonly occurs in intertriginous skin areas and presents as painful nodules that can progress to abscesses that open to the skin surface. Complications include sinus tracts, comedones, and scarring.

**References**

- Hidradenitis suppurativa: a guide for the practicing physician.

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Item 14 of 40
Question Id: 10152

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Explanation

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Explanation

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Item 14 of 40
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Explanation

## Exhibit Display



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Item 14 of 40
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Explanation

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Item 15 of 40
Question Id: 16396

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A 40-year-old man comes to the office for evaluation of hoarseness. The patient first noticed the symptoms 4 months ago. Since then, his voice has gotten progressively more "raspy." He has no fever, throat pain, shortness of breath, or trouble swallowing. Medical history includes asthma and gastroesophageal reflux disease. Medications include inhaled budesonide, albuterol, and omeprazole. The patient smokes 3 or 4 cigarettes per day. Vital signs are within normal limits. Flexible laryngoscopy shows irregular, exophytic growths in clusters on the surfaces of the vocal cords. Pathology shows no malignant features. Which of the following is the most likely cause of this patient's laryngeal lesions?

A. Cigarette smoking
B. Environmental allergens
C. Fungal infection
D. Gastroesophageal reflux disease
E. Viral infection
F. Vocal abuse

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Item 15 of 40
Question Id: 16396

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- A. Cigarette smoking (19%)
- B. Environmental allergens (1%)
- C. Fungal infection (6%)
- D. Gastroesophageal reflux disease (6%)
- ✓ E. Viral infection (56%)
- F. Vocal abuse (10%)

Omitted
Correct answer
E

56%
Answered correctly

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Last Updated

Explanation

**Normal vocal cords** | **Recurrent respiratory papillomatosis**

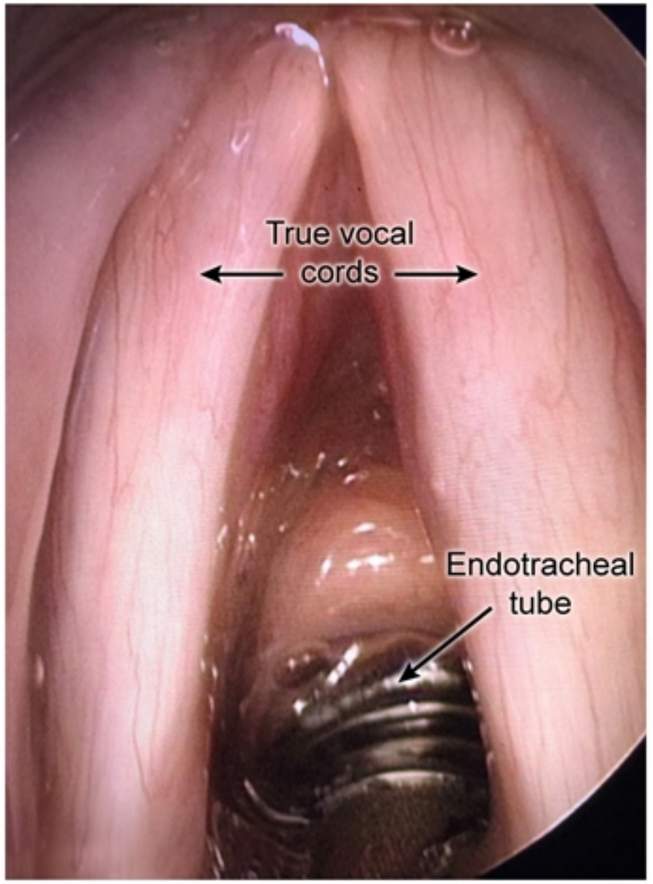




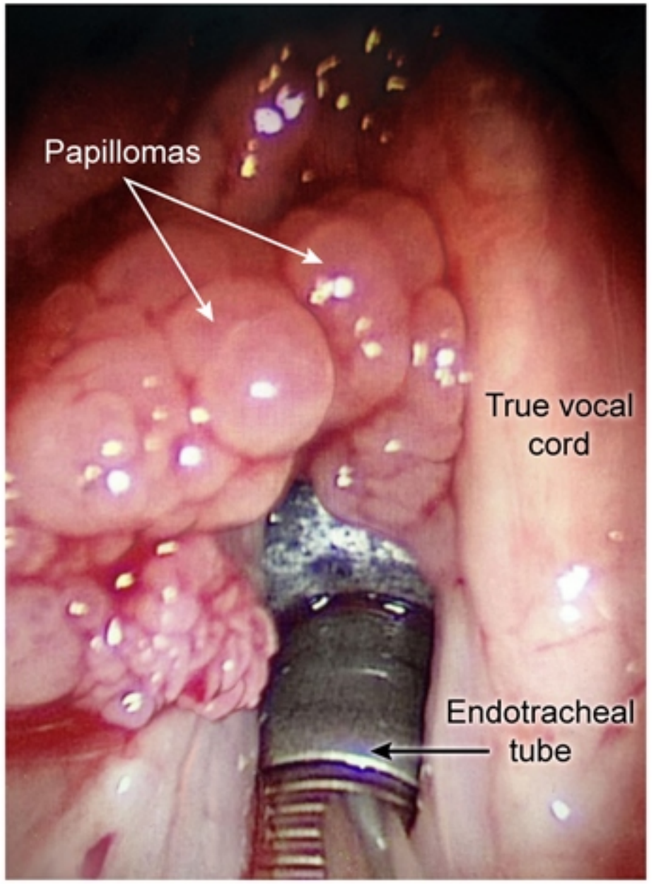
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**Normal vocal cords**




**Recurrent respiratory papillomatosis**




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Constant (≥1 month) or progressive hoarseness is often related to a vocal cord lesion and requires evaluation by laryngoscopy. This patient with **irregular, exophytic growths** in clusters on the surfaces of his vocal cords likely has **laryngeal papillomas** due to recurrent respiratory papillomatosis (RRP). These lesions are often warty or grapelike and, as with skin papillomas, have dark-red punctate areas corresponding to

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Constant (≥1 month) or progressive hoarseness is often related to a vocal cord lesion and requires evaluation by laryngoscopy. This patient with **irregular, exophytic growths** in clusters on the surfaces of his vocal cords likely has **laryngeal papillomas** due to recurrent respiratory papillomatosis (RRP). These lesions are often warty or grapelike and, as with skin papillomas, have dark-red punctate areas corresponding to blood vessels. Laryngeal papillomas are caused by **human papillomavirus (HPV) subtypes 6 and 11**. Infants typically acquire HPV via vertical transmission; adults may develop symptoms due to reactivation of vertically transmitted HPV or from exposure to HPV through sexual contact.

Although benign, RRP is associated with significant morbidity (eg, voice outcomes, airway obstruction, repeated operative interventions). In addition, the clinical course is variable and unpredictable with fluctuations in severity. In rare instances, it can spread beyond the vocal cords to involve the lower respiratory tract. Medical therapy (eg, interferon, cidofovir) has limited efficacy; therefore, the mainstay of treatment remains **surgical debridement**, and patients often require many procedures.

**(Choice A)** Cigarette smoking can cause a variety of laryngeal lesions including leukoplakia and squamous cell carcinoma. Although smoking can cause malignant degeneration of RRP lesions, this patient's pathology has no malignant features.

**(Choice B)** Environmental allergens can cause chronic inflammation of nasal and sinus mucosa, which can produce thick secretions that cause hoarseness. Inflammation may be seen but not wartlike growths.

**(Choice C)** Fungal infection of the larynx typically causes thickened, white patches on an erythematous base (similar to that seen in oral thrush).

**(Choice D)** Gastroesophageal reflux may affect the larynx and cause hoarseness and laryngeal lesions such as focal swelling, erythema, or granulation tissue. However, it generally has a fluctuating course (often worse when laying down) and would not cause wartlike growths.

**(Choice F)** Polyps and nodules can form on the vocal cords due to chronic irritation from vocal abuse (eg, yelling or using voice excessively). However, both polyps and nodules tend to have more smooth edges and would not form in clusters.

**Educational objective:**
Human papillomavirus can cause recurrent respiratory papillomatosis, which results in hoarseness due to wartlike growths on the true vocal cords.

**References**

- Update on recurrent respiratory papillomatosis.

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**References**

- Update on recurrent respiratory papillomatosis.

| Surgery | Ear, Nose & Throat (ENT) | Recurrent respiratory papillomatosis |
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| Subject | System | Topic |

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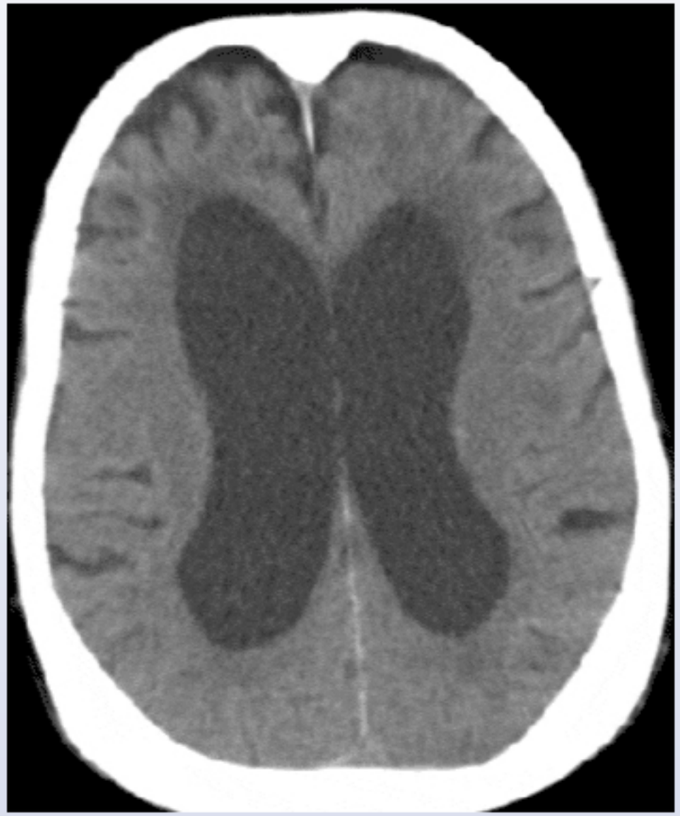
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Item 16 of 40
Question Id: 4652

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A 79-year-old woman is brought to the office due to recurrent falls. Over the past year, the patient has become increasingly unsteady while walking and has had several falls. The patient has had no headaches, vision changes, nausea, or vomiting. Medical history is significant for hypertension, for which she takes losartan. Vital signs are within normal limits. Cardiopulmonary and abdominal examinations are unremarkable. Neurological examination shows normal cranial nerves and fundoscopy. There is increased tone and hyperreflexia of the lower extremities. Sensation to light touch and vibration is intact. When instructed to walk, the patient moves slowly with small steps and a wide base; she takes several steps to turn around. CT scan of the brain is shown below.



This patient's symptoms would most likely improve with which of the following?

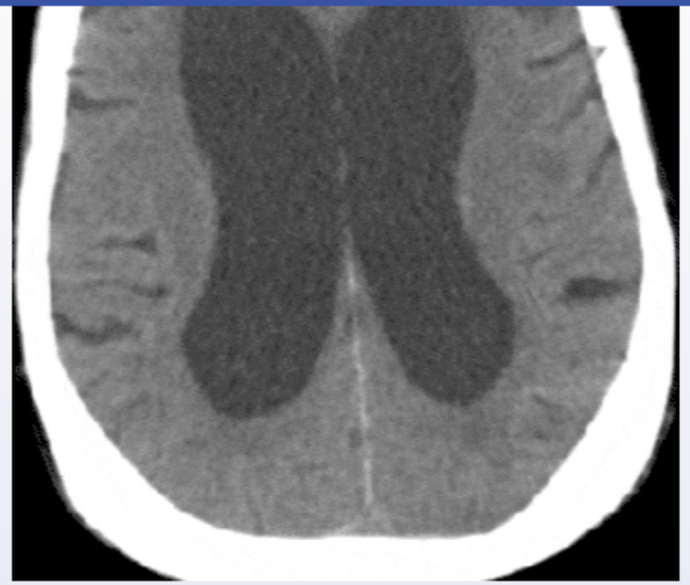
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Item 16 of 40
Question Id: 4652

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This patient's symptoms would most likely improve with which of the following?

A. Acetazolamide
B. Cholinesterase inhibitors
C. High-dose prednisone
D. High-volume lumbar puncture
E. Levodopa and carbidopa

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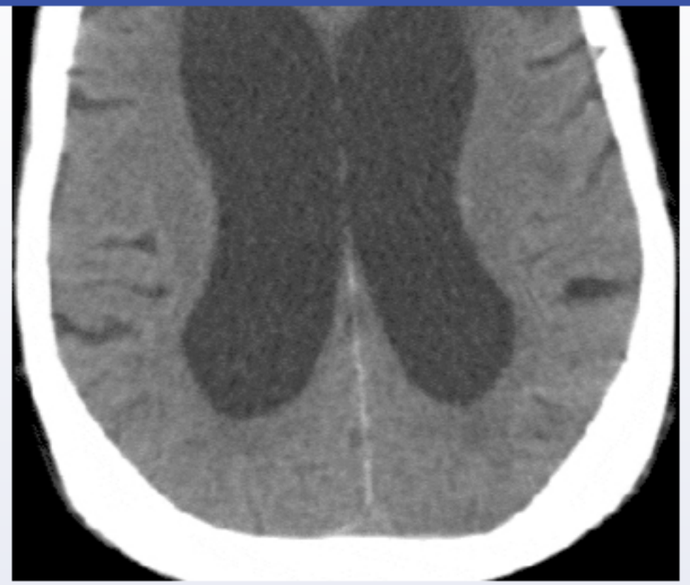
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This patient's symptoms would most likely improve with which of the following?

A. Acetazolamide (26%)
B. Cholinesterase inhibitors (1%)
C. High-dose prednisone (1%)
✓ D. High-volume lumbar puncture (65%)
E. Levodopa and carbidopa (6%)

Omitted
Correct answer

65%
Answered correctly

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Explanation

This patient with recurrent falls has hyperreflexia and a wide-based gait. In association with the CT of the head demonstrating **ventriculomegaly out of proportion to cerebral atrophy** (eg, normal sulci), this presentation suggests **normal pressure hydrocephalus** (NPH). NPH is characterized by abnormal cerebrospinal fluid (CSF) accumulation and results in increased ventricular size without persistent elevations in intracranial pressure.

Symptoms of NPH are classically described as a triad of urinary incontinence, cognitive impairment, and gait abnormalities. However, **all 3 features are not required** for diagnosis; in fact, only **gait dysfunction**, typically the most prominent symptom, is mandatory. In addition, **upper-motor neuron signs**, such as lower-extremity spasticity, hyperreflexia, and extensor plantar responses, may occur.

The diagnosis is confirmed with **high-volume lumbar puncture**, which allows for both confirmation of normal opening pressure and gait testing. Improvement of gait function after the CSF removal is diagnostic. Alternatively, a temporary lumbar drain may be placed to assess for gait improvement over a period of days. Definitive therapy is **ventricular shunt placement** to divert excess CSF into the abdomen (ventriculoperitoneal shunt) or heart (ventriculoatrial shunt).

**(Choice A)** Acetazolamide is used to treat patients with idiopathic intracranial hypertension (ie, pseudotumor cerebri). However, this typically occurs in young, obese women and is characterized by headache, vision change, and papilledema. Ventriculomegaly and gait dysfunction are unexpected.

**(Choice B)** Cholinesterase inhibitors (eg, donepezil) are used to treat Alzheimer dementia. Despite generalized brain atrophy (eg, hydrocephalus ex vacuo) being common, ventriculomegaly without sulcal enlargement suggests NPH. In addition, hyperreflexia is unexpected.

**(Choice C)** High-dose glucocorticoids are used in the treatment of multiple sclerosis, which can cause upper motor neuron signs and falls but typically occurs in young women with relapsing and remitting symptoms rather than the progressive symptoms seen in this patient. Ventriculomegaly is unexpected.

**(Choice E)** Levodopa and carbidopa are used to treat Parkinson disease (PD), which can cause gait abnormalities. However, although shuffling is common in PD, the gait is usually festinating (short, quick steps). In addition, PD typically causes a pill-rolling tremor and cogwheel rigidity.

**Educational objective:**

The diagnosis is confirmed with **high-volume lumbar puncture**, which allows for both confirmation of normal opening pressure and gait testing. Improvement of gait function after the CSF removal is diagnostic. Alternatively, a temporary lumbar drain may be placed to assess for gait improvement over a period of days. Definitive therapy is **ventricular shunt placement** to divert excess CSF into the abdomen (ventriculoperitoneal shunt) or heart (ventriculoatrial shunt).

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**Educational objective:**
Normal pressure hydrocephalus is characterized by abnormal gait, urinary incontinence, and cognitive impairment; however, only gait dysfunction is required for diagnosis. Neuroimaging demonstrates ventriculomegaly out of proportion to cerebral atrophy. The diagnosis is confirmed with high-volume lumbar puncture demonstrating improvement of gait with cerebrospinal fluid removal. Definitive treatment is ventricular shunt placement.

| Surgery | Nervous System | Normal pressure hydrocephalus |
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| Subject | System | Topic |

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Item 17 of 40
Question Id: 15961

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A 40-year-old man comes to the clinic due to runny nose, cough, and sore throat. He began having rhinorrhea 5 days ago and subsequently developed a cough that is worse at night. The patient has been taking an over-the-counter cough medication, but it has not improved his symptoms. Three days ago, he developed a sore throat, which he attributes to frequent coughing. Today, his throat is more painful, and he has been having difficulty swallowing liquids. The patient has hypertension and type 2 diabetes mellitus, for which he takes an antihypertensive and several medications for glycemic control. Temperature is 37.9 C (100.2 F), blood pressure is 148/90 mm Hg, pulse is 110/min, and respirations are 22/min. BMI is 35 kg/m$^2$. Pulse oximetry shows 99% on room air. The patient winces when swallowing. Examination shows pooling of oral secretions. There are several dental caries. The posterior oropharynx appears mildly erythematous due to postnasal drip. The anterior neck is soft but tender to palpation. Lung examination reveals faint stridor with no crackles or rhonchi. Which of the following is the best next step for establishing the diagnosis in this patient?

A. Chest radiograph
B. Diphtheria PCR
C. Group A *Streptococcus* rapid antigen
D. Lateral neck radiograph
E. Sputum Gram stain and culture

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- A. Chest radiograph (4%)
- B. Diphtheria PCR (8%)
- C. Group A *Streptococcus* rapid antigen (18%)
- ✓ D. Lateral neck radiograph (61%)
- E. Sputum Gram stain and culture (7%)

Omitted
Correct answer
D

61%
Answered correctly

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Time Spent

02/03/2020
Last Updated

Explanation

| Infectious epiglottitis | |
|---|---|
| **Epidemiology** | • *Streptococcus pneumoniae, Haemophilus influenzae*<br>• Risk reduced with *H influenzae* vaccination |
| **Clinical** | • Rapidly progressive & life-threatening<br>• Fever, sore throat, drooling, muffled voice<br>• Airway obstruction (stridor, dyspnea)<br>• Pooled oropharynx secretions<br>• Laryngotracheal tenderness |
| **Diagnosis** | • Direct visualization<br>• Imaging (lateral neck x-ray) |
| **Treatment** | • Early artificial airway (if needed)<br>• Intravenous antibiotics (ceftriaxone plus vancomycin) |

This patient's presentation raises suspicion for **epiglottitis**, a cellulitis of the epiglottis, aryepiglottic folds, and surrounding tissues. In adults, most cases are caused by *Streptococcus pneumoniae* or *Haemophilus influenzae*, with diabetes mellitus, obesity, and preceding **upper respiratory infection** (disruption of the respiratory epithelium creates a portal of entry for bacteria) increasing infection risk. Whereas children classically have abrupt onset of drooling, dysphagia, and distress (the "3 Ds"), initial manifestations in adults are more subtle and include **sore throat**, fever, and laryngotracheal tenderness to palpation. With worsening of the swelling, difficulty swallowing, **pooled oral secretions**, and respiratory compromise (eg, tachypnea, **stridor**) can develop, as seen in this patient.

The diagnosis is confirmed by direct visualization or soft-tissue **lateral neck radiograph**, which usually shows an enlarged epiglottis, loss of the vallecular air space, and/or a distended hypopharynx. Radiographs may also help exclude other conditions. Respiratory compromise is less common in adults but can progess quickly; therefore, patients with significant compromise (eg, hypoxia resistant to noninvasive intervention) require airway establishment prior to considering neck radiograph.

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**(Choices A and E)** Chest x-ray and sputum Gram stain/culture are used to diagnose pneumonia. Although this patient has a cough, his pulse oximetry is normal, and his lungs have no evidence of intrapulmonary pathology (eg, crackles). The presence of stridor and pooled oral secretions makes an upper airway issue such as epiglottitis far more likely than pneumonia.

**(Choice B)** Diphtheria can cause slowly progressive sore throat, malaise, cough, stridor, hoarseness, low-grade fever, and a thick, white exudate (pseudomembrane) on the posterior pharynx. However, diphtheria is very rare in developed countries due to widespread vaccination; epiglottitis is more common.

**(Choice C)** Group A *Streptococcus* pharyngitis usually presents with acute-onset sore throat, tonsillar exudates, cervical lymphadenopathy, and no cough (Centor criteria). This patient's slow onset of sore throat, cough, pooled oral secretions, and stridor make epiglottitis far more likely.

**Educational objective:**
Epiglottitis should be suspected in patients with sore throat, hoarseness, stridor, pooled oral secretions, and drooling. Risk factors include diabetes mellitus, obesity, and preceding upper respiratory infection. The diagnosis can be confirmed (in those with stable respiratory status) using lateral neck radiograph.

| Surgery | Ear, Nose & Throat (ENT) | Epiglottitis |
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| Subject | System | Topic |

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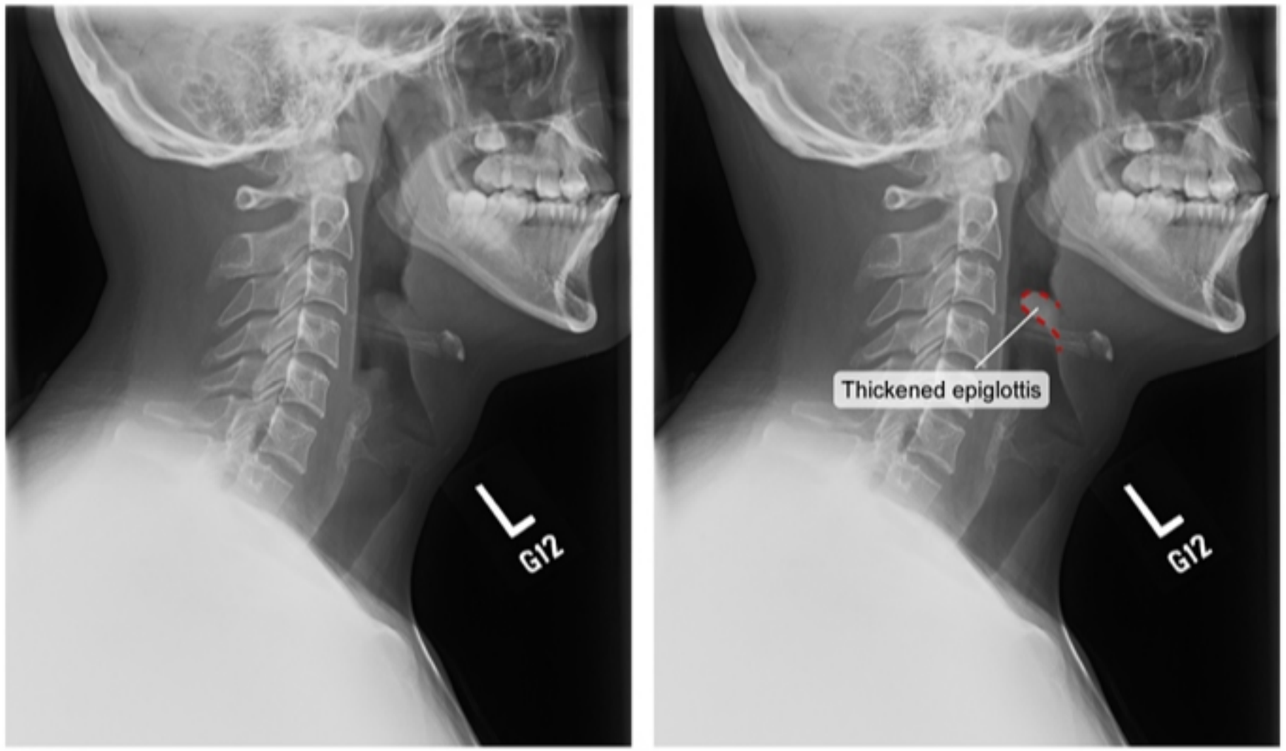
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infection (disruption of the respiratory epithelium creates a portal of entry for bacteria) increasing infection risk. Whereas children classically have

Exhibit Display

## Adult epiglottitis




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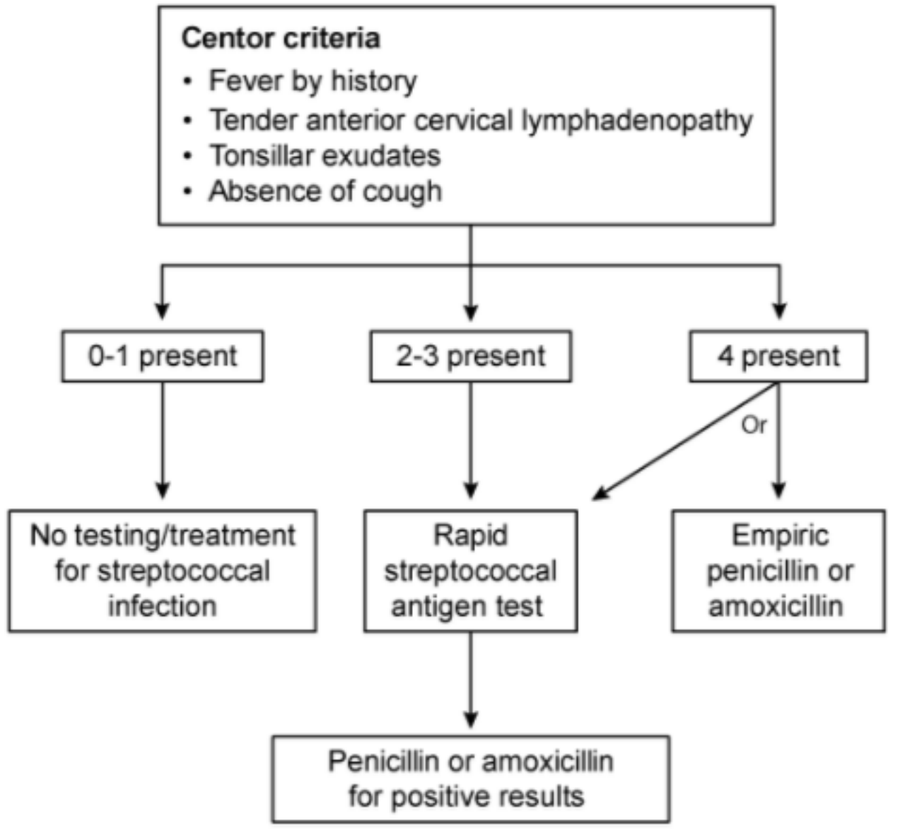
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infection (disruption of the respiratory epithelium creates a portal of entry for bacteria) increasing infection risk. Whereas children classically have

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## Evaluation & management of pharyngitis




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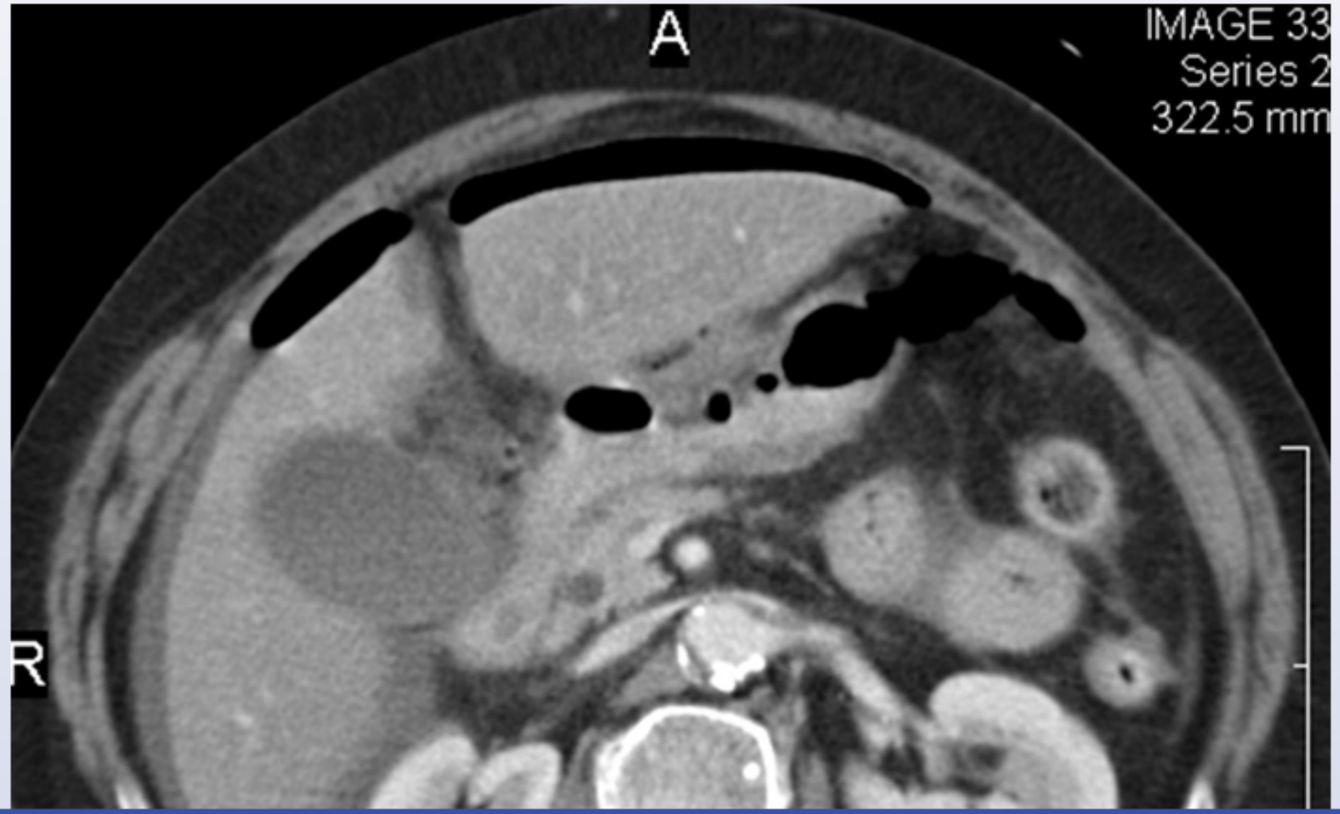
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Item 18 of 40
Question Id: 4555

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A 28-year-old man is brought to the emergency department after a high-speed motor vehicle collision in which he was the restrained driver. The patient is awake and has left chest pain and vague abdominal discomfort. Blood pressure is 114/74 mm Hg and pulse is 112/min. Physical examination shows chest and abdominal ecchymoses and tenderness in the distribution of the seat belt. Breath sounds are equal bilaterally. Heart sounds are normal. The abdomen is mildly tender. Chest x-ray reveals a left sixth rib fracture without pneumothorax. Focused assessment with sonography is negative for free abdominal fluid. CT scan of the abdomen shows thickened proximal small bowel and a small mesenteric hematoma. The patient is hospitalized for monitoring and supportive care. Over the next 24 hours, he develops worsening abdominal pain, nausea, vomiting, and abdominal tenderness with guarding. Repeat CT scan of the abdomen is shown in the image below:




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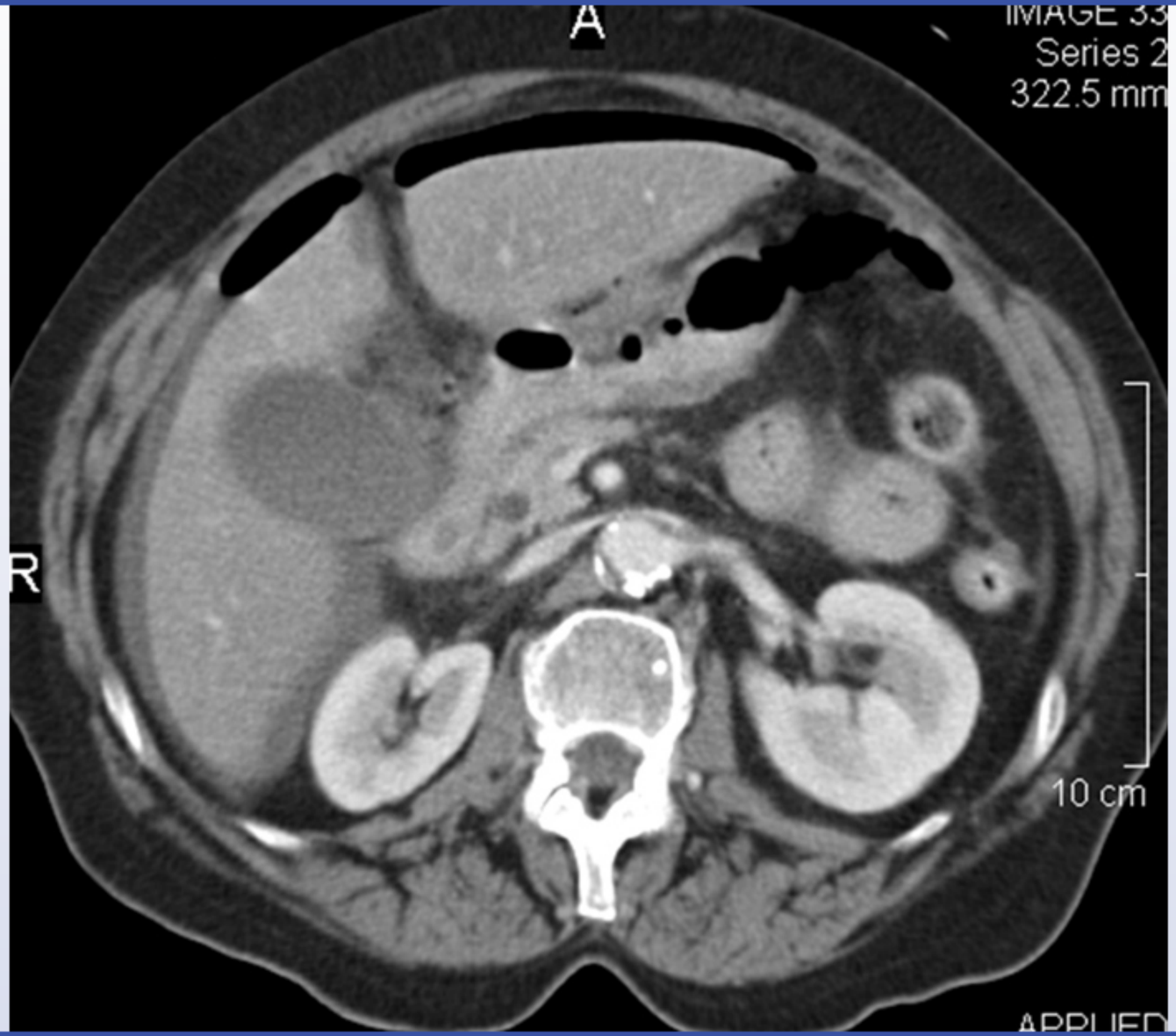
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Item 18 of 40
Question Id: 4555

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Item 18 of 40
Question Id: 4555

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Which of the following is the best next step in management of this patient?

A. Diagnostic peritoneal lavage
B. Increased analgesia and close observation
C. Mesenteric angiography
D. Surgical exploration
E. Upper gastrointestinal series

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Item 18 of 40
Question Id: 4555

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Which of the following is the best next step in management of this patient?

A. Diagnostic peritoneal lavage (2%)
B. Increased analgesia and close observation (0%)
C. Mesenteric angiography (3%)
✓ D. Surgical exploration (93%)
E. Upper gastrointestinal series (0%)

Omitted
Correct answer

93%
Answered correctly

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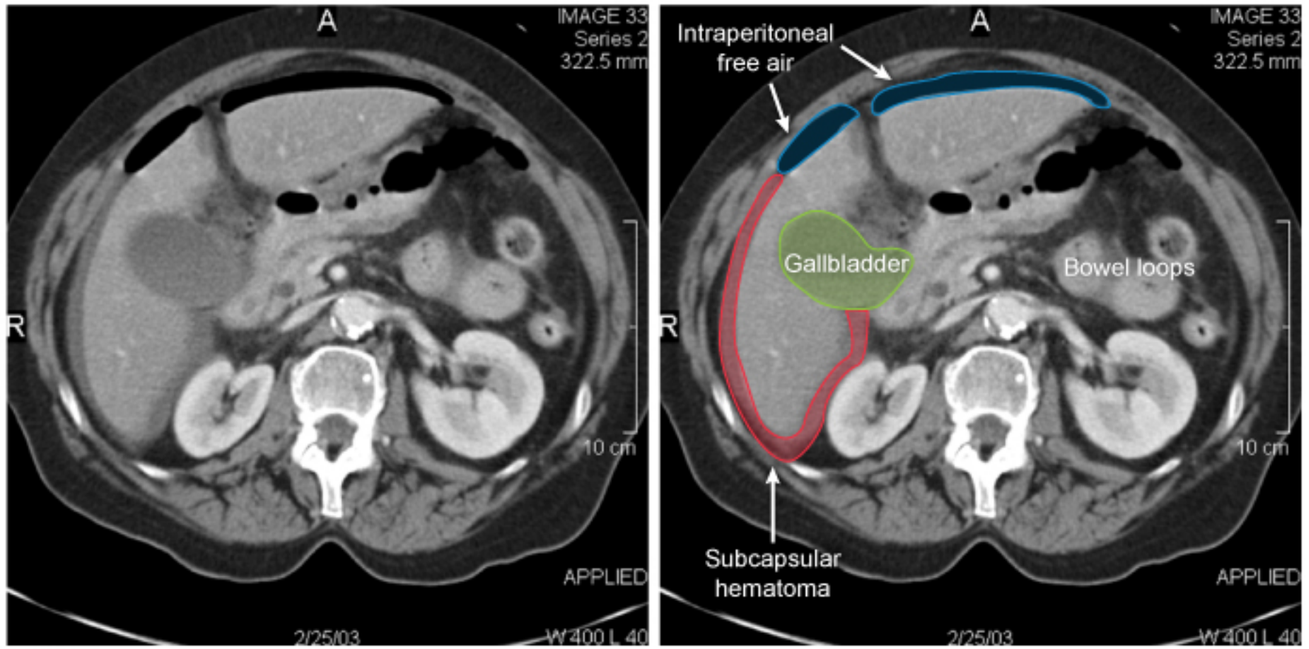
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## Intraperitoneal free air on abdominal CT scan




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This patient with **blunt abdominal trauma** (eg, ecchymoses and tenderness in a seatbelt distribution) from a motor vehicle collision has worsening abdominal pain and signs of peritoneal inflammation (eg, tenderness with guarding). Repeat abdominal CT scan reveals accumulation of a hepatic subcapsular hematoma and—most important—**intraperitoneal free air**. The free air establishes the diagnosis of **perforated viscus**, which warrants immediate **surgical exploration (Choice B)**.

Although gastrointestinal (GI) perforation is more frequently associated with penetrating abdominal trauma, it can also result from blunt abdominal trauma. Perforation may occur acutely (eg, during rapid compression of the GI tract that causes high intraluminal pressure) or in a **delayed fashion** (eg, several hours to days following trauma), as in this patient. Delayed perforation can be due to the following:

- **Bowel contusion** (eg, thickened [edematous] proximal small bowel on initial CT scan) progressing to full-thickness injury

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This patient with **blunt abdominal trauma** (eg, ecchymoses and tenderness in a seatbelt distribution) from a motor vehicle collision has worsening abdominal pain and signs of peritoneal inflammation (eg, tenderness with guarding). Repeat abdominal CT scan reveals accumulation of a hepatic subcapsular hematoma and—most important—**intraperitoneal free air**. The free air establishes the diagnosis of **perforated viscus**, which warrants immediate **surgical exploration (Choice B)**.

Although gastrointestinal (GI) perforation is more frequently associated with penetrating abdominal trauma, it can also result from blunt abdominal trauma. Perforation may occur acutely (eg, during rapid compression of the GI tract that causes high intraluminal pressure) or in a **delayed fashion** (eg, several hours to days following trauma), as in this patient. Delayed perforation can be due to the following:

- **Bowel contusion** (eg, thickened [edematous] proximal small bowel on initial CT scan) progressing to full-thickness injury
- **Injured mesenteric vasculature** (eg, mesenteric hematoma on initial CT scan) progressing to ischemia and necrosis

Many patients with bowel contusion or mesenteric hematoma do not need further intervention. However, an extended period of observation should be considered due to the risk of progression to perforation, as occurred in this patient.

**(Choice A)** The role of diagnostic peritoneal lavage (DPL) has been largely reduced to evaluating for intraabdominal hemorrhage in hemodynamically unstable patients with questionable bedside ultrasound results. This patient has clear evidence of GI perforation, indicating the need for emergent surgical intervention rather than DPL.

**(Choice C)** Mesenteric angiography can evaluate the blood supply to the small and large intestines in cases of suspected injury, occlusion, or bleeding. Although this patient may have had injury to his mesenteric vessels (eg, mesenteric hematoma) that led to necrosis and perforation, angiography should not delay surgical intervention once perforation is confirmed.

**(Choice E)** An upper GI series uses contrast to outline the lumen of the upper GI tract and, depending on the exact location of this patient's perforation, may demonstrate contrast leaking through the perforation. However, this study is time-consuming (eg, time to drink contrast, time for contrast to pass through the GI system) and unnecessary because the diagnosis of perforation has already been established by CT scan.

**Educational objective:**
Blunt abdominal trauma can cause gastrointestinal perforation in an acute or a delayed (eg, progression of bowel contusion, mesenteric ischemia) fashion. Confirmation of perforation (eg, intraperitoneal free air on imaging) should prompt emergent surgical exploration.

- **Injured mesenteric vasculature** (eg, mesenteric hematoma on initial CT scan) progressing to ischemia and necrosis

Many patients with bowel contusion or mesenteric hematoma do not need further intervention. However, an extended period of observation should be considered due to the risk of progression to perforation, as occurred in this patient.

**(Choice A)** The role of diagnostic peritoneal lavage (DPL) has been largely reduced to evaluating for intraabdominal hemorrhage in hemodynamically unstable patients with questionable bedside ultrasound results. This patient has clear evidence of GI perforation, indicating the need for emergent surgical intervention rather than DPL.

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**Educational objective:**
Blunt abdominal trauma can cause gastrointestinal perforation in an acute or a delayed (eg, progression of bowel contusion, mesenteric ischemia) fashion. Confirmation of perforation (eg, intraperitoneal free air on imaging) should prompt emergent surgical exploration.

**References**


- Blunt small bowel perforation (SBP): an Eastern Association for the Surgery of Trauma multicenter update 15 years later.
- Delayed small bowel perforation following blunt abdominal trauma: a case report and review of the literature.


| Surgery | Gastrointestinal & Nutrition | Blunt abdominal trauma |
|---|---|---|
| Subject | System | Topic |

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A 58-year-old, previously healthy man is evaluated due to a 2-month history of early satiety, postprandial epigastric pain and vomiting, and unintended weight loss. Physical examination shows cachexia and a palpable epigastric mass. Upper gastrointestinal endoscopy reveals a large prepyloric mass causing gastric outlet obstruction; biopsy of the mass is consistent with poorly differentiated adenocarcinoma. Abdominal CT scan reveals thickening of the gastric wall with adjacent fat infiltration, enlarged lymph nodes, and multiple hepatic metastatic lesions. The disease is considered unresectable, and the patient undergoes laparoscopic gastrojejunostomy for palliation of gastric outlet obstruction. Postoperatively, he tolerates tube feeding but experiences worsening weakness. The patient also has frequent episodes of nonsustained ventricular tachycardia. Laboratory results are as follows:

| | At admission | Postoperative day 2 |
|---|---|---|
| Hemoglobin | 9.9 g/dL | 9.8 g /dL |
| Leukocytes | 8,800/mm$^3$ | 10,000/mm$^3$ |
| Serum chemistry | | |
| Sodium | 130 mEq/L | 135 mEq/L |
| Potassium | 3.7 mEq/L | 2.8 mEq/L |
| Creatinine | 1.1 mg/dL | 0.8 mg/dL |
| Glucose | 90 mg/dL | 120 mg/dL |
| Phosphorus | 3.1 mg/dL | 1.2 mg/dL |

Which of the following is the most likely cause of this patient's worsening condition?

A. Hepatic metabolic impairment
B. Hospital-acquired infection

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| | At admission | Postoperative day 2 |
|---|---|---|
| Hemoglobin | 9.9 g/dL | 9.8 g /dL |
| Leukocytes | 8,800/mm$^3$ | 10,000/mm$^3$ |
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| Glucose | 90 mg/dL | 120 mg/dL |
| Phosphorus | 3.1 mg/dL | 1.2 mg/dL |

Which of the following is the most likely cause of this patient's worsening condition?

A. Hepatic metabolic impairment
B. Hospital-acquired infection
C. Hypermetabolic syndrome
D. Nutritional replenishment
E. Paraneoplastic syndrome

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| | At admission | Postoperative day 2 |
|---|---|---|
| Hemoglobin | 9.9 g/dL | 9.8 g /dL |
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| Creatinine | 1.1 mg/dL | 0.8 mg/dL |
| Glucose | 90 mg/dL | 120 mg/dL |
| Phosphorus | 3.1 mg/dL | 1.2 mg/dL |

Which of the following is the most likely cause of this patient's worsening condition?

- A. Hepatic metabolic impairment (5%)
- B. Hospital-acquired infection (1%)
- C. Hypermetabolic syndrome (21%)
- ✓ D. Nutritional replenishment (64%)
- E. Paraneoplastic syndrome (6%)

Omitted
Correct answer

64%
Answered correctly

04 secs
Time Spent

02/09/2020
Last Updated

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This patient with a malignant gastric outlet obstruction has evidence of severe malnutrition (ie, weight loss, cachexia). The development of hypophosphatemia, hypokalemia, weakness, and arrhythmias after the initiation of tube feeding suggests **refeeding syndrome**, which occurs after the **reintroduction of nutrition** in patients with **chronic malnourishment** (eg, anorexia nervosa, malignancy).

Starvation results in the depletion of phosphate, although serum levels may remain normal due to transcellular shifts. The reintroduction of carbohydrates (ie, tube feeding) leads to increased insulin secretion. This stimulates the cellular uptake of electrolytes (ie, phosphate, potassium, magnesium) and increases phosphate utilization during glycolysis (eg, **formation of ATP**, 2-3 diphosphoglycerate). This eventually leads to phosphate depletion and failure of cellular energy metabolism, as well as massive fluid and electrolyte shifts.

Manifestations of refeeding syndrome include **muscle weakness** (which can include the muscles of respiration), **arrhythmias**, congestive heart failure, rhabdomyolysis, and neurologic dysfunction (eg, paresthesia, seizure). The disorder is characterized by **hypophosphatemia**; other common laboratory abnormalities include hypomagnesemia, hypokalemia, and liver function test abnormalities. Management includes close laboratory monitoring and aggressive repletion of electrolytes.

**(Choice A)** Hepatic metabolic dysfunction (eg, due to massive tumor burden) results in loss of synthetic function (eg, coagulopathy, hypoalbuminemia) and ammonia accumulation (eg, asterixis, hepatic encephalopathy). Electrolyte abnormalities and arrythmias would be unexpected.

**(Choice B)** Infection can cause leukocytosis and could induce arrythmias in a patient with underlying cardiac disease. However, this patient has no cardiac history, and infection would not cause muscle weakness or electrolyte abnormalities.

**(Choice C)** Hypermetabolic syndrome typically occurs in the setting of severe burns, sepsis, or hyperthyroidism, not chronic malnutrition, which suppresses metabolism. It typically results in ongoing protein catabolism and weight loss despite adequate nutrition; severe electrolyte derangements and muscle weakness would be unexpected early in the clinical course.

**(Choice E)** Paraneoplastic syndrome can cause metabolic disturbances but typically results in hyponatremia (syndrome of inappropriate antidiuretic hormone), hypercalcemia (humoral hypercalcemia of malignancy), or hypoglycemia. Hypokalemia and hypophosphatemia developing after nutritional repletion is more suggestive of refeeding syndrome.

**Educational objective:**
Refeeding syndrome occurs after the reintroduction of nutrition in patients with chronic malnourishment. Clinical manifestations include

phosphate depletion and failure of cellular energy metabolism, as well as massive fluid and electrolyte shifts.

Manifestations of refeeding syndrome include **muscle weakness** (which can include the muscles of respiration), **arrhythmias**, congestive heart failure, rhabdomyolysis, and neurologic dysfunction (eg, paresthesia, seizure). The disorder is characterized by **hypophosphatemia**; other common laboratory abnormalities include hypomagnesemia, hypokalemia, and liver function test abnormalities. Management includes close laboratory monitoring and aggressive repletion of electrolytes.

**(Choice A)** Hepatic metabolic dysfunction (eg, due to massive tumor burden) results in loss of synthetic function (eg, coagulopathy, hypoalbuminemia) and ammonia accumulation (eg, asterixis, hepatic encephalopathy). Electrolyte abnormalities and arrythmias would be unexpected.

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**(Choice E)** Paraneoplastic syndrome can cause metabolic disturbances but typically results in hyponatremia (syndrome of inappropriate antidiuretic hormone), hypercalcemia (humoral hypercalcemia of malignancy), or hypoglycemia. Hypokalemia and hypophosphatemia developing after nutritional repletion is more suggestive of refeeding syndrome.

**Educational objective:**
Refeeding syndrome occurs after the reintroduction of nutrition in patients with chronic malnourishment. Clinical manifestations include hypophosphatemia and other electrolyte abnormalities, muscle weakness, arrhythmias, and congestive heart failure.

| Surgery | Gastrointestinal & Nutrition | Refeeding Syndrome |
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| Subject | System | Topic |

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Item 20 of 40
Question Id: 4250

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A 22-year-old man comes to the office due to intermittent right knee pain that has been increasing for the past 8 weeks. The pain began after the patient participated in a recreational soccer tournament, but he does not recall any significant injuries. He has intermittent, moderate pain associated with a sensation of "catching" in the knee while walking. At times he is unable to completely extend the knee. The patient also had swelling at the joint several days after the pain began, but the swelling slowly resolved. The symptoms affect his daily routine, especially outdoor activities, which he has not done since the injury. He has taken over-the-counter acetaminophen with inconsistent relief. On examination, his gait is grossly normal. There is full, pain-free range of motion of the knee with no erythema, warmth, or swelling. No ligamentous laxity is found with varus or valgus stress, or with anterior or posterior traction on the lower leg. With the knee held in internal and external rotation, flexion and extension at the knee elicits moderate pain and crepitus. X-ray of the knee is normal. Which of the following is the best next step in management of this patient?

A. Arthrocentesis
B. Intraarticular glucocorticoid injection
C. Joint rest and naproxen only
D. MRI of the knee
E. Radionuclide bone scan

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A 22-year-old man comes to the office due to intermittent right knee pain that has been increasing for the past 8 weeks. The pain began after the patient participated in a recreational soccer tournament, but he does not recall any significant injuries. He has intermittent, moderate pain associated with a sensation of "catching" in the knee while walking. At times he is unable to completely extend the knee. The patient also had swelling at the joint several days after the pain began, but the swelling slowly resolved. The symptoms affect his daily routine, especially outdoor activities, which he has not done since the injury. He has taken over-the-counter acetaminophen with inconsistent relief. On examination, his gait is grossly normal. There is full, pain-free range of motion of the knee with no erythema, warmth, or swelling. No ligamentous laxity is found with varus or valgus stress, or with anterior or posterior traction on the lower leg. With the knee held in internal and external rotation, flexion and extension at the knee elicits moderate pain and crepitus. X-ray of the knee is normal. Which of the following is the best next step in management of this patient?

A. Arthrocentesis (3%)
B. Intraarticular glucocorticoid injection (3%)
C. Joint rest and naproxen only (20%)
✓ D. MRI of the knee (72%)
E. Radionuclide bone scan (0%)

Omitted
Correct answer
D

72%
Answered correctly

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Time Spent

04/06/2020
Last Updated

Explanation

Explanation

| Meniscal tears | |
|---|---|
| **Etiology** | • **Younger patients**: rotational force on planted foot<br>• **Older patients**: degeneration of meniscal cartilage |
| **Symptoms** | • Acute "popping" sensation<br>• Catching, locking, reduced range of motion<br>• Slow-onset joint effusion |
| **Examination** | • Joint line tenderness<br>• Pain or catching in **provocative tests** (Thessaly, McMurray) |
| **Diagnosis** | • **MRI**<br>• Arthroscopy |
| **Management** | • Mild symptoms, older patients: rest, activity modification<br>• Persistent symptoms, impaired activity: **surgery** |

This patient has intermittent knee pain associated with catching of the joint and limitation in range of motion. This suggests a **tear of the meniscus**, which is commonly caused by a twisting injury while the foot is in a fixed position. Patients may also have an associated effusion and a sensation of instability. Examination findings can include medial joint line tenderness and palpable locking or catching when the joint is rotated or **extended while under load** (eg, Thessaly test, McMurray test [as in this patient]). However, although these tests have high specificity for meniscal injury, sensitivity is variable, and patients may have normal findings at the time of examination.

Patients with short-term symptoms and minimal limitations in activity, or older patients with chronic tears due to degeneration of the cartilage, can be managed conservatively with rest and nonsteroidal anti-inflammatory drugs **(Choice C)**. However, young patients who have mechanical limitations or recurrent effusions lasting >3-4 weeks should be considered for confirmatory **MRI**, which can clearly visualize the soft tissues of the knee. If a significant tear is found, surgical consultation is recommended.

- Persistent symptoms, impaired activity: **surgery**

This patient has intermittent knee pain associated with catching of the joint and limitation in range of motion. This suggests a **tear of the meniscus**, which is commonly caused by a twisting injury while the foot is in a fixed position. Patients may also have an associated effusion and a sensation of instability. Examination findings can include medial joint line tenderness and palpable locking or catching when the joint is rotated or **extended while under load** (eg, Thessaly test, McMurray test [as in this patient]). However, although these tests have high specificity for meniscal injury, sensitivity is variable, and patients may have normal findings at the time of examination.

Patients with short-term symptoms and minimal limitations in activity, or older patients with chronic tears due to degeneration of the cartilage, can be managed conservatively with rest and nonsteroidal anti-inflammatory drugs **(Choice C)**. However, young patients who have mechanical limitations or recurrent effusions lasting >3-4 weeks should be considered for confirmatory **MRI**, which can clearly visualize the soft tissues of the knee. If a significant tear is found, surgical consultation is recommended.

**(Choice A)** Arthrocentesis is recommended to evaluate unexplained joint effusions. This patient's effusion has resolved, and arthrocentesis is unlikely to be useful.

**(Choice B)** Intraarticular glucocorticoid injections are recommended only in patients with degenerative meniscal injury due to underlying osteoarthritis.

**(Choice E)** Radionuclide bone scans are used to evaluate malignant, infectious, or inflammatory bone diseases. These scans can also identify occult fractures, but MRI is superior for imaging the soft tissues of the knee and would identify an occult fracture as well.

**Educational objective:**
Acute knee pain associated with catching or reduced range of motion suggests a meniscal tear. Persistent symptoms in patients with suspected meniscal injury should be evaluated by MRI, and surgical consultation is advised for significant tears.

| Surgery | Rheumatology/Orthopedics & Sports | Knee trauma |
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- Persistent symptoms, impaired activity: **surgery**

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Thessaly test



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- Persistent symptoms, impaired activity: **surgery**

**Exhibit Display**

## McMurray test



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A 22-year-old man comes to the urgent care clinic after being hit in the face with a basketball. He had bleeding from both sides of his nose for about 10 minutes that stopped with pressure. He is currently unable to breathe through his nose. Medical history is significant for allergic rhinitis treated with oral antihistamines. Temperature is 37 C (98.6 F), blood pressure is 110/70 mm Hg, pulse is 70/min, and respiratory rate is 14/min. Oxygen saturation is 99% on room air. On examination, there is bruising across the nose and under the eyes. Anterior rhinoscopy reveals no bleeding. There is soft, fluctuant swelling of the septum bilaterally. There is no blood in the oropharynx. Which of the following is the best next step in management of this patient?

A. Apply ice packs to the nose and recommend NSAIDs
B. Embolize the sphenopalatine artery
C. Incise and drain the nasal septum
D. Insert anterior nasal packing
E. Order a complete blood count and coagulation studies

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A 22-year-old man comes to the urgent care clinic after being hit in the face with a basketball. He had bleeding from both sides of his nose for about 10 minutes that stopped with pressure. He is currently unable to breathe through his nose. Medical history is significant for allergic rhinitis treated with oral antihistamines. Temperature is 37 C (98.6 F), blood pressure is 110/70 mm Hg, pulse is 70/min, and respiratory rate is 14/min. Oxygen saturation is 99% on room air. On examination, there is bruising across the nose and under the eyes. Anterior rhinoscopy reveals no bleeding. There is soft, fluctuant swelling of the septum bilaterally. There is no blood in the oropharynx. Which of the following is the best next step in management of this patient?

A. Apply ice packs to the nose and recommend NSAIDs (43%)
B. Embolize the sphenopalatine artery (6%)
✓ C. Incise and drain the nasal septum (34%)
D. Insert anterior nasal packing (9%)
E. Order a complete blood count and coagulation studies (6%)

Omitted
Correct answer
C

34%
Answered correctly

02 secs
Time Spent

05/03/2020
Last Updated

Explanation

This patient who sustained **nasal trauma** and now has nasal obstruction and fluctuant swelling of the nasal septum has a **septal hematoma**, which is an accumulation of blood between the perichondrium and the septal cartilage.

Although the incidence is rare, the complications of an untreated septal hematoma are significant. Infection can develop rapidly (2-3 days) and

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This patient who sustained **nasal trauma** and now has nasal obstruction and fluctuant swelling of the nasal septum has a **septal hematoma**, which is an accumulation of blood between the perichondrium and the septal cartilage.

Although the incidence is rare, the complications of an untreated septal hematoma are significant. Infection can develop rapidly (2-3 days) and lead to a **septal abscess**. In addition, because the septal cartilage has no direct blood supply and receives all nutrients via diffusion from the perichondrium, a septal hematoma can cause **avascular necrosis** of the septal cartilage. Destruction of the nasal septal cartilage can result in septal perforations, external nasal deformities (eg, saddle nose), or internal nasal valve collapse (ie, nasal obstruction).

Therefore, all patients who sustain nasal trauma undergo examination of the nasal septum. Palpation can differentiate between a deviated nasal septum (firm) and a septal hematoma (soft, fluctuant). Patients with a septal hematoma require **prompt incision and drainage**. After incision and drainage, anterior nasal packing should be placed to compress the perichondrium to the nasal septum; ice packs and NSAIDs can reduce edema due to inflammation **(Choices A and D)**. Patients are treated with antibiotics and require otolaryngology evaluation after a few days for packing removal and assessment.

**(Choice B)** Embolization of the sphenopalatine artery is one method to control posterior epistaxis. This patient does not currently have epistaxis because blood has already accumulated in the nasal septum.

**(Choice E)** A complete blood count is ordered in cases of severe epistaxis that may require transfusion, but it is not needed in this patient who has had no further bleeding. Coagulation studies are ordered in patients who are anticoagulated or have recurrent, spontaneous epistaxis. This patient is healthy and has an obvious cause of epistaxis (trauma).

**Educational objective:**
A septal hematoma presents after nasal trauma as fluctuant swelling of the nasal septum. It should be recognized and promptly drained to avoid complications of infection, septal perforation, and nasal deformities.

**References**


- Traumatic injuries of the ear, nose and throat.
- Critical ENT skills and procedures in the emergency department.
- Videos in clinical medicine. Treatment of hematoma of the nasal septum

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Item 22 of 40
Question Id: 2603

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A 67-year-old man comes to the physician for the evaluation of a sore on his right cheek. The sore bleeds, oozes, and has remained open for 3 weeks. The patient also thinks that it has been growing slowly over the past year. He recently retired from his job as a mail carrier and spent his entire career delivering mail outdoors. He has a 30-pack-year smoking history, but his medical history is otherwise unremarkable. Physical examination shows a punched out 1.5 cm ulcer on his cheek. Full thickness biopsy reveals proliferating malignant cells arising from the epidermis and extending into the dermis in lobules or strands consistent with basal cell carcinoma.



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Item 22 of 40
Question Id: 2603

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Which of the following is the best next step in management of this patient?

A. Mohs surgery
B. Radiation therapy
C. Systemic chemotherapy
D. Topical chemotherapy with 5-fluorouracil
E. Wide excision with 4 mm margins

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Item 22 of 40
Question Id: 2603

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Which of the following is the best next step in management of this patient?

- ✓ A. Mohs surgery (76%)
- B. Radiation therapy (0%)
- C. Systemic chemotherapy (0%)
- D. Topical chemotherapy with 5-fluorouracil (3%)
- E. Wide excision with 4 mm margins (18%)

Omitted
Correct answer

76%
Answered correctly

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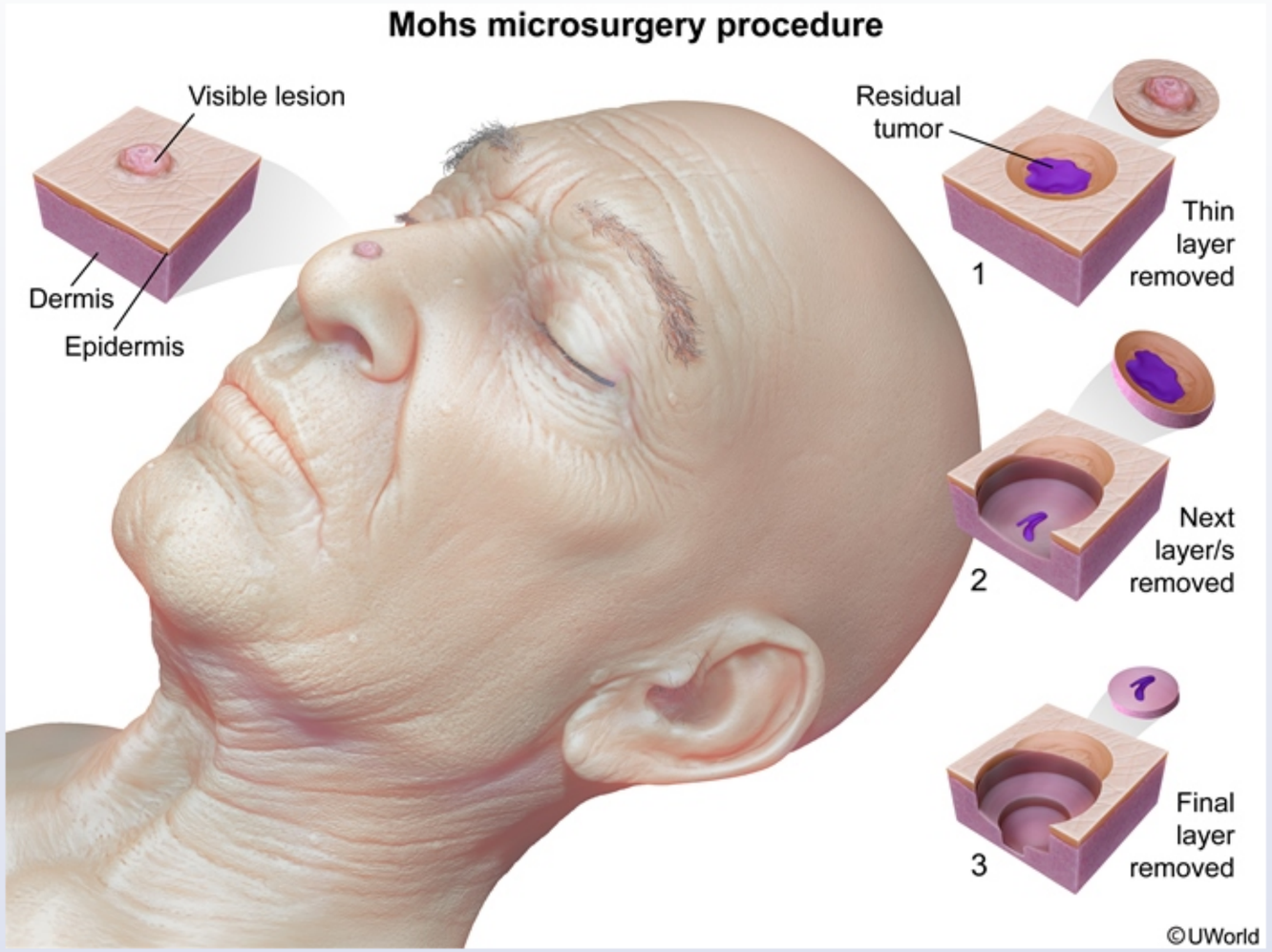
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## Mohs microsurgery procedure




Basal cell carcinoma (BCC) is the most common form of skin cancer in the United States, accounting for approximately 75% of all skin cancers.
Possible features of BCC include:

- Persistent open sore that bleeds, oozes, or crusts

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Basal cell carcinoma (BCC) is the most common form of skin cancer in the United States, accounting for approximately 75% of all skin cancers. Possible features of BCC include:

- Persistent open sore that bleeds, oozes, or crusts
- Reddish patch or irritated area (superficial BCC)
- Pearly or translucent nodule with pink, red, or white color (nodular BCC)
- Elevated or rolled border with central ulceration
- Pale scar-like area with poorly defined borders

The cancer usually remains local and only rarely spreads to distant parts of the body, but it may continue to grow and invade nearby tissues and structures, including the nerves, bones, and brain.

The treatment of BCC varies, depending on the size, depth, and location of the cancer. Low-risk lesions on the trunk or extremities can be managed with electrodessication and curettage (ED&C). However, ED&C is not recommended for higher-risk lesions or for BCC on the face, where the resulting scarring and hypopigmentation are undesirable. Surgical excision is advised for this patient's large facial lesion. Nodular BCC on the trunk or extremities may be easily managed with standard surgical excision, typically with 3-5 mm margins **(Choice E)**. However, **Mohs micrographic surgery** is employed more often for the face. Mohs surgery is characterized by sequential removal of thin skin layers with microscopic inspection to confirm that the margins have been cleared of malignant tissue. This technique currently has the highest cure rate for BCC and provides the least disruption to surrounding tissues, making it ideal for delicate or cosmetically sensitive areas (eg, perioral region, nose, lips, ears).

**(Choice B)** Radiation therapy is occasionally used to treat BCC in patients who are unable to undergo surgical excision. It is otherwise not considered first-line management.

**(Choice C)** Systemic chemotherapy is used in patients with widely metastatic BCC. However, this occurrence is rare and few patients with BCC require systemic treatment.

**(Choice D)** Low-risk superficial BCC may be managed with topical therapy using either 5-fluorouracil or imiquimod. These agents may also be used in field therapy for patients with multiple actinic keratoses. However, they are less effective in nodular BCC and are not recommended.

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**Educational objective:**
Nodular basal cell carcinoma has low metastatic potential but should be removed with either electrodessication and curettage or surgical excision. Mohs micrographic surgery, in which thin layers are removed and inspected microscopically to ensure clear margins, is used for high-risk lesions in delicate or cosmetically sensitive areas.

**References**

- Mohs' micrographic surgery for treatment of basal cell carcinoma of the face--results of a retrospective study and review of the literature.

| Surgery | Dermatology | Nonmelanoma skin cancer |
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| Subject | System | Topic |

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A 17-year-old boy is brought to the emergency department following a motor vehicle accident. He is found to have an extensive cerebral hemorrhage leading to deep coma, as well as fractures of the C4 vertebra, pelvis, and right femur. Following admission to the hospital, he is intubated and central lines are placed. The patient develops acute renal failure due to rhabdomyolysis, which improves rapidly with treatment. He is extubated after regaining consciousness. He also undergoes percutaneous endoscopic gastrostomy tube placement due to persistent problems with swallowing. The patient is unable to ambulate due to quadriparesis resulting from cervical cord injury. Four weeks after his initial injury, he develops nausea and polyuria. His laboratory results are as follows:

| | |
|---|---|
| Calcium | 12.1 mg/dL |
| Albumin | 3.0 g/dL |
| Creatinine | 1.4 mg/dL |
| Phosphorus | 3.1 mg/dL |
| Glucose | 108 mg/dL |
| Parathyroid hormone | 9 pg/mL |
| Parathyroid hormone-related protein | undetectable |
| 1,25-dihydroxyvitamin D | 19 pg/mL (normal: 20-60 pg/mL) |

Which of the following is the most likely cause of this patient's hypercalcemia?

A. Hypoalbuminemia
B. Immobilization
C. Malignancy

| | |
|---|---|
| Albumin | 3.6 g/dL |
| Creatinine | 1.4 mg/dL |
| Phosphorus | 3.1 mg/dL |
| Glucose | 108 mg/dL |
| Parathyroid hormone | 9 pg/mL |
| Parathyroid hormone-related protein | undetectable |
| 1,25-dihydroxyvitamin D | 19 pg/mL (normal: 20-60 pg/mL) |

Which of the following is the most likely cause of this patient's hypercalcemia?

A. Hypoalbuminemia
B. Immobilization
C. Malignancy
D. Primary hyperparathyroidism
E. Rhabdomyolysis
F. Vitamin D-induced hypercalcemia

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|---|---|
| Albumin | 3.0 g/dL |
| Creatinine | 1.4 mg/dL |
| Phosphorus | 3.1 mg/dL |
| Glucose | 108 mg/dL |
| Parathyroid hormone | 9 pg/mL |
| Parathyroid hormone-related protein | undetectable |
| 1,25-dihydroxyvitamin D | 19 pg/mL (normal: 20-60 pg/mL) |

Which of the following is the most likely cause of this patient's hypercalcemia?

- A. Hypoalbuminemia (17%)
- ✓ B. Immobilization (60%)
- C. Malignancy (0%)
- D. Primary hyperparathyroidism (2%)
- E. Rhabdomyolysis (17%)
- F. Vitamin D-induced hypercalcemia (1%)

Omitted
Correct answer

60%
Answered correctly

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- D. Primary hyperparathyroidism (2%)
- E. Rhabdomyolysis (17%)
- F. Vitamin D-induced hypercalcemia (1%)

Omitted
Correct answer

60%
Answered correctly

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## Diagnosis of hypercalcemia

**Confirm hypercalcemia**
- Repeat testing
- Correct for albumin concentration or measure ionized calcium

↓

Measure **PTH** level

↓

High-normal or elevated PTH (**PTH-dependent**)

**Causes**
- **Primary** (or tertiary) **hyperparathyroidism**
- Familial hypocalciuric hypercalcemia
- Lithium

Suppressed PTH (**PTH-independent**)

↓

Measure PTHrP, 25-hydroxyvitamin D, 1,25-dihydroxyvitamin D

**Causes**
- **Malignancy**
- Vitamin D toxicity
- Granulomatous diseases
- Drug-induced (eg, thiazides)
- Milk-alkali syndrome
- Thyrotoxicosis
- Vitamin A toxicity
- Immobilization

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This patient with quadriparesis has a corrected calcium level of 12.9 mg/dL:

$$\text{corrected calcium} = \text{measured calcium} + 0.8 \times (4 - \text{albumin})$$

$$12.1 + 0.8 \times (4 - 3) = 12.1 + 0.8 = 12.9 \text{ mg/dL}$$

with symptomatic **hypercalcemia** (nausea, polyuria) and **suppressed parathyroid hormone (PTH)** level likely due to **immobilization**. Hypercalcemia of immobilization is likely due to increased **osteoclastic bone resorption**. The risk is increased in patients with a pre-existing high rate of bone turnover (eg, younger individuals, Paget disease). The onset of hypercalcemia is usually around 4 weeks after immobilization, although patients with chronic renal insufficiency may develop hypercalcemia in as little as 3 days.

The onset of hypercalcemia due to immobilization is often insidious, and the presenting symptoms can be nonspecific. **Bisphosphonates** inhibit osteoclastic bone resorption and are effective in treating hypercalcemia of immobilization and reducing the associated bone loss.

**(Choice A)** Approximately 40% of circulating calcium is bound to proteins (predominantly albumin). Hypoalbuminemia will lower the total serum calcium level; therefore, measured calcium levels are corrected upward based on the extent of hypoalbuminemia. Conversely, hyperalbuminemia is associated with an increase in total calcium. In either case, the ionized fraction is unaffected, and patients will not have calcium-related symptoms directly related to the change in albumin levels.

**(Choices C and F)** Hypercalcemia in malignancy can be due to osteolytic metastasis, secretion of PTH-related protein (PTHrP), or increased formation of 1,25-dihydroxyvitamin D. This patient's PTHrP and 1,25-dihydroxyvitamin D levels are low.

**(Choice D)** This patient's PTH level is suppressed, which makes primary hyperparathyroidism unlikely.

**(Choice E)** Acute rhabdomyolysis causes hypocalcemia due to precipitation of calcium and phosphorus in damaged muscles. Hypercalcemia can occur due to remobilization of calcium during the diuretic/recovery phase of the illness, often with concurrent hyperphosphatemia. However, this patient recovered from rhabdomyolysis several weeks before the onset of hypercalcemia.

**Educational objective:**
Hypercalcemia can occur in prolonged immobilization due to increased osteoclastic activity, especially in individuals with a high baseline rate of

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**Educational objective:**
Hypercalcemia can occur in prolonged immobilization due to increased osteoclastic activity, especially in individuals with a high baseline rate of bone turnover. Bisphosphonates can reduce this hypercalcemia and prevent bone loss.

**References**

- Immobilization induced hypercalcemia.

| Surgery | Endocrine, Diabetes & Metabolism | Hypercalcemia |
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Item 24 of 40
Question Id: 4498

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A 24-year-old man is brought to the emergency department after the all-terrain vehicle he was driving rolled over and landed on him. Blood pressure is 82/50 mm Hg, pulse is 128/min, and respirations are 24/min. The patient is alert but anxious and diaphoretic. He has a scalp laceration that has stopped bleeding. The pupils are equal and reactive to light. The trachea is midline. Bruising is present over the chest wall and abdomen. Breath sounds are present bilaterally. Heart sounds are normal. The abdomen is distended and has diffuse tenderness. Portable chest x-ray shows fracture of multiple ribs, including the right eighth and ninth ribs and the left fourth rib, with no pneumothorax. Focused Assessment with Sonography for Trauma shows no pericardial effusion but a large amount of intraperitoneal free fluid. Pelvic x-ray is negative for fractures. The patient remains hypotensive after the rapid infusion of 2 L of intravenous crystalloid and is taken for emergency exploratory laparotomy. Which of the following injuries is the most likely cause of this patient's persistent hypotension?

A. Abdominal aortic injury
B. Duodenal hematoma
C. Liver laceration
D. Pancreatic transection
E. Splenic hematoma
F. Urinary bladder rupture

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Item 24 of 40
Question Id: 4498

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- A. Abdominal aortic injury (10%)
- B. Duodenal hematoma (1%)
- ✓ C. Liver laceration (70%)
- D. Pancreatic transection (0%)
- E. Splenic hematoma (15%)
- F. Urinary bladder rupture (0%)

Omitted
Correct answer
C

70%
Answered correctly

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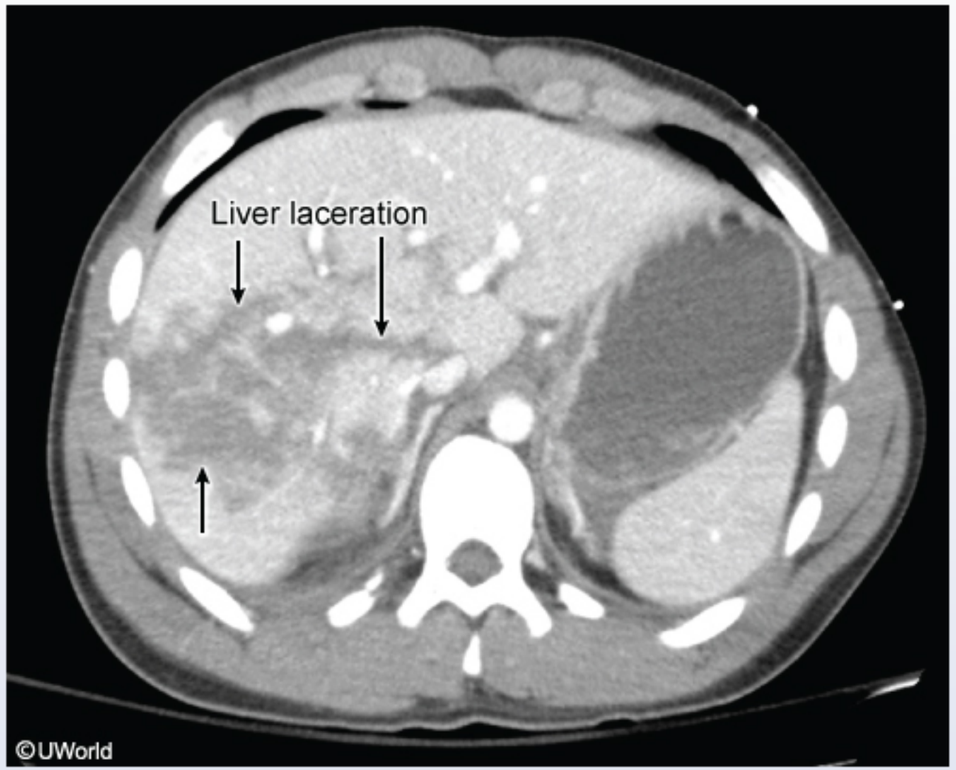
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Explanation

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This patient with blunt abdominal trauma (BAT) has signs of **hypovolemic shock** (eg, severe hypotension, tachycardia) due to **intraabdominal hemorrhage** (eg, abdominal distension, intraperitoneal free fluid). Given the patient's concomitant fractures of the right lower ribs, which signal likely **trauma of the right upper quadrant** (RUQ), this presentation is most consistent with **liver laceration**.

The liver is one of the most frequently injured organs in BAT, with the spectrum of injury ranging from subcapsular hematoma to parenchymal disruption (ie, laceration) causing bleeding into the peritoneum. Trauma to the RUQ, right lower rib cage (eg, right eighth and ninth ribs), or right flank should raise suspicion for hepatic injury.

Triage of patients with BAT without frank peritonitis (eg, abdominal rigidity, rebound tenderness) includes bedside Focused Assessment with

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Triage of patients with BAT without frank peritonitis (eg, abdominal rigidity, rebound tenderness) includes bedside Focused Assessment with Sonography for Trauma (FAST) to assess for intraperitoneal free fluid, a marker of intraabdominal organ injury. As in this case, hemodynamically unstable (eg, systolic blood pressure <90 mm Hg) patients with a positive FAST should undergo exploratory laparotomy.

**(Choice A)** Abdominal aortic injuries due to BAT are rare (<1%). Many patients with traumatic aortic injury die from exsanguination before reaching the hospital. Those who survive (because bleeding has been contained within the retroperitoneum) typically would not have a large amount of intraperitoneal free fluid on FAST.

**(Choices B and E)** BAT can cause duodenal and splenic hematoma from intraluminal and subcapsular bleeding, respectively. However, because the bleeding is contained within the lumen or capsule, hematoma formation often tamponades further bleeding, making such a severe degree of shock (eg, unresponsive to 2 L of volume resuscitation) less common. In addition, neither type of hematoma would cause intraperitoneal free fluid.

**(Choice D)** Pancreatic injuries can occur with BAT, especially when the pancreas is crushed against the vertebral column by an anterior blow to the central abdomen. However, because of its retroperitoneal location, even severe injuries to the pancreas (eg, transection with pancreatic fluid leakage) typically do not cause intraperitoneal free fluid.

**(Choice F)** Urinary bladder rupture can occur from BAT, especially with pelvic fractures. Patients often have evidence of intraperitoneal free fluid (ie, urine) on FAST, but significant hemodynamic instability is uncommon. In addition, gross hematuria is typically present.

**Educational objective:**
The liver is one of the most commonly injured organs in blunt abdominal trauma. Patients with severe liver laceration causing intraabdominal hemorrhage may have shock and intraperitoneal free fluid on Focused Assessment with Sonography for Trauma.

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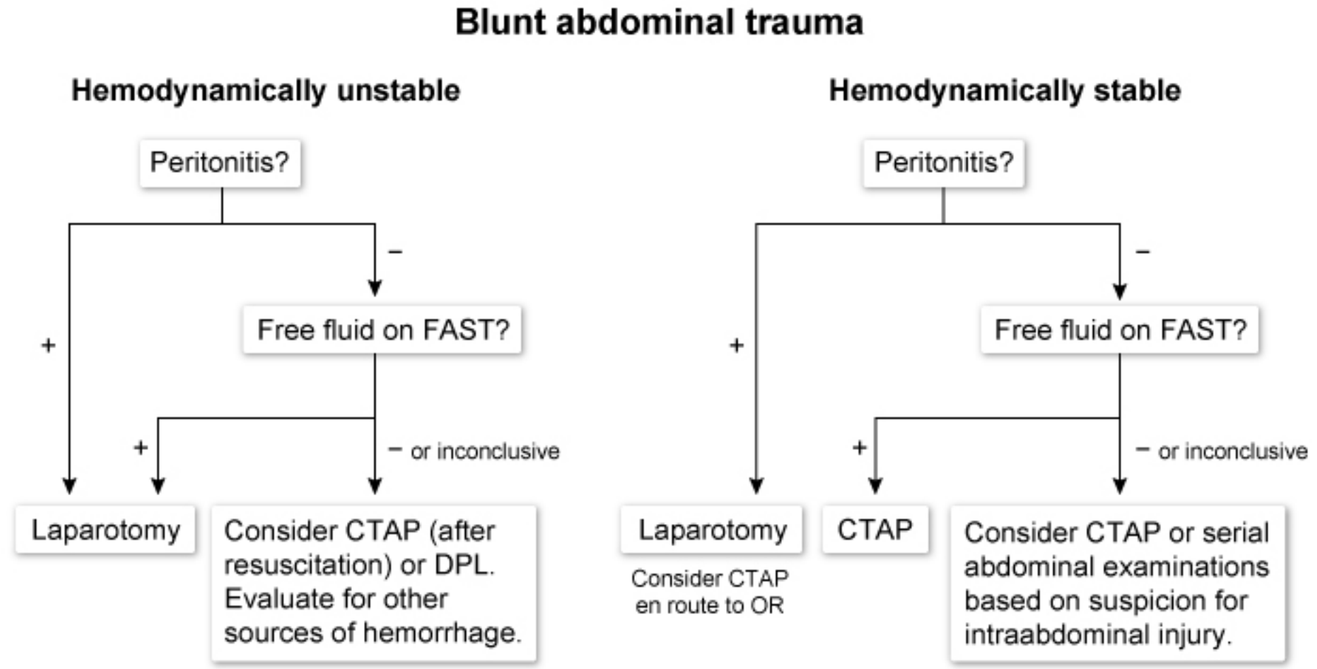
**Educational objective:**
The liver is one of the most commonly injured organs in blunt abdominal trauma. Patients with severe liver laceration causing intraabdominal hemorrhage may have shock and intraperitoneal free fluid on Focused Assessment with Sonography for Trauma.

**References**


- Management of blunt liver injury: what is new?
- Western Trauma Association/critical decisions in trauma: operative management of adult blunt hepatic trauma.


| Surgery | Gastrointestinal & Nutrition | Blunt abdominal trauma |
|---|---|---|
| Subject | System | Topic |

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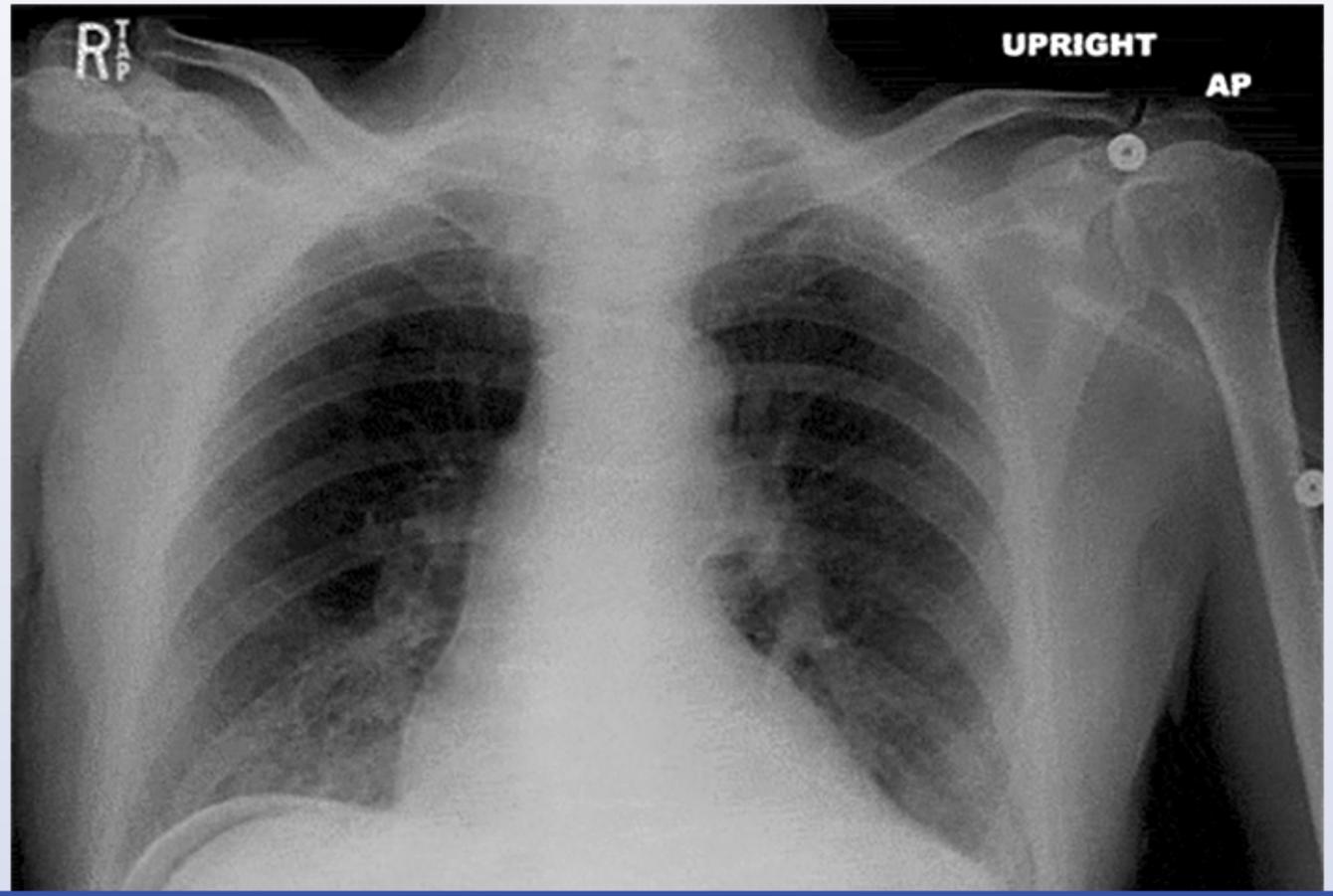



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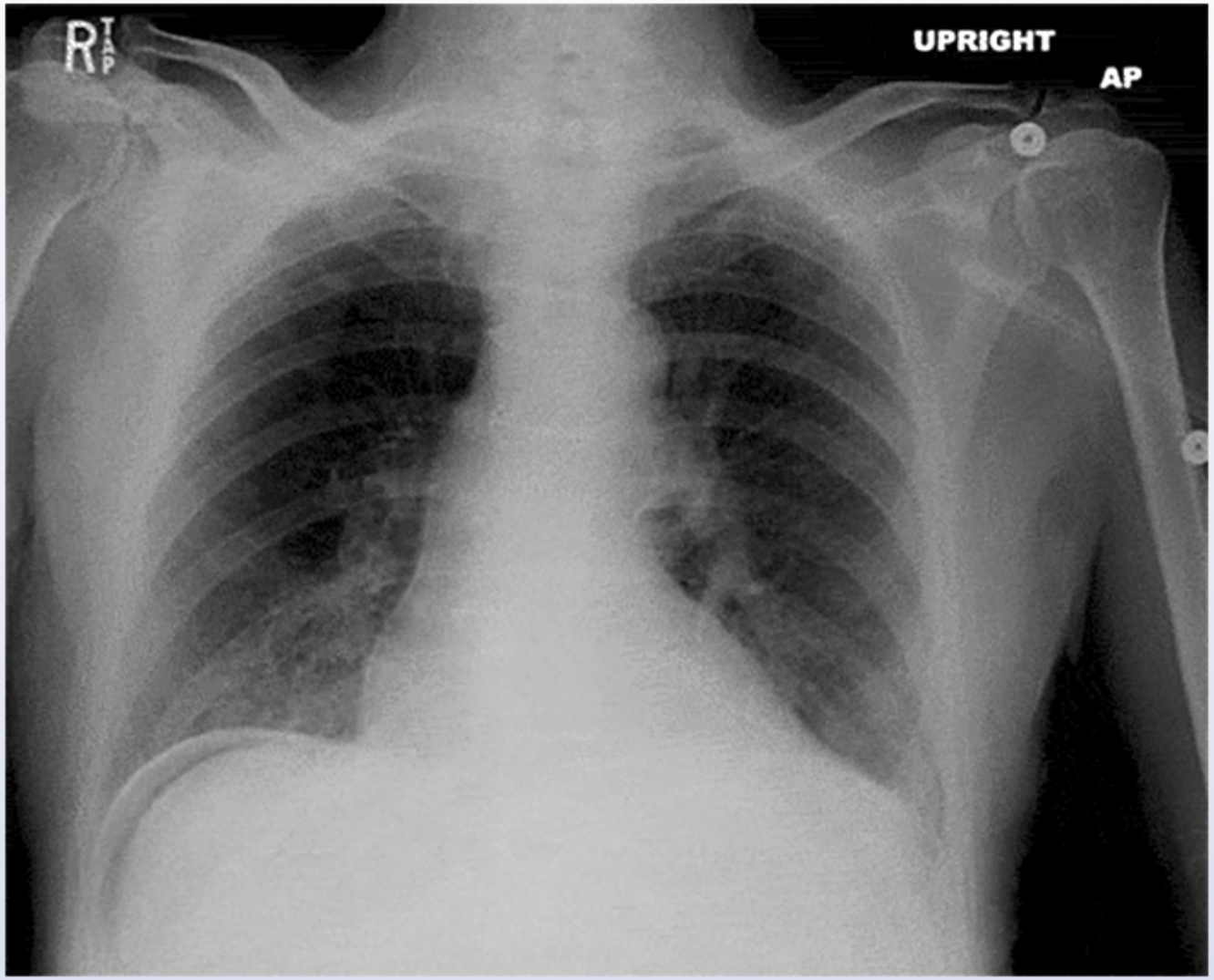
A 62-year-old man comes to the emergency department with severe epigastric pain lasting an hour. He has had postprandial epigastric discomfort for the past several days, but now the pain is severe and constant. The patient also feels nauseated and has vomited once since the pain began. Medical history is significant for hypertension, type 2 diabetes mellitus, hyperlipidemia, and coronary artery disease. He underwent coronary artery stenting 5 months ago. Temperature is 37.6 C (99.7 F), blood pressure is 116/70 mm Hg, pulse is 108/min, and respirations are 24/min. ECG shows Q waves in the inferior leads. Chest x-ray is shown in the image below:



Settings

Item 25 of 40
Question Id: 4462
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ECG shows Q waves in the inferior leads. Chest x-ray is shown in the image below:




Which of the following is the best next step in management of this patient?

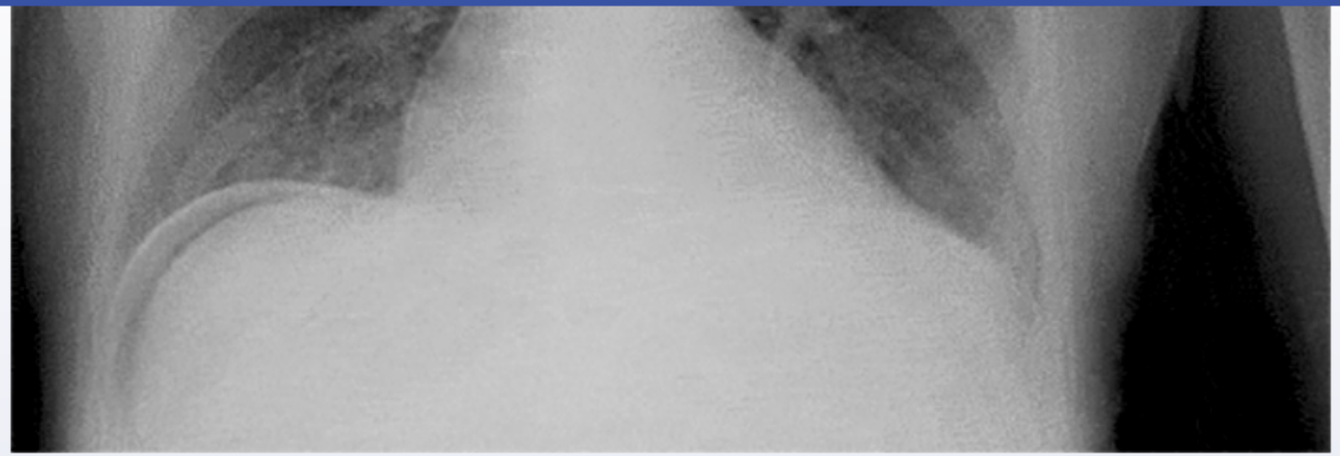
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Item 25 of 40
Question Id: 4462

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Which of the following is the best next step in management of this patient?

A. Cardiac catheterization
B. CT scan of the abdomen with oral contrast
C. Emergent surgical exploration
D. Gallbladder ultrasonography
E. Mesenteric angiography
F. Nasogastric suction and serial abdominal examinations
G. Upper gastrointestinal endoscopy

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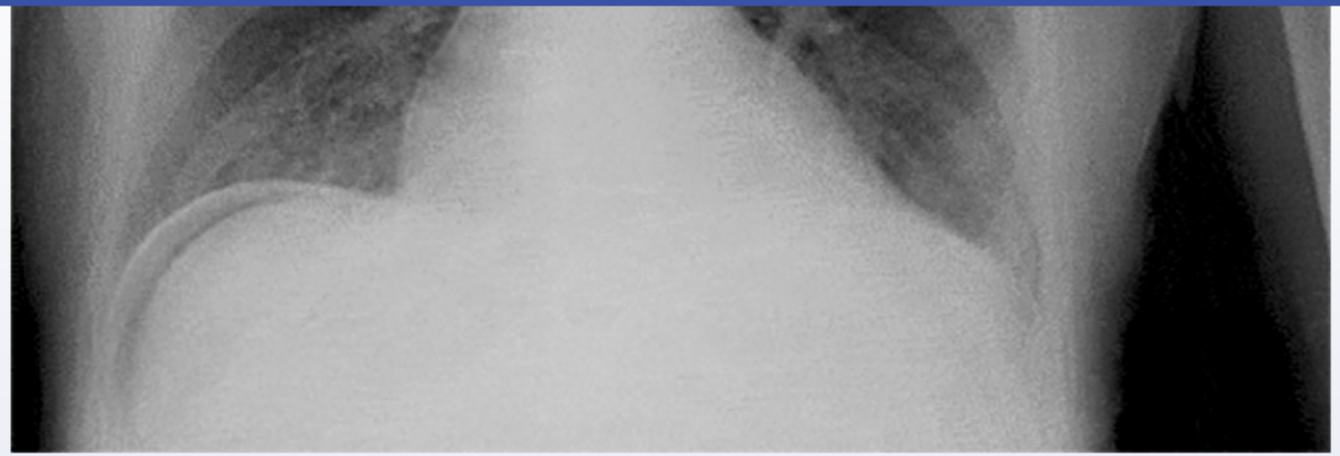
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Item 25 of 40
Question Id: 4462

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Which of the following is the best next step in management of this patient?

- A. Cardiac catheterization (2%)
- B. CT scan of the abdomen with oral contrast (5%)
- ✓ C. Emergent surgical exploration (78%)
- D. Gallbladder ultrasonography (1%)
- E. Mesenteric angiography (4%)
- F. Nasogastric suction and serial abdominal examinations (1%)
- G. Upper gastrointestinal endoscopy (4%)

Omitted
Correct answer

78%
Answered correctly

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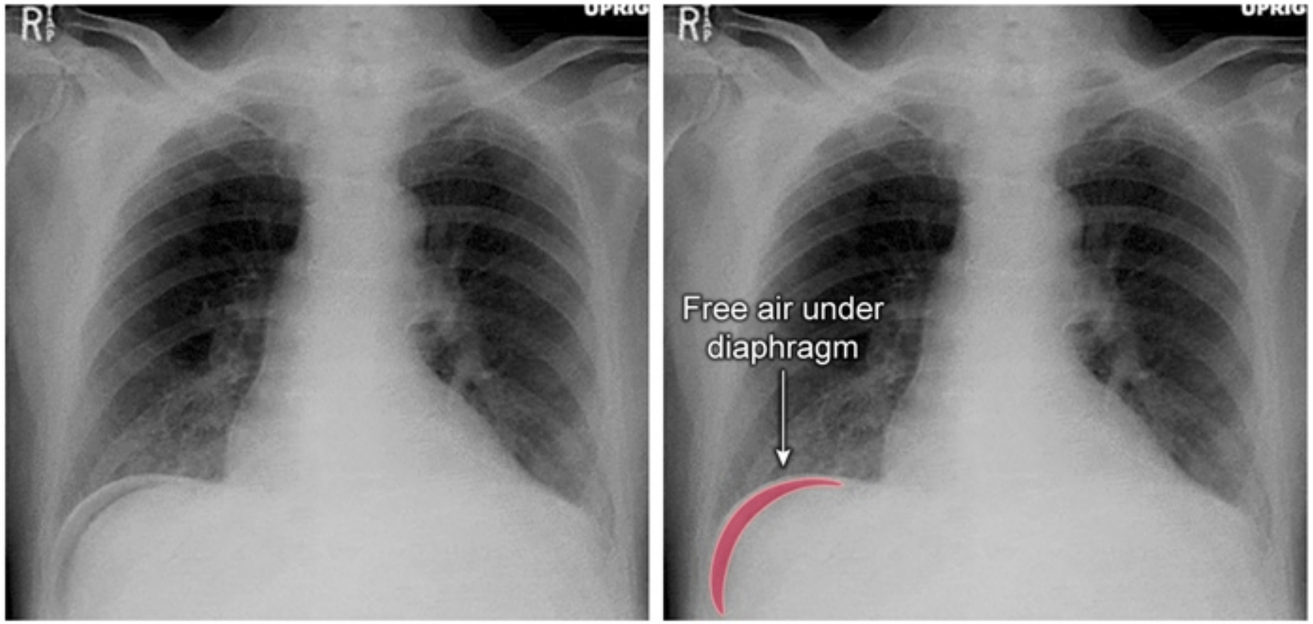
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## Subdiaphragmatic free air on upright chest x-ray




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This patient's history of postprandial epigastric pain followed by acute-onset, severe pain is concerning for **perforated peptic ulcer**. Full-thickness erosion of a peptic ulcer through the stomach or duodenal wall quickly releases both air and caustic (ie, pH ~1-2) gastric secretions/contents into the peritoneal cavity, resulting in pain and a systemic inflammatory response (eg, tachycardia, tachypnea). Upright chest x-ray revealing **intraperitoneal free air** (pneumoperitoneum) confirms the diagnosis of perforation.

Immediately following diagnosis, the following should be initiated:

- Surgical consultation
- Intravenous proton pump inhibitors and broad-spectrum antibiotics
- Fluid resuscitation and nasogastric suction

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Immediately following diagnosis, the following should be initiated:

- Surgical consultation
- Intravenous proton pump inhibitors and broad-spectrum antibiotics
- Fluid resuscitation and nasogastric suction

Patients require **emergent surgical exploration** (laparotomy or laparoscopy) because delay to surgery has been associated with increased mortality (up to 30%). A minority of patients (eg, minimal/localized symptoms, stable vital signs) may receive a trial of medical management with surgical backup available.

**(Choice A)** Acute myocardial infarction (MI) can present with epigastric pain and nausea/vomiting. However, this patient's Q waves on ECG indicate an old, rather than an ongoing, MI. In addition, MI is unlikely to cause pneumoperitoneum.

**(Choice B)** If plain x-rays are negative and perforation is suspected, CT scan can help detect smaller amounts of free air or fluid. However, upright chest x-ray already confirms perforation in this patient. In addition, a CT scan with oral contrast is rarely used for life-threatening conditions (eg, perforated peptic ulcer) because oral contrast use delays disposition by 45-60 minutes.

**(Choice D)** Cholecystitis can present with epigastric pain and nausea/vomiting. However, pain typically involves the right upper quadrant, and pneumoperitoneum is not seen, even with gallbladder perforation (ie, the gallbladder does not contain significant air).

**(Choice E)** Although acute mesenteric ischemia often occurs in patients with cardiovascular risk factors (eg, hyperlipidemia, coronary artery disease), pneumoperitoneum is not expected except in severe cases with bowel necrosis, in which case surgical intervention is the correct next step.

**(Choice F)** In this patient with a perforated peptic ulcer, nasogastric tube placement would decrease the amount of gastric contents available to leak through the perforation; however, surgical intervention is necessary because of the severe symptoms and systemic inflammatory response.

- Fluid resuscitation and nasogastric suction

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**(Choice E)** Although acute mesenteric ischemia often occurs in patients with cardiovascular risk factors (eg, hyperlipidemia, coronary artery disease), pneumoperitoneum is not expected except in severe cases with bowel necrosis, in which case surgical intervention is the correct next step.

**(Choice F)** In this patient with a perforated peptic ulcer, nasogastric tube placement would decrease the amount of gastric contents available to leak through the perforation; however, surgical intervention is necessary because of the severe symptoms and systemic inflammatory response.

**(Choice G)** Upper endoscopy should be performed after the perforation has healed to evaluate for cancer and/or *Helicobacter pylori* infection. Endoscopy is contraindicated in the setting of acute perforation because it can worsen the injury.

**Educational objective:**
Peptic ulcer disease can be complicated by perforation, revealed as intraperitoneal free air. Emergent surgical exploration is indicated for patients with severe symptoms and a systemic inflammatory response.

**References**

- Perforated peptic ulcer.

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A 32-year-old woman, gravida 1 para 1, is evaluated on the postpartum floor due to fluid leakage from her incision. Two days ago, the patient underwent a cesarean delivery after failed induction of labor and intraamniotic infection. She had her incision bandage removed this morning with minimal clear fluid on the bandage. The patient then walked to the nursery, where she noticed that serosanguineous fluid had stained her hospital gown. Fluid has continued to drain from her abdominal incision. Temperature is 37.2 C (99 F). BMI is 35 kg/m$^2$. The uterus is palpable below the umbilicus and has no fundal tenderness. The Pfannenstiel incision has a 4-cm defect at the right corner that is draining scant serosanguineous fluid. There is no surrounding erythema or induration. The subcutaneous tissue has no areas of necrosis or crepitus, and the rectus fascia is intact. Which of the following is the best next step in management of this patient?

A. CT scan of the abdomen and pelvis
B. Emergency surgical exploration
C. Regular dressing changes only
D. Systemic antibiotics and wound debridement
E. Topical antibiotics and abdominal binder placement

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- A. CT scan of the abdomen and pelvis (5%)
- B. Emergency surgical exploration (10%)
- ✓ C. Regular dressing changes only (50%)
- D. Systemic antibiotics and wound debridement (9%)
- E. Topical antibiotics and abdominal binder placement (23%)

Omitted
Correct answer
C

50%
Answered correctly

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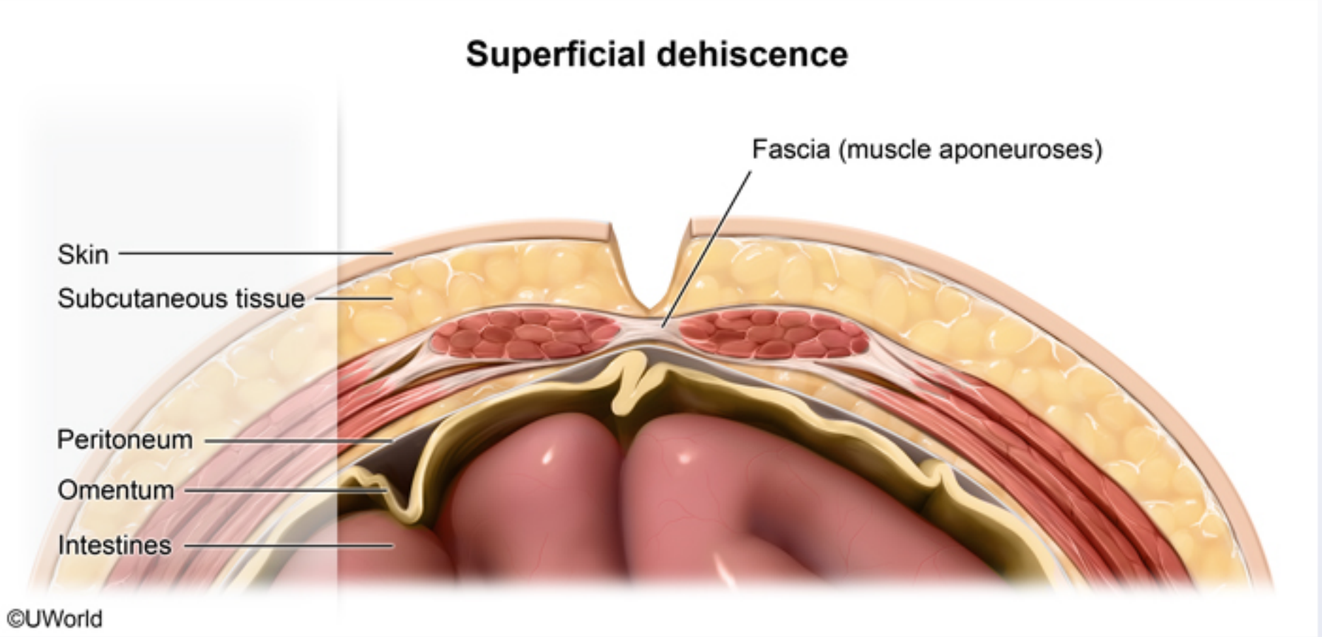
03/31/2020
Last Updated

Explanation

**Superficial dehiscence**

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## Superficial dehiscence




Abdominal surgery can result in a variety of **postoperative wound complications** (eg, infection, dehiscence). These complications are more common in obese patients (as seen in this case), those who are immunocompromised (eg, chronic corticosteroids, cancer), and those with increased intraabdominal straining (eg, excessive lifting, cough).

Postoperative abdominal wounds can be categorized based on fascial involvement:

- **Superficial wound dehiscence** is a separation of the skin and subcutaneous tissue with an **intact rectus fascia** (as seen in this patient). It typically develops within the first postoperative week and occurs secondary to an abnormal subcutaneous fluid buildup (eg, seroma), resulting in a scant serosanguineous fluid drainage.
- Deep (fascial) wound dehiscence involves the rectus fascia (ie, nonintact) and results in exposure of the intraabdominal organs to the external environment.

Patients with a superficial dehiscence and no signs of infection (eg, induration, erythema, purulent drainage) are conservatively managed with

Abdominal surgery can result in a variety of **postoperative wound complications** (eg, infection, dehiscence). These complications are more common in obese patients (as seen in this case), those who are immunocompromised (eg, chronic corticosteroids, cancer), and those with increased intraabdominal straining (eg, excessive lifting, cough).

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- Deep (fascial) wound dehiscence involves the rectus fascia (ie, nonintact) and results in exposure of the intraabdominal organs to the external environment.

Patients with a superficial dehiscence and no signs of infection (eg, induration, erythema, purulent drainage) are conservatively managed with **regular dressing changes**. These regular changes help with delayed (secondary) closure by removing excessive fluid and closing physiologic dead space, which debrides nonviable tissue and eliminates potential bacterial reservoirs. In contrast, fascial dehiscence is a surgical emergency because of the risk of bowel evisceration and strangulation **(Choice B)**.

**(Choices A and D)** CT scan of the abdomen and pelvis may be used in patients with suspected necrotizing fasciitis or abscess. These patients typically have signs of infection (eg, edema, induration, purulent drainage); those with necrotizing fasciitis may also have associated crepitus. In both cases, treatment is with systemic antibiotics and wound debridement.

**(Choice E)** Abdominal binders may be used temporarily in patients with fascial dehiscence (but no evisceration) in preparation for emergency surgery. They are not used for superficial dehiscence because they do not improve outcomes.

**Educational objective:**
Superficial wound dehiscence, separation of the epidermis and/or subcutaneous tissue with an intact fascia, is typically managed conservatively with regular dressing changes. In contrast, deep (fascial) dehiscence involves the fascia and is a surgical emergency.

**References**

- Role of subcutaneous closure in preventing wound complications after cesarean delivery with Pfannenstiel incision: a randomized clinical trial.

- Deep (fascial) wound dehiscence involves the rectus fascia (ie, nonintact) and results in exposure of the intraabdominal organs to the external environment.

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Superficial wound dehiscence, separation of the epidermis and/or subcutaneous tissue with an intact fascia, is typically managed conservatively with regular dressing changes. In contrast, deep (fascial) dehiscence involves the fascia and is a surgical emergency.

**References**


- Role of subcutaneous closure in preventing wound complications after cesarean delivery with Pfannenstiel incision: a randomized clinical trial.
- Postoperative wound dehiscence: predictors and associations.
- Impact of evidence-based interventions on wound complications after cesarean delivery.


| Surgery | Pregnancy, Childbirth & Puerperium | Wound dehiscence and evisceration |
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Settings

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Question Id: 2145
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A 76-year-old man with no past medical history has an operation for a strangulated inguinal hernia, with approximately 40 cm of small bowel resected. On the morning of his third postoperative day, he falls while getting out of bed. Immediately after the fall, the patient is responsive but confused with slurred speech. He cannot explain what happened. His blood pressure is 89/50 mm Hg, pulse is 122/min, and respirations are 24/min. Examination shows decreased bibasilar lung sounds and distended neck veins. Electrocardiogram shows new-onset right bundle branch block with nonspecific ST- and T-wave changes. Immediate resuscitation with wide-open intravenous fluids is attempted but unsuccessful. Shortly thereafter, the patient's pupils start to dilate, his pulse drops to 45/min, and he becomes unresponsive. He eventually dies despite resuscitative efforts. Which of the following is the most likely cause of this patient's death?

A. Acute ischemic stroke
B. Hypovolemia accompanied by syncope
C. Massive pulmonary thromboembolism
D. Myocardial infarction
E. Postoperative sepsis

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- A. Acute ischemic stroke (8%)
- B. Hypovolemia accompanied by syncope (3%)
- ✓ C. Massive pulmonary thromboembolism (69%)
- D. Myocardial infarction (13%)
- E. Postoperative sepsis (4%)

Omitted
Correct answer
C

69%
Answered correctly

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Time Spent

02/22/2020
Last Updated

Explanation

This patient's history and presentation are strongly suggestive of postoperative massive pulmonary embolism (PE) complicated by cardiogenic shock. Massive PE is defined as PE complicated by **hypotension** and/or acute **right heart strain**. Although dyspnea and pleuritic chest pain are common symptoms of segmental PE, syncope tends to occur only in massive PE. Jugular venous distension on physical examination and right

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Survival following massive PE is poor, with death often occurring within an hour of the onset of symptoms. If time permits, massive PE can be confirmed with CT pulmonary angiography. Although echocardiography has poor sensitivity for segmental PE, massive PE often has visible echocardiographic abnormalities that allow for rapid bedside diagnosis. In conjunction with respiratory and hemodynamic support, fibrinolysis is indicated in the treatment of massive PE. However, hemorrhagic complications are frequent, and surgery within the preceding 10 days is a relative contraindication to fibrinolytic therapy.

**(Choice A)** Confusion and slurred speech always raise concern for an acute ischemic stroke. However, new-onset jugular venous distension and RBBB are indicative of right heart strain, which is commonly seen in association with PE. Moreover, blood pressure is typically elevated with ischemic stroke. This patient was likely hypoxic from the PE, causing the slurred speech and confusion.

**(Choice B)** Hypovolemia should be considered in the setting of syncope and hypotension. However, decreased rather than increased jugular venous pressure would be expected in hypovolemia.

**(Choice D)** The risk of myocardial infarction (MI) is increased during the postoperative period, and an MI could explain this patient's hypotension and jugular venous distension. However, the absence of significant cardiovascular risk factors and no ST elevation, T-wave inversion, or Q waves on this patient's ECG make MI less likely.

**(Choice E)** Classic cardiovascular changes in the setting of sepsis include hypotension, decreased peripheral vascular resistance, increased cardiac output, and decreased pulmonary capillary wedge pressure. Fever and warm extremities might also be seen. However, jugular vein distension and RBBB typically do not occur.

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**Educational objective:**
Massive pulmonary embolism is likely in a postoperative patient with hypotension, jugular venous distension, and new-onset right bundle branch block.

**References**


- Fibrinolysis for acute pulmonary embolism
- Thrombolytic treatment (alteplase; rt-Pa) in acute massive pulmonary embolism and cardiopulmonary arrest.


Surgery Pulmonary & Critical Care Pulmonary embolism

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**Educational objective:**
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**References**


- Fibrinolysis for acute pulmonary embolism
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Surgery Pulmonary & Critical Care Pulmonary embolism

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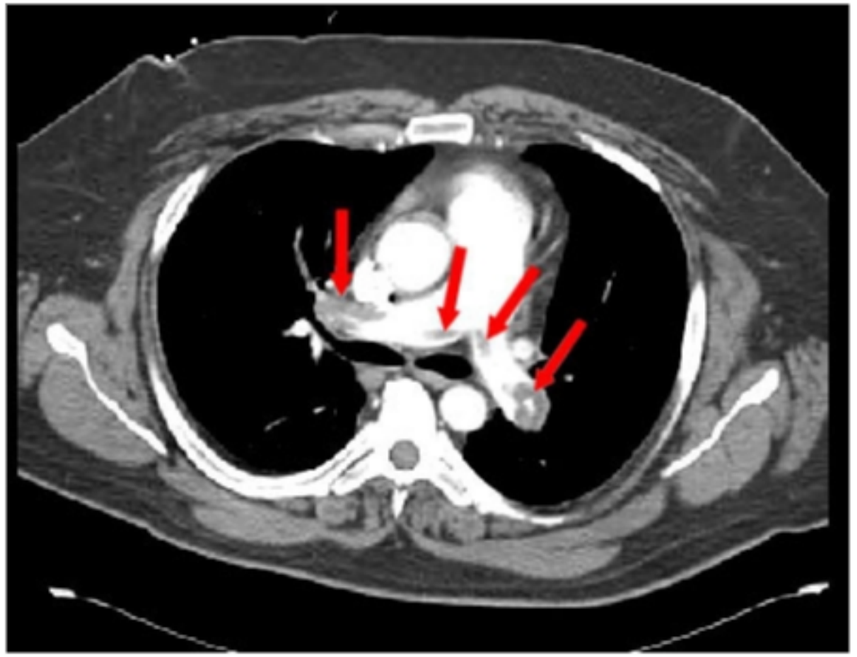
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Item 27 of 40
Question Id: 2145

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Survival following massive PE is poor, with death often occurring within an hour of the onset of symptoms. If time permits, massive PE can be

**Exhibit Display**



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Surgery Pulmonary & Critical Care Pulmonary embolism

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Item 28 of 40
Question Id: 4312

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A 32-year-old woman comes to the office due to a "mole." The lesion is located on her back, and she believes it has been present for years but does not recall when it first appeared. The patient thinks it might be enlarging and is concerned due to a family history of skin cancer. The lesion is not painful and does not itch or bleed. She has fair skin and a history of severe sunburns in childhood. Medical history is unremarkable, and she does not use tobacco, alcohol, or illicit drugs. Vital signs are normal. Skin examination shows a few scattered benign-appearing nevi and a single prominent lesion at her right scapular area. Which of the following additional skin examination findings would be most concerning for malignancy?

A. Central keratin plug
B. Golf ball-size subcutaneous mass
C. Multicolored lesion
D. Peripheral scaling
E. "Stuck-on" appearance

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Item 28 of 40
Question Id: 4312

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A 32-year-old woman comes to the office due to a "mole." The lesion is located on her back, and she believes it has been present for years but does not recall when it first appeared. The patient thinks it might be enlarging and is concerned due to a family history of skin cancer. The lesion is not painful and does not itch or bleed. She has fair skin and a history of severe sunburns in childhood. Medical history is unremarkable, and she does not use tobacco, alcohol, or illicit drugs. Vital signs are normal. Skin examination shows a few scattered benign-appearing nevi and a single prominent lesion at her right scapular area. Which of the following additional skin examination findings would be most concerning for malignancy?

- A. Central keratin plug (1%)
- B. Golf ball-size subcutaneous mass (1%)
- ✓ C. Multicolored lesion (93%)
- D. Peripheral scaling (0%)
- E. "Stuck-on" appearance (2%)

Omitted
Correct answer
C

93%
Answered correctly

02 secs
Time Spent

02/12/2020
Last Updated

Explanation

| Clinical features of melanoma (ABCDE) |
| --- |
| • **A**symmetry: When bisected, the 2 sides are not identical |

TUTOR

2 | Feedback | Suspend | End Block

| Clinical features of melanoma (ABCDE) |
| --- |
| • **A**symmetry: When bisected, the 2 sides are not identical<br>• **B**order irregularities: Uneven edges, pigment fading off<br>• **C**olor variegation: Variable mixtures of brown, tan, black & red<br>• **D**iameter: ≥6 mm<br>• **E**volving: Lesion changing in size, shape, or color; new lesion |

Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and examination findings are used in the evaluation of moles to determine which lesions require excision and which can be safely observed. Significant melanoma risk factors include prior personal or family (≥2 members) history of melanoma, numerous (>100) nevi, prior atypical/dysplastic nevi, fair skin, and history of severe sunburns.

Gross features favoring the diagnosis of melanoma include **A**symmetry, **B**order irregularities, **C**olor variegation (ie, color differences within a single lesion), **D**iameter ≥6 mm, and change in appearance over time (**E**volving lesion). Coloration of melanoma can be highly variable. Lesions can be pigmented or unpigmented and various shades of brown, black, red, blue, or pink. Color variegation in particular strongly suggests malignancy.

**(Choice A)** Keratoacanthomas are cutaneous tumors that usually present as dome-shaped nodules with a central keratinous plug. They are generally benign, although rare cases with malignant transformation and metastasis have been reported.

**(Choice B)** Lipomas present as slowly enlarging, mobile subcutaneous masses. They have a soft or rubbery texture and are often golf-ball size or larger by the time they are brought to clinical attention. Lesions with the typical appearance of a lipoma are rarely malignant and can be safely observed without biopsy.

**(Choice D)** Ring-shaped inflammatory skin lesions with peripheral scaling are characteristic of tinea corporis.

**(Choice E)** Seborrheic keratosis is a benign pigmented lesion with a well-demarcated border and a velvety or greasy surface. It can be nearly flat, but thickened lesions are often described as having a "stuck on" appearance. An explosive onset of multiple seborrheic keratoses (Leser-Trélat sign) can indicate internal malignancy, but isolated lesions are benign.

**Educational objective:**

Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and examination findings are used in the evaluation of moles to determine which lesions require excision and which can be safely observed. Significant melanoma risk factors include prior personal or family (≥2 members) history of melanoma, numerous (>100) nevi, prior atypical/dysplastic nevi, fair skin, and history of severe sunburns.

Gross features favoring the diagnosis of melanoma include **A**symmetry, **B**order irregularities, **C**olor variegation (ie, color differences within a single lesion), **D**iameter ≥6 mm, and change in appearance over time (**E**volving lesion). Coloration of melanoma can be highly variable. Lesions can be pigmented or unpigmented and various shades of brown, black, red, blue, or pink. Color variegation in particular strongly suggests malignancy.

**(Choice A)** Keratoacanthomas are cutaneous tumors that usually present as dome-shaped nodules with a central keratinous plug. They are generally benign, although rare cases with malignant transformation and metastasis have been reported.

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**(Choice D)** Ring-shaped inflammatory skin lesions with peripheral scaling are characteristic of tinea corporis.

**(Choice E)** Seborrheic keratosis is a benign pigmented lesion with a well-demarcated border and a velvety or greasy surface. It can be nearly flat, but thickened lesions are often described as having a "stuck on" appearance. An explosive onset of multiple seborrheic keratoses (Leser-Trélat sign) can indicate internal malignancy, but isolated lesions are benign.

**Educational objective:**
On clinical examination, features of a lesion that suggest melanoma include **A**symmetry, **B**order irregularities, **C**olor variegation, **D**iameter ≥6 mm, and **E**volution in color, size, or shape.

**References**

- Skills training to learn discrimination of ABCDE criteria by those at risk of developing melanoma.

| Surgery | Dermatology | Melanoma |
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| Subject | System | Topic |

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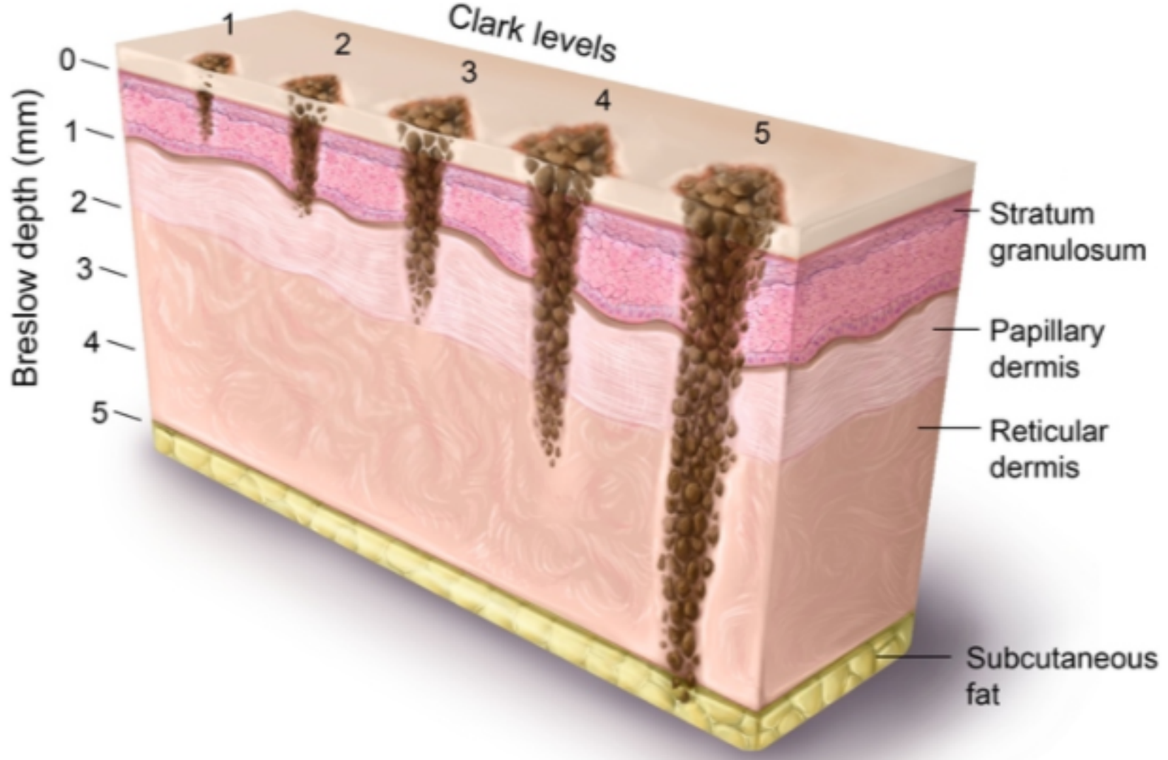
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Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and

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## Melanoma depth of invasion




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Subject System Topic

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Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and

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Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and

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Question Id: 4312

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Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and

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Item 28 of 40
Question Id: 4312

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Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and

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Question Id: 4312

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Early diagnosis is critical in **melanoma** as survival rates rapidly decrease with increased tumor thickness and depth of invasion. Historical and

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Item 29 of 40
Question Id: 3569

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A 23-year-old man comes to the urgent care center due to a knee injury 2 days ago. He was playing basketball when he was hit on the left side by an opposing player while running. The patient attempted to continue playing, but his left knee felt tight and he had to sit out the rest of the game. Over the last 2 days, the pain has been persistent and only partially relieved with ice and ibuprofen. He also has been using a knee brace for improved stability. Examination shows mild soft-tissue swelling of the left knee without a significant joint effusion. There is tenderness at the medial joint line but no locking or catching. Range of motion of the knee is near normal. Abduction (valgus) stress test shows some left knee laxity but is limited by pain. X-ray of the knee is normal. Which of the following is the most likely diagnosis in this patient?

A. Anterior cruciate ligament injury
B. Lateral collateral ligament injury
C. Medial collateral ligament injury
D. Medial meniscus tear
E. Patellar tendinitis
F. Tibial plateau fracture

Submit

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Item 29 of 40
Question Id: 3569

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- A. Anterior cruciate ligament injury (1%)
- B. Lateral collateral ligament injury (7%)
- ✓ C. Medial collateral ligament injury (84%)
- D. Medial meniscus tear (6%)
- E. Patellar tendinitis (0%)
- F. Tibial plateau fracture (0%)

Omitted
Correct answer
C

84%
Answered correctly

01 sec
Time Spent

04/06/2020
Last Updated

Explanation

## Medial collateral ligament injury

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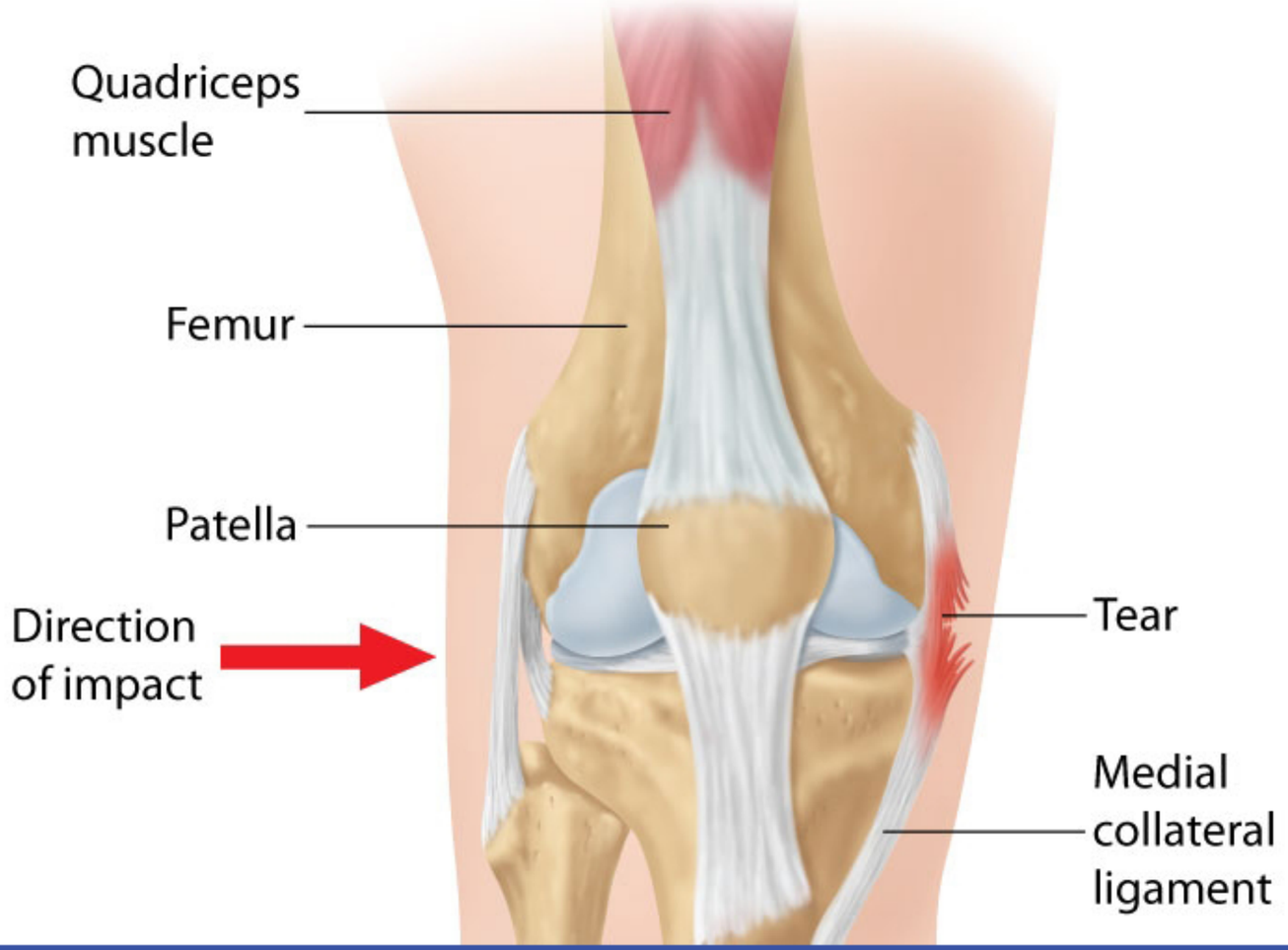
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Item 29 of 40
Question Id: 3569

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# Medial collateral ligament injury




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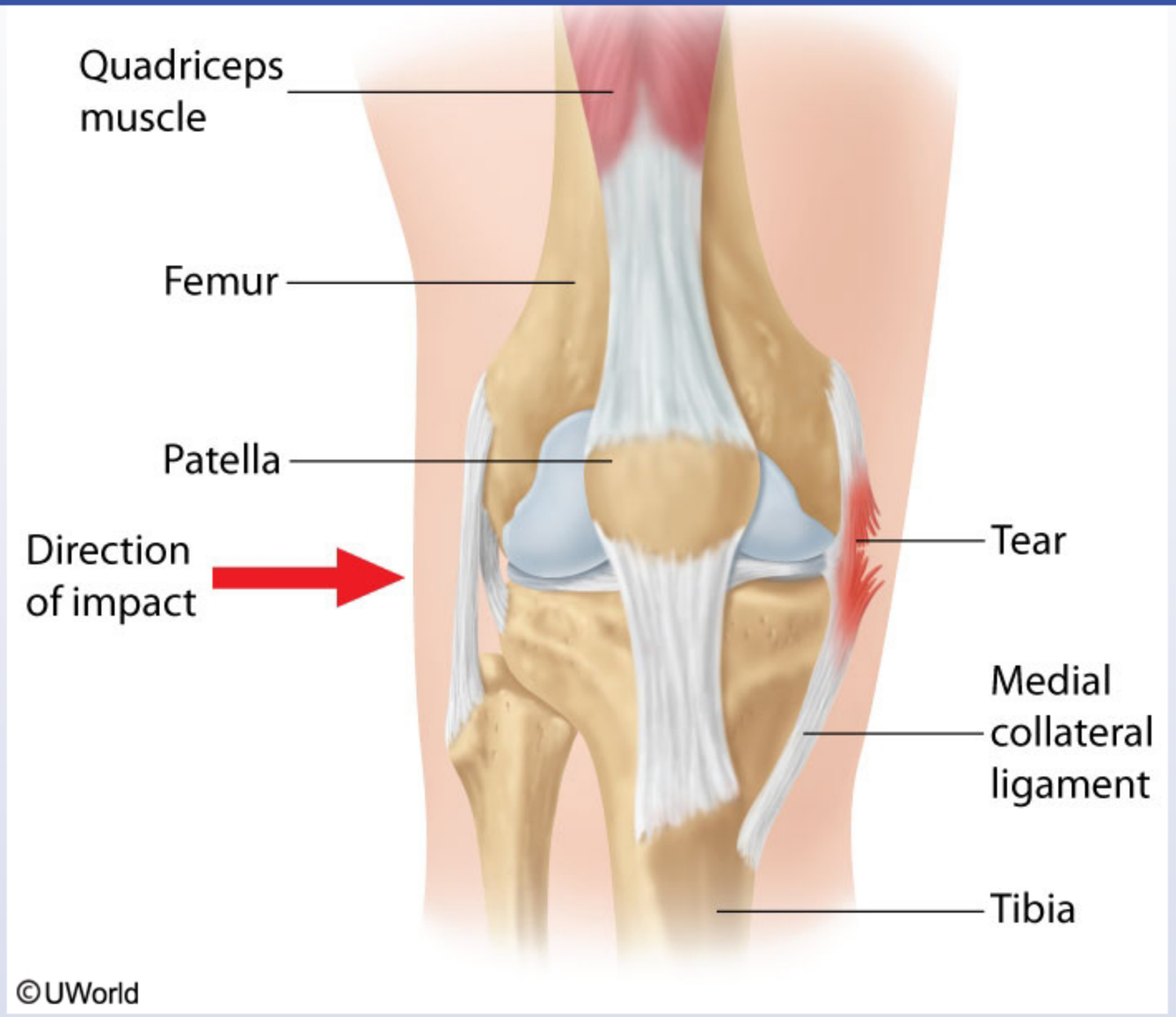
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**Medial collateral ligament** (MCL) tear is a common knee injury caused by severe valgus stress (eg, blow to the lateral knee) or twisting injury. Examination findings may include local swelling, ecchymosis, and joint line tenderness at the medial knee. Appreciable laxity when the leg is forced into abduction (**valgus stress test**) is helpful for diagnosis but may be masked by swelling and muscle spasm. Acute effusion/hemarthrosis is uncommon unless there is concurrent injury to the anterior cruciate ligament.

MRI is the most sensitive test for diagnosis but is generally reserved for patients being considered for surgical intervention. Patients with uncomplicated MCL tears can be managed **nonoperatively** with rest, ice, compression, and elevation (RICE measures) and analgesics with progressive return to activity as tolerated.

**(Choice A)** Injury to the anterior cruciate ligament will produce acute, often dramatic hemarthrosis with an effusion on physical examination. The tibia will show anterior rather than valgus laxity.

**(Choice B)** Injuries to the lateral collateral ligament are uncommon but are occasionally seen following high-velocity trauma. The knee will have varus laxity.

**(Choice D)** The medial meniscus and MCL are intimately associated and may be injured together. A meniscus injury may show joint line tenderness, but there is typically also a small joint effusion and crepitus, locking, or catching with range of motion. Meniscal tears often occur when patients pivot on a flexed knee while the foot is planted.

**(Choice E)** Patellar tendonitis ("jumper's knee") is a chronic overuse injury characterized by anterior knee pain and tenderness. Stress testing of the ligaments is normal.

**(Choice F)** Tibial plateau fractures can occur due to contact sports, falls, or motor vehicle accidents. However, most patients with such fractures are unable to bear weight on the knee.

**Educational objective:**
Medial collateral ligament tear is caused by valgus stress or severe twisting injury and can be associated with injury to the medial meniscus. Findings include tenderness at the medial knee and valgus laxity. MRI is the most sensitive test, and most patients are managed nonoperatively.

**References**

- Structure and function, injury, pathology, and treatment of the medial collateral ligament of the knee.

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**Exhibit Display**




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- Structure and function, injury, pathology, and treatment of the medial collateral ligament of the knee.

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An 82-year-old man is found to be agitated and confused on day 2 following surgery for a right hip fracture. The surgery was uncomplicated and was not accompanied by hemodynamic instability. The patient has a history of mild cognitive impairment and lives at home with his daughter. He also has hypertension, gout, and benign prostatic hyperplasia. Temperature is 37.2 C (99 F), blood pressure is 134/90 mm Hg, and pulse is 100/min. The patient has 2 peripheral intravenous lines that appear clean. He does not have a Foley catheter. Lungs are clear on auscultation. Heart rhythm is regular with a faint mid-systolic murmur heard over the left sternal border. The lower abdomen is tender and palpation exacerbates the agitation. The surgical site appears clean with minimal discharge. Laboratory results are as follows:

| | |
|---|---|
| **Complete blood count** | |
| Hemoglobin | 10.5 g/dL |
| Leukocytes | 10,000/mm$^3$ |
| Platelets | 155,000/mm$^3$ |
| **Serum chemistry** | |
| Sodium | 132 mEq/L |
| Potassium | 3.6 mEq/L |
| Creatinine | 1.2 mg/dL |

Which of the following is the best next step in management of this patient?

A. Abdominal CT scan without contrast
B. Abdominal x-rays
C. Bladder ultrasound

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Complete blood count

| | |
|---|---|
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Serum chemistry

| | |
|---|---|
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| Creatinine | 1.2 mg/dL |

Which of the following is the best next step in management of this patient?

A. Abdominal CT scan without contrast
B. Abdominal x-rays
C. Bladder ultrasound
D. Blood cultures followed by intravenous vancomycin
E. Quiet environment and intramuscular haloperidol

Submit

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Complete blood count

| | |
|---|---|
| Hemoglobin | 10.5 g/dL |
| Leukocytes | 10,000/mm$^3$ |
| Platelets | 155,000/mm$^3$ |

Serum chemistry

| | |
|---|---|
| Sodium | 132 mEq/L |
| Potassium | 3.6 mEq/L |
| Creatinine | 1.2 mg/dL |

Which of the following is the best next step in management of this patient?

A. Abdominal CT scan without contrast (15%)
B. Abdominal x-rays (8%)
✓ C. Bladder ultrasound (59%)
D. Blood cultures followed by intravenous vancomycin (6%)
E. Quiet environment and intramuscular haloperidol (10%)

Omitted
Correct answer

59%
Answered correctly

05 secs
Time Spent

02/18/2020
Last Updated

Explanation

This elderly male patient with **agitation**, tachycardia, and **lower abdominal (suprapubic) tenderness** 2 days following surgical repair of a hip fracture likely has **acute urinary retention (AUR)**. The major risk factors for development of AUR include:

- **Male** sex (AUR rarely occurs in women)
- Advanced **age** (~33% of men age >80 will develop AUR)
- History of **benign prostatic hyperplasia**
- **History of neurologic disease** (eg, mild cognitive impairment)
- **Surgery** (especially abdominal surgery, pelvic surgery, and joint arthroplasty)

It is likely that this patient has also recently taken medications (eg, anesthetics, **opioids**, **anticholinergics**) that are common precipitants of AUR.

In a patient with suspected AUR who is unable to void, the diagnosis is confirmed by **bladder ultrasound** demonstrating **≥300 mL of urine**. Treatment is with insertion of a **Foley catheter**, and urinalysis should be collected to rule out urinary tract infection (a potential cause of AUR). Obesity, abdominal ascites, or tissue edema may render bladder ultrasound inaccurate; in such cases, Foley catheter insertion can be both diagnostic and therapeutic.

**(Choices A and B)** CT scan and x-rays of the abdomen are often helpful in diagnosing causes of acute abdominal pain (eg, colitis, nephrolithiasis, appendicitis). However, AUR should be suspected first in this patient with numerous risk factors.

**(Choice D)** Blood cultures followed by intravenous vancomycin would be appropriate for treatment of suspected gram-positive bacteremia, which may present with confusion and tachycardia. This patient's clean surgical site, lower abdominal tenderness, and absence of fever and leukocytosis make AUR more likely.

**(Choice E)** A quiet environment may help improve delirium, which is a common cause of agitation and confusion in hospitalized elderly patients. However, AUR commonly causes confusion and agitation and should be suspected first in this patient with numerous risk factors. If possible, the use of haloperidol and other typical antipsychotics should be avoided in elderly patients.

**Educational objective:**
Acute urinary retention (AUR) is common in elderly men, especially in the setting of underlying benign prostatic hyperplasia. The risk of AUR is

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In a patient with suspected AUR who is unable to void, the diagnosis is confirmed by **bladder ultrasound** demonstrating **≥300 mL of urine**. Treatment is with insertion of a **Foley catheter**, and urinalysis should be collected to rule out urinary tract infection (a potential cause of AUR). Obesity, abdominal ascites, or tissue edema may render bladder ultrasound inaccurate; in such cases, Foley catheter insertion can be both diagnostic and therapeutic.

**(Choices A and B)** CT scan and x-rays of the abdomen are often helpful in diagnosing causes of acute abdominal pain (eg, colitis, nephrolithiasis, appendicitis). However, AUR should be suspected first in this patient with numerous risk factors.

**(Choice D)** Blood cultures followed by intravenous vancomycin would be appropriate for treatment of suspected gram-positive bacteremia, which may present with confusion and tachycardia. This patient's clean surgical site, lower abdominal tenderness, and absence of fever and leukocytosis make AUR more likely.

**(Choice E)** A quiet environment may help improve delirium, which is a common cause of agitation and confusion in hospitalized elderly patients. However, AUR commonly causes confusion and agitation and should be suspected first in this patient with numerous risk factors. If possible, the use of haloperidol and other typical antipsychotics should be avoided in elderly patients.

**Educational objective:**
Acute urinary retention (AUR) is common in elderly men, especially in the setting of underlying benign prostatic hyperplasia. The risk of AUR is further increased during the postoperative period. Diagnosis is made using bladder ultrasound.

**References**

- Risk factors for postoperative urinary retention in men undergoing total hip arthroplasty.

| Surgery | Renal, Urinary Systems & Electrolytes | Urinary retention |
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Item 31 of 40
Question Id: 14528

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A 30-year-old man is brought to the emergency department due to a worsening headache. The patient has had episodic right-sided headaches over the past 6 months. Thirty minutes ago, he began experiencing a right temporal headache while at rest, which gradually worsened to severe pain over the next several minutes. He also had nausea and an episode of vomiting. The patient is now somnolent and difficult to rouse. He has no other medical conditions and had a normal medical evaluation a year ago for military enlistment. Temperature is 37 C (98.6 F), blood pressure is 150/90 mm Hg, pulse is 64/min, and respirations are 14/min. The patient withdraws all extremities to painful stimuli, but left-sided deep tendon reflexes are increased. There is no neck rigidity. Which of the following is the most likely underlying cause of this patient's current condition?

A. Arteriovenous malformation
B. Carotid artery atheroma
C. Cerebral amyloid angiopathy
D. Dural venous sinus thrombosis
E. Hypertensive vasculopathy
F. Paroxysmal cardiac arrhythmia

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A 30-year-old man is brought to the emergency department due to a worsening headache. The patient has had episodic right-sided headaches over the past 6 months. Thirty minutes ago, he began experiencing a right temporal headache while at rest, which gradually worsened to severe pain over the next several minutes. He also had nausea and an episode of vomiting. The patient is now somnolent and difficult to rouse. He has no other medical conditions and had a normal medical evaluation a year ago for military enlistment. Temperature is 37 C (98.6 F), blood pressure is 150/90 mm Hg, pulse is 64/min, and respirations are 14/min. The patient withdraws all extremities to painful stimuli, but left-sided deep tendon reflexes are increased. There is no neck rigidity. Which of the following is the most likely underlying cause of this patient's current condition?

- ✓ A. Arteriovenous malformation (56%)
- B. Carotid artery atheroma (5%)
- C. Cerebral amyloid angiopathy (3%)
- D. Dural venous sinus thrombosis (10%)
- E. Hypertensive vasculopathy (23%)
- F. Paroxysmal cardiac arrhythmia (1%)

Omitted
Correct answer
A

56%
Answered correctly

02 secs
Time Spent

02/25/2020
Last Updated

Explanation

This patient with a right-sided headache developed nausea, vomiting, and a decreased level of consciousness, suggesting an **intracerebral hemorrhage** (ICH). The presentation of ICH varies with the location of bleeding; this patient's left-sided hyperreflexia suggests a possible right

This patient with a right-sided headache developed nausea, vomiting, and a decreased level of consciousness, suggesting an **intracerebral hemorrhage** (ICH). The presentation of ICH varies with the location of bleeding; this patient's left-sided hyperreflexia suggests a possible right hemispheric lobar hemorrhage. Symptoms tend to progress over **minutes to hours** as the hemorrhage expands. Elevated intracranial pressure can result in headache, nausea/vomiting, and altered mental status.

Although ICH can be caused by a variety of mechanisms, this patient's young age and history of right-sided headaches suggests a **ruptured arteriovenous malformation** (AVM). AVMs occur when an artery directly anastomoses with the veins without an interposed capillary bed. The high-pressure system predisposes patients to aneurysm formation and/or **spontaneous bleeding**. Most AVMs are congenital, although de novo formation may occur. Patients are typically diagnosed **before age 40**, most commonly after developing an ICH. Other presenting symptoms may include **recurrent headache**, seizure, or focal neurologic deficit (due to compression).

**(Choice B)** Carotid artery atheromas typically cause ischemic stroke. Common symptoms include unilateral weakness and aphasia, which often fluctuate and progress in a stuttering fashion. Atheroma would be unexpected in this young patient without risk factors (eg, hyperlipidemia, diabetes).

**(Choices C and E)** Cerebral amyloid angiopathy (CAA) and hypertensive vasculopathy are both potential causes of ICH. However, CAA typically presents in elderly patients and is associated with dementia, whereas hypertensive vasculopathy would be unexpected in a patient without a prolonged history of hypertension. Although uncontrolled hypertension can cause headaches, recurrent unilateral headaches would be unexpected.

**(Choice D)** Dural venous sinus thrombosis can present with headache and signs of intracranial hypertension. However, rapid progression to coma with focal neurologic deficits is more consistent with ICH. In addition, venous sinus thrombosis typically occurs in the setting of hypercoagulability (eg, pregnancy, malignancy), infection, or head injury.

**(Choice F)** Paroxysmal atrial fibrillation can result in cardioembolic disease; however, symptoms are typically maximal at onset rather than progressive, as seen in ICH. In addition, multiple vascular territories are often affected, leading to a variety of neurologic deficits.

**Educational objective:**
Intracerebral hemorrhage (ICH) typically presents with progressive headache, nausea/vomiting, and altered mental status over a period of minutes to hours. ICH in young patients is commonly due to arteriovenous malformation, which may also present with recurrent headache, seizure, or

high-pressure system predisposes patients to aneurysm formation and/or **spontaneous bleeding**. Most AVMs are congenital, although de novo formation may occur. Patients are typically diagnosed **before age 40**, most commonly after developing an ICH. Other presenting symptoms may include **recurrent headache**, seizure, or focal neurologic deficit (due to compression).

**(Choice B)** Carotid artery atheromas typically cause ischemic stroke. Common symptoms include unilateral weakness and aphasia, which often fluctuate and progress in a stuttering fashion. Atheroma would be unexpected in this young patient without risk factors (eg, hyperlipidemia, diabetes).

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**Educational objective:**
Intracerebral hemorrhage (ICH) typically presents with progressive headache, nausea/vomiting, and altered mental status over a period of minutes to hours. ICH in young patients is commonly due to arteriovenous malformation, which may also present with recurrent headache, seizure, or focal neurologic deficits.

| Surgery | Nervous System | Hemorrhagic stroke |
|---|---|---|
| Subject | System | Topic |

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Item 32 of 40
Question Id: 2214

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A 76-year-old man with multi-infarct dementia comes to the emergency department due to cough and low-grade fever. He was treated for pneumonia twice in the last year. For the past 6 months, he has had difficulty swallowing and has occasionally regurgitated undigested food. The patient has a lengthy history of hypertension and chronic atrial fibrillation. BMI is 22 kg/m$^2$. Temperature is 38.5 C (101.3 F), blood pressure is 150/95 mm Hg, pulse is 102/min, and respirations are 16/min. Physical examination is notable for foul-smelling breath and a fluctuant mass in the left neck. Auscultation shows crackles in the right lung base. Chest x-ray shows an infiltrate without cavitation in the right lower lung field. The patient is admitted to the hospital, sputum and blood cultures are sent to the laboratory, and antibiotics are started. A few days later, the patient's condition is markedly improved. Which of the following is the most appropriate next step in management of this patient?

A. Bronchoscopy
B. Contrast esophagography
C. Gastric feeding tube placement
D. Neck mass biopsy
E. Upper gastrointestinal endoscopy

Submit

TUTOR

2 | Feedback | Suspend | End Block

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- A. Bronchoscopy (3%)
- ✓ B. Contrast esophagography (58%)
- C. Gastric feeding tube placement (7%)
- D. Neck mass biopsy (6%)
- E. Upper gastrointestinal endoscopy (23%)

Omitted
Correct answer
B

58%
Answered correctly

02 secs
Time Spent

04/28/2020
Last Updated

Explanation

| Zenker diverticulum | |
|---|---|

| Zenker diverticulum | |
|---|---|
| **Pathophysiology** | • Impaired UES relaxation (cricopharyngeus muscle) → ↑ intraluminal pressure → herniation → pseudodiverticulum |
| **Clinical manifestations** | • Age >60, more common in men<br>• Insidious, progressive dysphagia<br>• Halitosis, gurgling, or crepitus<br>• Regurgitation of undigested food<br>• Aspiration |
| **Diagnosis** | • Swallow study with contrast esophagography |
| **Treatment** | • Surgery: cricopharyngeal myotomy ± diverticulectomy |

UES = upper esophageal sphincter.

Recurrent pneumonia in an elderly patient with dysphagia and regurgitation of undigested food raises strong suspicion for a Zenker diverticulum (ZD), a pouch posterior to the esophagus that forms due to herniation of the esophageal mucosa through an area of muscle weakness. ZD presents with an insidious onset of progressive **dysphagia**. Trapping of food in the pouch can lead to **halitosis**. Patients often **regurgitate the undigested food** or medications several hours after eating, which can lead to aspiration and **recurrent aspiration pneumonia**. The pouch occasionally becomes so large that it is palpable, as in this patient.

A swallow study with **contrast esophagography** confirms the diagnosis. In this study, serial x-rays are taken of the esophagus after the patient has ingested a radiopaque contrast solution. In ZD, contrast is retained in the pouch. Despite the risk of pneumonitis due to aspiration of contrast, it remains the test of choice for diagnosing ZD because it is the only study that provides information regarding both the anatomy of the pouch (eg, size) and the functional impact of the diverticulum (eg, aspiration, esophageal obstruction). Treatment is surgical (cricopharyngeal myotomy ± diverticulectomy).

**(Choice A)** Bronchoscopy is generally indicated if there is concern for an obstructing mass that could cause recurrent pneumonia in the same

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**(Choice A)** Bronchoscopy is generally indicated if there is concern for an obstructing mass that could cause recurrent pneumonia in the same anatomic location. Even then, CT scan of the chest is the preferred initial study.

**(Choice C)** Placement of a gastric feeding tube would be premature in this patient because surgical treatment of ZD will likely improve the aspiration.

**(Choice D)** A neck mass in an adult is often suspicious for head and neck cancer. However, such masses are typically firm, whereas in the context of regurgitation of undigested food, a fluctuant mass is likely a very large ZD. Biopsy could therefore lead to esophageal perforation.

**(Choice E)** Upper gastrointestinal endoscopy is not as sensitive as esophagography for detecting ZD because the openings of small diverticula may not be visible. Esophagography also yields more information about the functional impact of the diverticulum. Furthermore, endoscopy can be confusing or even risky if the cannula inadvertently enters the diverticulum during the procedure.

**Educational objective:**
Recurrent pneumonia in an elderly patient with dysphagia and regurgitation of undigested food raises concern for a Zenker diverticulum, which may occasionally present with a palpable mass. A swallow study with contrast esophagography can be used to confirm the diagnosis.

**References**

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**Educational objective:**
Recurrent pneumonia in an elderly patient with dysphagia and regurgitation of undigested food raises concern for a Zenker diverticulum, which may occasionally present with a palpable mass. A swallow study with contrast esophagography can be used to confirm the diagnosis.

**References**


- Pharyngeal pouch (Zenker's diverticulum).
- Zenker's diverticulum: aetiopathogenesis, symptoms and diagnosis. Comparison of operative methods.


| Surgery | Gastrointestinal & Nutrition | Zenker diverticulum |
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| Subject | System | Topic |

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Item 33 of 40
Question Id: 17510

Mark

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A 28-year-old woman comes to the office due to a painful breast mass. She first noticed the mass during her last menstrual period, and its size has not changed since then. The patient has no chronic medical conditions, and her only medication is a daily combined oral contraceptive. On examination, there is a palpable, 1.5-cm right breast mass at the 8-o'clock position. The mass is tender, soft, and mobile, and there are no skin changes or galactorrhea. Breast ultrasound shows a single, thin-walled, fluid-filled cyst. Fine-needle aspiration of the mass reveals clear, yellow-tinged fluid. The mass is still palpable after aspiration. Which of the following is the most appropriate next step in management of this patient?

A. Breast MRI
B. Core needle biopsy
C. Discontinuation of the combined oral contraceptive
D. Observation and repeat examination in 6 weeks
E. Thermography

Submit

TUTOR

1 | Feedback | Suspend | End Block

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- A. Breast MRI (3%)
- ✓ B. Core needle biopsy (27%)
- C. Discontinuation of the combined oral contraceptive (5%)
- D. Observation and repeat examination in 6 weeks (63%)
- E. Thermography (0%)

Omitted
Correct answer
B

27%
Answered correctly

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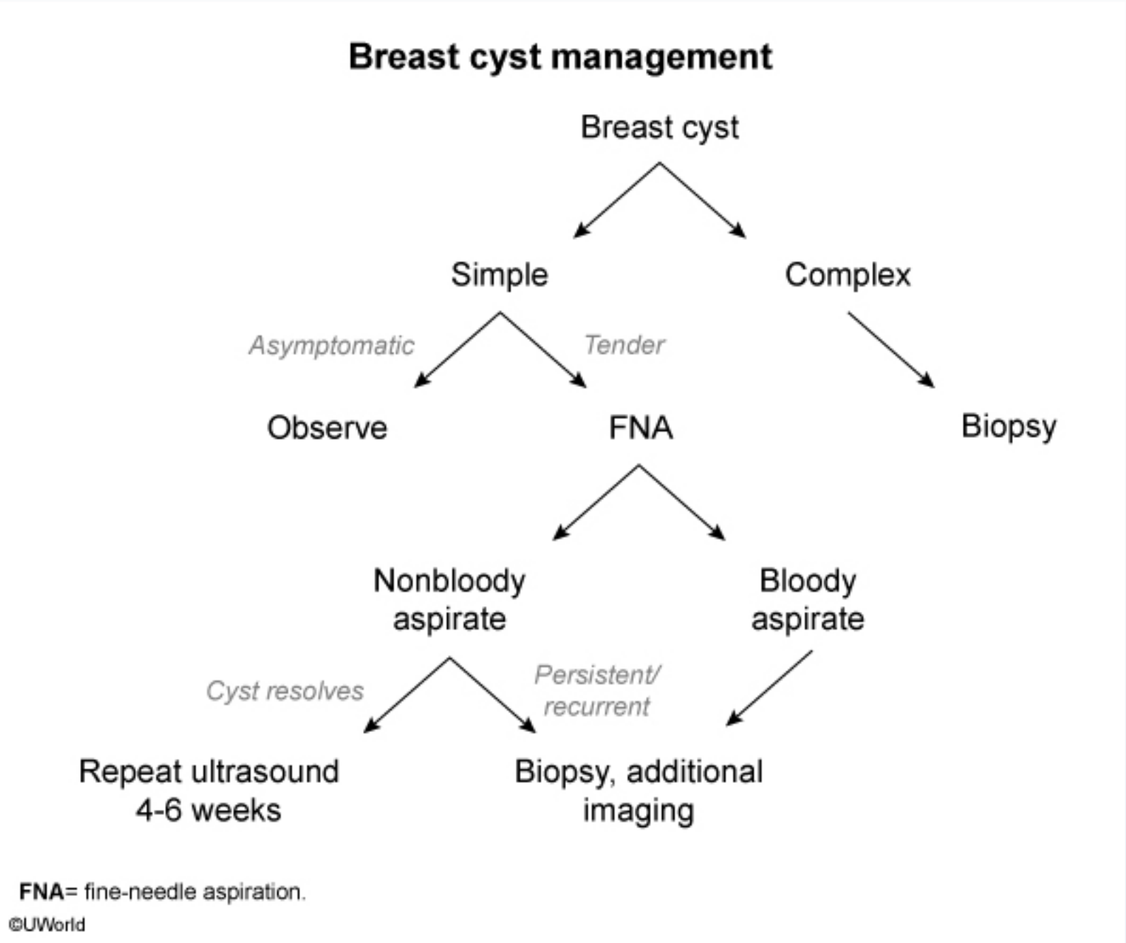
03/16/2020
Last Updated

Explanation

**Breast cyst management**

Breast cyst

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30




This patient has a painful, palpable breast mass. Because history and physical examination alone are insufficient for breast cancer evaluation, all breast masses in women age <30 require evaluation with ultrasonography. Ultrasonography can help in the assessment of cancer risk based on the composition and characteristics of the mass. Patients with a **symptomatic**, simple **breast cyst** can undergo **fine-needle aspiration** for pain relief. Further management depends on the results of the fine-needle aspiration:

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This patient has a painful, palpable breast mass. Because history and physical examination alone are insufficient for breast cancer evaluation, all breast masses in women age <30 require evaluation with ultrasonography. Ultrasonography can help in the assessment of cancer risk based on the composition and characteristics of the mass. Patients with a **symptomatic**, simple **breast cyst** can undergo **fine-needle aspiration** for pain relief. Further management depends on the results of the fine-needle aspiration:

- If the aspirated fluid is clear (ie, not bloody) and the breast mass resolves completely, patients are at low risk for cancer and may undergo observation with a repeat breast examination in 4-6 weeks **(Choice D)**.
- In contrast, if the fluid is bloody or the **mass does not resolve** (ie, remains palpable), patients are at increased risk for breast cancer and require **core needle biopsy**, which can provide a definitive histologic diagnosis.

**(Choice A)** Breast MRI is used for screening in high-risk patients (eg, *BRCA* carrier) or assessing for metastatic disease in patients with diagnosed breast cancer. It is not used for evaluating a new breast mass because breast MRI has high sensitivity but low specificity for cancer (ie, both benign and malignant masses appear enhanced).

**(Choice C)** Combined oral contraceptives (COCs) can cause breast pain, particularly in the first few months after initiation, but they do not typically cause breast cysts. Therefore, this patient does not need to discontinue her COCs.

**(Choice E)** Thermography is the measurement of skin temperature in an attempt to detect underlying cancer (ie, increased temperature may suggest higher metabolic activity and increased risk of cancer). However, thermography has not been proven to identify breast cancer and is not recommended.

**Educational objective:**
Symptomatic breast cysts can be managed with fine-needle aspiration. Breast cysts containing bloody fluid or masses that do not resolve with aspiration require core needle biopsy to evaluate for breast cancer.

**References**

- ACOG practice bulletin no. 164: diagnosis and management of benign breast disorders.
- ACR Appropriateness Criteria® palpable breast masses.

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Item 34 of 40
Question Id: 16414

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A 25-year-old man comes to the emergency department due to abdominal pain, nausea, and vomiting. The symptoms began 2 months ago, at which time the pain was intermittent and located in the right lower quadrant. Since then, it has progressed and is now diffuse, severe, and unremitting. The patient started vomiting bilious fluid 2 days ago but has not had hematemesis, melena, hematochezia, diarrhea, or unexpected weight loss. In addition, he has not moved his bowels in 2 days, although he frequently passes flatus. Medical history is significant for Crohn disease with ileal involvement, which is currently managed with infliximab and has never required surgery. The patient has used acetaminophen and ibuprofen to relieve his pain and has not used narcotics. He smokes 3-4 cigarettes a day but does not use alcohol or illicit drugs. Temperature is 37.5 C (99.5 F), blood pressure is 134/78, pulse is 95/min, and respirations are 18/min. On physical examination, the patient is awake and cooperative. Chest examination is unremarkable. The abdomen is distended, tympanic, and tender to palpation; there is no rebound tenderness or guarding. Which of the following most likely explains this patient's presentation?

A. Adverse reaction to infliximab
B. Adynamic ileus
C. *Clostridioides difficile* infection
D. Fibrotic intestinal stricture
E. Intestinal malignancy
F. Toxic megacolon

Submit

TUTOR

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Item 34 of 40
Question Id: 16414

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- A. Adverse reaction to infliximab (0%)
- B. Adynamic ileus (16%)
- C. *Clostridioides difficile* infection (0%)
- ✓ D. Fibrotic intestinal stricture (68%)
- E. Intestinal malignancy (0%)
- F. Toxic megacolon (13%)

Omitted
Correct answer
D

68%
Answered correctly

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Time Spent

02/02/2020
Last Updated

Explanation

TUTOR

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Explanation

This patient with Crohn disease most likely has small bowel obstruction (SBO) due to a **fibrotic stricture**. Strictures are a complication of **Crohn disease** that result from poorly controlled, severe inflammation. **Smoking** and young age (<30) at diagnosis are significant risk factors for **uncontrolled inflammation** and disease progression despite medical therapy.

**SBO** due to fibrotic stricture typically presents with **bilious vomiting**, severe abdominal pain, and either partial (ie, ability to pass gas but not stool) or complete (ie, inability to pass flatus or stool) obstruction. Abdominal examination commonly reveals distension and high-pitched (tympanic) bowel sounds.

Although medical treatment for Crohn disease (eg, infliximab) can reduce inflammation and may help prevent fibrotic stricture development it cannot resolve a stricture once one develops. Depending on the location and length of the stricture, **surgical resection** may be required.

**(Choice A)** Infliximab and other tumor necrosis factor–alpha antagonists (eg, adalimumab) are commonly used to treat Crohn disease. They are usually well tolerated but can increase a patient's risk for infection and malignancy. Gastrointestinal distress is not a typical adverse effect.

**(Choice B)** Adynamic ileus occurs when small bowel motility is disrupted, leading to intestinal dilation, obstipation, and bilious emesis. Although it presents similarly to SBO, adynamic ileus only develops after exposure to an insult that "stuns" the bowel, such as recent intra-abdominal surgery or high-dose opioids.

**(Choices C and F)** Toxic megacolon can complicate both ulcerative colitis and severe *Clostridioides* (formerly *Clostridium*) *difficile* colitis; it presents with colonic dilation, obstipation, vomiting, and hemodynamic instability. This patient's Crohn disease only involves the small bowel, and since he never had watery diarrhea (a hallmark sign of *C difficile*), toxic megacolon is exceedingly unlikely.

**(Choice E)** Crohn disease is a risk factor for small bowel cancer, which can lead to SBO; however, one would expect severe weight loss if small bowel cancer were present.

**Educational objective:**
Severe, uncontrolled inflammation in Crohn disease can lead to a fibrotic stricture of the small bowel with small bowel obstruction (SBO); smoking and young age (<30) at diagnosis increase the risk of such disease progression. Fibrotic stricture with SBO presents with bilious emesis, severe abdominal pain, and inability to pass flatus and/or stool. Treatment usually requires surgical removal of the strictured portion of small bowel.

Explanation

This patient with Crohn di… **disease** that result from p… **uncontrolled inflammati…**

**SBO** due to fibrotic strictu… stool) or complete (ie, inab… (tympanic) bowel sounds.

Although medical treatme… cannot resolve a stricture …

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**(Choice B)** Adynamic ileu… presents similarly to SBO, … or high-dose opioids.

**(Choices C and F)** Toxic… presents with colonic dilat… since he never had watery…

**(Choice E)** Crohn diseas… bowel cancer were preser…

**Educational objective:**
Severe, uncontrolled inflam… and young age (<30) at di… abdominal pain, and inability to pass flatus and/or stool. Treatment usually requires surgical removal of the strictured portion of small bowel.

**Exhibit Display**

| | Crohn disease | Ulcerative colitis |
|---|---|---|
| **Involvement** | • Anywhere mouth to anus (mostly ileum & colon)<br>• Perianal disease with rectal sparing<br>• Skip lesions | • Rectum (always) & colon<br>• Continuous lesions |
| **Microscopy** | • Noncaseating granulomas | • No granulomas |
| **Gross findings** | • Transmural inflammation<br>• Linear mucosal ulcerations<br>• Cobblestoning, creeping fat | • Mucosal & submucosal inflammation<br>• Pseudopolyps |
| **Clinical manifestations** | • Abdominal pain (often RLQ)<br>• Watery diarrhea (bloody if colitis) | • Abdominal pain (varying locations)<br>• Bloody diarrhea |
| **Intestinal complications** | • Fistulae, abscesses<br>• Strictures (bowel obstruction) | • Toxic megacolon |

RLQ = right lower quadrant.

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**SBO** due to fibrotic stricture typically presents with **bilious vomiting**, severe abdominal pain, and either partial (ie, ability to pass gas but not stool) or complete (ie, inability to pass flatus or stool) obstruction. Abdominal examination commonly reveals distension and high-pitched (tympanic) bowel sounds.

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**Educational objective:**
Severe, uncontrolled inflammation in Crohn disease can lead to a fibrotic stricture of the small bowel with small bowel obstruction (SBO); smoking and young age (<30) at diagnosis increase the risk of such disease progression. Fibrotic stricture with SBO presents with bilious emesis, severe abdominal pain, and inability to pass flatus and/or stool. Treatment usually requires surgical removal of the strictured portion of small bowel.

| Surgery | Gastrointestinal & Nutrition | Bowel obstruction |
|---|---|---|
| Subject | System | Topic |

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A 62-year-old woman comes to the office due to 6 weeks of malaise and intermittent fever. She has also had decreased appetite and unintentional weight loss but no bowel or bladder symptoms. The patient has a history of type 2 diabetes mellitus and hypertension, and 10 years ago she underwent total hysterectomy and bilateral salpingo-oophorectomy for early stage endometrial cancer. She has smoked a pack of cigarettes daily for 30 years and does not drink alcohol. She works as an accountant. Temperature is 37.9 C (100.2 F), blood pressure is 140/90 mm Hg, pulse is 90/min, and respirations are 16/min. On examination, she appears thin and pale. A hard mass is palpated over the right flank area. There is no abdominal tenderness, and bowel sounds are normal. The liver and spleen are not enlarged. No lymphadenopathy is present. Laboratory results are as follows:

Complete blood count

| | |
|---|---|
| Hemoglobin | 10.5 g/dL |
| Leukocytes | 9,800/mm$^3$ |

Serum chemistry

| | |
|---|---|
| Creatinine | 1.2 mg/dL |
| Calcium | 9.8 mg/dL |

Which of the following is the most likely diagnosis in this patient?

A. Acute diverticulitis
B. Appendiceal abscess
C. Hydronephrosis
D. Non-Hodgkin lymphoma
E. Polycystic kidney disease

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C. Hydronephrosis
D. Non-Hodgkin lymphoma
E. Polycystic kidney disease
F. Renal cell carcinoma

Submit

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|---|---|
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| Leukocytes | 9,800/mm$^3$ |

Serum chemistry

| | |
|---|---|
| Creatinine | 1.2 mg/dL |
| Calcium | 9.8 mg/dL |

Which of the following is the most likely diagnosis in this patient?

- A. Acute diverticulitis (0%)
- B. Appendiceal abscess (2%)
- C. Hydronephrosis (3%)
- D. Non-Hodgkin lymphoma (7%)
- E. Polycystic kidney disease (2%)
- ✓ F. Renal cell carcinoma (83%)

Omitted
Correct answer

83%
Answered correctly

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Time Spent

02/15/2020
Last Updated

| Renal cell carcinoma | |
|---|---|
| **Epidemiology** | • Age >50<br>• Risk ↑ with smoking, obesity, chemical exposure |
| **Manifestations** | • Hematuria: microscopic or gross ± clots<br>• Abdominal/flank mass<br>• Flank pain<br>• Left-sided varicocele that does not decompress<br>• Paraneoplastic syndrome (eg, EPO production, ↑ calcium) |
| **Diagnosis** | • Abdominal CT<br>• Partial/complete nephrectomy (for histology) |

EPO = erythropoietin.

This patient's unintentional weight loss, smoking history, and hard flank mass raise strong suspicion for **renal cell carcinoma (RCC)**, a primary malignant neoplasm of the kidney. Most cases arise in patients age >50; risk is greatest in former or current **smokers** and those with obesity, hypertension, and/or occupational exposure to toxic compounds (eg, asbestos).

Although RCC is classically associated with the triad of flank pain, hematuria, and a palpable abdominal mass, <10% of patients have all 3 of these symptoms. RCC is sometimes discovered incidentally on abdominal imaging, but patients often have ≥1 the following:

- Unintentional **weight loss**
- An abdominal or **flank mass** that is firm, nontender, and moves with respiration
- Hematuria (when the tumor invades the renal collecting system), which may lead to iron deficiency anemia
- Intermittent fever
- Paraneoplastic syndromes (eg, ectopic erythropoietin production, hypercalcemia)

Patients with suspected RCC usually require abdominal CT with and without contrast for further evaluation followed by staging imaging (eg, CT chest). Nephrectomy or partial nephrectomy provides a tissue diagnosis.

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Although RCC is classically associated with the triad of flank pain, hematuria, and a palpable abdominal mass, <10% of patients have all 3 of these symptoms. RCC is sometimes discovered incidentally on abdominal imaging, but patients often have ≥1 the following:

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Patients with suspected RCC usually require abdominal CT with and without contrast for further evaluation followed by staging imaging (eg, CT chest). Nephrectomy or partial nephrectomy provides a tissue diagnosis.

**(Choices A and B)** Although acute diverticulitis is common in older adults, it usually causes significant lower abdominal pain and (sometimes) a tender abdominal mass and leukocytosis. Acute appendicitis typically arises in younger (not older) adults and usually causes right lower quadrant abdominal pain, anorexia, vomiting, and leukocytosis. This patient with 6 weeks of symptoms, no abdominal pain, and no leukocytosis is unlikely to have acute diverticulitis or appendicitis.

**(Choice C)** Hydronephrosis primarily occurs in the setting of urinary tract obstruction and is generally asymptomatic unless the obstruction is acute (eg, renal stone). It is not typically associated with a flank mass, and weight loss and systemic symptoms would be unusual.

**(Choice D)** Non-Hodgkin lymphoma often causes B symptoms (eg, intermittent fever, night sweats, weight loss), but it usually (>70%) also causes painless peripheral lymphadenopathy and can cause hepatosplenomegaly. Furthermore, it rarely arises in the kidney.

**(Choice E)** Polycystic kidney disease (PKD) is an autosomal dominant disorder that typically causes bilateral cystic renal enlargement and progressive renal failure. Although flank pain and hematuria are common complications of PKD, this patient's unintentional weight loss; unilateral, hard flank mass; and smoking history make RCC far more likely. In addition, a patient age >60 with PKD would likely have a more significant creatinine elevation

- Intermittent fever
- Paraneoplastic syndromes (eg, ectopic erythropoietin production, hypercalcemia)

Patients with suspected RCC usually require abdominal CT with and without contrast for further evaluation followed by staging imaging (eg, CT chest). Nephrectomy or partial nephrectomy provides a tissue diagnosis.

**(Choices A and B)** Although acute diverticulitis is common in older adults, it usually causes significant lower abdominal pain and (sometimes) a tender abdominal mass and leukocytosis. Acute appendicitis typically arises in younger (not older) adults and usually causes right lower quadrant abdominal pain, anorexia, vomiting, and leukocytosis. This patient with 6 weeks of symptoms, no abdominal pain, and no leukocytosis is unlikely to have acute diverticulitis or appendicitis.

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**(Choice D)** Non-Hodgkin lymphoma often causes B symptoms (eg, intermittent fever, night sweats, weight loss), but it usually (>70%) also causes painless peripheral lymphadenopathy and can cause hepatosplenomegaly. Furthermore, it rarely arises in the kidney.

**(Choice E)** Polycystic kidney disease (PKD) is an autosomal dominant disorder that typically causes bilateral cystic renal enlargement and progressive renal failure. Although flank pain and hematuria are common complications of PKD, this patient's unintentional weight loss; unilateral, hard flank mass; and smoking history make RCC far more likely. In addition, a patient age >60 with PKD would likely have a more significant creatinine elevation.

**Educational objective:**
Renal cell carcinoma is common in older patients who smoke. It often presents with weight loss, hematuria, firm/nontender flank mass, and/or intermittent fever.

| Surgery | Renal, Urinary Systems & Electrolytes | Renal cell carcinoma |
|---|---|---|
| Subject | System | Topic |

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The following vignette applies to the next **2** items. The items in this set must be answered in sequential order. Once you click **Proceed to Next Item**, you will not be able to add or change an answer.

A 45-year-old man is brought to the emergency department after a high-speed motor vehicle collision in which he was a restrained driver. Although the airbags deployed, the patient's leg smashed against the front console and he had to be extricated from the vehicle. The emergency medical team placed him in a rigid cervical collar and transported him to the hospital on a backboard. He received intravenous fluids en route. Blood pressure is 138/92 mm Hg, pulse is 105/min, and respirations are 14/min. The patient is alert and oriented but has significant leg pain. Bilateral breath sounds are equal with no chest tenderness. Heart sounds are normal. The abdomen is nondistended, soft, and nontender. There is no pelvic tenderness. The right lower leg is grossly deformed, with an exposed, broken tibia. Capillary refill is <2 seconds in both feet. Plain x-rays of the right leg show comminuted fractures of the tibia and fibula.

**Item 1 of 2**

Which additional imaging study is most appropriate to obtain at this time?

A. CT angiography of the lower extremities
B. CT scan of the abdomen and pelvis
C. CT scan of the cervical spine
D. CT scan of the chest
E. No additional imaging

Submit

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The following vignette applies to the next **2** items. The items in this set must be answered in sequential order. Once you click **Proceed to Next Item**, you will not be able to add or change an answer.

A 45-year-old man is brought to the emergency department after a high-speed motor vehicle collision in which he was a restrained driver. Although the airbags deployed, the patient's leg smashed against the front console and he had to be extricated from the vehicle. The emergency medical team placed him in a rigid cervical collar and transported him to the hospital on a backboard. He received intravenous fluids en route. Blood pressure is 138/92 mm Hg, pulse is 105/min, and respirations are 14/min. The patient is alert and oriented but has significant leg pain. Bilateral breath sounds are equal with no chest tenderness. Heart sounds are normal. The abdomen is nondistended, soft, and nontender. There is no pelvic tenderness. The right lower leg is grossly deformed, with an exposed, broken tibia. Capillary refill is <2 seconds in both feet. Plain x-rays of the right leg show comminuted fractures of the tibia and fibula.

**Item 1 of 2**

Which additional imaging study is most appropriate to obtain at this time?

- A. CT angiography of the lower extremities (23%)
- B. CT scan of the abdomen and pelvis (16%)
- ✓ C. CT scan of the cervical spine (39%)
- D. CT scan of the chest (3%)
- E. No additional imaging (16%)

Omitted
Correct answer
C

39%
Answered correctly

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Time Spent

04/02/2020
Last Updated

This patient's evaluation (as with any trauma patient) began with a primary survey, which showed an intact airway, normal breathing, and hemodynamic stability. Adjunct imaging that often follows the primary survey includes portable chest and pelvic x-rays, Focused Assessment with Sonography for Trauma (FAST), and **cervical spine imaging**.

Cervical spine imaging should be performed whenever there is a **high-energy mechanism** of injury (eg, high-speed motor vehicle collision, fall ≥3 m [10 ft], trauma causing concomitant closed-head injury). Even when a high-risk mechanism is not present, imaging may still be indicated according to clinical decision rules (eg, NEXUS [**N**ational **E**mergency **X**-Radiography **U**tilization **S**tudy] low-risk criteria). Any 1 of the following is an indication for cervical spine imaging:

- Neurologic deficit
- Spinal tenderness
- Altered mental status
- Intoxication
- **Distracting injury**

This patient has both a high-energy mechanism of injury (ie, high-speed motor vehicle collision) and a painful, distracting injury (open right tibia-fibula fracture). Therefore, he should undergo cervical spine imaging **(Choice E)**. **CT scan** of the cervical spine is the **preferred screening** test to evaluate for cervical spine injury because it is significantly more sensitive than plain radiography (eg, ~98% vs ~52% sensitivity). Imaging should be done prior to performing urgent surgical intervention (eg, irrigation, fixation) for the patient's open fracture because he may require orotracheal intubation and neck manipulation.

**(Choice A)** CT angiography of the lower extremities may be indicated if clinical signs of vascular injury (eg, diminished pulses) are present following trauma. Although tibia-fibula fractures may be associated with vascular injury in some patients, this patient has normal capillary refill (ie, <2 sec) in both feet. Complete pulse examination and measurement of the injured extremity index (analogous to the ankle-brachial index) would be better next steps than CT angiography.

**(Choices B and D)** Portable chest and pelvic x-rays and FAST are commonly performed as adjuncts to the primary survey. If evidence of injury is found in these screening studies, CT scans of the chest/abdomen/pelvis are typically performed afterward. Occasionally, CT may be the initial test when such significant injuries are found on physical examination that CT is already deemed necessary. However, examination of this patient's

- Altered mental status
- Intoxication
- **Distracting injury**

This patient has both a high-energy mechanism of injury (ie, high-speed motor vehicle collision) and a painful, distracting injury (open right tibia-fibula fracture). Therefore, he should undergo cervical spine imaging **(Choice E)**. **CT scan** of the cervical spine is the **preferred screening** test to evaluate for cervical spine injury because it is significantly more sensitive than plain radiography (eg, ~98% vs ~52% sensitivity). Imaging should be done prior to performing urgent surgical intervention (eg, irrigation, fixation) for the patient's open fracture because he may require orotracheal intubation and neck manipulation.

**(Choice A)** CT angiography of the lower extremities may be indicated if clinical signs of vascular injury (eg, diminished pulses) are present following trauma. Although tibia-fibula fractures may be associated with vascular injury in some patients, this patient has normal capillary refill (ie, <2 sec) in both feet. Complete pulse examination and measurement of the injured extremity index (analogous to the ankle-brachial index) would be better next steps than CT angiography.

**(Choices B and D)** Portable chest and pelvic x-rays and FAST are commonly performed as adjuncts to the primary survey. If evidence of injury is found in these screening studies, CT scans of the chest/abdomen/pelvis are typically performed afterward. Occasionally, CT may be the initial test when such significant injuries are found on physical examination that CT is already deemed necessary. However, examination of this patient's chest, abdomen, and pelvis are normal.

**Educational objective:**
CT scan is the preferred test to screen for cervical spine injury. Indications include high-energy mechanism of injury or any of the following findings: neurologic deficit, spinal tenderness, altered mental status, intoxication, or distracting injury.

**References**

- Emergency department evaluation and treatment of cervical spine injuries.
- Practice management guidelines for identification of cervical spine injuries following trauma: update from the Eastern Association for the Surgery of Trauma Practice Management Guidelines Committee.

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Question Id: 18659
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**Item 2 of 2**

CT scan of the cervical spine shows a minimally displaced fracture of the right C5 lamina, with slight subluxation of the right C5-C6 facet joint. On further examination, the patient has mild weakness of right wrist extension and loss of pinprick sensation in the right thumb. Which of the following additional studies should be obtained?

A. Barium esophagography
B. Carotid ultrasound
C. CT scan of the thoracic and lumbar spine
D. Nerve conduction study of the right upper extremity

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**Item 2 of 2**

CT scan of the cervical spine shows a minimally displaced fracture of the right C5 lamina, with slight subluxation of the right C5-C6 facet joint. On further examination, the patient has mild weakness of right wrist extension and loss of pinprick sensation in the right thumb. Which of the following additional studies should be obtained?

A. Barium esophagography (2%)
B. Carotid ultrasound (25%)
✓ C. CT scan of the thoracic and lumbar spine (39%)
D. Nerve conduction study of the right upper extremity (32%)

Omitted
Correct answer
C

39%
Answered correctly

06 mins, 17 secs
Time Spent

04/02/2020
Last Updated

Explanation

This patient's CT scan reveals a C5 right lamina fracture, a fracture that can occur with neck hyperextension (eg, head impacting an expanded airbag). If the fracture causes osteoligamentous injury to the adjacent facet (eg, right C5-C6 facet joint), unilateral facet joint subluxation may occur. The subluxation can compress the associated spinal nerve root and cause monoradiculopathy, as seen in this patient with signs of C6 radiculopathy (eg, weak wrist extension, thumb sensory loss).

The **presence** of a **single vertebral fracture** (especially cervical) in a patient with blunt trauma is an indication to **image** the **entire spine** because the risk of a second, noncontiguous vertebral fracture is as high as 20%. Other indications for imaging the thoracolumbar spine (TLS) include focal pain or signs of injury (eg, bruising, step-off), corresponding neurologic deficit, altered mental status or distracting injury, and high

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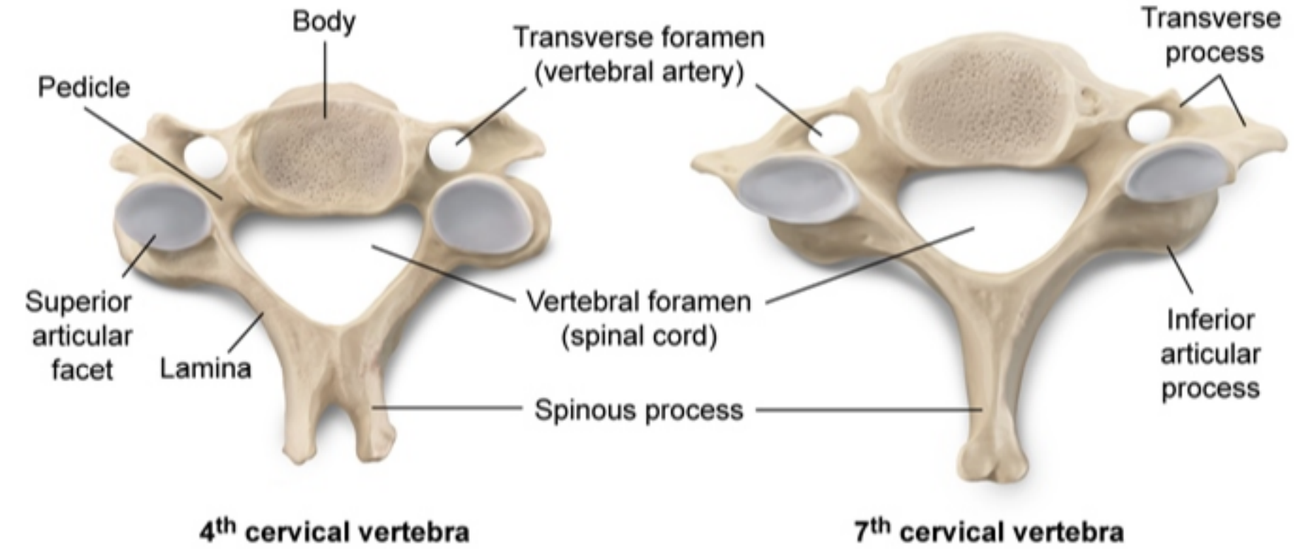
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Explanation

**Exhibit Display**

## Cervical vertebral anatomy




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References

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Explanation

This patient's CT scan reveals a C5 right lamina fracture, a fracture that can occur with neck hyperextension (eg, head impacting an expanded airbag). If the fracture causes osteoligamentous injury to the adjacent facet (eg, right C5-C6 facet joint), unilateral facet joint subluxation may occur. The subluxation can compress the associated spinal nerve root and cause monoradiculopathy, as seen in this patient with signs of C6 radiculopathy (eg, weak wrist extension, thumb sensory loss).

The **presence** of a **single vertebral fracture** (especially cervical) in a patient with blunt trauma is an indication to **image** the **entire spine** because the risk of a second, noncontiguous vertebral fracture is as high as 20%. Other indications for imaging the thoracolumbar spine (TLS) include focal pain or signs of injury (eg, bruising, step-off), corresponding neurologic deficit, altered mental status or distracting injury, and high-energy mechanism (eg, high-speed motor vehicle collision, fall ≥3 m [10 ft]). Because **CT scan** is more sensitive and accurate than plain radiography for diagnosing TLS injury, it is the screening modality of choice in patients with any of the above indications.

**(Choice A)** Because the esophagus lies anterior to the cervical spinal column, cervical spine injury can sometimes cause esophageal perforation (which barium esophagography can evaluate). However, this complication is very rare (<1%) compared to concomitant TLS fracture (~20%). Routine screening is not performed, but evaluation would be appropriate if the patient later develops dysphagia, odynophagia, and/or subcutaneous emphysema.

**(Choice B)** Cervical trauma can rarely injure the carotid arteries, causing dissection or occlusion (which might be seen on carotid ultrasound). However, symptoms related to dissection or occlusion (eg, hemiparesis, headache, Horner syndrome) would be expected. This patient's symptoms are most consistent with C6 radiculopathy.

**(Choice D)** A nerve conduction study is commonly performed to localize the site of peripheral nerve injury/compression (eg, carpal tunnel), usually in order to direct treatment (eg, carpal tunnel release). This patient's symptoms are more consistent with right C6 radiculopathy (ie, nerve root compression) than with peripheral neuropathy and are already explained by the right C5-C6 facet joint subluxation.

**Educational objective:**
The presence of a single vertebral fracture in a patient with blunt trauma is an indication to image the entire spine. CT scan is the screening modality of choice because of its sensitivity and accuracy.

**References**

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Item 38 of 40
Question Id: 15478

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A 12-year-old African American girl is brought to the clinic by her mother for evaluation of leg pain. The patient first noticed a dull ache in her left thigh a month ago. The pain is intermittent, worse after skipping rope with friends, and typically resolves after rest or ibuprofen. She does not recall any inciting injury to the leg. Prior to last month, the patient had never experienced any similar pain. Temperature is 37.5 C (99.5 F). BMI is at the 97th percentile for age. The abdomen is soft with no hepatosplenomegaly. A few soft, nontender, mobile, 1-cm inguinal lymph nodes are palpable bilaterally. Skin examination reveals a few small, healing abrasions over the bilateral anterior knees. The left hip demonstrates decreased range of motion with internal rotation. There is no increased warmth over the joint. The left foot points laterally during ambulation. Which of the following is the most likely underlying cause of this patient's symptoms?

A. Bacterial infection of the joint space
B. Expansion of malignant cells in bone marrow
C. Shearing at the proximal femoral physis
D. Transient intraarticular inflammation
E. Vasoocclusion from intravascular red cell sickling

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TUTOR

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- A. Bacterial infection of the joint space (3%)
- B. Expansion of malignant cells in bone marrow (7%)
- ✓ C. Shearing at the proximal femoral physis (61%)
- D. Transient intraarticular inflammation (8%)
- E. Vasoocclusion from intravascular red cell sickling (18%)

Omitted
Correct answer
C

61%
Answered correctly

02 secs
Time Spent

01/09/2020
Last Updated

Explanation

| Slipped capital femoral epiphysis | |
|---|---|

| Slipped capital femoral epiphysis | |
|---|---|
| **Risk factors** | • Obesity<br>• Adolescence |
| **Clinical presentation** | • Dull hip pain<br>• Referred knee pain<br>• Altered gait<br>• Limited internal rotation of hip |
| **Diagnosis** | • Posteriorly displaced femoral head on x-ray |
| **Treatment** | • Non–weight bearing<br>• Surgical pinning |
| **Complications** | • Avascular necrosis<br>• Osteoarthritis |

This obese (BMI >95th percentile) patient with dull thigh pain and decreased range of motion of the hip likely has **slipped capital femoral epiphysis** (SCFE). SCFE occurs when excessive **shearing at the proximal femoral physis** (growth plate) weakens the growth plate, causing anterosuperior displacement of the proximal femur diaphysis and giving the appearance of a posteriorly displaced femoral head. **Obese adolescents** are at highest risk due to increased mechanical strain on the hip.

Symptoms most commonly include **chronic** (>3 weeks), intermittent, **dull pain**/ache of the hip, thigh, or knee that is **exacerbated by activity**, as seen in this patient. The leg is typically externally rotated (foot pointed laterally), and gait may be altered due to pain. On examination, decreased range of motion (particularly internal rotation) and tenderness of the hip may be present. Abduction and external rotation of the thigh during passive flexion of the hip is characteristic. Diagnosis is confirmed by visualization of a posteriorly slipped femoral head on x-ray.

**(Choice A)** Septic arthritis, a bacterial joint infection, presents with acute fever, joint pain, inability to bear weight, and a swollen, warm joint. In contrast, this patient is afebrile with chronic symptoms and no joint swelling.

This obese (BMI >95th percentile) patient with dull thigh pain and decreased range of motion of the hip likely has **slipped capital femoral epiphysis** (SCFE). SCFE occurs when excessive **shearing at the proximal femoral physis** (growth plate) weakens the growth plate, causing anterosuperior displacement of the proximal femur diaphysis and giving the appearance of a posteriorly displaced femoral head. **Obese adolescents** are at highest risk due to increased mechanical strain on the hip.

Symptoms most commonly include **chronic** (>3 weeks), intermittent, **dull pain**/ache of the hip, thigh, or knee that is **exacerbated by activity**, as seen in this patient. The leg is typically externally rotated (foot pointed laterally), and gait may be altered due to pain. On examination, decreased range of motion (particularly internal rotation) and tenderness of the hip may be present. Abduction and external rotation of the thigh during passive flexion of the hip is characteristic. Diagnosis is confirmed by visualization of a posteriorly slipped femoral head on x-ray.

**(Choice A)** Septic arthritis, a bacterial joint infection, presents with acute fever, joint pain, inability to bear weight, and a swollen, warm joint. In contrast, this patient is afebrile with chronic symptoms and no joint swelling.

**(Choice B)** Expansion of malignant cells in the bone marrow is characteristic of leukemia, which can present with chronic bone pain. Systemic findings such as fever, weight loss, lymphadenopathy, and splenomegaly are typical. This patient is otherwise asymptomatic and has lymph nodes of normal size.

**(Choice D)** Transient synovitis is characterized by self-limiting, intraarticular inflammation and presents in children age 3-8 with acute hip pain and limp following a viral illness. This patient's age and chronic symptoms make SCFE more likely.

**(Choice E)** Vasoocclusive crisis due to red cell sickling causes bone pain in patients with sickle cell disease. Undiagnosed sickle cell disease is unlikely in this adolescent because pain crises typically present in early childhood.

**Educational objective:**
Slipped capital femoral epiphysis occurs when excessive shearing at the proximal femoral physis weakens the growth plate, causing displacement of the proximal femur diaphysis. Patients are classically obese adolescents with chronic, dull pain along the thigh or knee that worsens with activity.

**References**

- Slipped capital femoral epiphysis: prevalence, pathogenesis, and natural history.

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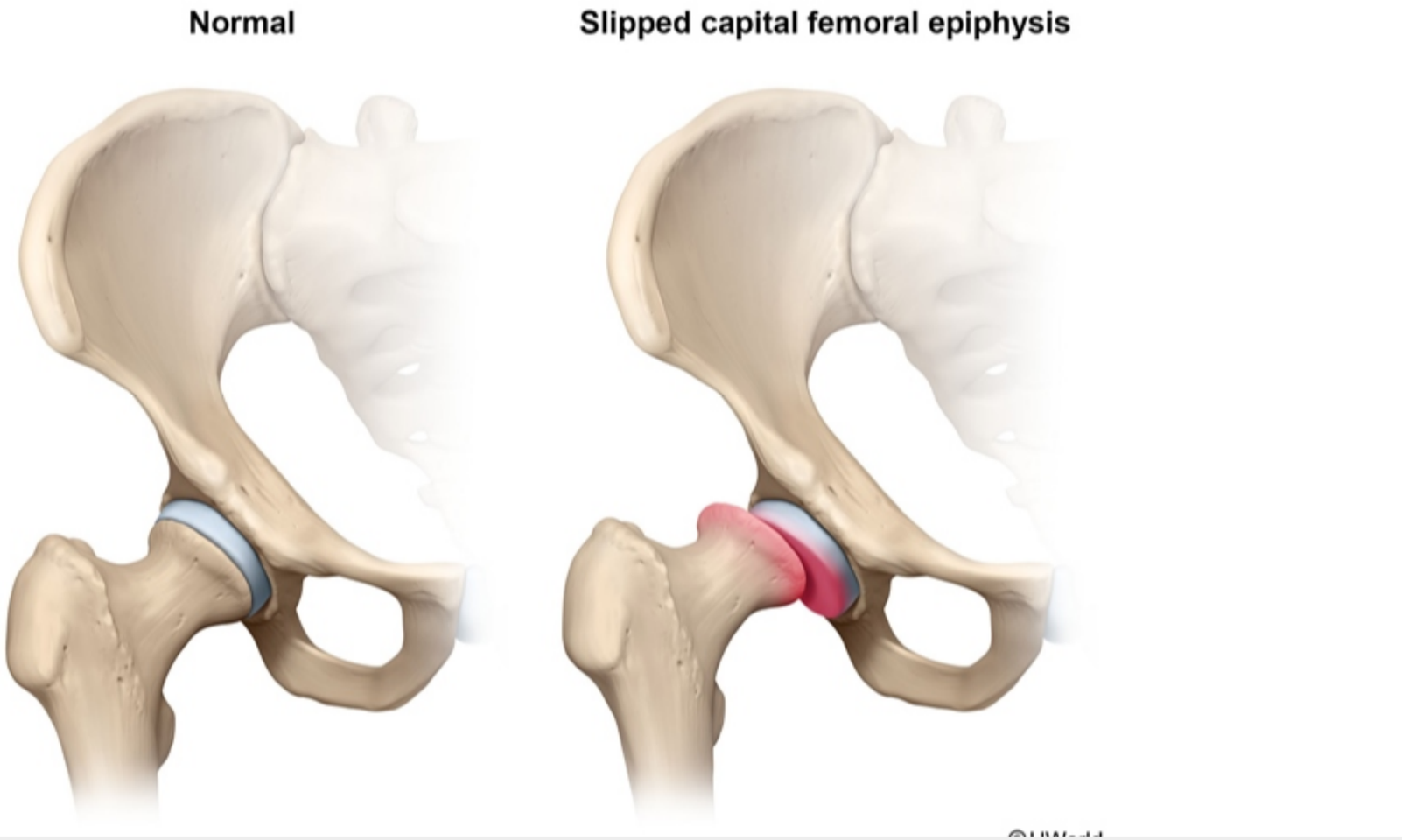
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Question Id: 15478

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epiphysis (SCFE). SCFE occurs when excessive shearing at the proximal femoral physis (growth plate) weakens the growth plate, causing

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Question Id: 15478

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Item 39 of 40
Question Id: 4565

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A 38-year-old man comes to the office with a 6-week history of progressive right hip pain. He localizes the pain to the right groin and says that it is present at rest and worse with weight bearing. The patient has no history of trauma and has not had similar symptoms before. Medical history is notable for sarcoidosis, which has required extended courses of oral glucocorticoids. His temperature is 37.2 C (98.9 F) and blood pressure is 156/86 mm Hg. On examination, the patient's face is round and there is fullness in the supraclavicular area. Forced abduction and internal rotation of the femur aggravate the pain. Muscle power is slightly decreased in the proximal thigh muscles in both legs. Reflexes are 2+ throughout, and there are no sensory deficits. Plain films of the right hip show no significant abnormalities. Which of the following is the most likely cause of this patient's hip pain?

A. Bacterial infection of the joint
B. Degeneration of articular cartilage
C. Disruption of bone vasculature
D. Inflammation of the trochanteric bursa
E. Monosodium urate synovitis

Submit

TUTOR

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- A. Bacterial infection of the joint (1%)
- B. Degeneration of articular cartilage (19%)
- ✓ C. Disruption of bone vasculature (71%)
- D. Inflammation of the trochanteric bursa (6%)
- E. Monosodium urate synovitis (1%)

Omitted
Correct answer
C

71%
Answered correctly

02 secs
Time Spent

04/02/2020
Last Updated

Explanation

| Avascular necrosis | |
|---|---|

| Avascular necrosis | |
|---|---|
| **Etiology** | • Steroid use<br>• Alcohol abuse<br>• Systemic lupus erythematosus<br>• Antiphospholipid syndrome<br>• Hemoglobinopathies (eg, sickle cell)<br>• Infections (eg, osteomyelitis, HIV)<br>• Renal transplantation<br>• Decompression sickness |
| **Clinical manifestations** | • Groin pain on weight bearing<br>• Pain on hip abduction & internal rotation<br>• No erythema, swelling, or point tenderness |
| **Laboratory findings** | • Normal white blood cell count<br>• Normal ESR & CRP |
| **Radiologic imaging** | • Crescent sign seen in advanced stage<br>• MRI is most sensitive modality |

CRP = C-reactive protein; ESR = erythrocyte sedimentation rate.

This patient with progressive hip pain in the setting of chronic glucocorticoid use (dorsocervical fat pad, moon facies, glucocorticoid myopathy) has typical features of **osteonecrosis** (avascular necrosis) of the femoral head. Osteonecrosis occurs in disorders that disrupt the circulation of bone through micro-occlusion, abnormal endothelial function, or increased intraosseous pressure. It is a common complication of **long-term glucocorticoid use**, possibly due to effects on osteocytes or abnormal plasma lipid levels causing microemboli. Osteonecrosis causes **bone and bone marrow infarction**. Abnormal bone remodeling subsequently results in trabecular thinning and collapse over months to years.

Osteonecrosis of the femoral head is characterized by **pain in the groin**, thigh, or buttock that is worsened by activity and relieved by rest

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Osteonecrosis of the femoral head is characterized by **pain in the groin**, thigh, or buttock that is worsened by activity and relieved by rest. Progression of the disease can lead to **reduced range of motion** (usually abduction and internal rotation), rest pain, and joint instability. In the first few months, x-rays are often normal, and **MRI** is a more sensitive test.

**(Choice A)** Septic arthritis can occur in the hip from hematogenous seeding or direct extension of a regional infection (eg, diverticulitis). Most patients have systemic symptoms (eg, fever) and an acute course over days.

**(Choice B)** Osteoarthritis is characterized by degeneration of the articular cartilage, leading to pain with movement. Advanced disease can cause pain at rest but would likely be associated with x-ray findings. Osteoarthritis of the hip is uncommon in patients age <40 unless there is antecedent trauma or a systemic disorder that causes premature joint degeneration (eg, hemochromatosis).

**(Choice D)** Trochanteric bursitis is caused by friction of the tendons of the gluteus medius and tensor fascia lata over the greater trochanter. Pain is localized to the lateral hip and is worsened by direct pressure.

**(Choice E)** Gout is an inflammatory arthritis caused by deposition of monosodium urate crystals. It affects the metatarsophalangeal joints and knees much more often than the hips, usually causes recurrent attacks, and would be relieved by glucocorticoid use.

**Educational objective:**
Osteonecrosis (avascular necrosis) of the femoral head is a common complication of glucocorticoid use. It is characterized by progressive hip pain, leading to reduced range of motion and joint instability. X-rays will often be normal, and MRI is a more sensitive test.

**References**

- High-dose corticosteroid use and risk of hip osteonecrosis: meta-analysis and systematic literature review.

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**References**

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| Surgery | Rheumatology/Orthopedics & Sports | Osteonecrosis |
|---|---|---|
| Subject | System | Topic |

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A 68-year-old man with no previous history of renal disease is evaluated in the postoperative unit due to decreased urine output. The patient was admitted due to severe abdominal pain, fever, and vomiting. Evaluation revealed perforated sigmoid diverticulitis, and the patient underwent urgent sigmoid resection. Postoperatively, he has received maintenance intravenous fluids and piperacillin/tazobactam. In the day since surgery, the patient has had 200 mL of urine output. Temperature is 37.1 C (98.8 F), blood pressure is 100/70 mm Hg, and pulse is 96/min. The lungs are clear to auscultation, and heart sounds are normal. The abdomen shows postoperative changes with sluggish bowel sounds. The patient has no skin rash. Laboratory results are as follows:

| | |
|---|---|
| Hemoglobin | 10.5 g/dL |
| Leukocytes | 13,000/mm$^3$ |
| Sodium | 138 mg/dL |
| Potassium | 5.1 mg/dL |
| Glucose | 108 mg/dL |
| Creatinine | 1.9 mg/dL |
| Blood urea nitrogen | 82 mg/dL |

Urinalysis reveals no sediment, and bladder scanning reveals no urine. Which of the following is the best next step in management of this patient?

A. Bolus of isotonic saline
B. Discontinuation of antibiotics
C. Dopamine infusion
D. Intravenous furosemide
E. Intravenous mannitol

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Submit

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| Blood urea nitrogen | 82 mg/dL |

Urinalysis reveals no sediment, and bladder scanning reveals no urine. Which of the following is the best next step in management of this patient?

- ✓ A. Bolus of isotonic saline (70%)
- B. Discontinuation of antibiotics (4%)
- C. Dopamine infusion (2%)
- D. Intravenous furosemide (5%)
- E. Intravenous mannitol (1%)
- F. Intravenous urography (14%)

Omitted
Correct answer

70%
Answered correctly

05 secs
Time Spent

06/04/2020
Last Updated

| Prerenal acute kidney injury | |
|---|---|
| **Etiology** | • Decreased renal perfusion<br>  ◦ True volume depletion<br>  ◦ Decreased EABV (eg, heart failure, cirrhosis)<br>  ◦ Displacement of intravascular fluid (eg, sepsis, pancreatitis)<br>  ◦ Renal artery stenosis<br>  ◦ Afferent arteriole vasoconstriction (eg, NSAIDs) |
| **Clinical features** | • Increase in serum creatinine (eg, 50% from baseline)<br>• Decreased urine output<br>• Blood urea nitrogen/creatinine ratio >20:1<br>• Fractional excretion of sodium <1%<br>• Unremarkable ("bland") urine sediment |
| **Treatment** | • Restoration of renal perfusion |

**EABV** = effective arterial blood volume; **NSAIDs** = nonsteroidal anti-inflammatory drugs.

This patient with elevated serum creatinine and no underlying renal disease likely has **prerenal acute kidney injury (AKI)** due to **intravascular volume depletion**. Preoperative infection and intraoperative blood loss predispose patients to volume depletion, and volume depletion is further suggested by tachycardia. There is no intrinsic damage to the kidneys in prerenal AKI, but decreased renal perfusion leads to a decreased glomerular filtration rate and increased serum creatinine. The kidneys increase tubular sodium and water resorption, resulting in markedly increased passive resorption of urea. Therefore, a **blood urea nitrogen/creatinine ratio >20:1** (43:1 in this patient) is highly suggestive of a prerenal state. **Oliguria** (<500 mL of urine/24 hours) is often present, as is **unremarkable urine sediment** (absence of casts, cells, or protein).

Although heart failure can lead to prerenal AKI in the setting of hypervolemia (due to decreased effective arterial blood volume), most prerenal AKI is due to a volume-depleted state. In the absence of clear signs of volume overload (eg, elevated jugular venous pressure, lung crackles), patients with suspected prerenal AKI should be treated with **intravenous isotonic fluid** (eg, normal saline) to restore renal perfusion.

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**(Choice B)** Beta-lactam antibiotics (eg, piperacillin/tazobactam) are a common cause of intrinsic AKI due to acute interstitial nephritis (AIN). AIN necessitates discontinuation of the offending drug; however, no leukocytes on urinalysis and absence of skin rash make AIN unlikely.

**(Choice C)** Low-dose dopamine acts primarily as a dopamine-1 receptor agonist, resulting in renal arteriole dilation and increased renal blood flow. However, fluid bolus is the best treatment in this patient with evidence of hypovolemia.

**(Choices D and E)** Loop diuretics (eg, furosemide) or osmotic diuretics (eg, mannitol) would worsen this patient's volume depletion and possibly lead to intrinsic renal injury (eg, acute tubular necrosis) due to a further decrease in renal perfusion.

**(Choice F)** Intravenous urography visualizes radiopaque contrast filling the urinary tract and is useful in diagnosing ureteral injury. Iatrogenic ureteral injury can occur following abdominal surgery; however, unilateral injury does not result in AKI, and bilateral injury (a potential cause of postrenal AKI) is extremely unlikely.

**Educational objective:**
Intravascular volume depletion is a common cause of prerenal acute kidney injury (AKI). Patients typically have an elevated blood urea nitrogen/creatinine ratio (>20:1), oliguria, and unremarkable urine sediment. Administration of intravenous fluid restores renal perfusion and corrects the AKI.

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Intravascular volume depletion is a common cause of prerenal acute kidney injury (AKI). Patients typically have an elevated blood urea nitrogen/creatinine ratio (>20:1), oliguria, and unremarkable urine sediment. Administration of intravenous fluid restores renal perfusion and corrects the AKI.

**References**

- Clinical scenarios in acute kidney injury: pre-renal acute kidney injury.

| Surgery | Renal, Urinary Systems & Electrolytes | Prerenal azotemia |
|---|---|---|
| Subject | System | Topic |

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