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Item 1 of 40
Question Id: 17513

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A 62-year-old woman comes to the emergency department due to a 2-day history of right knee pain and swelling. In the past, the patient has occasionally had knee pain brought on by physical activity, but the current episode is more severe and persistent. She has had difficulty bending the knee or bearing weight; NSAIDs have provided minimal relief. The patient's other medical conditions include hypertension, type 2 diabetes mellitus, chronic kidney disease, and diabetic foot ulcers. Temperature is 38.4 C (101.1 F), blood pressure is 142/84 mm Hg, and pulse is 104/min. On physical examination, the right knee is swollen, warm, and erythematous with limited active and passive range of motion. The left knee appears normal, but there is mild crepitus on movement. X-rays of the right knee reveal subcutaneous edema, joint effusion, and degenerative changes. Right knee arthrocentesis yields 5 mL of cloudy fluid with a leukocyte count of 55,000/mm^3, of which 95% are polymorphonuclear cells. No bacteria or crystals are visualized. Cultures of the synovial fluid are sent, and empiric antibiotics are begun. Which of the following additional interventions are most appropriate in management of this patient?

A. Antinuclear antibody studies
B. Cast immobilization of the knee
C. MRI of the right knee
D. Serial aspiration of the knee
E. Oral prednisone therapy
F. Total right knee arthroplasty

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Item 1 of 40
Question Id: 17513
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A. Antinuclear antibody studies (6%)
B. Cast immobilization of the knee (1%)
C. MRI of the right knee (28%)
✓ D. Serial aspiration of the knee (46%)
E. Oral prednisone therapy (12%)
F. Total right knee arthroplasty (4%)

Omitted
Correct answer
D

46%
Answered correctly

05 secs
Time Spent

06/12/2020
Last Updated

Explanation

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Septic arthritis	
Risk factors	• Abnormal joint (eg, rheumatoid arthritis, prosthetic joint) • Age >80 • Diabetes • Intravenous drug abuse, alcoholism
Clinical features	• Acute monarthritis: hot, swollen, decreased ROM • Fever • Elevated ESR & CRP
Diagnosis	• Blood cultures • **Synovial fluid analysis:** leukocytosis (>50,000/mm^3), Gram stain, culture
Initial treatment	• **Joint drainage:** needle aspiration (eg, knee, ankle, wrist), arthroscopy (eg, hip, shoulder), or open arthrotomy • **Intravenous antibiotics**

CRP = C-reactive protein; **ESR** = erythrocyte sedimentation rate; **ROM** = range of motion.

This patient's presentation of acute knee pain, fever, and synovitis (eg, erythema, warmth, swelling) is concerning for **septic arthritis**. This diagnosis is further supported by joint aspiration yielding cloudy synovial fluid with >50,000/mm^3 leukocytes.

Initial treatment of septic arthritis includes **intravenous antibiotics** and, as with other purulent infections in closed spaces (eg, abscess), adequate **drainage of purulent material**. For easily accessed joints (like the knee in this patient), **needle aspiration** may be performed. However, for deep joints (eg, hip) or when needle aspiration does not facilitate adequate drainage, **arthroscopic irrigation** or **open surgical drainage** may be needed. Regardless of drainage technique, serial procedures (eg, daily needle aspirations) are often required to completely clear the infection.

(Choice A) Systemic lupus erythematosus (with a positive antinuclear antibody assay) can cause synovitis of the knee, but it is usually

This patient's presentation of acute knee pain, fever, and synovitis (eg, erythema, warmth, swelling) is concerning for **septic arthritis**. This diagnosis is further supported by joint aspiration yielding cloudy synovial fluid with >50,000/mm^3 leukocytes.

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(Choice A) Systemic lupus erythematosus (with a positive antinuclear antibody assay) can cause synovitis of the knee, but it is usually polyarticular and symmetric; the synovial fluid leukocyte count is relatively low, often in the noninflammatory range (eg, <2,000/mm^3). Even though this patient's Gram stain is negative, the severe synovial leukocytosis and single joint involvement are more consistent with septic arthritis.

(Choice B) For the first few days of treatment, splinting the infected joint to reduce motion may facilitate relief of pain. However, placement of a cast can limit clinical access to the joint and is not advised.

(Choice C) MRI or CT scan can often be helpful for assessing effusions involving deep (eg, hip) or atypical joints in septic arthritis. However, for the knee, plain film x-ray is typically adequate.

(Choice E) Systemic glucocorticoids (eg, prednisone) are sometimes used as an adjunctive measure for reducing joint damage in pediatric septic arthritis. However, they are not well studied in adults and are relatively contraindicated in this patient with comorbid diabetes.

(Choice F) Arthroplasty is sometimes needed in chronic management (after resolution of infection) for patients with severe joint injury and impaired mobility. However, arthroplasty would not be considered for this patient with an active infection.

Educational objective:
Initial treatment of septic arthritis includes intravenous antibiotics and adequate drainage of purulent material via needle aspiration, arthroscopic irrigation, or open surgical drainage. Serial procedures are often required to completely clear the infection.

References

- Septic arthritis of native joints.

drainage may be needed. Regardless of drainage technique, serial procedures (eg, daily needle aspirations) are often required to completely clear the infection.

(Choice A) Systemic lupus erythematosus (with a positive antinuclear antibody assay) can cause synovitis of the knee, but it is usually polyarticular and symmetric; the synovial fluid leukocyte count is relatively low, often in the noninflammatory range (eg, <2,000/mm^3). Even though this patient's Gram stain is negative, the severe synovial leukocytosis and single joint involvement are more consistent with septic arthritis.

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Initial treatment of septic arthritis includes intravenous antibiotics and adequate drainage of purulent material via needle aspiration, arthroscopic irrigation, or open surgical drainage. Serial procedures are often required to completely clear the infection.

References

- Septic arthritis of native joints.

Surgery	Rheumatology/Orthopedics & Sports	Septic arthritis
Subject	System	Topic

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A 48-year-old man comes to the emergency department due to fever and malaise for the past 2 days. He also complains of fatigue and lethargy but not nausea, vomiting, diarrhea, or dysuria. Medical history is significant for alcoholic cirrhosis, which was treated with an orthotopic liver transplant 10 weeks ago. Current medications include tacrolimus, mycophenolate mofetil, and low-dose prednisone. Temperature is 38.1 C (100.6 F), blood pressure is 125/82, pulse is 80/min, and respirations are 12/min. The patient is awake and oriented to person, place, and time. Scleral icterus is present. Cardiopulmonary examination is unremarkable. There is a well-healed surgical scar on the abdomen but no tenderness or distension. Laboratory results are as follows:

Complete blood count	
Hemoglobin	12.9 g/dL
Leukocytes	6,000/mm^3
Platelets	345,000/mm^3
Liver function studies	
Total bilirubin	3.2 mg/dL
Alkaline phosphatase	378 U/L
Aspartate aminotransferase (SGOT)	345 U/L
Alanine aminotransferase (SGPT)	473 U/L

A liver biopsy shows inflammatory infiltration of the portal tracts consisting of lymphocytes, eosinophils, and neutrophils. Interlobular bile duct destruction and prominent endotheliitis are both present. Which of the following is the best next step in management?

A. Administer high-dose corticosteroids

B. Discontinue mycophenolate

Hemoglobin	12.9 g/dL
Leukocytes	6,000/mm^3
Platelets	345,000/mm^3

Liver function studies

Total bilirubin	3.2 mg/dL
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A. Administer high-dose corticosteroids
B. Discontinue mycophenolate
C. Initiate ursodeoxycholic acid therapy
D. Reduce the tacrolimus dose
E. Start metronidazole therapy

Submit

Hemoglobin	12.9 g/dL
Leukocytes	6,000/mm^3
Platelets	345,000/mm^3
Liver function studies	
Total bilirubin	3.2 mg/dL
Alkaline phosphatase	378 U/L
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Alanine aminotransferase (SGPT)	473 U/L

A liver biopsy shows inflammatory infiltration of the portal tracts consisting of lymphocytes, eosinophils, and neutrophils. Interlobular bile duct destruction and prominent endotheliitis are both present. Which of the following is the best next step in management?

- A. Administer high-dose corticosteroids (80%)
- B. Discontinue mycophenolate (5%)
- C. Initiate ursodeoxycholic acid therapy (5%)
- D. Reduce the tacrolimus dose (5%)
- E. Start metronidazole therapy (3%)

Omitted
Correct answer

80%
Answered correctly

05 secs
Time Spent

03/18/2020
Last Updated

This patient with a recent liver transplant who now has fevers, malaise, and liver function test (LFT) elevations exhibits histologic findings concerning for **acute cellular rejection** (ACR).

ACR usually occurs **within the first 3 months** after transplant and results from the patient's own immune system targeting the liver allograft. Although some patients have **fevers**, malaise, and lethargy, many are completely asymptomatic. Therefore, in patients with a recent liver transplant, ACR is often suspected based upon the development of **LFT abnormalities** (eg, elevations in aminotransferases, bilirubin, and alkaline phosphatase). Definitive diagnosis is made by **liver biopsy**, which classically reveals:

- mixed **inflammatory infiltration** of the portal tracts involving eosinophils, neutrophils, and lymphocytes
- interlobular bile duct destruction (often referred to as nonsuppurative cholangitis)
- **endotheliitis** (ie, lymphocytic subendothelial invasion of the portal and hepatic veins), which is the most reliable sign of ACR.

The mainstay of therapy for ACR is **increased immunosuppression**, which typically reverses the rejection. Most patients are treated successfully with **high-dose corticosteroids**. In steroid-refractory cases, thymoglobulin, sirolimus, and other immunosuppressants can be used. Very rarely, if a patient fails to respond to any immunosuppressant, a repeat transplant is required.

(Choice B) The immunosuppressant mycophenolate is most commonly associated with cytopenias and gastrointestinal (eg, pain, vomiting, diarrhea) side effects. It is generally discontinued in patients with active infection due to the risk of neutropenia. This patient's findings do not suggest side effects of mycophenolate (eg, no cytopenia, no gastrointestinal symptoms), and his biopsy results are consistent with ACR.

(Choice C) Ursodeoxycholic acid is used in the treatment of primary biliary cholangitis (PBC). The classic histologic finding in PBC is a florid duct lesion, defined as inflammation limited to the bile duct. Endotheliitis and mixed-inflammatory infiltration of the portal tract are not expected in PBC.

(Choice D) Calcineurin inhibitors (eg, tacrolimus) are associated with acute renal injury, but significant hepatic injury is rare. Dose reduction is not indicated and would likely worsen the ACR in this patient.

(Choice E) Metronidazole is commonly used to treat intraabdominal abscesses or other infections that can occur in the posttransplant period. Such an infection would present with fever and, potentially, transaminase elevations; however, leukocytosis is expected and the infection would not explain this patient's histologic findings.

Educational objective:

Acute cellular rejection typically occurs within the first 3 months after liver transplant and can present with fevers, malaise, and a rise in

Very rarely, if a patient fails to respond to any immunosuppressant, a repeat transplant is required.

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Educational objective:
Acute cellular rejection typically occurs within the first 3 months after liver transplant and can present with fevers, malaise, and a rise in aminotransferases, bilirubin, and alkaline phosphatase. Liver biopsy is diagnostic, demonstrating mixed inflammatory infiltration of the portal tracts, interlobular bile duct destruction, and endotheliitis. Most patients can be treated successfully with high-dose corticosteroids.

References

- Acute allograft rejection in liver transplant recipients: incidence, risk factors, treatment success, and impact on graft failure.
- Acute and chronic rejection after liver transplantation: what a clinician needs to know.

Surgery	Gastrointestinal & Nutrition	Transplant rejection
Subject	System	Topic

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Item 3 of 40
Question Id: 16000

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A 36-year-old man comes to the office after experiencing intermittent episodes of rectal bleeding over the past 2 months. Initially, he noted only small streaks of blood on the tissue when wiping, but yesterday he dripped bright red blood after defecating and the stool was coated with blood. He has had no anal or abdominal pain, nausea, vomiting, anorexia, or weight loss. The patient has been having bowel movements every 2 or 3 days, which is unchanged from his previous routine. He has no other medical concerns and takes no medications. The patient's father was diagnosed with colon cancer at age 54. Blood pressure is 130/70 mm Hg, and pulse is 80/min with no orthostatic changes. Physical examination shows a soft and nontender abdomen with no masses or organomegaly. Inspection of the perianal skin shows no abnormalities. No mass or tenderness is palpable on digital rectal examination. Anoscopy reveals purplish mucosal bulges. Which of the following is the best next step in management of this patient?

A. Biopsy of the anal lesions
B. High-fiber diet and follow-up
C. Referral for colonoscopy
D. Referral for surgical evaluation
E. Topical nifedipine therapy

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Item 3 of 40
Question Id: 16000

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- A. Biopsy of the anal lesions (2%)
- ✓ B. High-fiber diet and follow-up (57%)
- C. Referral for colonoscopy (12%)
- D. Referral for surgical evaluation (14%)
- E. Topical nifedipine therapy (13%)

Omitted
Correct answer
B

57%
Answered correctly

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03/13/2020
Last Updated

Explanation

Initial management of hemorrhoids

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Initial management of hemorrhoids	
Dietary factors	• Increased fluid intake • Increased fiber intake (foods, fiber supplements) • Reduced fat intake • Moderation of alcohol intake
Behavioral factors	• Limit time sitting on toilet (eg, 3 minutes) • Limit defecation to once daily • Avoid straining during defecation
Topical agents	• Analgesics (eg, benzocaine) • Astringents (eg, witch hazel) • Hydrocortisone

This patient has **painless, bright red rectal bleeding** and mucosal bulges on anoscopy consistent with internal hemorrhoids. **Hemorrhoids** are the most common cause of low-volume rectal bleeding, especially in patients who do not have red-flag features (eg, passage of dark blood or blood mixed with stool, fever, abdominal pain, change in bowel habits) to suggest more serious causes. The diagnosis is usually obvious based on clinical findings. Anoscopy is useful for those whose hemorrhoids are not palpable on examination, but further diagnostic testing is not usually required for young, otherwise healthy patients with typical symptoms, such as this patient.

Initial management of uncomplicated hemorrhoids includes **increased intake** of **fluid and fiber** (eg, psyllium husk), reduction in fat and alcohol intake, and regular exercise. Additional measures may include phlebotonics (eg, calcium dobesilate), topical hydrocortisone, astringents (eg, witch hazel), and local anesthetics (eg, benzocaine, lidocaine). More aggressive management, including rubber band ligation and surgical hemorrhoidectomy, is generally advised only for patients with refractory symptoms or prolapsed hemorrhoids that cannot be reduced manually (ie, grade IV hemorrhoids) **(Choice D)**.

(Choice A) Biopsy is warranted for pedunculated or sessile colorectal polyps, which typically present as pink, red, or flesh-colored papules or

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(Choice A) Biopsy is warranted for pedunculated or sessile colorectal polyps, which typically present as pink, red, or flesh-colored papules or masses. The purplish bulges in this patient are typical for hemorrhoids, and biopsy would lead only to unnecessary bleeding.

(Choice C) Colonoscopy is recommended for patients who have profuse rectal bleeding or who are at high risk for colorectal cancer. High risk features include prior adenomatous colon polyps, age ≥50 (unless the patient has had a negative colonoscopy within the last 2-3 years), age 40-49 with a first-degree relative with colorectal cancer at age <60, or a familial colon cancer syndrome (eg, Lynch syndrome). Younger patients, such as this patient, with low-volume bleeding (eg, blood on the surface of the stool, drips in the toilet) and a benign explanation (eg, hemorrhoids) may be monitored without colonoscopy.

(Choice E) Topical nifedipine is used to reduce anal sphincter pressure in patients with anal fissures. Fissures can cause bright red rectal bleeding, but are typically associated with severe pain and would not present as a purplish mucosal bulge.

Educational objective:
Initial management of uncomplicated hemorrhoids includes increased intake of fluid and fiber, reduction of fat and alcohol intake, and regular exercise. Additional measures may include phlebotonics, topical hydrocortisone, astringents, and local anesthetics. Rubber band ligation and surgical hemorrhoidectomy are advised only for patients with refractory symptoms or prolapsed hemorrhoids that cannot be reduced manually.

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Educational objective:
Initial management of uncomplicated hemorrhoids includes increased intake of fluid and fiber, reduction of fat and alcohol intake, and regular exercise. Additional measures may include phlebotonics, topical hydrocortisone, astringents, and local anesthetics. Rubber band ligation and surgical hemorrhoidectomy are advised only for patients with refractory symptoms or prolapsed hemorrhoids that cannot be reduced manually.

References

- Adequate dietary fiber supplement and TONE can help avoid surgery in most patients with advanced hemorrhoids.

Surgery	Gastrointestinal & Nutrition	Hemorrhoids
Subject	System	Topic

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Question Id: 4545

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A 67-year-old male comes to the clinic for medical clearance prior to an elective abdominal aortic aneurysm repair. He denies any cough, shortness of breath or chest pain. He has coronary artery disease, diabetes and hypertension. He does not use tobacco, alcohol or drugs. His blood pressure is 120/76 mm Hg, pulse is 60/min, and respirations are 14/min. Examination shows no abnormalities, except prominent epigastric pulsations. Which of the following interventions would be most helpful in preventing postoperative pneumonia in this patient?

A. Albuterol inhalers
B. Prophylactic antibiotics
C. Incentive spirometry
D. Continuous positive airway pressure
E. Intercostal nerve blocks for pain control

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A. Albuterol inhalers (0%)
B. Prophylactic antibiotics (8%)
✓ C. Incentive spirometry (83%)
D. Continuous positive airway pressure (2%)
E. Intercostal nerve blocks for pain control (4%)

Omitted
Correct answer
C

83%
Answered correctly

01 sec
Time Spent

03/07/2020
Last Updated

Explanation

This patient has numerous risk factors for postoperative pneumonia. His age, poor health, and scheduled long invasive surgery put him at increased risk. Postoperative measures used to decrease the risk of pneumonia are aimed at encouraging lung expansion. These include incentive spirometry, deep breathing exercises, continuous positive airway pressure, and intermittent positive pressure breathing. Of these, incentive spirometry has been shown to be the most effective, and is thus the first line preventive measure.

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(Choice A) Albuterol inhalers are used preoperatively in patients with COPD or asthma, exhibiting dyspnea or wheezing. This treatment is unnecessary for a patient without preexisting pulmonary disease.

(Choice B) Prophylactic antibiotics prior to surgery are only used in patients with evidence of preexisting respiratory infection. The use of antibiotics in patients without respiratory infection has not been shown to improve outcomes, and may increase the risk of developing antibiotic-resistant pneumonia.

(Choice D) Continuous positive airway pressure (CPAP), like incentive spirometry, promotes lung expansion postoperatively. However, it is more costly and has a higher rate of complications than incentive spirometry. For these reasons, CPAP is used only in patients who develop pulmonary complications in spite of incentive spirometry.

(Choice E) By controlling pain and encouraging early ambulation, intercostal nerve blocks have shown some efficacy in preventing postoperative pulmonary complications. The findings have been most pronounced in patients under age 50, and with subcostal incisions.

Educational objective:
Postoperative pulmonary complications are common, particularly in patients with known risk factors. These risk factors include smoking, preexisting pulmonary disease, age >50, thoracic or abdominal surgery, surgery lasting >3 hours, and poor general health. Postoperative measures such as incentive spirometry and deep breathing exercises are used to prevent such complications and improve outcomes by promoting lung expansion.

Surgery	Pulmonary & Critical Care	Prevention Of Postoperative Pneumonia
Subject	System	Topic

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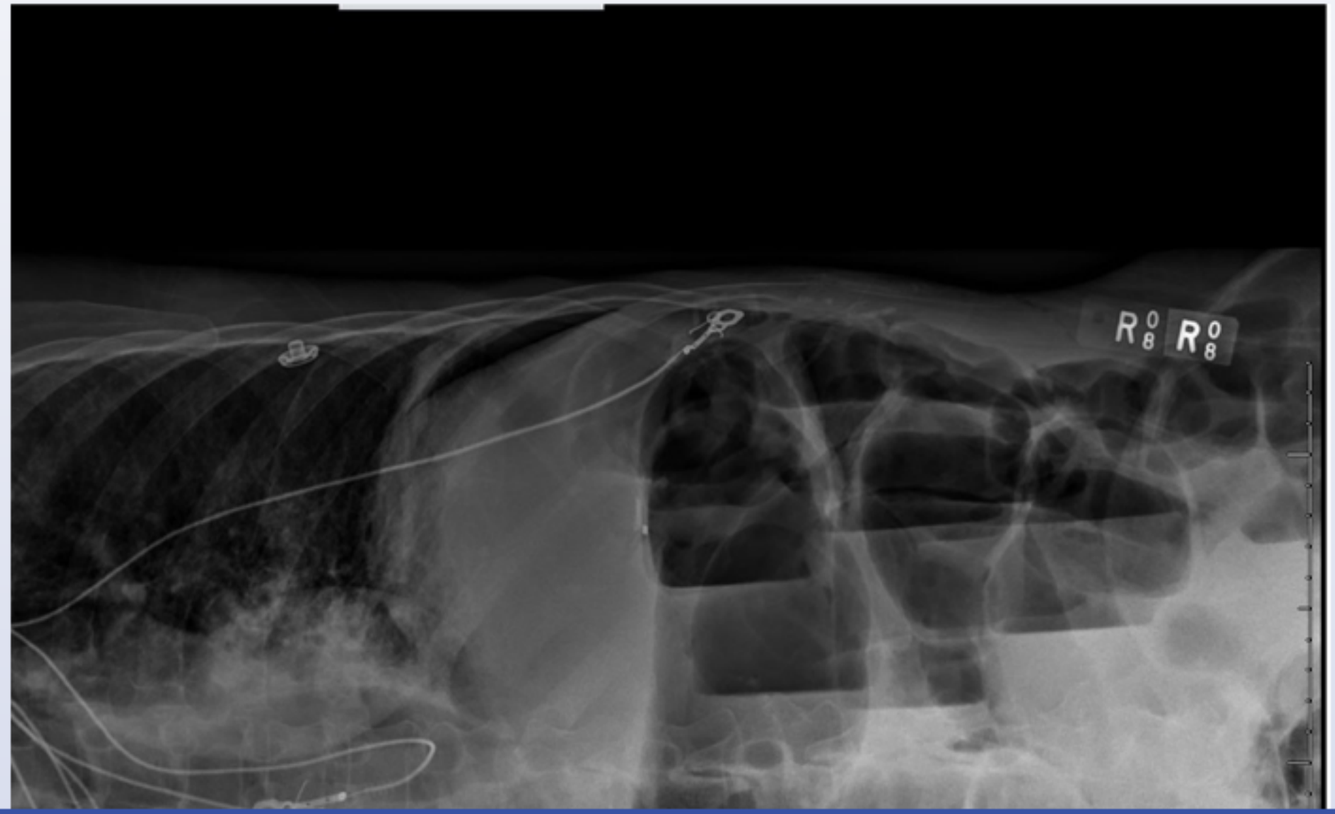
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Item 5 of 40
Question Id: 16572

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A 78-year-old man is brought to the emergency department after he was found obtunded and moaning in bed at his nursing care facility. For 2 days prior, he refused to eat most of his food. Medical history is significant for early Alzheimer disease, hypertension, hyperlipidemia, bilateral knee replacement, and right hemicolectomy for stage I colon cancer. The patient has a 50-pack-year smoking history but no longer smokes or drinks alcohol. Temperature is 38.7 C (101.7 F), blood pressure is 102/54 mm Hg, pulse is 114/min, and respirations are 22/min. The patient is holding his abdomen and groaning. He opens his eyes to a loud voice but does not follow commands. The abdomen is distended, tympanitic to percussion, and rigid to palpation. Stool guaiac test is negative. The patient cannot tolerate sitting upright. Lateral decubitus x-ray of the abdomen is shown below.



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Question Id: 16572

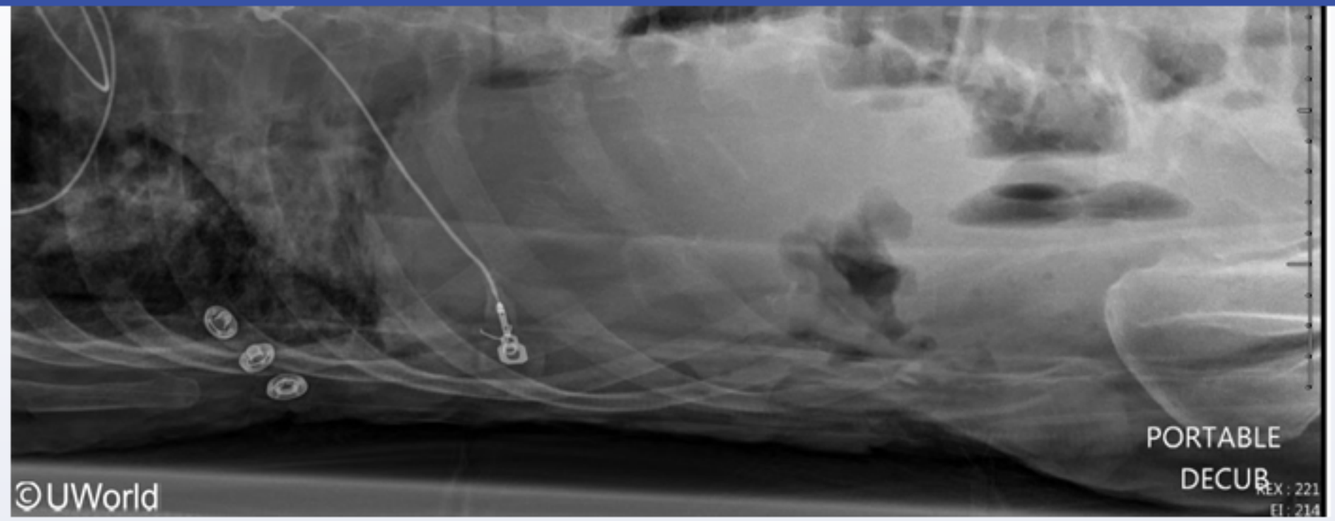
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Which of the following is the best next step in management of this patient?

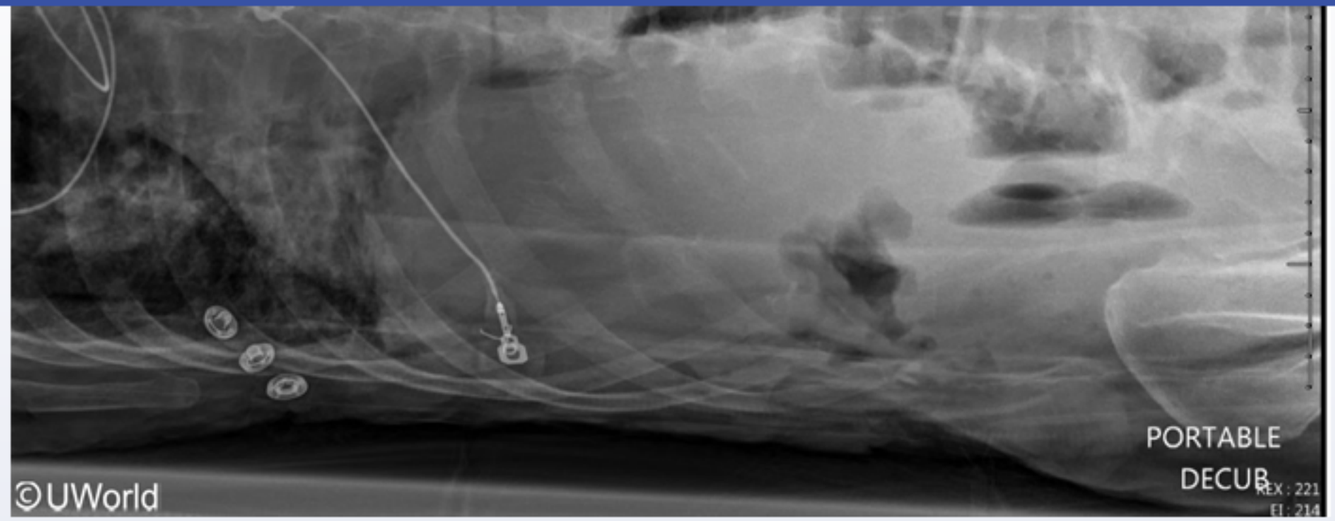
A. Barium enema
B. Contrast angiography
C. CT scan of the abdomen with IV contrast
D. Nasogastric tube and serial abdominal examinations
E. Surgical exploration
F. Upper gastrointestinal series

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Item 5 of 40
Question Id: 16572

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

- A. Barium enema (2%)
- B. Contrast angiography (1%)
- C. CT scan of the abdomen with IV contrast (3%)
- D. Nasogastric tube and serial abdominal examinations (18%)
- ✓ E. Surgical exploration (73%)
- F. Upper gastrointestinal series (0%)

Omitted
Correct answer

73%
Answered correctly

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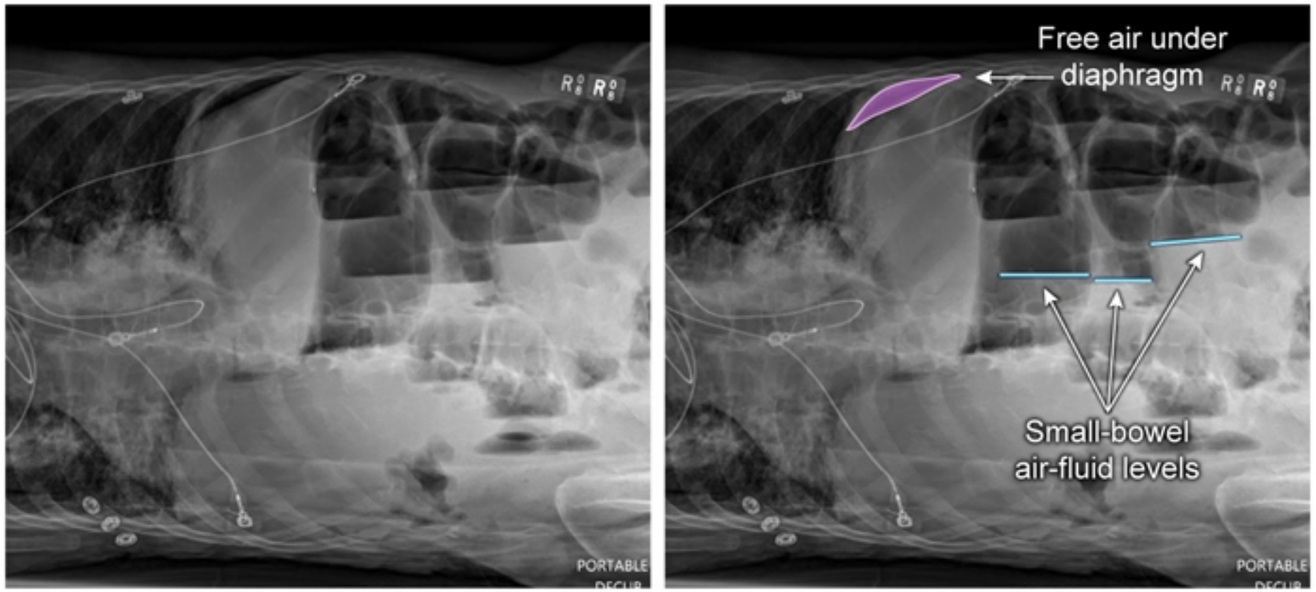
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Complicated small-bowel obstruction with perforation



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This patient with abdominal pain, fever, and peritonitis (eg, abdominal rigidity) has subdiaphragmatic free air on lateral decubitus x-ray, indicating **perforated viscus**. Given his history of hemicolectomy, the most likely cause of perforation is postoperative adhesions leading to bowel obstruction (eg, anorexia, x-ray findings of dilated small-bowel loops with air-fluid levels) complicated by increased intraluminal pressure.

Clinical suspicion of gastrointestinal perforation can be confirmed by demonstration of intraperitoneal **free air** (ie, pneumoperitoneum) on imaging. Plain radiographs often confirm the diagnosis (sensitivity ~50%-70%). Upright radiographs of the chest and abdomen are usually performed, but supine and lateral decubitus x-rays can be obtained for patients, such as this one, who cannot tolerate being upright. Free air on x-ray and clinical signs of **peritonitis** should prompt **emergent surgical exploration** to prevent deterioration and possible death.

In patients in whom perforation is suspected and plain radiographs are negative (unlike this patient), CT scan of the abdomen with IV contrast can help detect smaller amounts of free air or free fluid. In this patient with peritonitis and an x-ray confirming perforation, operative intervention



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This patient with abdominal pain, fever, and peritonitis (eg, abdominal rigidity) has subdiaphragmatic free air on lateral decubitus x-ray, indicating **perforated viscus**. Given his history of hemicolectomy, the most likely cause of perforation is postoperative adhesions leading to bowel obstruction (eg, anorexia, x-ray findings of dilated small-bowel loops with air-fluid levels) complicated by increased intraluminal pressure.

Clinical suspicion of gastrointestinal perforation can be confirmed by demonstration of intraperitoneal **free air** (ie, pneumoperitoneum) on imaging. Plain radiographs often confirm the diagnosis (sensitivity ~50%-70%). Upright radiographs of the chest and abdomen are usually performed, but supine and lateral decubitus x-rays can be obtained for patients, such as this one, who cannot tolerate being upright. Free air on x-ray and clinical signs of **peritonitis** should prompt **emergent surgical exploration** to prevent deterioration and possible death.

In patients in whom perforation is suspected and plain radiographs are negative (unlike this patient), CT scan of the abdomen with IV contrast can help detect smaller amounts of free air or free fluid. In this patient with peritonitis and an x-ray confirming perforation, operative intervention should be immediately initiated (if operating availability is delayed, it would be reasonable to perform a CT scan to try to visualize the site of perforation) **(Choice C)**.

(Choices A and F) Barium enema and upper gastrointestinal series use contrast to outline the lumen of the gastrointestinal tract for diagnosis of functional or structural abnormalities (eg, obstructing mass). However, barium contrast is contraindicated if perforation is suspected because it incites a severe inflammatory response if leaked into the peritoneal cavity. In addition, emergent surgical exploration should not be delayed for further imaging because of the patient's peritonitis and radiographic confirmation of perforation.

(Choice B) This patient has risk factors (eg, hyperlipidemia, 50-pack-year smoking history) for chronic mesenteric ischemia (which can be evaluated by contrast angiography), but this type of ischemia typically causes recurrent episodes of postprandial pain, which are not seen in this patient. Pneumoperitoneum is not expected except in severe cases with bowel necrosis, in which case surgical intervention is the correct next step.

(Choice D) Nasogastric tube placement may be helpful for decompressing the patient's small-bowel obstruction. However, operative intervention, rather than observation with serial abdominal examinations, is indicated due to this patient's peritonitis and radiographic evidence of perforation.

Educational objective:

Small-bowel obstruction can be complicated by bowel perforation. Free air on x-ray and clinical signs of peritonitis should prompt emergent

perforation) **(Choice C)**.

(Choices A and F) Barium enema and upper gastrointestinal series use contrast to outline the lumen of the gastrointestinal tract for diagnosis of functional or structural abnormalities (eg, obstructing mass). However, barium contrast is contraindicated if perforation is suspected because it incites a severe inflammatory response if leaked into the peritoneal cavity. In addition, emergent surgical exploration should not be delayed for further imaging because of the patient's peritonitis and radiographic confirmation of perforation.

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(Choice D) Nasogastric tube placement may be helpful for decompressing the patient's small-bowel obstruction. However, operative intervention, rather than observation with serial abdominal examinations, is indicated due to this patient's peritonitis and radiographic evidence of perforation.

Educational objective:
Small-bowel obstruction can be complicated by bowel perforation. Free air on x-ray and clinical signs of peritonitis should prompt emergent surgical exploration.

References

- Pneumoperitoneum.
- Small bowel and colon perforation.
- Small bowel obstruction.

Surgery	Gastrointestinal & Nutrition	Perforated viscus
Subject	System	Topic

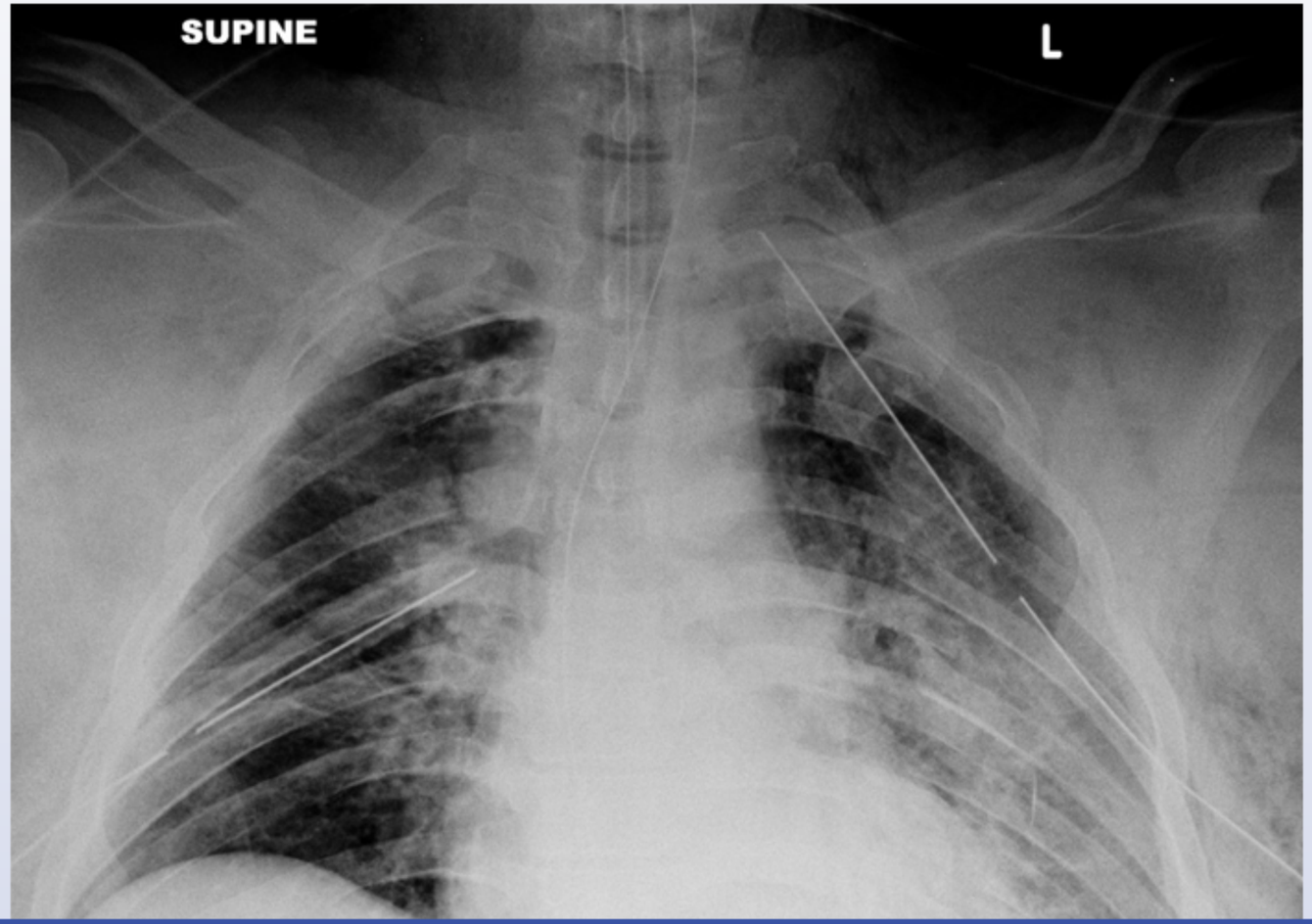
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Question Id: 4559
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A 22-year-old man is brought to the emergency department after a high-speed motor vehicle collision. Blood pressure is 102/60 mm Hg, pulse is 122/min, and respirations are 40/min. Pulse oximetry is 88% on 6 L oxygen. The patient is alert but appears to be in respiratory distress. Breath sounds are diminished bilaterally, and bilateral chest tubes are placed. The patient's respiratory status initially improves; however, over the next hour, he develops respiratory failure, requiring intubation and mechanical ventilation. Postintubation chest x-ray is shown below.



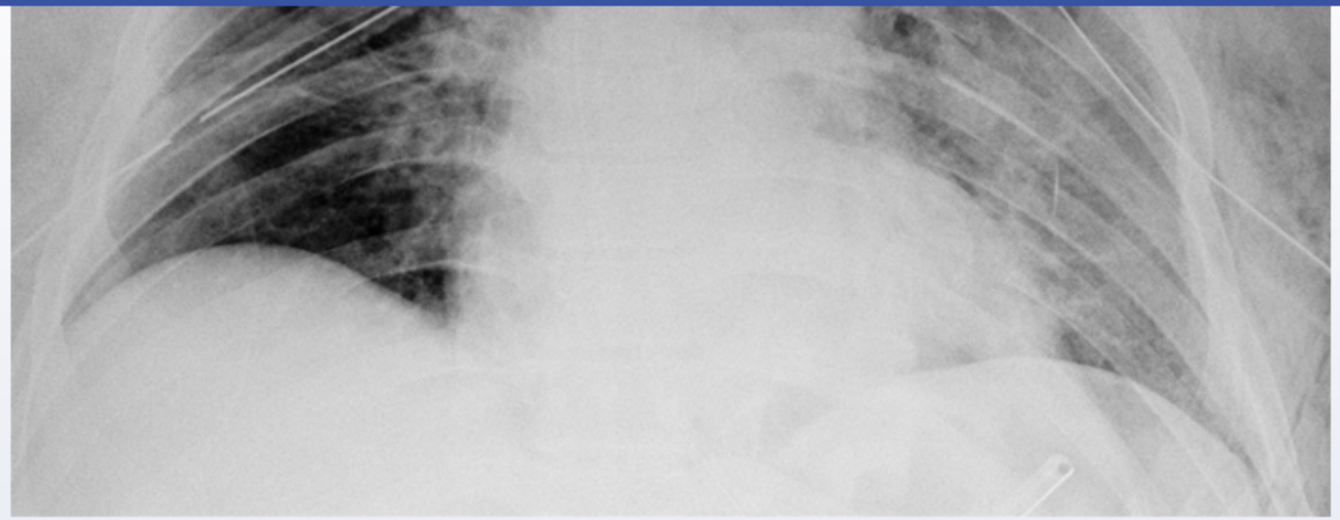
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Which of the following is the most likely cause of this patient's need for mechanical ventilation?

A. Acute respiratory distress syndrome
B. Blunt cardiac injury
C. Diaphragmatic rupture
D. Fat embolism
E. Flail chest
F. Tension pneumothorax

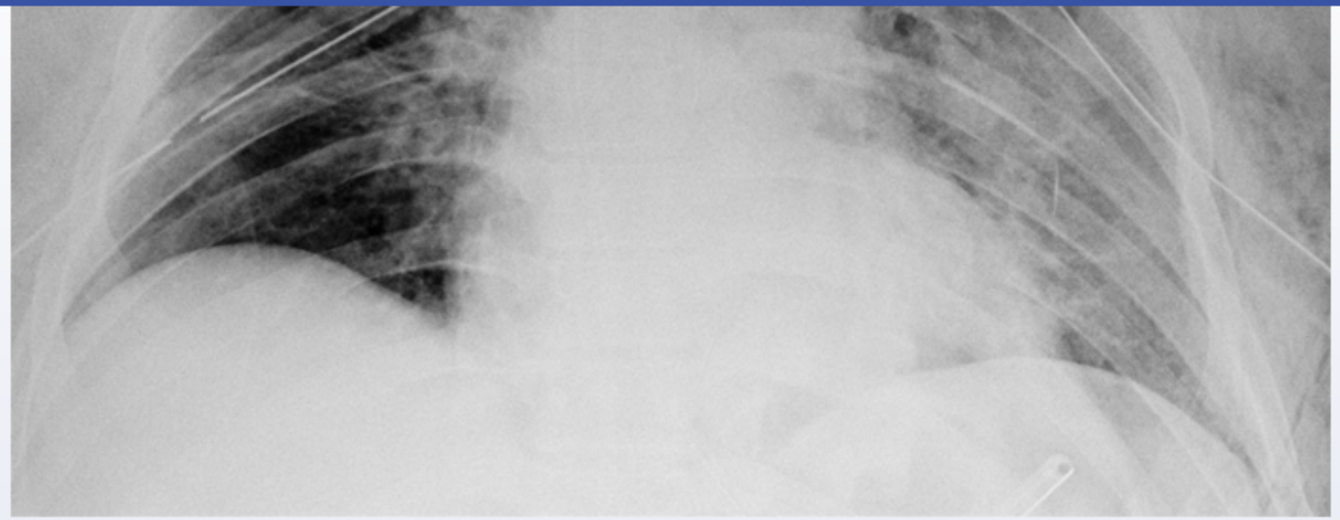
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Which of the following is the most likely cause of this patient's need for mechanical ventilation?

A. Acute respiratory distress syndrome (23%)
B. Blunt cardiac injury (5%)
C. Diaphragmatic rupture (2%)
D. Fat embolism (0%)
✓ E. Flail chest (63%)
F. Tension pneumothorax (4%)

Omitted
Correct answer

63%
Answered correctly

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Time Spent

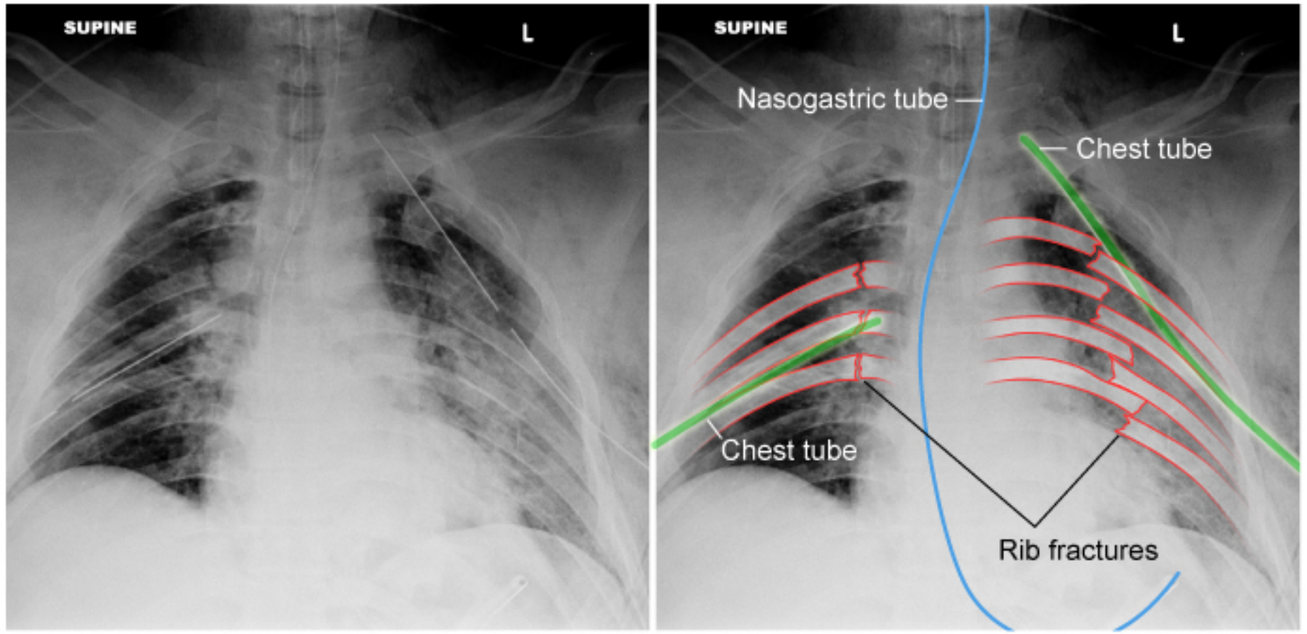
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Flail chest



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This patient with respiratory distress and multiple rib fractures on chest x-ray likely has **flail chest**. Flail chest occurs when **fracture of ≥3 adjacent ribs in ≥2 locations** (multiple x-ray views are usually required to see both locations) creates an isolated chest wall segment that **moves paradoxically** to the remaining rib cage during respiration. The paradoxical motion impairs generation of negative intrathoracic pressure during inspiration. As a result, tidal volume decreases and work of breathing increases.

In addition, the extreme blunt force required to create flail chest typically injures the underlying lung. The resulting **pulmonary contusion** (eg, seen on x-ray as infiltrates underlying this patient's rib fractures) decreases oxygen diffusion (due to alveolar hemorrhage and edema). As a result, patients must breathe harder to maintain oxygenation. The combination of **increased work of breathing** and decreased oxygenation causes many patients, such as this one, to fatigue and develop **respiratory failure**, requiring mechanical ventilation.

This patient with respiratory distress and multiple rib fractures on chest x-ray likely has **flail chest**. Flail chest occurs when **fracture of ≥3 adjacent ribs in ≥2 locations** (multiple x-ray views are usually required to see both locations) creates an isolated chest wall segment that **moves paradoxically** to the remaining rib cage during respiration. The paradoxical motion impairs generation of negative intrathoracic pressure during inspiration. As a result, tidal volume decreases and work of breathing increases.

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(Choice A) This patient is at risk for acute respiratory distress syndrome (ARDS) from both trauma and pulmonary contusion. However, ARDS typically takes 6-72 hours (or longer) to evolve after the inciting event (while the inflammatory response builds) and causes more diffuse bilateral infiltrates on x-ray.

(Choice B) Blunt cardiac injury can cause myocardial dysfunction leading to cardiogenic pulmonary edema and hypoxia. However, concomitant hypotension (from acute pump failure) is expected in addition to more symmetric bilateral alveolar infiltrates.

(Choice C) Diaphragmatic rupture can alter respiratory mechanics and cause respiratory distress; however, it typically causes loss of diaphragmatic contour and/or visualization of abdominal organs within the thoracic cavity (eg, intrathoracic nasogastric tube).

(Choice D) Fat embolism can cause hypoxemia but typically occurs after long bone or pelvic fracture and does not manifest until 24-72 hours after the inciting event.

(Choice F) Although this patient likely had bilateral pneumothoraces upon arrival, bilateral tube thoracostomy initially improved his respiratory status. Recurrent (especially tension) pneumothorax is unlikely given functioning chest tubes and would be seen on x-ray as an area without lung markings bordered by a visceral pleural line.

Educational objective:
Flail chest should be suspected in patients with respiratory distress and multiple rib fractures. Flail chest increases work of breathing and may injure the underlying lung, often leading to respiratory failure.

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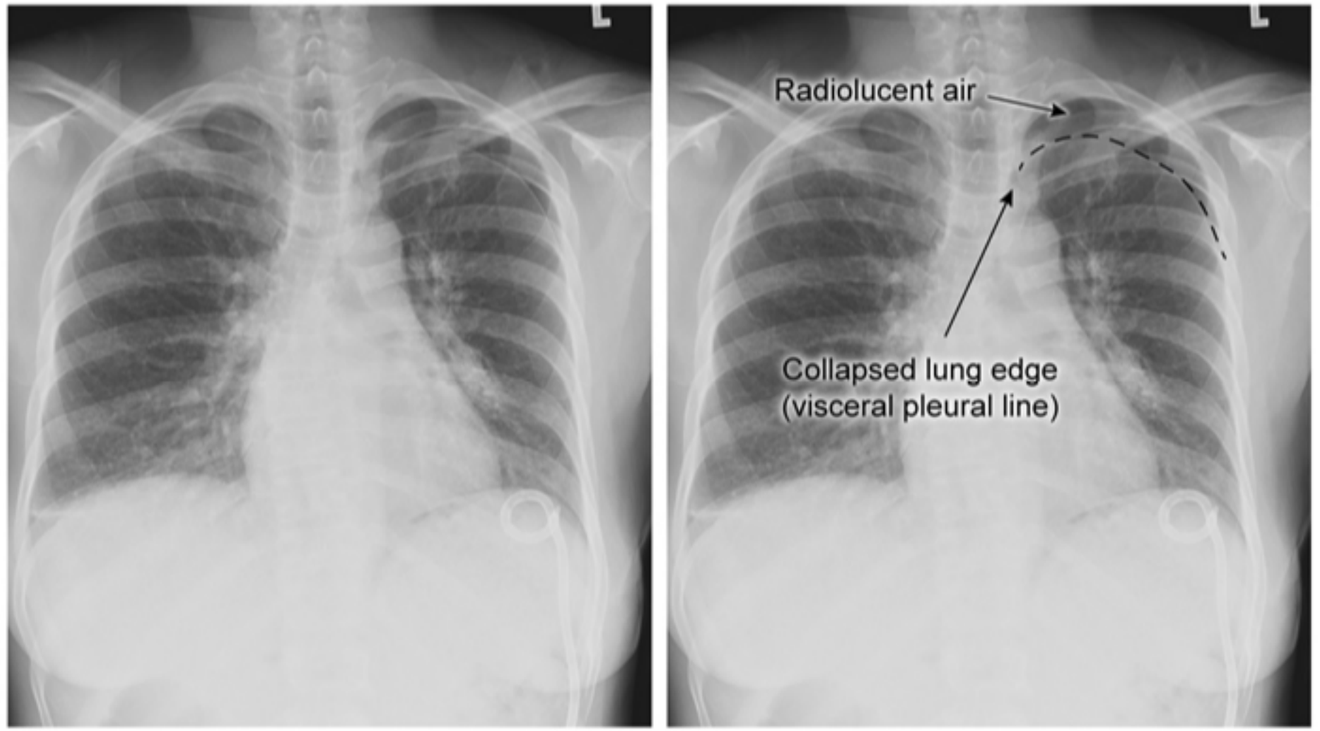
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Question Id: 4559

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Exhibit Display

Left pneumothorax



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(Choice A) This patient is at risk for acute respiratory distress syndrome (ARDS) from both trauma and pulmonary contusion. However, ARDS typically takes 6-72 hours (or longer) to evolve after the inciting event (while the inflammatory response builds) and causes more diffuse bilateral infiltrates on x-ray.

(Choice B) Blunt cardiac injury can cause myocardial dysfunction leading to cardiogenic pulmonary edema and hypoxia. However, concomitant hypotension (from acute pump failure) is expected in addition to more symmetric bilateral alveolar infiltrates.

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Educational objective:
Flail chest should be suspected in patients with respiratory distress and multiple rib fractures. Flail chest increases work of breathing and may injure the underlying lung, often leading to respiratory failure.

References

- Chest wall trauma.
- Disorders of the chest wall: clinical manifestations.

Surgery	Pulmonary & Critical Care	Blunt thoracic trauma
Subject	System	Topic

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Item 7 of 40
Question Id: 4188

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A 65-year-old man comes to the office due to a several month history of difficulty swallowing and frequent coughing during meals. His wife reports that his breath odor has changed and his voice sounds "gurgly." The patient occasionally regurgitates food or medications taken earlier in the day. Medical history is significant for hypertension, gastroesophageal reflux disease, and osteoarthritis of the right knee. Medications include hydrochlorothiazide, ranitidine, and, occasionally, naproxen as needed. Which of the following mechanisms leads to the development of this patient's condition?

A. Abnormal cellular proliferation
B. Acid reflux
C. Inflammation
D. Metabolic abnormalities
E. Motor dysfunction

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A 65-year-old man comes to the office due to a several month history of difficulty swallowing and frequent coughing during meals. His wife reports that his breath odor has changed and his voice sounds "gurgly." The patient occasionally regurgitates food or medications taken earlier in the day. Medical history is significant for hypertension, gastroesophageal reflux disease, and osteoarthritis of the right knee. Medications include hydrochlorothiazide, ranitidine, and, occasionally, naproxen as needed. Which of the following mechanisms leads to the development of this patient's condition?

A. Abnormal cellular proliferation (14%)
B. Acid reflux (13%)
C. Inflammation (6%)
D. Metabolic abnormalities (0%)
✓ E. Motor dysfunction (65%)

Omitted
Correct answer
E

65%
Answered correctly

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Last Updated

Explanation

Zenker diverticulum

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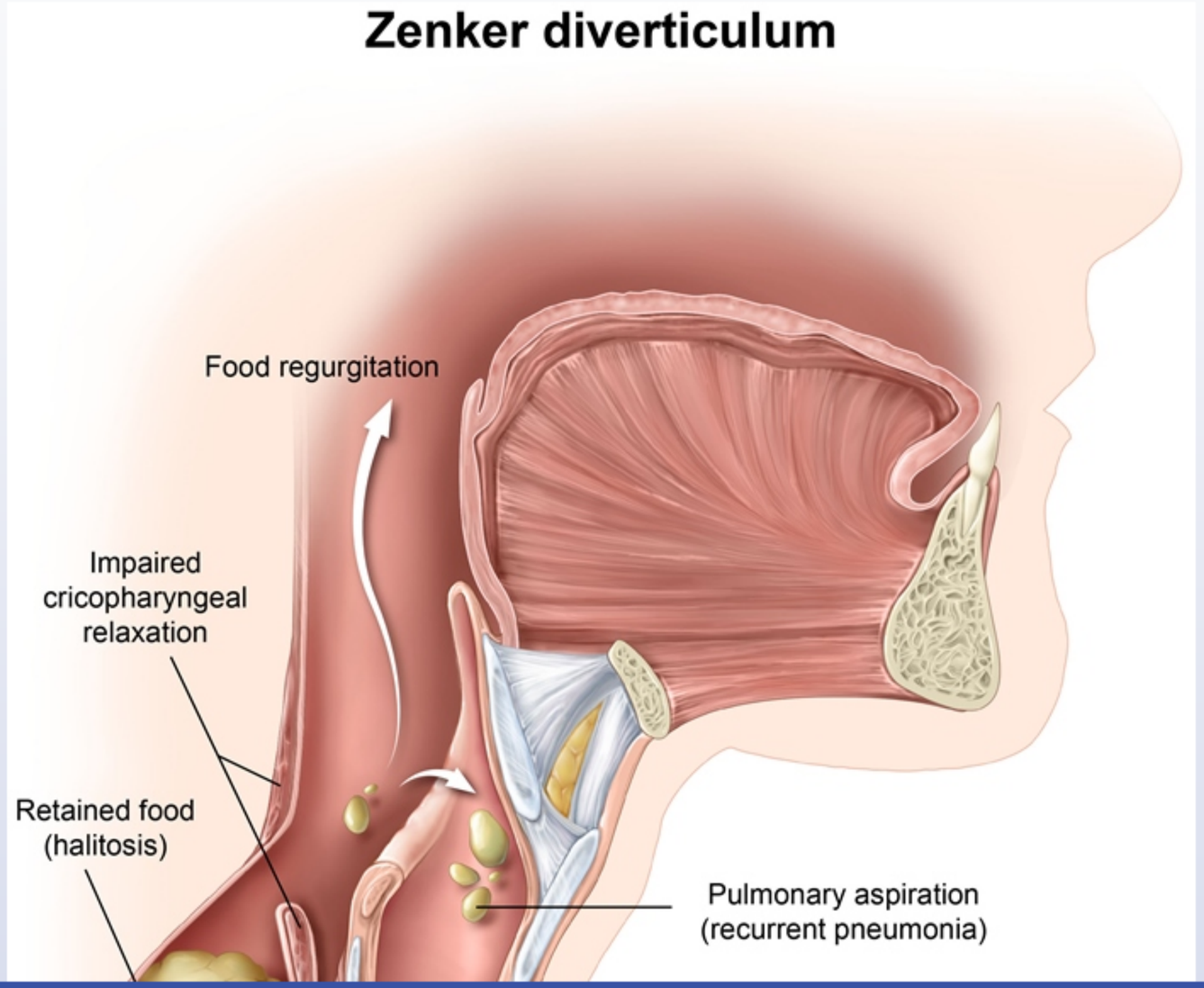
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Explanation

Zenker diverticulum



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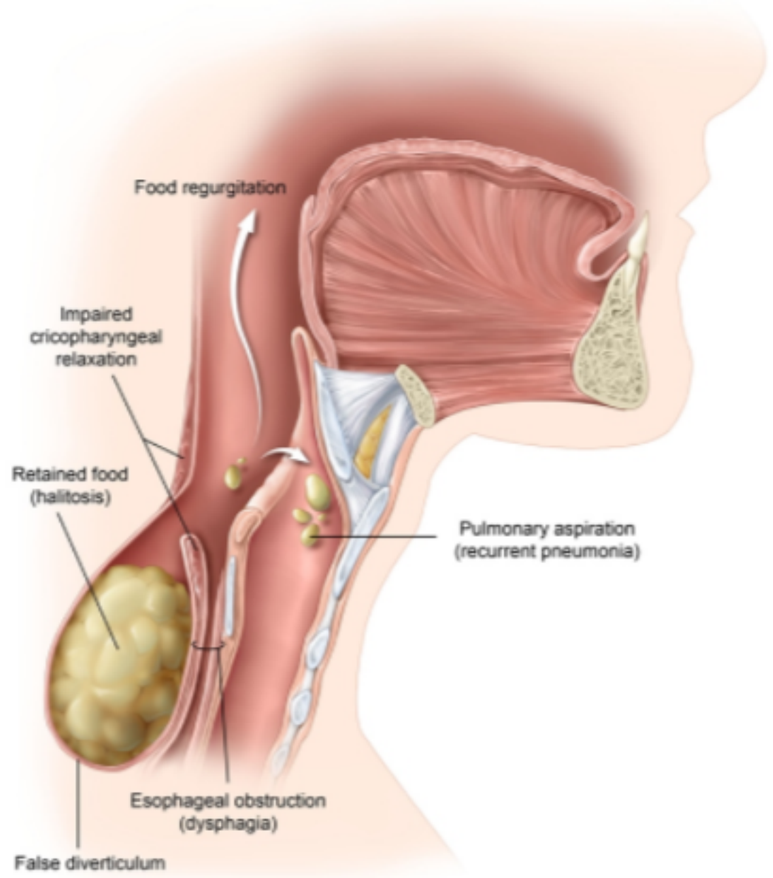
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Exhibit Display

Zenker diverticulum



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Esophageal obstruction

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This patient with dysphagia, halitosis, and a history of regurgitating undigested food likely has a **Zenker (pharyngoesophageal) diverticulum**. Patients are typically age >60 and have an insidious onset of progressive dysphagia. Retained food trapped in the pouch causes halitosis and sometimes a "gurgling" sound. This food is often regurgitated later and appears **undigested** because it has not been exposed to gastric enzymes. Aspiration of the **regurgitated food** may lead to **recurrent aspiration pneumonia**.

Abnormal spasm or diminished relaxation of the cricopharyngeal muscles during swallowing **(cricopharyngeal motor dysfunction)** is the underlying mechanism of the formation of a Zenker diverticulum. Increased intraluminal pressure above the cricopharyngeus muscle eventually causes herniation of the mucosa, resulting in a pulsion (ie, pushing) pseudodiverticulum. This occurs through a zone of muscle weakness between **inferior pharyngeal constrictor** fibers and the cricopharyngeus muscle.

Diagnosis is confirmed with a contrast swallow study. Treatment is surgical. The cricopharyngeus muscle is divided **(cricopharyngeal myotomy)**, and the diverticulum may be removed (ie, diverticulectomy) or combined with the esophageal lumen (ie, diverticulotomy).

(Choice A) Abnormal cellular proliferation is the underlying pathophysiologic defect in neoplasia. Esophageal cancer may cause dysphagia, but not typically regurgitation of undigested food.

(Choice B) Gastroesophageal reflux disease (GERD) is frequently associated with Zenker diverticula, but it is not causative. GERD can cause dysphagia and regurgitation of acid, but it does not typically cause regurgitation of undigested food or medications that were consumed several hours before.

(Choice C) Chronic inflammation in the mediastinum (eg, due to tuberculosis or fungal infections) can lead to the formation of midesophageal diverticula due to the pull (traction) of adjacent scar tissue. In contrast to pulsion diverticula, these traction diverticula are true diverticula (ie, involve the mucosal, submucosal, and muscular layers). Traction diverticula are very rare, and this patient has no signs of tuberculosis or other mediastinal inflammatory processes.

(Choice D) Metabolic abnormalities (eg, iron deficiency) may be associated with upper esophageal webs (Plummer-Vinson syndrome) that can cause an insidious onset of dysphagia. However, halitosis and regurgitation of undigested food are not typical.

Educational objective:
Diminished relaxation of the cricopharyngeus muscle during swallowing results in increased intraluminal pressure in the hypopharynx. This may cause the mucosa to herniate, forming a Zenker (pharyngoesophageal) diverticulum, which presents in patients age >60 with dysphagia, halitosis

Diagnosis is confirmed with a contrast swallow study. Treatment is surgical. The cricopharyngeus muscle is divided **(cricopharyngeal myotomy)**, and the diverticulum may be removed (ie, diverticulectomy) or combined with the esophageal lumen (ie, diverticulotomy).

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(Choice B) Gastroesophageal reflux disease (GERD) is frequently associated with Zenker diverticula, but it is not causative. GERD can cause dysphagia and regurgitation of acid, but it does not typically cause regurgitation of undigested food or medications that were consumed several hours before.

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Educational objective:
Diminished relaxation of the cricopharyngeus muscle during swallowing results in increased intraluminal pressure in the hypopharynx. This may cause the mucosa to herniate, forming a Zenker (pharyngoesophageal) diverticulum, which presents in patients age >60 with dysphagia, halitosis, and regurgitation of undigested food.

References

- Zenker's diverticula: pathophysiology, clinical presentation, and flexible endoscopic management.

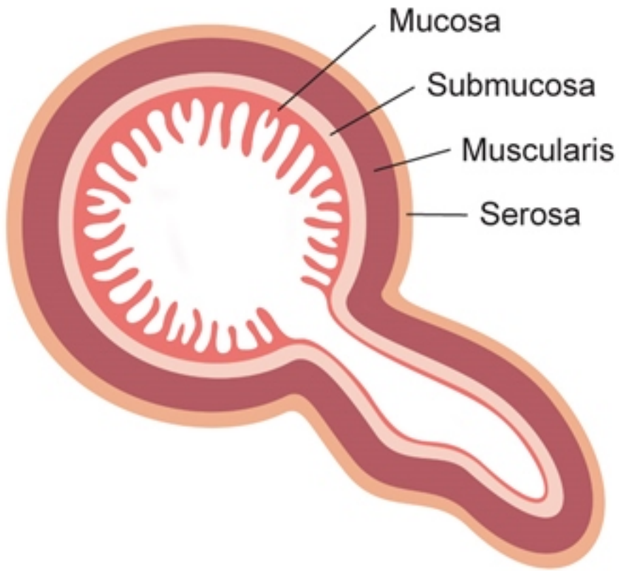
Surgery	Gastrointestinal & Nutrition	Zenker diverticulum
Subject	System	Topic

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Exhibit Display

True & false diverticula

True diverticulum



Examples:
Meckel diverticula,
normal appendix

Pseudodiverticulum



Examples:
Zenker esophageal diverticula,
diverticulosis

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Item 8 of 40
Question Id: 16535

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A 34-year-old woman comes to the office due to difficulty hearing, especially in the left ear. The hearing loss has worsened over the past year, and she is now having trouble hearing people at work; however, when the environment is noisy, she can understand speech better than when she is in a quiet room. The patient also hears ringing in the left ear. She has no dizziness, vertigo, or ear pain. She has had no significant noise exposure. The patient has no other medical conditions and takes no medications. Her mother had surgery for hearing loss when she was in her 40s. On examination, the tympanic membranes are clear with a good light reflex, good landmarks, and no middle ear effusion. There is a slight reddish hue behind the left tympanic membrane. Which of the following is the most likely mechanism of this patient's condition?

A. Bony overgrowth of the ossicles
B. Degeneration of neuronal cell bodies
C. Increased fluid in the cochlea
D. Lamellated basement membrane
E. Neoplastic growth involving CN VIII

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- ✓ A. Bony overgrowth of the ossicles (41%)
- B. Degeneration of neuronal cell bodies (7%)
- C. Increased fluid in the cochlea (11%)
- D. Lamellated basement membrane (13%)
- E. Neoplastic growth involving CN VIII (25%)

Omitted
Correct answer
A

41%
Answered correctly

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Time Spent

06/30/2020
Last Updated

Explanation

Otosclerosis	
	• Younger (early to mid-30s) Caucasian patients

Otosclerosis	
Epidemiology	• Younger (early to mid-30s) Caucasian patients • More common in women • Autosomal dominant with incomplete penetrance
Pathophysiology	• Imbalance of bone resorption & deposition → stiffening of stapes
Clinical manifestations	• Progressive conductive hearing loss • Paradoxical improvement in speech discrimination in noisy environments • ± Reddish hue behind tympanic membrane
Management	• Amplification (eg, hearing aids) • Surgery (eg, stapes reconstruction)

This patient has hearing loss that paradoxically improves (with regard to speech discrimination) in noisy environments, consistent with **conductive hearing loss** (CHL). Given her young age and family history of hearing loss at a young age, this presentation suggests **otosclerosis**.

Otosclerosis is inherited in an autosomal dominant pattern with incomplete penetrance. It results from an imbalance of bone resorption and deposition, causing **stiffening** and fixation of the ossicular chain (malleus, incus, stapes), primarily the **stapes**. Because the ossicles function as a lever connecting the tympanic membrane to the oval window to amplify sound energy, this stiffening results in CHL. As with other causes of CHL, patients with otosclerosis can have **paradoxical improvement** of speech understanding in a noisy environment (a phenomenon called the paracusis of Willis), possibly because CHL dampens the competing background noise, thereby allowing speech to be heard more clearly.

Ear examination is generally unremarkable, although excessive bony resorption can expose underlying blood vessels, leading to a reddish hue sometimes seen behind the tympanic membrane. Management involves hearing amplification or surgical reconstruction of the stapes.

(Choice B) Degeneration of neuronal cell bodies (which can occur in presbycusis) is seen in older individuals and presents with bilateral, symmetric sensorineural hearing loss (SNHL). Unlike CHL, SNHL is characterized by worse speech understanding with increasing background noise.

This patient has hearing loss that paradoxically improves (with regard to speech discrimination) in noisy environments, consistent with **conductive hearing loss** (CHL). Given her young age and family history of hearing loss at a young age, this presentation suggests **otosclerosis**.

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(Choice C) Increased fluid in the cochlea (which is thought to occur in Ménière disease) can cause a unilateral hearing loss in young adults that sometimes runs in families. However, it presents with episodic vertigo, hearing loss, and aural fullness.

(Choice D) A lamellated basement membrane is characteristic of Alport syndrome, which can cause hereditary SNHL (not CHL) due to damage of the basement membrane in the cochlea. It typically presents with recurrent hematuria in childhood.

(Choice E) A neoplastic growth involving CN VIII (vestibular schwannoma) would also cause a unilateral hearing loss and is sometimes hereditary (eg, neurofibromatosis, type 2). However, it would present with SNHL and a normal otoscopic examination (no reddish hue).

Educational objective:
A conductive hearing loss (CHL) may show improved speech understanding in background noise. CHL in a young woman with a positive family history of hearing loss likely represents otosclerosis, which is characterized by bony overgrowth of the stapes that causes stiffening of the ossicular chain.

References

Ear examination is generally unremarkable, although excessive bony resorption can expose underlying blood vessels, leading to a reddish hue sometimes seen behind the tympanic membrane. Management involves hearing amplification or surgical reconstruction of the stapes.

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Educational objective:
A conductive hearing loss (CHL) may show improved speech understanding in background noise. CHL in a young woman with a positive family history of hearing loss likely represents otosclerosis, which is characterized by bony overgrowth of the stapes that causes stiffening of the ossicular chain.

References

- Schwartze sign.
- Controversies in the evaluation and management of otosclerosis.

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

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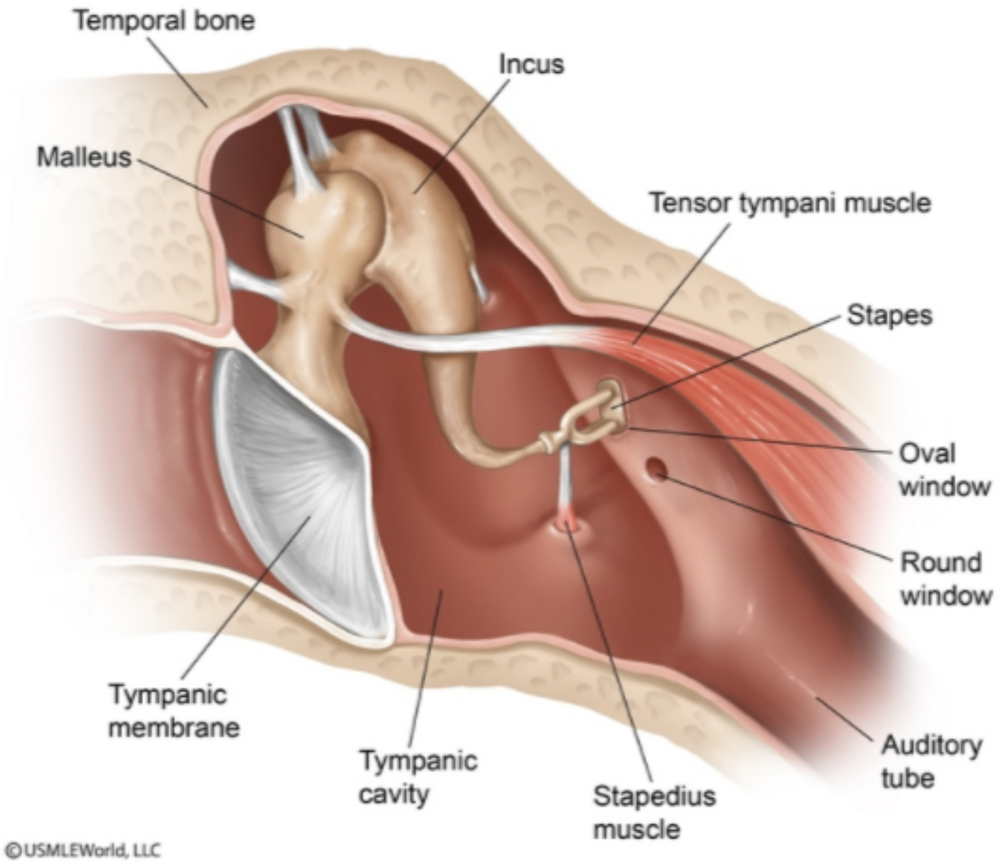
Item 8 of 40
Question Id: 16535

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Exhibit Display

Middle ear anatomy



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Item 9 of 40
Question Id: 4062

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A 59-year-old man comes to the office for a postoperative follow-up. He underwent a partial (distal) gastrectomy for a perforated peptic ulcer 3 weeks ago. The patient also received an extended course of antibiotics with the last dose given 2 weeks ago. For the last 10 days, he has had intermittent abdominal cramps and diarrhea. Symptoms begin 25-30 minutes after eating and are associated with nausea, weakness, palpitations, light-headedness, and diaphoresis. The patient has no symptoms overnight, and there is no associated fever or weight loss. Medical history is notable for hypertension. He has a 20-pack-year smoking history but quit after the recent hospitalization. His temperature is 36.7 C (98 F), blood pressure is 130/65 mm Hg, pulse is 80/min, and respirations are 18/min. BMI is 26 kg/m^2. On examination, the abdomen is soft and nontender with normal bowel sounds. The surgical wound is healing well without erythema or discharge. Cardiopulmonary examination is normal. Complete blood count is normal. Which of the following is the most appropriate next step in management of this patient?

A. Dietary modification
B. Endoscopy
C. Reconstructive operation
D. Stool polymerase chain reaction for *Clostridium difficile*
E. Trial of octreotide
F. Upper gastrointestinal contrast x-ray study

Submit

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Item 9 of 40
Question Id: 4062

Mark | Previous | Next | Full Screen | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom | Settings

A 59-year-old man comes to the office for a postoperative follow-up. He underwent a partial (distal) gastrectomy for a perforated peptic ulcer 3 weeks ago. The patient also received an extended course of antibiotics with the last dose given 2 weeks ago. For the last 10 days, he has had intermittent abdominal cramps and diarrhea. Symptoms begin 25-30 minutes after eating and are associated with nausea, weakness, palpitations, light-headedness, and diaphoresis. The patient has no symptoms overnight, and there is no associated fever or weight loss. Medical history is notable for hypertension. He has a 20-pack-year smoking history but quit after the recent hospitalization. His temperature is 36.7 C (98 F), blood pressure is 130/65 mm Hg, pulse is 80/min, and respirations are 18/min. BMI is 26 kg/m^2. On examination, the abdomen is soft and nontender with normal bowel sounds. The surgical wound is healing well without erythema or discharge. Cardiopulmonary examination is normal. Complete blood count is normal. Which of the following is the most appropriate next step in management of this patient?

- ✓ A. Dietary modification (53%)
- B. Endoscopy (7%)
- C. Reconstructive operation (1%)
- D. Stool polymerase chain reaction for *Clostridium difficile* (21%)
- E. Trial of octreotide (10%)
- F. Upper gastrointestinal contrast x-ray study (5%)

Omitted
Correct answer
A

53%
Answered correctly

02 secs
Time Spent

03/17/2020
Last Updated

Explanation

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Dumping syndrome	
Symptoms	• Abdominal pain, diarrhea, nausea • Hypotension/tachycardia • Dizziness/confusion, fatigue, diaphoresis
Timing	• 15-30 minutes after meals
Pathogenesis	• Rapid emptying of hypertonic gastric contents
Initial management	• Small/frequent meals • Replace simple sugars with complex carbohydrates • Incorporate high-fiber & protein-rich foods

This patient has clinical features typical of early **dumping syndrome** (DS), including gastrointestinal (eg, nausea, diarrhea, abdominal cramps) and vasomotor (eg, palpitations, diaphoresis) symptoms. DS is a common **postgastrectomy** complication occurring in up to 50% of patients. It is caused by loss of the normal action of the pyloric sphincter due to injury or surgical bypass and leads to rapid emptying of hypertonic gastric contents into the duodenum and small intestine. This causes fluid shifts from the intravascular space to the small intestine, leading to hypotension, stimulation of autonomic reflexes, and release of intestinal vasoactive polypeptides.

The diagnosis of DS is primarily based on clinical features, although an upper gastrointestinal x-ray series or gastric emptying studies may be helpful if the diagnosis is unclear **(Choice F)**. Most patients can be managed with dietary modification:

- Consume frequent, small meals and eat slowly
- Avoid simple sugars
- Increase fiber and protein
- Drink fluids between rather than during meals

Symptoms of DS usually diminish over time. A minority of patients with refractory symptoms may benefit from a trial of octreotide or require reconstructive surgery, but this is not usually needed **(Choices C and E)**.

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(Choice B) Endoscopy would confirm the postsurgical anatomy but would not otherwise contribute to the diagnosis of DS.

(Choice D) This patient has no fever or leukocytosis to suggest antibiotic-associated colitis. The postprandial onset with resolution of symptoms overnight is more consistent with DS.

Educational objective:
Dumping syndrome is a common postgastrectomy complication characterized by gastrointestinal (eg, nausea, diarrhea, abdominal cramps) and vasomotor (eg, palpitations, diaphoresis) symptoms. The symptoms can be controlled with dietary modification and usually diminish over time.

Surgery	Gastrointestinal & Nutrition	Dumping syndrome
Subject	System	Topic

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Educational objective:
Dumping syndrome is a common postgastrectomy complication characterized by gastrointestinal (eg, nausea, diarrhea, abdominal cramps) and vasomotor (eg, palpitations, diaphoresis) symptoms. The symptoms can be controlled with dietary modification and usually diminish over time.

Surgery	Gastrointestinal & Nutrition	Dumping syndrome
Subject	System	Topic

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Question Id: 3591

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A 45-year-old man comes to the physician due to epigastric pain and diarrhea. Past medical history is significant for peptic ulcer disease. He has a 20-pack-year smoking history but does not use alcohol or illicit drugs. Physical examination shows abdominal tenderness without rebound or rigidity. Endoscopy shows prominent gastric folds, 3 duodenal ulcers, and upper jejunal ulceration. Which of the following is the most appropriate next step in the management of this patient?

A. Calcium infusion study
B. Jejunal ulcer biopsy
C. Serum chromogranin A
D. Serum gastrin concentration
E. Triple therapy for *Helicobacter pylori*

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A 45-year-old man comes to the physician due to epigastric pain and diarrhea. Past medical history is significant for peptic ulcer disease. He has a 20-pack-year smoking history but does not use alcohol or illicit drugs. Physical examination shows abdominal tenderness without rebound or rigidity. Endoscopy shows prominent gastric folds, 3 duodenal ulcers, and upper jejunal ulceration. Which of the following is the most appropriate next step in the management of this patient?

A. Calcium infusion study (0%)
B. Jejunal ulcer biopsy (6%)
C. Serum chromogranin A (1%)
✓ D. Serum gastrin concentration (78%)
E. Triple therapy for *Helicobacter pylori* (12%)

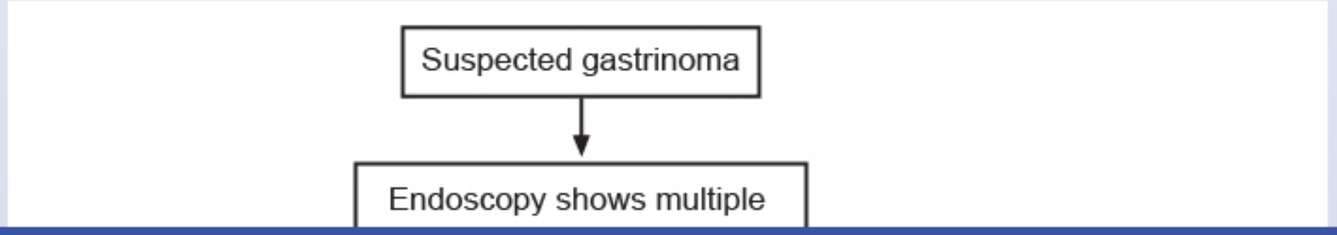
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Correct answer
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78%
Answered correctly

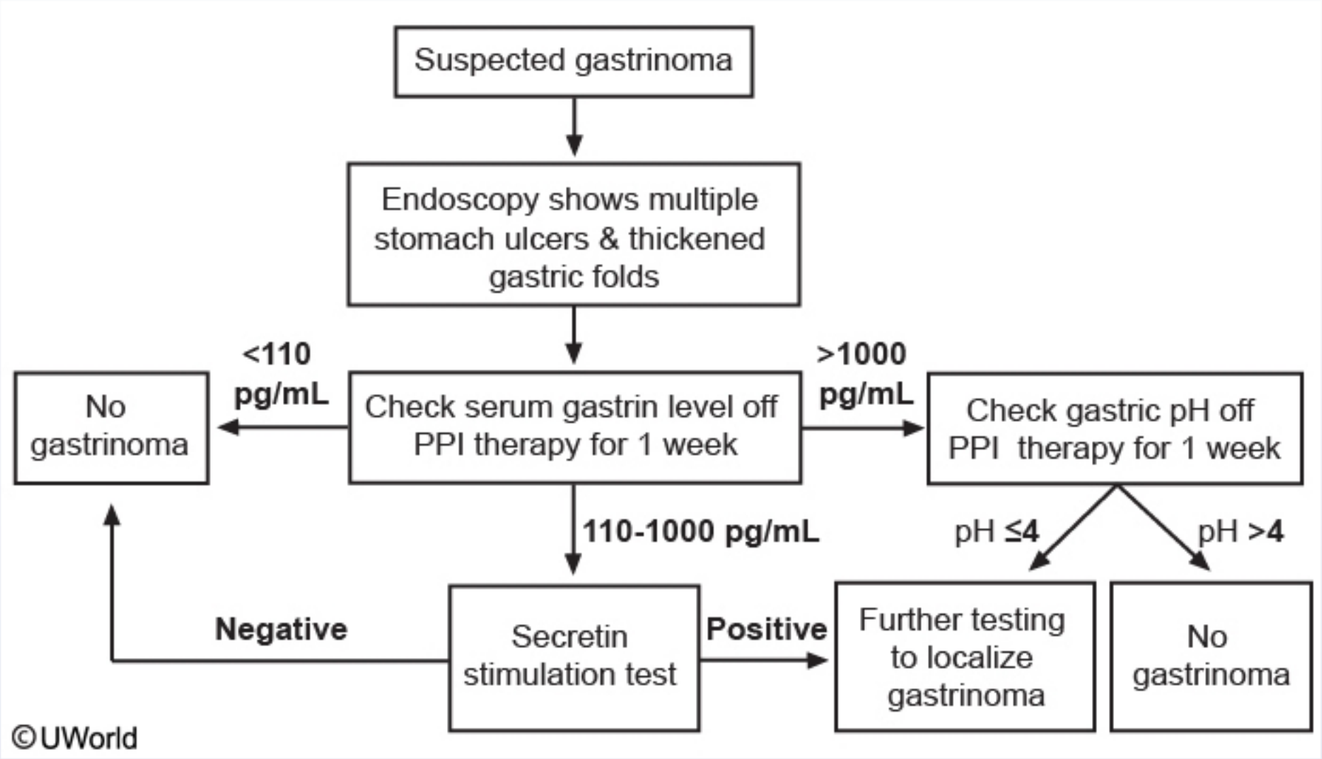
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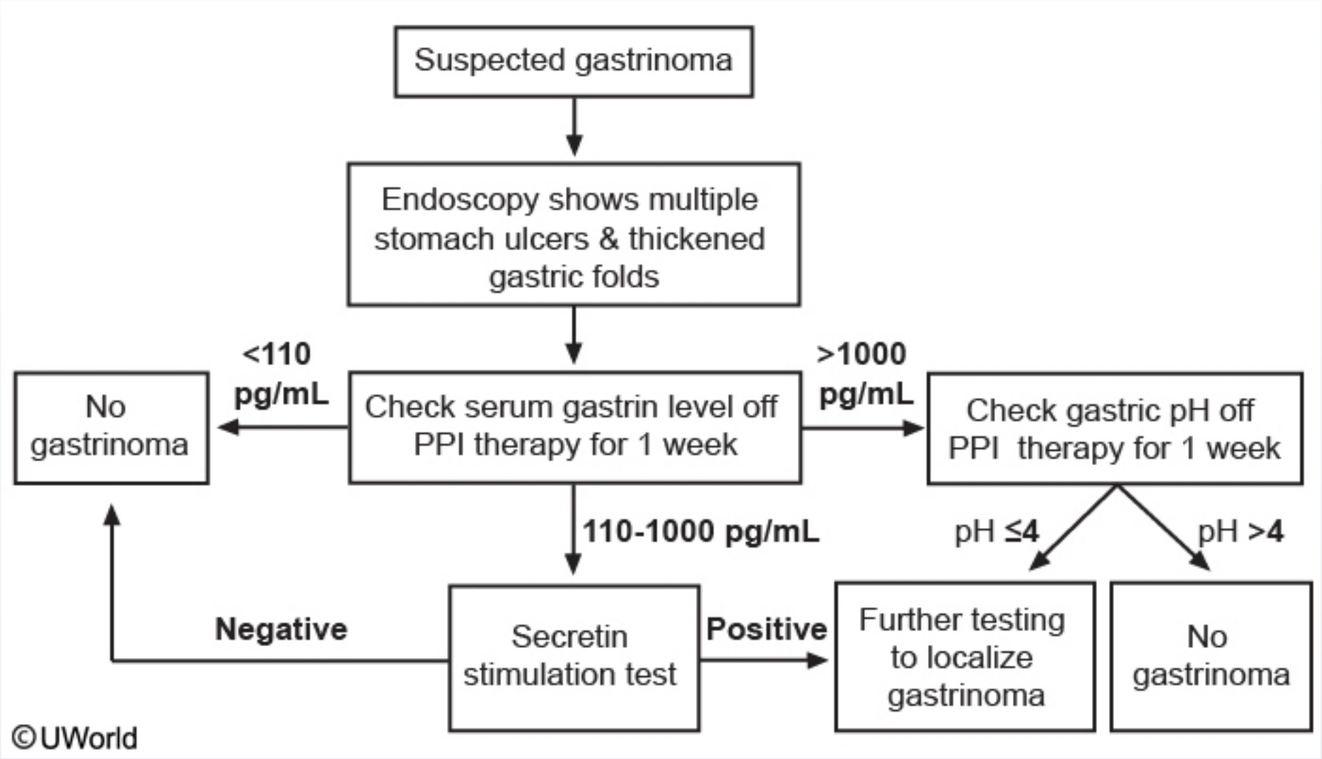
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This patient's clinical findings - recurrent peptic ulcer disease with multiple ulcers and jejunal ulceration - suggest **gastrinoma** (Zollinger-Ellison syndrome [ZES]). ZES is usually sporadic but is found in conjunction with multiple endocrine neoplasia type 1 (MEN1) in 20% of cases. Gastrinomas usually occur in patients age 20-50 with dyspepsia, reflux symptoms, abdominal pain, weight loss, diarrhea, or frank gastrointestinal bleeding. Endoscopy often shows **thickened gastric folds**, **multiple peptic ulcers**, refractory ulcers despite proton pump inhibitor (PPI) use, or ulcers distal to the duodenum in the jejunum (suggesting excess gastric acid that cannot be fully neutralized in the duodenum).

Fasting serum gastrin level (off PPI therapy for 1 week) should be checked in suspected gastrinoma; a level <110 pg/mL rules it out, and a **level >1000 pg/mL** is strongly suggestive, although gastric pH should also be measured as gastrin may also be elevated due to failure of gastric acid secretion (achlorhydria). A gastrin level of 110-1000 pg/mL is nondiagnostic and requires a follow-up secretin stimulation test. Secretin inhibits

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Gastrinomas are managed with high-dose PPI, with surgery (eg, exploratory laparotomy and resection) considered in patients with sporadic gastrinoma with no evidence of metastatic disease.

(Choice A) The calcium infusion study is usually reserved for patients who have gastric acid hypersecretion and are strongly suspected of having gastrinoma despite a negative secretin test. Calcium infusion can lead to an increase in serum gastrin levels in patients with gastrinoma.

(Choice B) Jejunal ulcer biopsy would not likely be useful as jejunal ulcers are usually due to gastric acid hypersecretion rather than local tumor invasion.

(Choice C) Serum chromogranin A is a marker for well-differentiated neuroendocrine tumors. It is elevated in several conditions such as carcinoid tumors, hyperthyroidism, chronic atrophic gastritis, and even chronic PPI therapy. For this reason, it is less sensitive and specific than measurement of serum gastrin level. However, it may be used as a confirmatory test in nondiagnostic cases.

(Choice E) Triple therapy (PPI, amoxicillin, and clarithromycin) treats *Helicobacter pylori* infection, which can cause gastric and duodenal ulcers. However, this patient's diarrhea and multiple ulcers in different sites are more suggestive of gastrinoma.

Educational objective:

Gastrinoma (Zollinger-Ellison syndrome) should be suspected in patients with multiple stomach ulcers and thickened gastric folds on endoscopy.

rise in serum gastrin concentrations in patients with other causes of hypergastrinemia.

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Educational objective:
Gastrinoma (Zollinger-Ellison syndrome) should be suspected in patients with multiple stomach ulcers and thickened gastric folds on endoscopy. The diagnosis is strongly suggested by a fasting serum gastrin level >1000 pg/mL. Patients with nondiagnostic serum gastrin levels should be evaluated with a secretin stimulation test.

References

- Diagnosis and treatment of gastrinoma in the era of proton pump inhibitors.

Surgery	Gastrointestinal & Nutrition	Zollinger ellison syndrome
Subject	System	Topic

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Item 11 of 40
Question Id: 4538

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A 22-year-old man comes to the emergency department due to sudden-onset dyspnea 2 hours ago while watching television. The patient's dyspnea is gradually improving but he still has sharp right-sided chest pain that is worse with deep inspiration or cough. His medical history is unremarkable. The patient smokes 4-5 cigarettes daily and occasionally drinks alcohol. Temperature is 36.7 C (98 F), blood pressure is 140/80 mm Hg, pulse is 86/min, and respirations are 18/min. Pulse oximetry shows 98% on room air. He weighs 68 kg (150 lb), is 188 cm (6 ft 2 in) tall, and has a BMI of 19.3 kg/m^2. Physical examination is unremarkable. Chest x-ray reveals a small right apical pneumothorax. Which of the following is the most appropriate management of this patient?

A. Chest tube placement
B. CT scan of the chest
C. Needle thoracostomy
D. Supplemental oxygen
E. Talc pleurodesis

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Item 11 of 40
Question Id: 4538

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A 22-year-old man comes to the emergency department due to sudden-onset dyspnea 2 hours ago while watching television. The patient's dyspnea is gradually improving but he still has sharp right-sided chest pain that is worse with deep inspiration or cough. His medical history is unremarkable. The patient smokes 4-5 cigarettes daily and occasionally drinks alcohol. Temperature is 36.7 C (98 F), blood pressure is 140/80 mm Hg, pulse is 86/min, and respirations are 18/min. Pulse oximetry shows 98% on room air. He weighs 68 kg (150 lb), is 188 cm (6 ft 2 in) tall, and has a BMI of 19.3 kg/m^2. Physical examination is unremarkable. Chest x-ray reveals a small right apical pneumothorax. Which of the following is the most appropriate management of this patient?

- A. Chest tube placement (20%)
- B. CT scan of the chest (11%)
- C. Needle thoracostomy (28%)
- ✓ D. Supplemental oxygen (35%)
- E. Talc pleurodesis (4%)

Omitted
Correct answer
D

35%
Answered correctly

02 secs
Time Spent

06/16/2020
Last Updated

Explanation

Pneumothorax		
	Spontaneous pneumothorax	Tension pneumothorax

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Pneumothorax		
	Spontaneous pneumothorax	**Tension pneumothorax**
Associated features	• Primary: no preceding event or lung disease; often thin, young men • Secondary: underlying lung disease (eg, COPD, CF)	• Life-threatening • Often due to trauma or mechanical ventilation
Signs & symptoms	• Chest pain, dyspnea • ↓Breath sounds, ↓chest movement • Hyperresonant to percussion	Same as spontaneous plus: • Hemodynamic instability • Tracheal deviation away from affected side
Imaging	• Visceral pleural line • Absent lung markings beyond pleural edge	Same as spontaneous plus: • Contralateral mediastinal shift • Ipsilateral hemidiaphragm flattening
Management	• Small (≤2 cm): observation & oxygen administration • Large & stable: needle aspiration or chest tube	• Urgent needle decompression or chest tube placement

CF = cystic fibrosis; COPD = chronic obstructive pulmonary disease.

This young man without prior medical problems who presents with a pneumothorax likely has a **primary spontaneous pneumothorax** (PSP). PSP occurs in patients without a history of lung disease and is most common in **tall, thin men** in their early 20s. Other risk factors include smoking, Marfan syndrome, and thoracic endometriosis. PSP occurs due to rupture of subpleural blebs and commonly develops while patients are at rest. Clinical manifestations include dyspnea, hypoxemia, reduced chest excursion and breath sounds on the affected side, and hyperresonance to percussion. Diagnosis is confirmed by identifying a visceral pleural line on chest x-ray with absent lung marking beyond the line.

The management of PSP depends on the size of the lesion and the clinical status of the patient. Radiographically, pneumothoraces are

This young man without prior medical problems who presents with a pneumothorax likely has a **primary spontaneous pneumothorax** (PSP). PSP occurs in patients without a history of lung disease and is most common in **tall, thin men** in their early 20s. Other risk factors include smoking, Marfan syndrome, and thoracic endometriosis. PSP occurs due to rupture of subpleural blebs and commonly develops while patients are at rest. Clinical manifestations include dyspnea, hypoxemia, reduced chest excursion and breath sounds on the affected side, and hyperresonance to percussion. Diagnosis is confirmed by identifying a visceral pleural line on chest x-ray with absent lung marking beyond the line.

The management of PSP depends on the size of the lesion and the clinical status of the patient. Radiographically, pneumothoraces are categorized as small (≤2 cm) or large. **Small pneumothoraces** in clinically stable patients, such as this patient, can be managed with observation and **supplemental oxygen** (regardless of oxygen saturation), which enhances the speed of resorption. Stable patients with large pneumothoraces should undergo decompression with a large-bore needle (eg, 14- to 18-gauge) inserted in the second or third intercostal space in the midclavicular line or at the fifth intercostal space in the mid or anterior axillary **(Choice C)**. Patients who are hemodynamically unstable should undergo emergent placement of a tube thoracostomy **(Choice A)**. If tube thoracostomy is not available or will be delayed, urgent needle decompression can be performed.

(Choice B) Chest CT scan is not necessary unless diagnostic uncertainty exists after a plain radiograph or if there is concern for tube thoracostomy placement or a loculated pneumothorax.

(Choice E) If the lung fails to adequately re-expand (eg, <90% expansion) and a persistent air leak is present, placement of a one-way valve, creation of a blood patch, or video-assisted thoracoscopic surgery (VATS) can be used. For patients with recurrence, VATS pleurodesis or chemical (eg, tetracycline derivative, talc) pleurodesis can be performed.

Educational objective:
Primary spontaneous pneumothorax (PSP) occurs in patients without a history of lung disease and is most common in tall, thin men in their early 20s. Management of small PSP in clinically stable patients includes observation and supplemental oxygen, which enhances the speed of resorption.

References

- Pneumothorax: observation.

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Educational objective:

Primary spontaneous pneumothorax (PSP) occurs in patients without a history of lung disease and is most common in tall, thin men in their early 20s. Management of small PSP in clinically stable patients includes observation and supplemental oxygen, which enhances the speed of resorption.

References

- Pneumothorax: observation.
- Pneumothorax: a tale of pain or spontaneity.

Surgery	Pulmonary & Critical Care	Pneumothorax
Subject	System	Topic

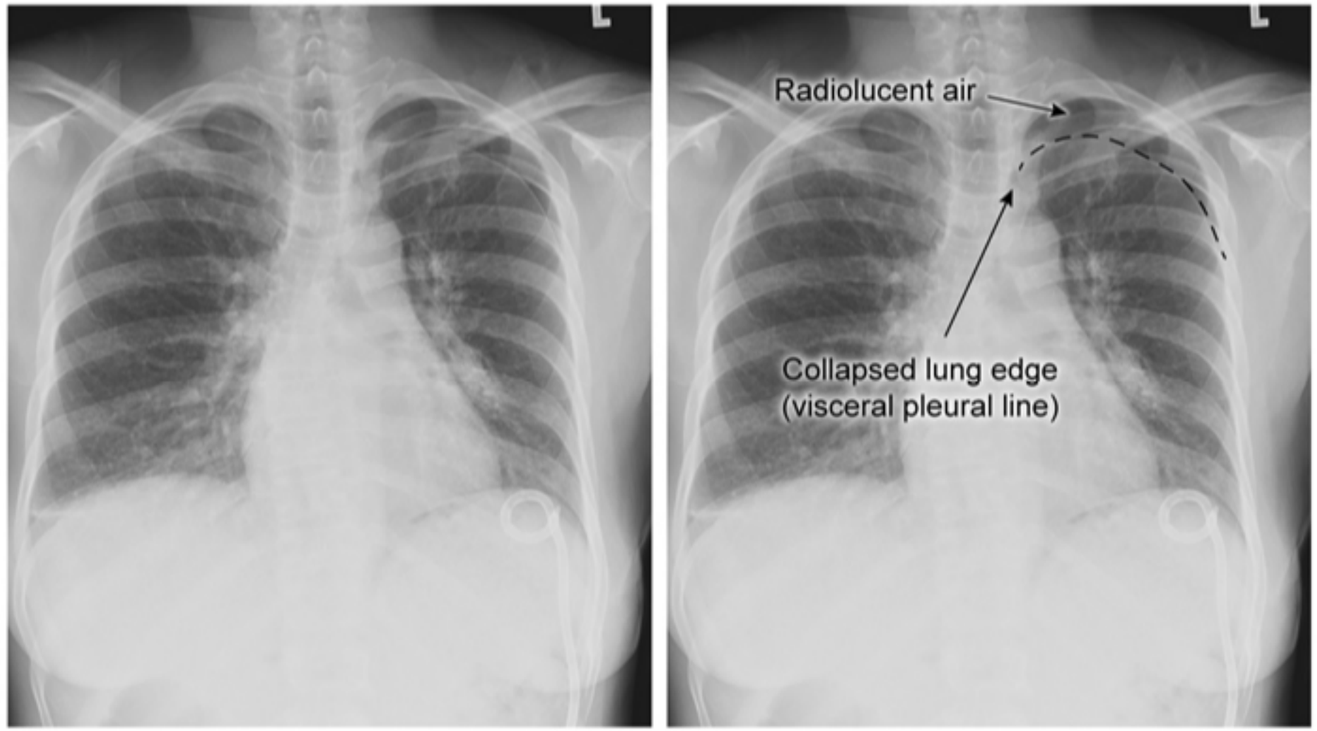
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features	
young men Secondary: underlying lung disease (eg, COPD, CF)	• Often due to trauma or mechanical ventilation

Exhibit Display

Left pneumothorax



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Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

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Item 12 of 40
Question Id: 3504
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A 64-year-old woman is brought to the emergency department due to fever, chills, flank pain, and lethargy for the past 2 days. Temperature is 38.9 C (102 F), blood pressure is 100/60 mm Hg, and pulse is 120/min. The patient has right costovertebral angle tenderness. Leukocytes are 16,000/mm^3 and urinalysis shows pyuria, many bacteria, and positive nitrites. ECG shows sinus tachycardia. A central venous catheter placement is planned for intravenous therapy and hemodynamic monitoring. After the patient's chest is appropriately prepared and draped, a needle is inserted just lateral to the angle of the left clavicle and a triple lumen catheter is placed into the left subclavian vein. Each lumen is flushed with sterile saline after obtaining blood return. The catheter is sutured in place to the skin and a sterile dressing is applied. Which of the following is the best next step in management of this patient?

A. Antibiotic through the catheter
B. Bedside echocardiography
C. Fluid bolus through the catheter
D. Portable chest radiograph
E. Repeat ECG

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- A. Antibiotic through the catheter (12%)
- B. Bedside echocardiography (2%)
- C. Fluid bolus through the catheter (13%)
- ✓ D. Portable chest radiograph (69%)
- E. Repeat ECG (1%)

Omitted
Correct answer
D

69%
Answered correctly

02 secs
Time Spent

04/30/2020
Last Updated

Explanation

A **central venous catheter (CVC)** is commonly used for the administration of critical care medications (eg, pressors, hypertonic saline) and in the setting of difficult vascular access or need for long-term medication (eg, chemotherapy). The preferred points of central venous access are the internal jugular vein (typically by ultrasound guidance) or the subclavian vein (typically by anatomic landmark guidance). CVC **complications**

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

Explanation

A **central venous catheter (CVC)** is commonly used for the administration of critical care medications (eg, pressors, hypertonic saline) and in the setting of difficult vascular access or need for long-term medication (eg, chemotherapy). The preferred points of central venous access are the internal jugular vein (typically by ultrasound guidance) or the subclavian vein (typically by anatomic landmark guidance). CVC **complications** occur in up to 15% of cases, and many are due to **inappropriate catheter placement**.

The ideal placement of a CVC tip is in the lower superior vena cava. Tip placement in smaller veins (eg, subclavian, jugular, azygous) predisposes to **venous perforation**. In addition, inappropriately placed catheter tips may cause lung puncture, leading to **pneumothorax**, or myocardial perforation, leading to **pericardial tamponade**. Arterial (eg, subclavian) puncture is also a risk, particularly in the absence of ultrasound guidance.

Confirmatory chest x-ray may be omitted in the setting of an uncomplicated (eg, first needle insertion, no resistance to catheter advancement) ultrasound-guided CVC placement. Otherwise, a **portable chest x-ray** should be performed immediately following CVC placement to facilitate timely recognition of a misplaced catheter tip, identify possible injury (eg, pneumothorax), and prevent exacerbation of injury (eg, infusion of fluid into the pericardial space). Visualization of the catheter tip just proximal to the angle between the trachea and right mainstem bronchus confirms appropriate placement.

(Choices A and C) In this patient, catheter tip location should be confirmed prior to the administration of medications (eg, antibiotics) or fluids.

(Choice B) Bedside echocardiography may determine the position of a CVC tip and detect a pneumothorax but only if performed by an experienced operator. Chest x-ray is the standard of care as it is more practical and reliable.

(Choice E) A CVC may trigger cardiac arrhythmias if inserted too far into the right atrium. Patients in critical care settings are typically on continuous telemetry that will detect cardiac arrhythmia. In the absence of continuous telemetry, patients should be monitored for hemodynamic instability (eg, tachycardia, hypotension) during and after catheter placement, but routine ECG is not indicated.

Educational objective:
Complications due to inappropriate central venous catheter placement are common. With the exception of select cases, appropriate catheter tip placement should be confirmed by chest x-ray prior to catheter use.

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Educational objective:
Complications due to inappropriate central venous catheter placement are common. With the exception of select cases, appropriate catheter tip placement should be confirmed by chest x-ray prior to catheter use.

References

- Aberrant locations and complications in initial placement of subclavian vein catheters.
- Incidence of mechanical complications of central venous catheterization using landmark technique: do not try more than 3 times.

Surgery	Cardiovascular System	Central venous catheter
Subject	System	Topic

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Item 13 of 40
Question Id: 2245

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A 46-year-old man is brought to the emergency department after being involved in a motor vehicle collision. He is unresponsive and his injuries include a basilar skull fracture, brain contusion, fractures of ribs 7-10, hemopneumothorax on the right, and a pelvic fracture. After multiple blood product transfusions, placement of a chest tube, and pelvis fixation, his condition stabilizes. On the 5th day of his hospital stay, he is minimally responsive and has spontaneous respirations. Examination shows diminished bowel sounds and facial grimacing with palpation of the right upper quadrant of the abdomen. Rectal examination shows no abnormalities. Nasogastric tube aspiration shows retention of gastric contents. An abdominal CT scan reveals gaseous distension of the small and large bowels without air-fluid levels. The gallbladder is distended with no gallstones; there is small amount of pericholecystic fluid. Which of the following is the most likely cause of this patient's condition?

A. Acalculous cholecystitis
B. Duodenal perforation
C. Mesenteric ischemia
D. Pancreatitis
E. Small-bowel obstruction

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Item 13 of 40
Question Id: 2245

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- A. Acalculous cholecystitis (65%)
- B. Duodenal perforation (4%)
- C. Mesenteric ischemia (16%)
- D. Pancreatitis (2%)
- E. Small-bowel obstruction (10%)

Omitted
Correct answer
A

65%
Answered correctly

01 sec
Time Spent

05/01/2020
Last Updated

Explanation

This patient's clinical presentation is suggestive of **acalculous cholecystitis**. This condition is most often seen in **severely ill** patients in the intensive care unit with multiorgan failure, severe trauma, surgery, burns, sepsis, or prolonged parenteral nutrition. Acalculous cholecystitis is likely due to cholestasis and gallbladder ischemia leading to secondary infection by enteric organisms and resultant edema and necrosis of the

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Acalculous cholecystitis is a serious condition that can lead to sepsis and death if undetected. The clinical signs of disease (eg, fever, leukocytosis) are vague, and patients most vulnerable to this condition are typically non-communicative due to their general medical condition. The best way to make the diagnosis is a high degree of clinical suspicion and confirmation with imaging studies. Radiologic signs include gallbladder wall thickening and distension and the presence of pericholecystic fluid. The immediate treatment in critically ill patients includes antibiotics followed by **percutaneous cholecystostomy** under radiologic guidance. Cholecystectomy with drainage of any associated abscesses is the definitive therapy once the patient's medical condition improves.

(Choice B) Duodenal perforation usually presents with sudden-onset, diffuse abdominal pain. The abdomen is rigid on initial examination (becomes distended later) with signs of peritonitis. Imaging studies typically show free air under the diaphragm.

(Choice C) Mesenteric ischemia usually presents with sudden periumbilical abdominal pain out of proportion to examination findings. Risk factors include older age, atrial fibrillation, congestive heart failure, and atherosclerotic vascular disease. CT of the abdomen typically shows focal or segmental bowel wall thickening, small-bowel dilation, and mesenteric stranding.

(Choice D) Pancreatitis would not cause a distended gallbladder and pericholecystic fluid. CT findings of pancreatitis include parenchymal enhancement with intravenous contrast (in patients with no pancreatic necrosis), pseudocyst formation, or peripancreatic fluid collection.

(Choice E) Small-bowel obstruction is characterized by abdominal distension, high-pitched hyperactive bowel sounds, dilated loops of bowel with air-fluid levels on imaging, and no or minimal air in the colon and rectum. This patient's small- and large-bowel distension and hypoactive bowel sounds are more consistent with ileus due to his serious medical condition.

Educational objective:
Acalculous cholecystitis occurs in critically ill patients. The clinical presentation may be similar to calculous cholecystitis, though assessment may be difficult due to the underlying illness. Imaging studies show gallbladder wall thickening and distension and pericholecystic fluid. The emergency treatment of choice is antibiotics and percutaneous cholecystostomy, followed by cholecystectomy when the medical condition

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Educational objective:
Acalculous cholecystitis occurs in critically ill patients. The clinical presentation may be similar to calculous cholecystitis, though assessment may be difficult due to the underlying illness. Imaging studies show gallbladder wall thickening and distension and pericholecystic fluid. The emergency treatment of choice is antibiotics and percutaneous cholecystostomy, followed by cholecystectomy when the medical condition stabilizes.

References

- Percutaneous cholecystostomy in critically ill patients: early response and final outcome in 82 patients
- Acute acalculous cholecystitis: a review
- Prolonged postoperative ileus-definition, risk factors, and predictors after surgery.
- Pneumatosis intestinalis and hepatic portal venous gas on computed tomography – a non-lethal outcome.

Surgery	Gastrointestinal & Nutrition	Cholecystitis
Subject	System	Topic

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A 75-year-old man comes to the office for evaluation of right hip pain. The patient first noticed the pain several months ago and it has become increasingly worse. He now has trouble putting on his shoes and socks. The patient used to walk his dog for 2 miles each night, but he now must use a cane and can only walk a half-mile. The patient has a history of hypertension. BMI is 32 kg/m^2. X-ray of the right hip is shown below:



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

A. Avascular necrosis

B. Femur fracture

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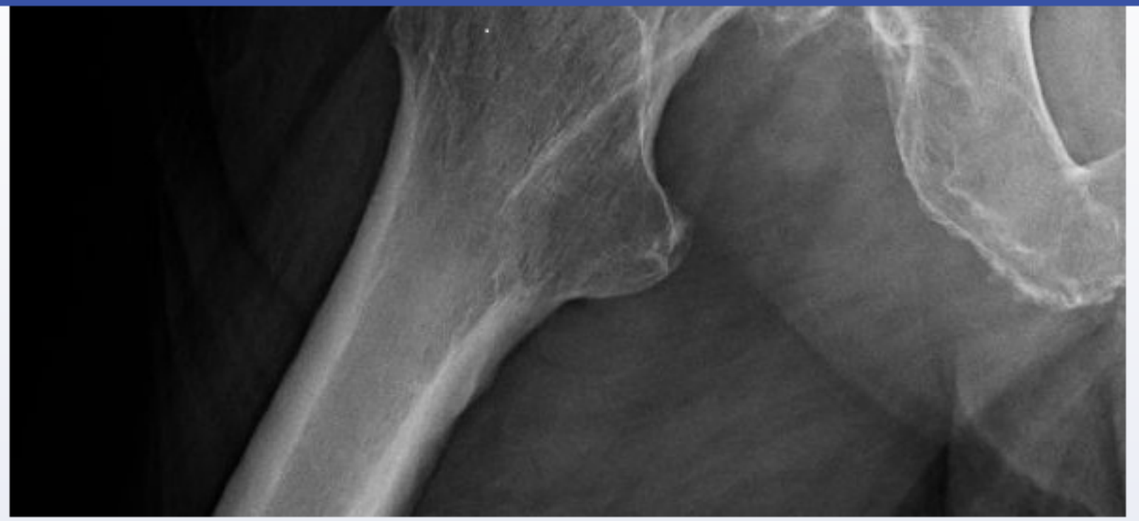
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Item 14 of 40
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Which of the following is the most likely cause of this patient's hip pain?

A. Avascular necrosis
B. Femur fracture
C. Greater trochanteric pain syndrome
D. Hip dislocation
E. Osteoarthritis
F. Osteosarcoma

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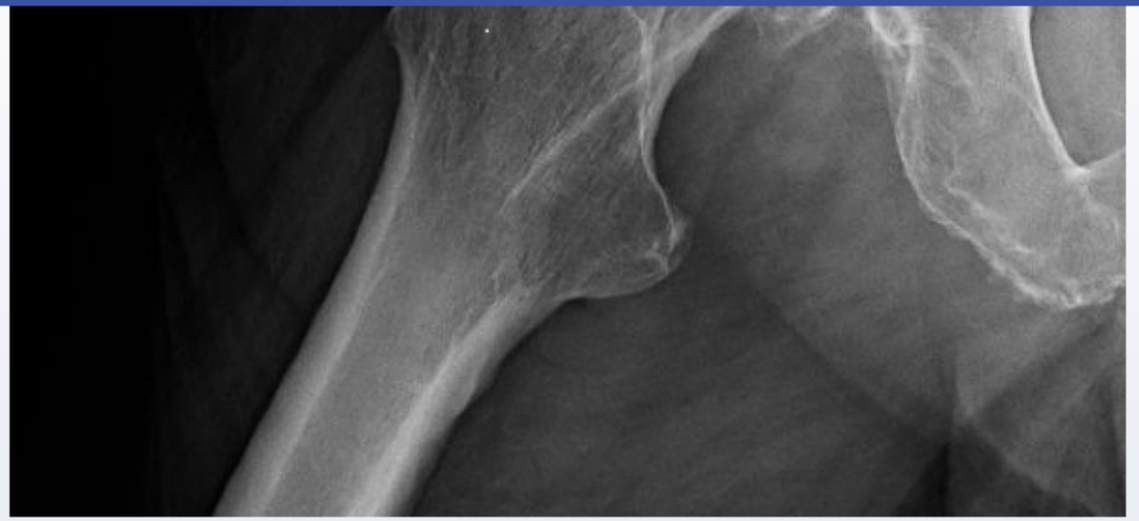
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Which of the following is the most likely cause of this patient's hip pain?

A. Avascular necrosis (13%)
B. Femur fracture (6%)
C. Greater trochanteric pain syndrome (1%)
D. Hip dislocation (0%)
✓ E. Osteoarthritis (75%)
F. Osteosarcoma (1%)

Omitted
Correct answer

75%
Answered correctly

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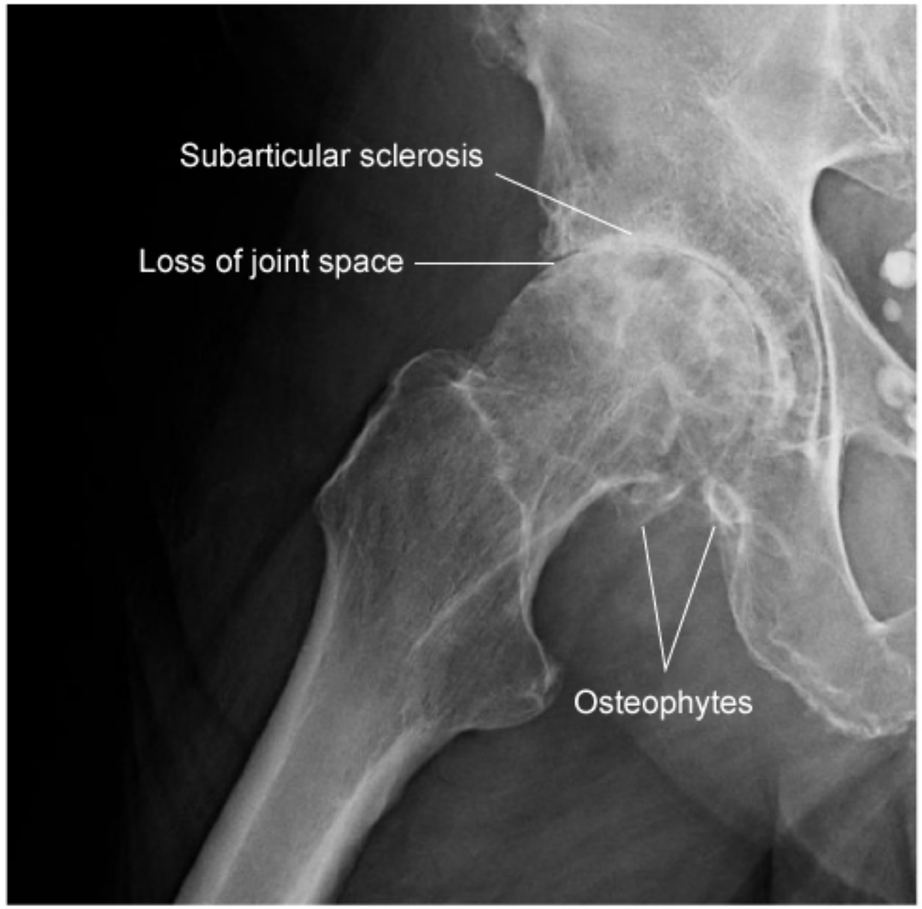
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Hip osteoarthritis



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This patient has chronic **joint pain** that is worse with **activity** and **weight bearing**. The x-ray shows **loss of the normal joint space**, periarticular **osteophytes**, and sclerosis of the acetabular surface. Together, these are typical findings of **osteoarthritis** of the hip.



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This patient has chronic **joint pain** that is worse with **activity** and **weight bearing**. The x-ray shows **loss of the normal joint space**, periarticular **osteophytes**, and sclerosis of the acetabular surface. Together, these are typical findings of **osteoarthritis** of the hip.

Osteoarthritis is characterized by progressive destruction of the articular cartilage. The pain of hip osteoarthritis is typically felt in the groin, buttock, or lateral hip region, and can radiate to the lower thigh. Patients may have mild pain and brief stiffness with prolonged rest, but the worst pain usually occurs with activity and weight bearing. Examination findings often include decreased rotational range of motion with no synovitis (redness, warmth).

(Choice A) Avascular necrosis (osteonecrosis) is characterized by reduced perfusion of the femoral head and collapse of the periarticular bone and can present with hip pain and reduced range of motion. Most atraumatic cases are associated with glucocorticoid or alcohol use. X-ray findings include subchondral lucency and loss of the normal spherical contour of the femoral head, but the joint space is preserved and osteophytes are not present.

(Choice B) Fracture of the femoral neck is most common in elderly patients following an acute fall. Examination typically shows a shortened and externally rotated leg, with severe pain on range of motion. X-ray reveals shortening and angulation of the femoral neck.

(Choice C) Greater trochanteric pain syndrome (formerly trochanteric bursitis) is caused by friction of the tendons of the gluteus medius and tensor fascia lata over the greater trochanter of the femur. Pain is localized to the lateral hip and is worsened by direct pressure. X-ray is typically normal.

(Choice D) Dislocation of the hip is uncommon in adults and is typically seen only in the context of major trauma. X-ray would show displacement of the femoral head from the acetabulum, whereas this patient's femoral head is well centered in the acetabulum.

(Choice F) Osteosarcoma is most common in children and adolescents, although it is occasionally seen in adults age >65. The femur is a common location in pediatric patients, but in adults, osteosarcoma more commonly affects the axial skeleton. X-ray shows destruction of trabecular and cortical bone with formation of new periosteal bone.

Educational objective:
Osteoarthritis of the hip is characterized by chronic pain in the groin, buttock, or lateral hip that is worse with activity and weight bearing.

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and can present with hip pain and reduced range of motion. Most atraumatic cases are associated with glucocorticoid or alcohol use. X-ray findings include subchondral lucency and loss of the normal spherical contour of the femoral head, but the joint space is preserved and osteophytes are not present.

(Choice B) Fracture of the femoral neck is most common in elderly patients following an acute fall. Examination typically shows a shortened and externally rotated leg, with severe pain on range of motion. X-ray reveals shortening and angulation of the femoral neck.

(Choice C) Greater trochanteric pain syndrome (formerly trochanteric bursitis) is caused by friction of the tendons of the gluteus medius and tensor fascia lata over the greater trochanter of the femur. Pain is localized to the lateral hip and is worsened by direct pressure. X-ray is typically normal.

(Choice D) Dislocation of the hip is uncommon in adults and is typically seen only in the context of major trauma. X-ray would show displacement of the femoral head from the acetabulum, whereas this patient's femoral head is well centered in the acetabulum.

(Choice F) Osteosarcoma is most common in children and adolescents, although it is occasionally seen in adults age >65. The femur is a common location in pediatric patients, but in adults, osteosarcoma more commonly affects the axial skeleton. X-ray shows destruction of trabecular and cortical bone with formation of new periosteal bone.

Educational objective:
Osteoarthritis of the hip is characterized by chronic pain in the groin, buttock, or lateral hip that is worse with activity and weight bearing. Examination often shows decreased rotational range of motion. X-ray reveals loss of the normal joint space, periarticular osteophytes, and sclerosis of the acetabular surface.

References

- Radiological aspects of osteoarthritis.

Surgery	Rheumatology/Orthopedics & Sports	Osteoarthritis
Subject	System	Topic

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Item 14 of 40
Question Id: 14202

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Osteophytes

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common location in pediatric patients, but in adults, osteosarcoma more commonly affects the axial skeleton. X-ray shows destruction of

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Item 15 of 40
Question Id: 2227

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A 26-year-old man comes to the emergency department due to sudden-onset severe, colicky right flank pain. He also has had dysuria, urgency, dark urine, and nausea but no vomiting. The patient has never before had these symptoms. Temperature is 37 C (98.6 F), blood pressure is 126/70 mm Hg, pulse is 90/min, and respirations are 18/min. Examination shows no abnormalities. Analgesics are administered with good control of pain. Noncontrast helical CT scan shows a 4-mm radiopaque stone in the right lower ureter. Laboratory studies show serum calcium of 9.8 mg/dL, serum creatinine of 0.9 mg/dL, and blood urea nitrogen of 15 mg/dL. Urinalysis shows hematuria but no casts. Which of the following is the most appropriate next step in management?

A. Admit to the hospital mainly for intravenous hydration and pain control
B. Admit to the hospital mainly for lithotripsy
C. Admit to the hospital mainly to make sure the patient does not develop pyelonephritis
D. Admit to the hospital mainly to make sure the stone is passed and collected for analysis
E. Discharge home with instructions to strain the urine and drink 2 L/day of fluids

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- A. Admit to the hospital mainly for intravenous hydration and pain control (32%)
- B. Admit to the hospital mainly for lithotripsy (4%)
- C. Admit to the hospital mainly to make sure the patient does not develop pyelonephritis (2%)
- D. Admit to the hospital mainly to make sure the stone is passed and collected for analysis (5%)
- ✓ E. Discharge home with instructions to strain the urine and drink 2 L/day of fluids (55%)

Omitted
Correct answer
E

55%
Answered correctly

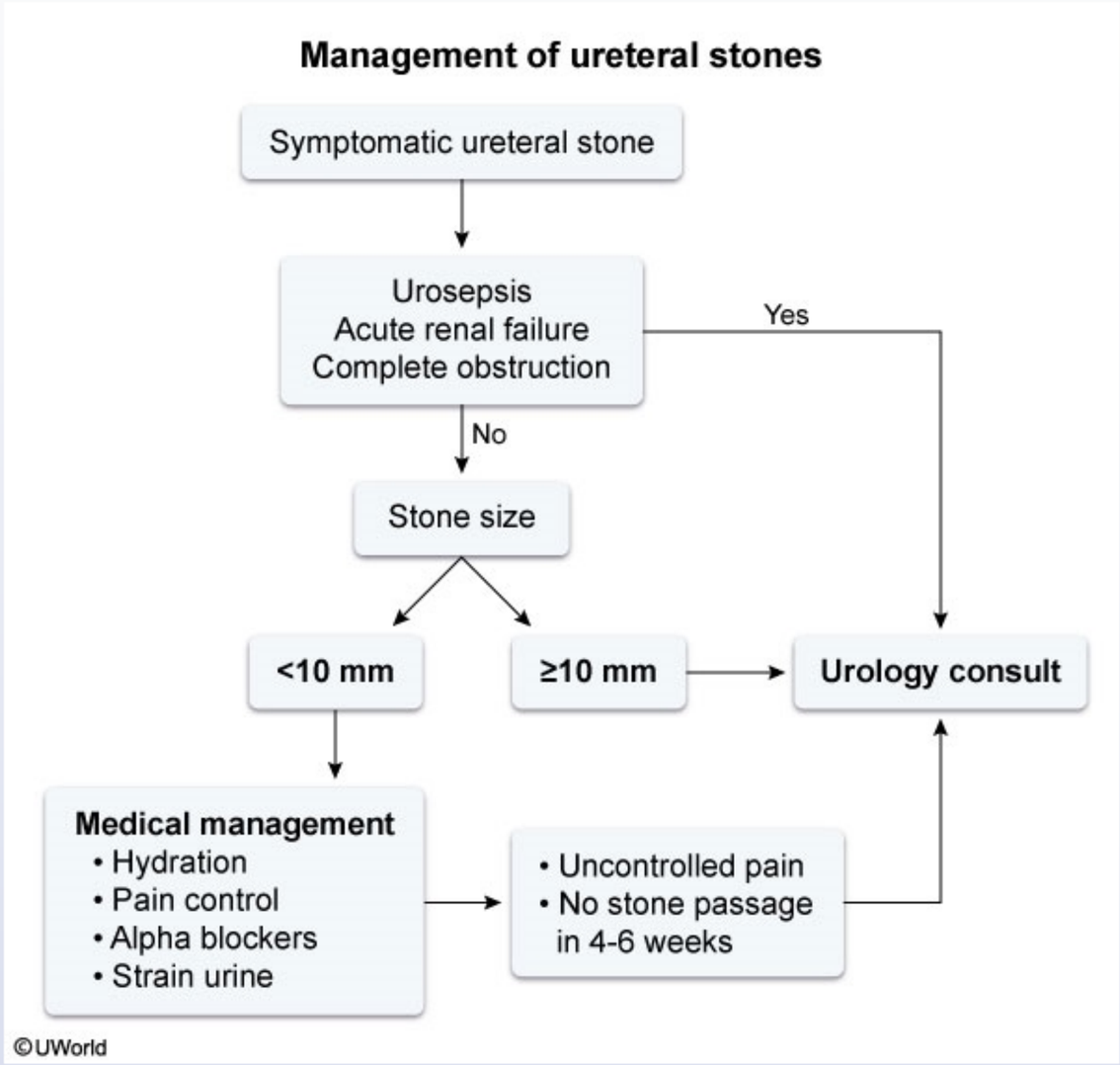
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Explanation

Management of ureteral stones

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This patient has acute flank pain and nausea due to **ureterolithiasis**, which is confirmed on CT scan. The majority of patients with uncomplicated

This patient has acute flank pain and nausea due to **ureterolithiasis**, which is confirmed on CT scan. The majority of patients with uncomplicated kidney stones can be managed conservatively.

- Most stones **≤5 mm** in diameter **pass spontaneously**; increased oral **fluid intake** (>2-2.5 L/day) is recommended to ensure adequate flow of dilute urine. Alpha blockers (eg, tamsulosin) can facilitate passage, especially for larger stones (6-10 mm).
- Stones ≥10 mm are unlikely to pass spontaneously and may warrant (outpatient) urologic evaluation to consider additional interventions (eg, lithotripsy). Regardless of stone size, urologic consultation and hospitalization is generally appropriate for patients with signs of urosepsis (eg, fever, altered mental status); acute kidney injury; complete obstruction; or refractory pain, nausea, or vomiting **(Choice B)**.

This patient has acute flank pain and nausea due to a 4-mm stone. There are no signs of urosepsis, renal function is normal, he is able to take oral fluids and medications, and his pain is well-controlled. The stone will likely pass spontaneously, and the patient can be discharged home with instructions to increase fluid intake and to strain the urine; straining urine for stone composition analysis is not by itself an indication for hospitalization **(Choice D)**.

(Choice A) Prolonged intravenous (forced) hydration is not proven superior to oral hydration for stone passage and is not needed for low-risk patients such as this one. Nonsteroidal anti-inflammatory drugs—which, in patients with nephrolithiasis, are as effective as opiates and associated with fewer side effects (eg, nausea)—would be appropriate in this patient with normal renal function.

(Choice C) Dysuria is a classic symptom of urinary tract infection but is also common in lower ureterolithiasis. This patient has no fever or pyuria to suggest pyelonephritis, so he does not require observation or antibiotics.

Educational objective:
Most ureteral stones ≤5 mm in diameter pass spontaneously; increased oral fluid intake is recommended to ensure adequate flow of dilute urine. Alpha blockers can be used to facilitate passage of larger stones (6-10 mm). Urologic consultation is recommended for stones ≥10 mm and for refractory pain, anuria, acute kidney injury, or signs of urosepsis.

References

- Urinary stone disease: diagnosis, medical therapy, and surgical management.

Surgery Renal, Urinary Systems & Electrolytes Renal calculi

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of dilute urine. Alpha blockers (eg, tamsulosin) can facilitate passage, especially for larger stones (6-10 mm).

- Stones ≥10 mm are unlikely to pass spontaneously and may warrant (outpatient) urologic evaluation to consider additional interventions (eg, lithotripsy). Regardless of stone size, urologic consultation and hospitalization is generally appropriate for patients with signs of urosepsis (eg, fever, altered mental status); acute kidney injury; complete obstruction; or refractory pain, nausea, or vomiting **(Choice B)**.

This patient has acute flank pain and nausea due to a 4-mm stone. There are no signs of urosepsis, renal function is normal, he is able to take oral fluids and medications, and his pain is well-controlled. The stone will likely pass spontaneously, and the patient can be discharged home with instructions to increase fluid intake and to strain the urine; straining urine for stone composition analysis is not by itself an indication for hospitalization **(Choice D)**.

(Choice A) Prolonged intravenous (forced) hydration is not proven superior to oral hydration for stone passage and is not needed for low-risk patients such as this one. Nonsteroidal anti-inflammatory drugs—which, in patients with nephrolithiasis, are as effective as opiates and associated with fewer side effects (eg, nausea)—would be appropriate in this patient with normal renal function.

(Choice C) Dysuria is a classic symptom of urinary tract infection but is also common in lower ureterolithiasis. This patient has no fever or pyuria to suggest pyelonephritis, so he does not require observation or antibiotics.

Educational objective:
Most ureteral stones ≤5 mm in diameter pass spontaneously; increased oral fluid intake is recommended to ensure adequate flow of dilute urine. Alpha blockers can be used to facilitate passage of larger stones (6-10 mm). Urologic consultation is recommended for stones ≥10 mm and for refractory pain, anuria, acute kidney injury, or signs of urosepsis.

References

- Urinary stone disease: diagnosis, medical therapy, and surgical management.

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

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Item 16 of 40
Question Id: 17450

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A 19-year-old man is brought to the emergency department after a hard fall during a skateboarding trick. The patient was attempting a board slide down a metal handrail when he lost his balance, striking his left flank against the rail. He did not hit his head or lose consciousness but felt short of breath for approximately a minute after the impact. The patient now has pain in the left midback. Blood pressure is 132/80 mm Hg and pulse is 106/min. Breath and heart sounds are normal. The abdomen is soft and nontender. The left flank is bruised and tender to palpation. Hematocrit is 44%. Urinalysis is normal. Which of the following is the best next step in management of this patient?

A. Admission for serial hematocrits
B. CT scan of the abdomen
C. Diagnostic laparoscopy
D. Discharge home with close follow-up
E. Retrograde cystourethrography

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A. Admission for serial hematocrits (2%)
✓ B. CT scan of the abdomen (76%)
C. Diagnostic laparoscopy (0%)
D. Discharge home with close follow-up (20%)
E. Retrograde cystourethrography (1%)

Omitted
Correct answer
B

76%
Answered correctly

02 secs
Time Spent

03/31/2020
Last Updated

Explanation

This patient who sustained a **direct blow to the flank** (eg, handrail impact) now has flank (ie, left midback) pain, ecchymosis, and tenderness to palpation. This presentation is concerning for **renal injury** and should prompt imaging of the kidneys via CT scan.

Blunt trauma can injure the kidneys by either a direct blow, as in this patient, or by rapid compression of the kidneys against the paravertebral muscles. Clinical findings frequently associated with renal injury include the following:

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Explanation

This patient who sustained a **direct blow to the flank** (eg, handrail impact) now has flank (ie, left midback) pain, ecchymosis, and tenderness to palpation. This presentation is concerning for **renal injury** and should prompt imaging of the kidneys via CT scan.

Blunt trauma can injure the kidneys by either a direct blow, as in this patient, or by rapid compression of the kidneys against the paravertebral muscles. Clinical findings frequently associated with renal injury include the following:

- **Flank pain/tenderness**
- **Flank ecchymosis**, which may represent retroperitoneal hematoma from renal bleeding
- Hematuria, either gross or microscopic (>3 erythrocytes/hpf on urinalysis)

Hematuria significantly increases suspicion for renal injury; however, its absence (as in this patient) does not exclude the need for further workup. Hematuria is not present in up to one-third of renal injuries, even when they are severe (eg, avulsion of the ureteropelvic junction).

CT scan of the abdomen and pelvis with contrast (typically multiphase: noncontrast, arterial, corticomedullary, excretory) is used to diagnose renal trauma and should be obtained in patients with **concerning clinical findings** (eg, flank tenderness/ecchymosis) and/or **mechanism of injury** (eg, direct blow to the flank) **(Choice D)**. In these patients, the advantages of contrast-enhanced CT scan for identifying renal injury generally outweigh the risks (eg, contrast-related complications). Once diagnosed, most blunt renal injuries can be managed nonoperatively.

(Choices A and C) This patient has tachycardia and flank ecchymosis, which may indicate renal injury with bleeding. Management of such an injury may eventually include admission for serial hematocrits (eg, for certain small bleeds expected to tamponade) or surgical intervention (eg, diagnostic laparoscopy). However, imaging is necessary first for visualizing and grading the renal injury, determining the extent of ongoing bleeding, and informing the management strategy.

(Choice E) Retrograde cystourethrography can be used to evaluate for bladder or urethral injury. These injuries typically cause gross hematuria, difficulty urinating, suprapubic pain (bladder injury), or blood at the urethral meatus (urethral injury).

Educational objective:
Blunt trauma (eg, direct blow to the flank) can cause renal injury. Concerning clinical findings (eg, flank pain/ecchymosis) should prompt CT scan of the abdomen and pelvis, regardless of whether hematuria is present.

- Hematuria, either gross or microscopic (>3 erythrocytes/hpf on urinalysis)

Hematuria significantly increases suspicion for renal injury; however, its absence (as in this patient) does not exclude the need for further workup. Hematuria is not present in up to one-third of renal injuries, even when they are severe (eg, avulsion of the ureteropelvic junction).

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Educational objective:
Blunt trauma (eg, direct blow to the flank) can cause renal injury. Concerning clinical findings (eg, flank pain/ecchymosis) should prompt CT scan of the abdomen and pelvis, regardless of whether hematuria is present.

References

- Renal trauma: the current best practice.
- Urotrauma: AUA guideline.
- Guideline of guidelines: a review of urological trauma guidelines.

Surgery	Renal, Urinary Systems & Electrolytes	Blunt abdominal trauma
Subject	System	Topic

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Item 17 of 40
Question Id: 3430

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A 62-year-old woman is brought to the emergency department due to an acute right-sided headache, ocular pain, and nausea. She was watching television in the evening after dinner when the symptoms began; initial treatment with cold compresses and acetaminophen was ineffective. The patient then developed decreased vision in the right eye and called for an ambulance. On examination, she appears uncomfortable and has episodic retching. The right eye has red conjunctival flushing; the right pupil is mid-dilated and nonreactive to light. Which of the following is the most appropriate next step in management of this patient?

A. Dilated fundus examination
B. Fluorescein eye examination
C. High-dose intravenous methylprednisolone
D. Intravenous acetazolamide
E. Oral valacyclovir

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A. Dilated fundus examination (8%)
B. Fluorescein eye examination (2%)
C. High-dose intravenous methylprednisolone (29%)
✓ D. Intravenous acetazolamide (59%)
E. Oral valacyclovir (0%)

Omitted
Correct answer
D

59%
Answered correctly

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Time Spent

02/26/2020
Last Updated

Explanation

Angle-closure glaucoma	
Clinical features	• **Symptoms:** headache, ocular pain, nausea, decreased visual acuity • **Signs:** conjunctival redness; corneal opacity; fixed, mid-dilated pupil

Angle-closure glaucoma	
Clinical features	• **Symptoms:** headache, ocular pain, nausea, decreased visual acuity • **Signs:** conjunctival redness; corneal opacity; fixed, mid-dilated pupil
Diagnosis	• Tonometry (measures intraocular pressure) • Gonioscopy (measures corneal angle)
Treatment	• **Topical therapy:** multidrug topical therapy (eg, timolol, pilocarpine, apraclonidine) • **Systemic therapy:** acetazolamide (consider mannitol) • Laser iridotomy

This patient has acute **angle-closure glaucoma (ACG)** presenting with headache, ocular pain, nausea, and decreased visual acuity. ACG is characterized by narrowing or closure of the anterior chamber angle, leading to decreased aqueous outflow and **elevated intraocular pressure (IOP)**. Examination findings include conjunctival injection; corneal edema; palpable firmness of the eyeball; and a fixed, mid-dilated pupil. The diagnosis is confirmed by gonioscopy to visualize the corneal angle and/or tonometry to measure IOP.

Initial management is directed at rapidly lowering IOP. Combination therapy with **multiple topical agents** is recommended; a typical regimen includes **timolol** (which reduces aqueous production), **apraclonidine** (which decreases aqueous production and increases outflow), and **pilocarpine** (which causes ciliary muscle contraction to open the trabecular meshwork at the corneal angle) eye drops. In addition, oral or intravenous **acetazolamide** is recommended to rapidly reduce further production of aqueous humor. Subsequently, **laser iridotomy** can facilitate aqueous outflow and provide definitive management.

(Choice A) Pupillary dilation (eg, dilated funduscopic examination) narrows the corneal angle and can precipitate or worsen ACG. Therefore, mydriatic drops (eg, phenylephrine, cyclopentolate) should not be given in patients with ACG.

(Choice B) Fluorescein dye can be instilled onto the surface of the eye to facilitate inspection of the cornea (eg, foreign body, corneal abrasion, keratitis). Systemic administration of fluorescein can be used to inspect the retinal circulation (ie, fluorescein angiography). These techniques are not helpful in the diagnosis of ACG.

(Choice C) High-dose systemic glucocorticoids (eg, methylprednisolone) are indicated for the treatment of anterior ischemic optic neuropathy in

This patient has acute **angle-closure glaucoma (ACG)** presenting with headache, ocular pain, nausea, and decreased visual acuity. ACG is characterized by narrowing or closure of the anterior chamber angle, leading to decreased aqueous outflow and **elevated intraocular pressure (IOP)**. Examination findings include conjunctival injection; corneal edema; palpable firmness of the eyeball; and a fixed, mid-dilated pupil. The diagnosis is confirmed by gonioscopy to visualize the corneal angle and/or tonometry to measure IOP.

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(Choice C) High-dose systemic glucocorticoids (eg, methylprednisolone) are indicated for the treatment of anterior ischemic optic neuropathy in giant cell (temporal) arteritis. They are also used in patients with optic neuritis (eg, due to multiple sclerosis). Although these conditions can cause various combinations of headache, ocular pain, and vision loss, this patient's conjunctival redness, mid-dilated pupil, and associated nausea are more consistent with ACG.

(Choice E) Ophthalmic zoster (which is treated with valacyclovir) presents with eye pain, conjunctivitis, and corneal ulcers. It is usually associated with a vesicular rash in the distribution of the cutaneous branch of the first division of the trigeminal nerve [CN V]. Headache and retching are more typical of ACG.

Educational objective:
Initial management of angle-closure glaucoma is directed at rapidly lowering intraocular pressure. Combination therapy with multiple topical agents (eg, timolol, pilocarpine, apraclonidine) is recommended. In addition, acetazolamide rapidly reduces further production of aqueous humor.

aqueous outflow and provide definitive management.

(Choice A) Pupillary dilation (eg, dilated funduscopic examination) narrows the corneal angle and can precipitate or worsen ACG. Therefore, mydriatic drops (eg, phenylephrine, cyclopentolate) should not be given in patients with ACG.

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Educational objective:
Initial management of angle-closure glaucoma is directed at rapidly lowering intraocular pressure. Combination therapy with multiple topical agents (eg, timolol, pilocarpine, apraclonidine) is recommended. In addition, acetazolamide rapidly reduces further production of aqueous humor. Subsequently, laser iridotomy can facilitate aqueous outflow and provide definitive management.

References

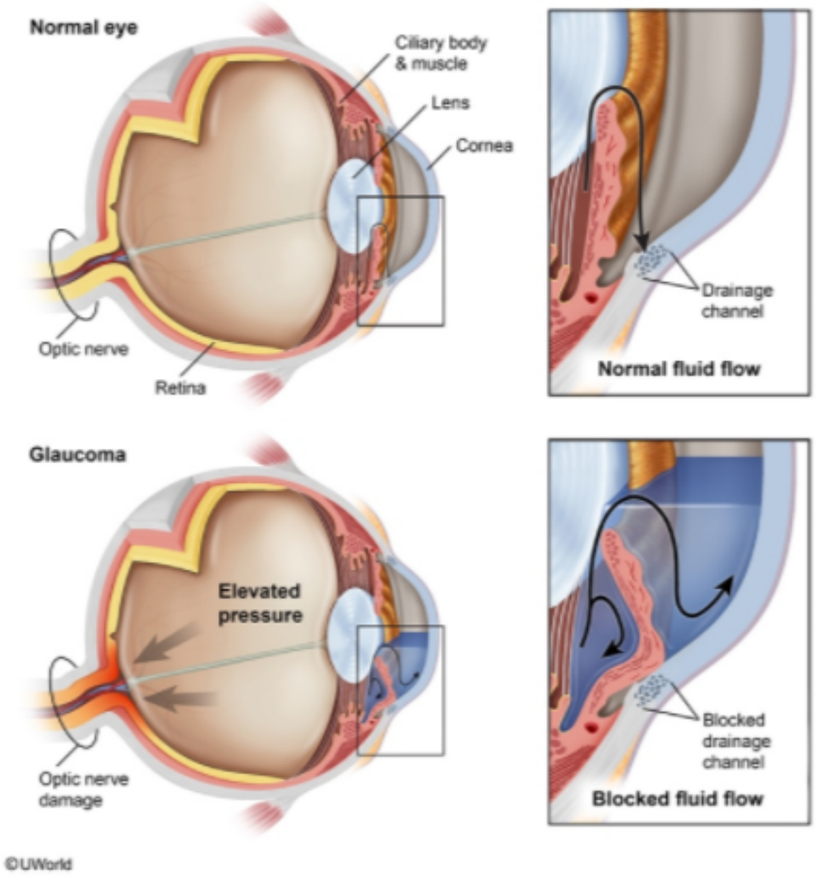
- Primary angle-closure glaucoma: an update.

Surgery	Ophthalmology	Glaucoma
Subject	System	Topic

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Angle-closure glaucoma



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(Choice C) High-dose systemic glucocorticoids (eg, methylprednisolone) are indicated for the treatment of anterior ischemic optic neuropathy in

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Item 18 of 40
Question Id: 4552

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A 23-year-old man is found at the scene of a motor vehicle accident with lower extremity fractures, abdominal bruising, and scalp lacerations. He complains of pain and some shortness of breath. Initially, his blood pressure is 95/60 mm Hg and pulse is 120/min and regular. His spine is immobilized, and peripheral intravenous access is obtained. He is given 1 L of intravenous fluids. On the way to the hospital, he becomes progressively drowsy and develops progressive weakness on the right side of his body. His blood pressure is 160/90 mm Hg and pulse is 50/min. Which of the following nerve functions is most likely to be compromised on physical examination?

A. Abducens
B. Accessory
C. Facial
D. Glossopharyngeal
E. Oculomotor

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A 23-year-old man is found at the scene of a motor vehicle accident with lower extremity fractures, abdominal bruising, and scalp lacerations. He complains of pain and some shortness of breath. Initially, his blood pressure is 95/60 mm Hg and pulse is 120/min and regular. His spine is immobilized, and peripheral intravenous access is obtained. He is given 1 L of intravenous fluids. On the way to the hospital, he becomes progressively drowsy and develops progressive weakness on the right side of his body. His blood pressure is 160/90 mm Hg and pulse is 50/min. Which of the following nerve functions is most likely to be compromised on physical examination?

- A. Abducens (14%)
- B. Accessory (15%)
- C. Facial (13%)
- D. Glossopharyngeal (14%)
- ✓ E. Oculomotor (41%)

Omitted
Correct answer
E

41%
Answered correctly

02 secs
Time Spent

06/08/2020
Last Updated

Explanation

Transtentorial (Uncal) Herniation	
Lesion	**Neurologic Signs**

Transtentorial (Uncal) Herniation	
Lesion	**Neurologic Signs**
Compression of the contralateral crus cerebri against the tentorial edge	Ipsilateral hemiparesis
Compression of the ipsilateral oculomotor nerve (i.e., CN III) by the herniated uncus	Loss of parasympathetic innervation causes mydriasis (occurs early); loss of motor innervation causes ptosis and a down-and-out gaze of the ipsilateral pupil due to unopposed trochlear (i.e., CN IV) and abducent (i.e., CN VI) action (occurs late)
Compression of the ipsilateral posterior cerebral artery (i.e., ischemia of visual cortex)	Contralateral homonymous hemianopsia
Compression of the reticular formation	Altered level of consciousness; coma

This patient presents after blunt head trauma with signs/symptoms worrisome for transtentorial (uncal) herniation secondary to a right-sided epidural hematoma. Epidural hematomas result from rupture of the middle meningeal artery, and this higher arterial pressure can rapidly expand the hematoma and compress the temporal lobe. The fluid resuscitation in this patient likely increased the rate at which the epidural hematoma expanded. The presence of hypertension, bradycardia, and respiratory depression (Cushing's reflex) indicates elevated intracranial pressure. The uncus is the innermost part of the temporal lobe and herniates through the tentorium to cause pressure on the ipsilateral oculomotor nerve,

This patient presents after blunt head trauma with signs/symptoms worrisome for transtentorial (uncal) herniation secondary to a right-sided epidural hematoma. Epidural hematomas result from rupture of the middle meningeal artery, and this higher arterial pressure can rapidly expand the hematoma and compress the temporal lobe. The fluid resuscitation in this patient likely increased the rate at which the epidural hematoma expanded. The presence of hypertension, bradycardia, and respiratory depression (Cushing's reflex) indicates elevated intracranial pressure. The uncus is the innermost part of the temporal lobe and herniates through the tentorium to cause pressure on the ipsilateral oculomotor nerve, ipsilateral posterior cerebral artery, and contralateral cerebral peduncle against the edge of the tentorium. Patients typically present with the focal neurologic signs shown in the table above.

(Choice A) Abducens nerve (i.e., CN VI) injury from uncal herniation usually occurs later in the clinical presentation, with a symptom of inability to abduct the eye.

(Choice B) Accessory nerve (i.e., CN XI) dysfunction can be due to lesions in the medulla, such as occlusion of the posterior inferior cerebellar artery. The accessory nerve can also be injured during surgical procedures involving the anterolateral neck. Injuries present with paralysis of the ipsilateral sternocleidomastoid and trapezius muscles.

(Choice C) The facial nerve originates between the pons and medulla, and lesions at that level can cause an upper motor neuron lesion, resulting in contralateral lower facial droop.

(Choice D) The glossopharyngeal nerve (i.e., CN IX) is most commonly injured by compression from a nearby tumor, as in jugular foramen syndrome (posterior fossa tumor). A glossopharyngeal nerve lesion would cause loss of the gag reflex, loss of taste and sensation on the posterior one-third of the tongue, loss of pharyngeal sensation, and dysfunction of the carotid sinus reflex leading to an increased risk of syncope.

Educational objective:
Transtentorial herniation of the parahippocampal uncus can occur during significant head trauma and leads to ipsilateral hemiparesis, ipsilateral mydriasis and strabismus, contralateral hemianopsia, and altered mentation.

Surgery	Nervous System	Brain herniation
Subject	System	Topic

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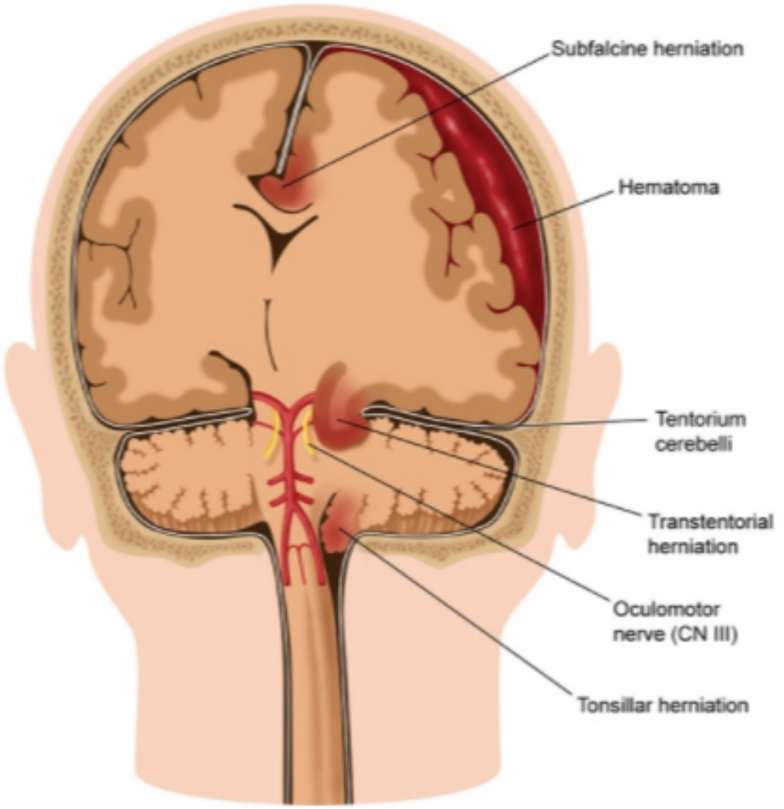
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Item 18 of 40
Question Id: 4552

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Exhibit Display

Major herniations of the brain



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Item 19 of 40
Question Id: 17426

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A 25-year-old man is brought to the emergency department after he fell headfirst down a flight of stairs while intoxicated. According to friends who witnessed the fall, the patient landed on his head but did not lose consciousness. On arrival, blood pressure is 128/78 mm Hg, pulse is 92/min, and respirations are 12/min. The patient smells of alcohol and is somnolent but can follow simple commands. There are facial abrasions. A rigid cervical collar is in place. Bilateral breath sounds are normal with no chest tenderness. Heart sounds are normal. The abdomen is soft and nontender. The patient is moving all extremities spontaneously. He states that he is uncomfortable due to the cervical collar and requests that it be removed. Which of the following is the best immediate step for evaluating and ruling out cervical spine injury in this patient?

A. CT scan without contrast
B. Flexion and extension x-rays
C. MR imaging without contrast
D. Portable lateral x-ray
E. Thorough neurologic examination

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Item 19 of 40
Question Id: 17426
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- A. CT scan without contrast (37%)
- B. Flexion and extension x-rays (4%)
- C. MR imaging without contrast (9%)
- D. Portable lateral x-ray (28%)
- E. Thorough neurologic examination (21%)

Omitted
Correct answer
A

37%
Answered correctly

02 secs
Time Spent

02/23/2020
Last Updated

Explanation

This patient who fell headfirst down a flight of stairs and landed on his head may have a **cervical spine** (CS) injury.

Patients at high risk of CS injury (eg, high-energy mechanism, trauma causing concomitant closed head injury) automatically require CS imaging. Other patients, such as this one, who have a less severe trauma mechanism but some risk for CS injury are managed according to clinical

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Patients at high risk of CS injury (eg, high-energy mechanism, trauma causing concomitant closed head injury) automatically require CS imaging. Other patients, such as this one, who have a less severe trauma mechanism but some risk for CS injury are managed according to clinical decision rules such as the National Emergency X-Radiography Utilization Study **(NEXUS)** low-risk **criteria**. According to these criteria, CS imaging is necessary if any of the following is present:

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

This patient is both somnolent and intoxicated; therefore, CS imaging is indicated. A **CT scan** of the CS without contrast is the **preferred screening** test to evaluate for CS injury, especially for fracture, because it is significantly more sensitive than plain radiography (ie, ~98% vs ~52% sensitivity) **(Choice D)**. If none of the NEXUS criteria are present, then imaging is not required; a normal neurologic examination is sufficient to rule out CS injury and remove the collar **(Choice E)**.

(Choice B) Flexion and extension x-rays are lateral views taken during CS flexion and extension to assess for ligamentous injury. However, these views are not performed until after a CS fracture has been ruled out (eg, with a negative CT scan) and can be performed safely only in alert, cooperative patients (vs this somnolent, intoxicated patient).

(Choice C) MR imaging is not commonly performed as the primary screening test for CS injury; instead, it is typically performed when a CT scan suggests ligamentous or spinal cord injury, in order to better visualize the soft tissues. CT scan is quicker, cheaper, and better tolerated by patients than MRI.

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.

- **Intoxication**
- Distracting injury

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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.

Surgery	Nervous System	Spinal cord injury
Subject	System	Topic

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A 40-year-old man comes to the emergency department with 2 weeks of fever, malaise, weakness, and an unintentional 2.3-kg (5-lb) weight loss. During the last 4 days, he developed left-sided chest and upper abdominal pain. He has asymptomatic mitral valve prolapse. His wife was treated for an upper respiratory infection 3 weeks ago. The patient works for a large corporation and frequently travels to Mexico. He has a 20-pack-year smoking history. He does not use alcohol. His temperature is 39.4 C (103 F), blood pressure is 120/70 mm Hg, pulse is 96/min, and respirations are 16/min. Lung examination shows decreased breath sounds in the left lower lung field with dullness to percussion. Cardiac examination shows a 2/6 systolic murmur at the apex. Laboratory results are as follows:

White blood cells	27,000/mm^3
Neutrophils	60%
Bands	15%
Hemoglobin	13 g/dL
Platelets	250,000/mm^3

Imaging studies reveal left-sided pleural effusion and splenomegaly with a splenic fluid collection. Which of the following is the most likely underlying diagnosis in this patient?

A. Chronic malaria
B. Hodgkin lymphoma
C. Infectious mononucleosis
D. Infective endocarditis
E. Lung adenocarcinoma
F. Tuberculosis

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C. Infectious mononucleosis
D. Infective endocarditis
E. Lung adenocarcinoma
F. Tuberculosis

Submit

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Hemoglobin	13 g/dL
Platelets	250,000/mm^3

Imaging studies reveal left-sided pleural effusion and splenomegaly with a splenic fluid collection. Which of the following is the most likely underlying diagnosis in this patient?

- A. Chronic malaria (7%)
- B. Hodgkin lymphoma (13%)
- C. Infectious mononucleosis (15%)
- ✓ D. Infective endocarditis (34%)
- E. Lung adenocarcinoma (4%)
- F. Tuberculosis (25%)

Omitted
Correct answer

34%
Answered correctly

05 secs
Time Spent

05/21/2020
Last Updated

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Explanation

Clinical features of splenic abscess	
Risk factors	• Infection (eg, infective endocarditis) with hematogenous spread • Hemoglobinopathy (eg, sickle cell disease) • Immunosuppression (eg, HIV) • IV drug use • Trauma
Clinical presentation	• Classic triad of fever, leukocytosis & left upper-quadrant abdominal pain • Left-sided pleuritic chest pain with left pleural effusion commonly seen • Possible splenomegaly • Most commonly due to *Staphylococcus, Streptococcus* & *Salmonella* • Usually diagnosed by abdominal computed tomography scan
Treatment	• Combination of broad-spectrum antibiotics & splenectomy • Possible percutaneous drainage in poor surgical candidates

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This patient's presentation is consistent with a likely **splenic abscess**, which classically causes the triad of fever, leukocytosis, and left upper-quadrant abdominal pain (due to a splenic fluid collection). Patients can also develop left-sided pleuritic chest pain, left pleural effusion, and

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This patient's presentation is consistent with a likely **splenic abscess**, which classically causes the triad of fever, leukocytosis, and left upper-quadrant abdominal pain (due to a splenic fluid collection). Patients can also develop left-sided pleuritic chest pain, left pleural effusion, and splenomegaly. Risk factors for splenic abscess include infection (eg, infective endocarditis) with hematogenous spread, immunosuppression, IV drug use, trauma, and hemoglobinopathies. Diagnosis is usually confirmed by CT scan of the abdomen.

Splenic abscess is typically due to **infective endocarditis** (or seeding from another site of infection). Likely mechanisms include hematogenous seeding or **septic emboli** to the spleen. Common causative organisms are *Staphylococcus, Streptococcus,* and *Salmonella.* Antibiotics alone for treating splenic abscess have a high mortality (up to 50% in some studies). As a result, splenectomy is recommended for all patients. Percutaneous drainage may be an option in poor surgical candidates.

Patients with preexisting structural cardiac conditions are at increased risk of endocarditis. There should be strong suspicion for endocarditis in this patient who has mitral valve prolapse (associated with a fivefold increased risk of endocarditis at least), fever with systemic manifestations (eg, malaise, weight loss), and splenic abscess (likely due to septic emboli); therefore, to complete the evaluation for Duke criteria, blood cultures should be obtained and echocardiography should be performed, particularly if blood culture results are positive.

(Choice A) Malaria can cause fever, chills, and fatigue; anemia, thrombocytopenia, and jaundice are also common. Splenic abscess is not seen with malaria although splenomegaly can be present.

(Choice B) Hodgkin lymphoma can present with fever, chills, and weight loss. Lymphoma can also be associated with splenomegaly but typically does not cause splenic abscess or infarction.

(Choice C) Infectious mononucleosis is due to the Epstein-Barr virus. Patients usually develop lymphadenopathy, fever, and possible hepatosplenomegaly. However, infectious mononucleosis is usually not associated with left pleural effusion or splenic abscess. It is also uncommon in this age group.

(Choice E) Lung adenocarcinoma can present with fever, weight loss, dyspnea, and pleural effusion, as seen in this patient. However, lung cancer usually metastasizes to the liver, bone, brain, and adrenal glands. Splenic abscess is not seen in the absence of an additional infectious process.

(Choice F) Tuberculosis can present with fever and weight loss. Gastrointestinal tuberculosis most commonly involves the liver, intestine, and

Percutaneous drainage may be an option in poor surgical candidates.

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(Choice F) Tuberculosis can present with fever and weight loss. Gastrointestinal tuberculosis most commonly involves the liver, intestine, and peritoneum. However, splenic involvement is less common, and symptoms are more chronic in nature.

Educational objective:
Splenic abscess usually presents with the classic triad of fever, leukocytosis, and left upper-quadrant abdominal pain. Patients can also develop left-sided pleuritic chest pain, left pleural effusion, and splenomegaly. Risk factors for splenic abscess include hematogenous spread, immunosuppression, intravenous drug use, trauma, and hemoglobinopathies. Infective endocarditis is most commonly associated with splenic abscess.

References

- Splenic abscesses.

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Educational objective:
Splenic abscess usually presents with the classic triad of fever, leukocytosis, and left upper-quadrant abdominal pain. Patients can also develop left-sided pleuritic chest pain, left pleural effusion, and splenomegaly. Risk factors for splenic abscess include hematogenous spread, immunosuppression, intravenous drug use, trauma, and hemoglobinopathies. Infective endocarditis is most commonly associated with splenic abscess.

References

- Splenic abscesses.
- Splenic infarction and abscess complicating infective endocarditis.

Surgery	Infectious Diseases	Endocarditis
Subject	System	Topic

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Item 21 of 40
Question Id: 16544

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A 56-year-old man comes to the office due to pain, redness, and swelling in his right arm. The patient was recently diagnosed with unresectable lung cancer. He received the first cycle of chemotherapy 2 weeks ago through a right-sided peripherally inserted central catheter (PICC). Temperature is 36.9 C (98.4 F), blood pressure is 130/80 mm Hg, pulse is 78/min, and respirations are 14/min. Oxygen saturation is normal. Examination shows right arm swelling and mild erythema. Capillary refill is normal. No discharge is seen around the PICC line. The remainder of the examination is normal. Which of the following is the most appropriate next step in management?

A. Chest MRI
B. Duplex ultrasonography
C. Echocardiography
D. Empiric antibiotics
E. Warm compresses and NSAIDs

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Item 21 of 40
Question Id: 16544

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A. Chest MRI (4%)
✓ B. Duplex ultrasonography (60%)
C. Echocardiography (0%)
D. Empiric antibiotics (10%)
E. Warm compresses and NSAIDs (24%)

Omitted
Correct answer
B

60%
Answered correctly

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Time Spent

01/07/2020
Last Updated

Explanation

Upper extremity deep venous thrombosis	
Epidemiology	• Central catheter or PICC line • Young, athletic males (spontaneous)

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Upper extremity deep venous thrombosis	
Epidemiology	• Central catheter or PICC line • Young, athletic males (spontaneous) • Thoracic outlet obstruction
Manifestations	• Unilateral arm or forearm edema • Pain/heavy sensation • Erythema • Dilated subcutaneous collateral veins
Diagnosis	• Doppler or duplex ultrasonography
Treatment	• 3 months of anticoagulation

PICC = peripherally inserted central catheter.

This patient's arm swelling, pain, and mild erythema developed in the setting of a **peripherally inserted central catheter** (PICC), raising strong suspicion for **upper extremity deep venous thrombosis** (DVT). All upper extremity central catheters (eg, internal jugular, subclavian) are associated with increased risk of DVT due to endothelial trauma during insertion and improper positioning of the catheter tip; the risk of DVT is somewhat higher with PICCs because they travel long distances through narrow peripheral veins (often occupying >50% of total vein caliber). Hospitalized patients, particularly those with a hypercoagulable state (eg, **malignancy**), are most likely to develop PICC-related DVT.

Upper extremity DVT is most common within 7-14 days of PICC insertion. The primary manifestation is **arm or forearm swelling**. Pain and mild erythema may also occur. In contrast to PICC infection, patients with DVT usually have a normal appearing catheter insertion site (eg, no purulence). The diagnosis is made with compression or **duplex ultrasonography**, which visualizes the subclavian, axillary, and brachiocephalic veins. Although upper extremity DVT is associated with a relatively low risk of pulmonary embolism (~6%), treatment with **3 months of anticoagulation** is recommended. The PICC line can often remain in place.

(Choice A) Chest MRI can be used to diagnose superior vena cava (SVC) syndrome, which is often caused by lung malignancy. The SVC is not well visualized with ultrasound, although indirect findings (eg, waveforms) can suggest SVC occlusion. Although SVC syndrome is associated

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(Choice A) Chest MRI can be used to diagnose superior vena cava (SVC) syndrome, which is often caused by lung malignancy. The SVC is not well visualized with ultrasound, although indirect findings (eg, waveforms) can suggest SVC occlusion. Although SVC syndrome is associated with increased risk of DVT, patients usually have dyspnea, chest pain, and/or face or neck swelling.

(Choice C) Echocardiography is used to evaluate for structural defects of the heart. It is not routinely used in the evaluation of upper extremity DVT. Although PICC lines can be associated with bacteremia and resultant endocarditis, this diagnosis is unlikely in a patient who is afebrile and does not have a murmur.

(Choice D) This patient with no fever or catheter site purulence is less likely to have infection. He should undergo duplex ultrasound to evaluate for DVT prior to consideration of empiric antibiotics for cellulitis.

(Choice E) Superficial phlebitis can be treated with warm compresses and NSAIDs. It is generally caused by peripheral, not central, venous access and marked by redness along the peripheral vein. Arm swelling in the setting of PICC is far more likely to indicate DVT.

Educational objective:
Peripherally inserted central catheters increase the risk of upper extremity deep venous thrombosis. The risk is greatest in hospitalized patients, particularly those with malignancy or other hypercoagulable state. Manifestations include arm swelling, erythema, and pain. The diagnosis is made with duplex ultrasonography. Treatment with 3 months of anticoagulation is required.

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Upper extremity DVT is most common within 7-14 days of PICC insertion. The primary manifestation is **arm or forearm swelling**. Pain and mild erythema may also occur. In contrast to PICC infection, patients with DVT usually have a normal appearing catheter insertion site (eg, no purulence). The diagnosis is made with compression or **duplex ultrasonography**, which visualizes the subclavian, axillary, and brachiocephalic veins. Although upper extremity DVT is associated with a relatively low risk of pulmonary embolism (~6%), treatment with **3 months of anticoagulation** is recommended. The PICC line can often remain in place.

(Choice A) Chest MRI can be used to diagnose superior vena cava (SVC) syndrome, which is often caused by lung malignancy. The SVC is not well visualized with ultrasound, although indirect findings (eg, waveforms) can suggest SVC occlusion. Although SVC syndrome is associated with increased risk of DVT, patients usually have dyspnea, chest pain, and/or face or neck swelling.

(Choice C) Echocardiography is used to evaluate for structural defects of the heart. It is not routinely used in the evaluation of upper extremity DVT. Although PICC lines can be associated with bacteremia and resultant endocarditis, this diagnosis is unlikely in a patient who is afebrile and does not have a murmur.

(Choice D) This patient with no fever or catheter site purulence is less likely to have infection. He should undergo duplex ultrasound to evaluate for DVT prior to consideration of empiric antibiotics for cellulitis.

(Choice E) Superficial phlebitis can be treated with warm compresses and NSAIDs. It is generally caused by peripheral, not central, venous access and marked by redness along the peripheral vein. Arm swelling in the setting of PICC is far more likely to indicate DVT.

Educational objective:
Peripherally inserted central catheters increase the risk of upper extremity deep venous thrombosis. The risk is greatest in hospitalized patients, particularly those with malignancy or other hypercoagulable state. Manifestations include arm swelling, erythema, and pain. The diagnosis is made with duplex ultrasonography. Treatment with 3 months of anticoagulation is required.

Surgery	Hematology & Oncology	Venous thromboembolism
Subject	System	Topic

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Item 22 of 40
Question Id: 15913

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An 18-year-old man comes to the office due to 3 days of progressive left testicular pain. The pain began gradually and is dull and achy. The patient has had no trauma to that area and has never had similar symptoms. He has no fever, chills, urinary frequency, dysuria, urethral discharge, or penis ulcerations. The patient is sexually active. Vital signs are within normal limits. The left testicle is lower in the scrotum than the right testicle. The area posterior to the left testis is swollen and very tender. The pain improves with elevation of the testis, and the cremaster reflex is normal. Urinalysis shows 4-5 white blood cells/hpf. Which of the following is the best next step in management of this patient?

A. Analgesics and observation
B. Antibiotic therapy
C. Color Doppler ultrasonogram
D. Elective surgery
E. Urgent surgery

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- A. Analgesics and observation (7%)
- ✓ B. Antibiotic therapy (58%)
- C. Color Doppler ultrasonogram (22%)
- D. Elective surgery (2%)
- E. Urgent surgery (8%)

Omitted
Correct answer
B

58%
Answered correctly

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Time Spent

02/01/2020
Last Updated

Explanation

Acute epididymitis	
Etiology	• Age <35: sexually transmitted (chlamydia, gonorrhea) • Age >35: bladder outlet obstruction (coliform bacteria)

Explanation

Acute epididymitis	
Etiology	• Age <35: sexually transmitted (chlamydia, gonorrhea) • Age >35: bladder outlet obstruction (coliform bacteria)
Manifestations	• Unilateral, posterior testicular pain • Epididymal edema • Pain improved with testicular elevation • Dysuria, frequency (with coliform infection)
Diagnosis	• NAAT for chlamydia & gonorrhea • Urinalysis/culture

NAAT = nucleic acid amplification test.

This patient with posterior testicular pain and swelling likely has **acute epididymitis**. Most cases arise when pathogens from the urethra travel in a retrograde fashion through the ejaculatory duct to the ductus deferens and epididymis. The likely underlying pathogen differs based on the age of the patient:

- Age <35 – most cases are caused by sexually transmitted infections, particularly ***Neisseria gonorrhoeae*** or ***Chlamydia trachomatis***. Patients often have minimal urinary symptoms (eg, dysuria, frequency, urethral discharge) and mild or no pyuria.
- Age >35 – most cases are associated with bladder outlet obstruction (eg, benign prostatic hypertrophy) and are caused by coliform bacteria (eg, *Escherichia coli*). Patients generally have urinary symptoms and significant pyuria on urinalysis.

Epididymitis is often suspected when physical examination reveals posterior testicular swelling and tenderness that improves with elevation of the testes (Prehn sign). Confirmation requires urinalysis/urine culture and nucleic acid amplification testing for *N gonorrhoeae* and *C trachomatis*. Treatment with **ceftriaxone plus doxycycline** (for *N gonorrhoeae* or *C trachomatis*) or levofloxacin (for enteric pathogens) is generally curative. Nonsteroidal anti-inflammatory drugs and testicular elevation may provide symptomatic relief but must be accompanied by antibiotic therapy

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(Choices C and E) Urgent surgery is required for testicular torsion, which is usually characterized by severe testicular pain and a negative cremaster reflex (testes do not elevate with stroking of inner thigh). It is often diagnosed clinically but is supported by color Doppler ultrasound evidence of no blood flow to the affected testis. This patient's progressive pain over days, posterior testicular tenderness, and normal cremaster reflex makes torsion unlikely.

(Choice D) Elective surgery is occasionally required to treat hydrocele or varicocele. Hydrocele, a collection of fluid between the parietal and visceral layers of the tunica vaginalis, is generally marked by painless testicular swelling over weeks or months. Varicocele, which is caused by dilation of the pampiniform plexus, generally presents with a soft, testicular mass that is often described as "a bag of worms" on palpation. Neither condition generally presents with pyuria or acute pain.

Educational objective:
Acute epididymitis is associated with posterior testicular pain/swelling, improvement of pain with testicular elevation, and normal cremaster reflex. Most cases are caused by sexually transmitted pathogens (eg, chlamydia, gonorrhea) in patients age <35 and by colonic pathogens (eg,

- Age >35 – most cases are associated with bladder outlet obstruction (eg, benign prostatic hypertrophy) and are caused by coliform bacteria (eg, *Escherichia coli*). Patients generally have urinary symptoms and significant pyuria on urinalysis.

Epididymitis is often suspected when physical examination reveals posterior testicular swelling and tenderness that improves with elevation of the testes (Prehn sign). Confirmation requires urinalysis/urine culture and nucleic acid amplification testing for *N gonorrhoeae* and *C trachomatis*. Treatment with **ceftriaxone plus doxycycline** (for *N gonorrhoeae* or *C trachomatis*) or levofloxacin (for enteric pathogens) is generally curative. Nonsteroidal anti-inflammatory drugs and testicular elevation may provide symptomatic relief but must be accompanied by antibiotic therapy **(Choice A)**.

(Choices C and E) Urgent surgery is required for testicular torsion, which is usually characterized by severe testicular pain and a negative cremaster reflex (testes do not elevate with stroking of inner thigh). It is often diagnosed clinically but is supported by color Doppler ultrasound evidence of no blood flow to the affected testis. This patient's progressive pain over days, posterior testicular tenderness, and normal cremaster reflex makes torsion unlikely.

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Educational objective:
Acute epididymitis is associated with posterior testicular pain/swelling, improvement of pain with testicular elevation, and normal cremaster reflex. Most cases are caused by sexually transmitted pathogens (eg, chlamydia, gonorrhea) in patients age <35 and by colonic pathogens (eg, *Escherichia coli*) in those age >35. Treatment with antibiotics is required.

Surgery	Male Reproductive System	Epididymitis
Subject	System	Topic

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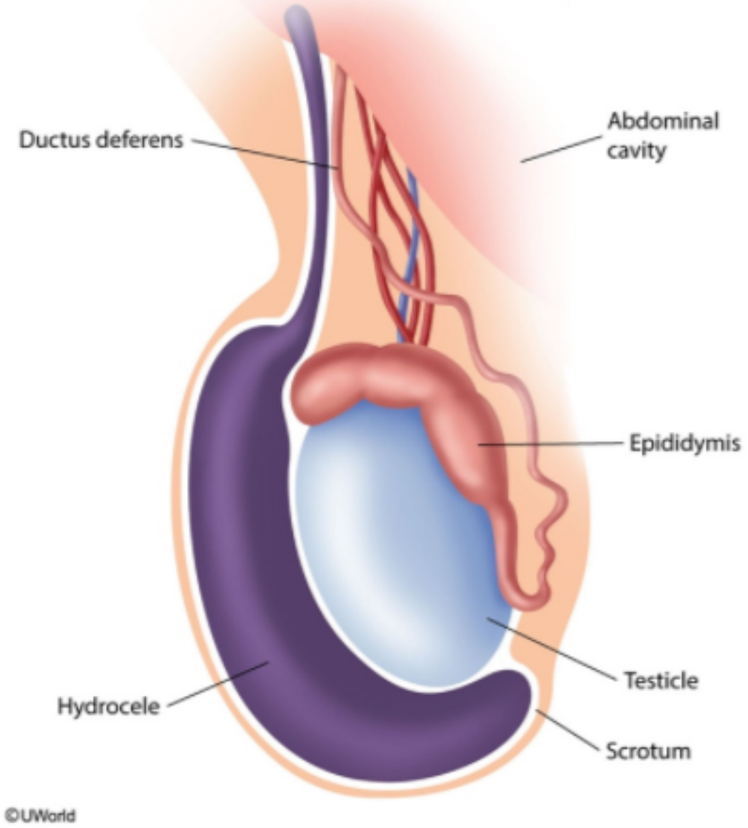
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Item 22 of 40
Question Id: 15913

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Exhibit Display

Communicating hydrocele



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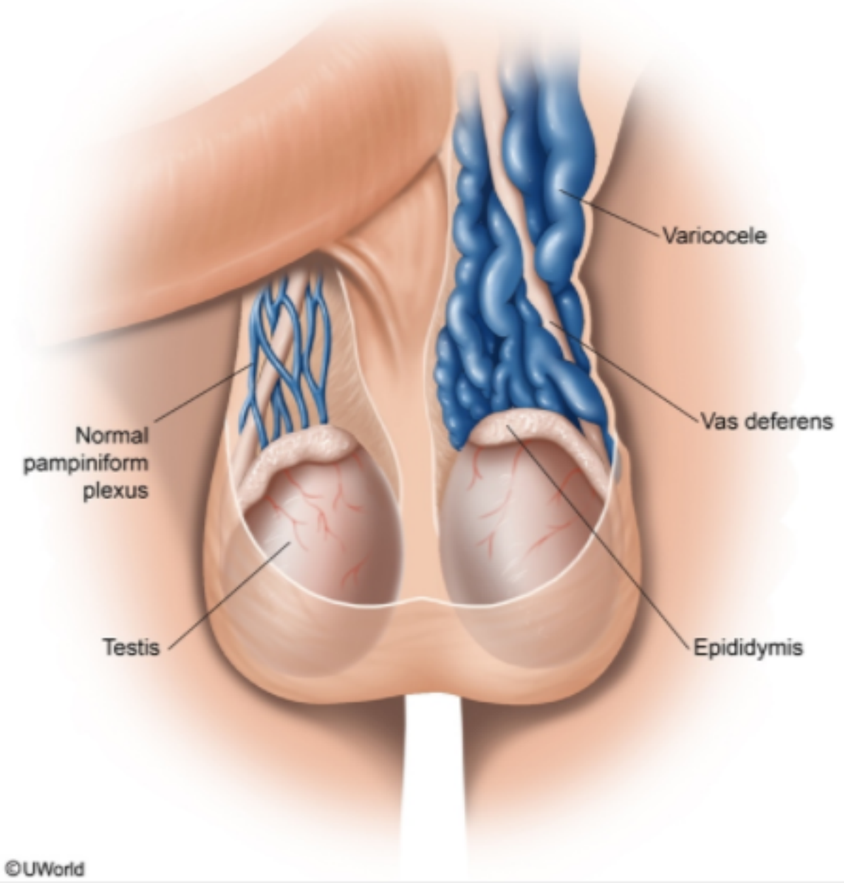
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Question Id: 15913

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Exhibit Display

Varicocele



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Item 23 of 40
Question Id: 4071

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A 60-year-old woman undergoes elective coronary artery bypass surgery and aortic valve replacement. The postoperative course is complicated by acute renal failure, atrial fibrillation, and pulmonary edema. On the third postoperative day, the patient cannot tolerate attempted extubation and requires reintubation. On the fifth postoperative day, she develops a fever to 38.9 C (102 F). Her blood pressure is 110/65 mm Hg, pulse is 110-120/min and irregular, and respirations are 32/min. Chest x-ray shows dense infiltrates in the right middle and lower lobes. White blood cell count is 16,200/mm^3 with 8% bands. Which of the following is the most appropriate next step in management of this patient?

A. C-reactive protein
B. CT scan of the chest
C. D-dimer test
D. Lower respiratory tract sampling with culture
E. No further testing required

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Item 23 of 40
Question Id: 4071

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A. C-reactive protein (0%)
B. CT scan of the chest (14%)
C. D-dimer test (6%)
✓ D. Lower respiratory tract sampling with culture (58%)
E. No further testing required (20%)

Omitted
Correct answer
D

58%
Answered correctly

02 secs
Time Spent

03/05/2020
Last Updated

Explanation

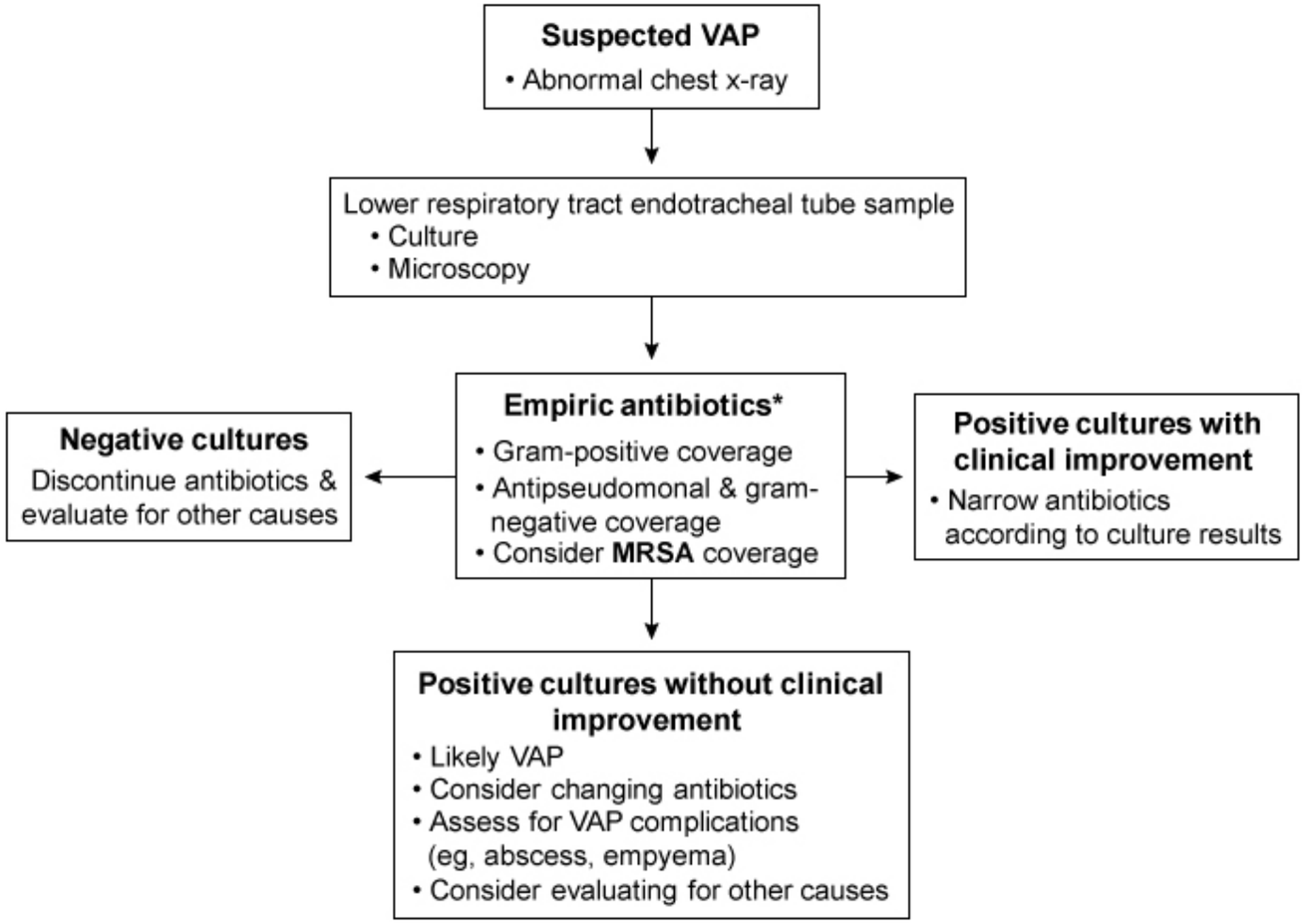
Evaluation of suspected ventilator-associated pneumonia

Suspected VAP
• Abnormal chest x-ray

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Evaluation of suspected ventilator-associated pneumonia



MRSA = methicillin-resistant *Staphylococcus aureus;* **VAP** = ventilator-associated pneumonia.
*Empiric coverage depends on drug-resistance pattern at institution.

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This intubated patient's presentation suggests ventilator-associated pneumonia (VAP). VAP is a type of nosocomial pneumonia that develops

This intubated patient's presentation suggests **ventilator-associated pneumonia (VAP)**. VAP is a type of nosocomial pneumonia that develops **≥48 hours** after endotracheal intubation and is most commonly caused by aerobic gram-negative bacilli (eg, *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella pneumoniae*) and gram-positive cocci (eg, methicillin-resistant *Staphylococcus aureus*, *Streptococcus*). Patients usually have fever, purulent secretions, difficulty with ventilation (eg, increased respiratory rate, decreased tidal volume), and leukocytosis.

The first step is to obtain a **chest x-ray**. Patients with a normal x-ray are unlikely to have VAP and should be evaluated for other causes. Those with an abnormal x-ray (eg, alveolar infiltrates, air bronchograms, silhouetting of adjacent solid organs) require **lower respiratory tract sampling** (ie, tracheobronchial aspiration) for Gram stain and culture. Patients should receive **empiric antibiotics** (usually gram-positive, antipseudomonal, and gram-negative coverage) until culture susceptibility results return as treatment delay can increase mortality. However, respiratory tract sampling should be done **prior** to starting antibiotics as treatment can decrease the sensitivity of both Gram stain and culture.

(Choice A) C-reactive protein may be elevated in VAP, but it is a nonspecific marker of inflammation and cannot identify the underlying diagnosis.

(Choice B) CT scan of the chest can identify complications (eg, empyema) in patients that do not improve clinically with therapy. When Gram stain and culture are not suggestive of VAP, CT scan can also be considered to evaluate for alternate causes (eg, pulmonary embolism). VAP is much more likely than pulmonary embolism in this patient with fever, leukocytosis, and dense infiltrates on chest x-ray. In addition, routine prophylactic anticoagulation (eg, subcutaneous heparin) is standard of care in patients in the intensive care unit, and it is likely that this patient who underwent aortic valve replacement and has atrial fibrillation is already receiving therapeutic anticoagulation therapy (eg, intravenous heparin). All these factors make pulmonary embolism less likely than VAP.

(Choice C) D-dimer is used as an initial test for deep venous thrombosis and pulmonary embolism. However, it is nonspecific and may be elevated in inflammatory or infectious conditions (eg, VAP). This patient's fever, leukocytosis, and lobar infiltrates are more consistent with VAP.

(Choice E) This patient with fever, leukocytosis, and x-ray abnormalities needs respiratory tract sampling to identify the causative pathogen and empiric antibiotics to prevent death.

Educational objective:
Ventilator-associated pneumonia occurs ≥48 hours after intubation and usually presents with fever, purulent secretions, and abnormal chest x-ray. Patients should have lower respiratory tract sampling (Gram stain and culture) and receive empiric antibiotics.

References

(ie, tracheobronchial aspiration) for Gram stain and culture. Patients should receive **empiric antibiotics** (usually gram-positive, antipseudomonal, and gram-negative coverage) until culture susceptibility results return as treatment delay can increase mortality. However, respiratory tract sampling should be done **prior** to starting antibiotics as treatment can decrease the sensitivity of both Gram stain and culture.

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Educational objective:
Ventilator-associated pneumonia occurs ≥48 hours after intubation and usually presents with fever, purulent secretions, and abnormal chest x-ray. Patients should have lower respiratory tract sampling (Gram stain and culture) and receive empiric antibiotics.

References

- Management of ventilator-associated pneumonia: epidemiology, diagnosis and antimicrobial therapy.

Surgery	Infectious Diseases	Healthcare associated pneumonia
Subject	System	Topic

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Settings

Item 24 of 40
Question Id: 12167

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A 38-year-old hospitalized man is evaluated for persistent fever. He has a history of paraplegia after spinal injury and was admitted 2 weeks ago due to septic shock from an infected sacral pressure ulcer. His condition improved with broad-spectrum antibiotics, intravenous fluids, vasopressors, and wound debridement, but he has been having recurrent fevers for the past 4 days. The patient also has a history of asthma and takes an inhaled glucocorticoid and bronchodilator. Temperature is 38.3 C (101 F), blood pressure is 120/80 mm Hg, and pulse is 96/min. Several white patches are present on the oral mucosa. There is a peripherally inserted central venous catheter in the right arm with mild tenderness but no surrounding erythema. The sacral pressure ulcer has pink granulation tissue with a mild amount of serosanguinous fluid. A chronic indwelling urinary catheter is draining yellow-colored urine. Repeat blood cultures grow budding yeasts. Which of the following is the most likely source of the organism in this patient's blood culture?

- A. Central venous catheter
- B. Contaminated sample
- C. Indwelling urinary catheter
- D. Oropharyngeal infection
- E. Pressure ulcer

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- ✓ A. Central venous catheter (32%)
- B. Contaminated sample (4%)
- C. Indwelling urinary catheter (19%)
- D. Oropharyngeal infection (41%)
- E. Pressure ulcer (2%)

Omitted
Correct answer
A

32%
Answered correctly

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Last Updated

Explanation

Central venous catheters are the most common cause of **nosocomial bloodstream infections** as they create a direct pathway for **colonized skin organisms** to access the circulatory system. Coagulase-negative staphylococci and *Staphylococcus aureus* cause the majority of infections;

Central venous catheters are the most common cause of **nosocomial bloodstream infections** as they create a direct pathway for **colonized skin organisms** to access the circulatory system. Coagulase-negative staphylococci and *Staphylococcus aureus* cause the majority of infections; however, ***Candida*** species are isolated in approximately 10% of cases.

Candida is a budding yeast that frequently colonizes the skin, mucous membranes, and gastrointestinal tract of humans. Active infections are rare in healthy individuals and are usually limited to superficial structures (eg, vaginal candidiasis). However, patients with immunocompromise (eg, postchemotherapy) or intravascular catheter (especially in the **intensive care unit** setting) are at high risk for invasive disease.

Candida bloodstream infections may cause fever, sepsis, and/or multiorgan failure. Diagnosis is made primarily with **blood cultures** (or biopsy), but serum beta-D-glucan antigen can be used as a rapid indicator of possible infection. Treatment usually requires several weeks of intravenous antifungals.

(Choice B) *Candida* in a blood culture should always prompt a search for a nidus of infection and should never be considered a contaminant.

(Choice C) Indwelling urinary catheters, especially those obstructed by a fungus ball, may occasionally cause candidemia; however, this is a far less common source of infection than an intravascular catheter.

(Choice D) This patient likely has oropharyngeal candidiasis (white mucosal plaques); however, mucous membrane infections are a rare cause of invasive disease.

(Choice E) Pressure ulcers may cause bacteremia with a wide range of skin and fecal organisms; however, skin wounds are a rare cause of invasive candidal infections.

Educational objective:
Candidemia is common in patients hospitalized in the intensive care unit with intravascular catheters. Manifestations include fever, sepsis, and/or multiorgan failure. Blood cultures or biopsy are usually required for diagnosis. A positive blood culture for *Candida* should never be considered a contaminant.

References

- Clinical Practice Guideline for the Management of Candidiasis: 2016 Update by the Infectious Diseases Society of America.

Settings

Item 24 of 40
Question Id: 12167

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Item 25 of 40
Question Id: 3467

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A 65-year-old man comes to the office with 2 weeks of dysuria and turbid, foul-smelling urine. He has also noticed air bubbles while urinating. He has no fever, hematuria, hematochezia, weight loss, or pelvic or flank pain. The patient has a long history of straining on urination and a weak urine stream and is currently being treated for benign prostatic hyperplasia. Four weeks ago, he was seen in the emergency department for persistent lower quadrant abdominal pain and diagnosed with acute diverticulitis. He was discharged on an oral antibiotic. Current temperature is 98.7 F (37.1 C), blood pressure is 132/84 mm Hg, and pulse is 72/min. The abdomen is soft and mildly tender in the left lower quadrant. There is no costovertebral angle tenderness. Rectal examination shows a smooth, enlarged, nontender prostate. Laboratory studies show normal complete blood count and serum chemistries, including serum creatinine. Urinalysis is positive for numerous white cells and bacteria. Urine culture grows *Escherichia coli, Proteus mirabilis*, and *Klebsiella pneumoniae*. Which of the following is the most likely cause of this patient's current condition?

A. Acute bacterial prostatitis
B. Bladder cancer
C. Colovesical fistula
D. Emphysematous pyelonephritis
E. Prostatic abscess
F. Staghorn calculi

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Item 25 of 40
Question Id: 3467

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- A. Acute bacterial prostatitis (5%)
- B. Bladder cancer (0%)
- ✓ C. Colovesical fistula (84%)
- D. Emphysematous pyelonephritis (3%)
- E. Prostatic abscess (0%)
- F. Staghorn calculi (6%)

Omitted
Correct answer
C

84%
Answered correctly

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03/02/2020
Last Updated

Explanation

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Clinical features of colovesical fistula	
Etiology	• Diverticular disease (sigmoid most common) • Crohn disease • Malignancy (colon, bladder, pelvic organs)
Clinical presentation	• Pneumaturia (air in urine) • Fecaluria (stool in urine) • Recurrent urinary tract infections (mixed flora)
Diagnosis	• Abdominal CT with oral or rectal (**not intravenous**) contrast • Colonoscopy to exclude colonic malignancy

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This patient's presentation is consistent with **colovesical fistula** (connection between the colon and bladder), which can be a complication of acute diverticulitis. The mechanism is usually due to direct extension of a ruptured diverticulum or erosion of a diverticular abscess into the bladder. Patients typically develop **fecaluria** (stool in the urine) or **pneumaturia** (air in the urine) that usually occurs at the end of urination as the gas collects at the top of the bladder. Patients can also develop recurrent urinary tract infections (sometimes due to **mixed flora** with coliform organisms) or other nonspecific symptoms that can sometimes delay the diagnosis. Colovesical fistula can also occur in patients with Crohn disease or malignancy (usually of the colon).

Abdominal CT scan with oral or rectal (**not intravenous**) contrast can confirm the diagnosis by showing **contrast material in the bladder** with thickened colonic and vesicular walls. Colonoscopy is usually recommended in patients diagnosed with colovesical fistula to exclude colonic malignancy. Treatment is typically surgical after resolution of the infection.

(Choices A and E) Acute bacterial prostatitis typically presents with acute onset of systemic findings (eg, fever, chills, malaise), irritative urinary symptoms (eg, dysuria, frequency), pelvic/perineal pain, and cloudy urine. Prostatic abscess, a focal purulent collection, is a complication of acute bacterial prostatitis. However, both conditions usually cause an exquisitely tender prostate on rectal examination and are not usually associated

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(Choice B) Bladder cancer classically presents with irritative urinary symptoms and painless hematuria. This patient's pneumaturia and absence of hematuria make this less likely.

(Choice D) Emphysematous pyelonephritis (pyelonephritis due to a gas-producing infection, typically in patients with diabetes) can present with abrupt or gradual onset of fever, chills, flank or abdominal pain, and nausea/vomiting. This patient's absence of fever and flank pain makes this less likely.

(Choice F) Staghorn calculi, which are typically due to struvite stones filling the entire intrarenal collecting system, can lead to recurrent urinary tract infections. Patients can develop irritative urinary symptoms, flank pain, or hematuria. However, staghorn calculi are not usually associated with pneumaturia.

Educational objective:
Colovesical fistula is most commonly due to diverticular disease and presents with pneumaturia, fecaluria, or findings consistent with urinary tract infection. Abdominal CT scan with oral or rectal (not intravenous) contrast can confirm the diagnosis by showing contrast material in the bladder

malignancy. Treatment is typically surgical after resolution of the infection.

(Choices A and E) Acute bacterial prostatitis typically presents with acute onset of systemic findings (eg, fever, chills, malaise), irritative urinary symptoms (eg, dysuria, frequency), pelvic/perineal pain, and cloudy urine. Prostatic abscess, a focal purulent collection, is a complication of acute bacterial prostatitis. However, both conditions usually cause an exquisitely tender prostate on rectal examination and are not usually associated with pneumaturia.

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Educational objective:
Colovesical fistula is most commonly due to diverticular disease and presents with pneumaturia, fecaluria, or findings consistent with urinary tract infection. Abdominal CT scan with oral or rectal (not intravenous) contrast can confirm the diagnosis by showing contrast material in the bladder with thickened colonic and vesicular walls.

References

- A case of colovesical fistula induced by sigmoid diverticulitis.

Surgery	Gastrointestinal & Nutrition	Diverticular disease
Subject	System	Topic

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disease or malignancy (usually of the colon).

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Surgery Gastrointestinal & Nutrition Diverticular disease

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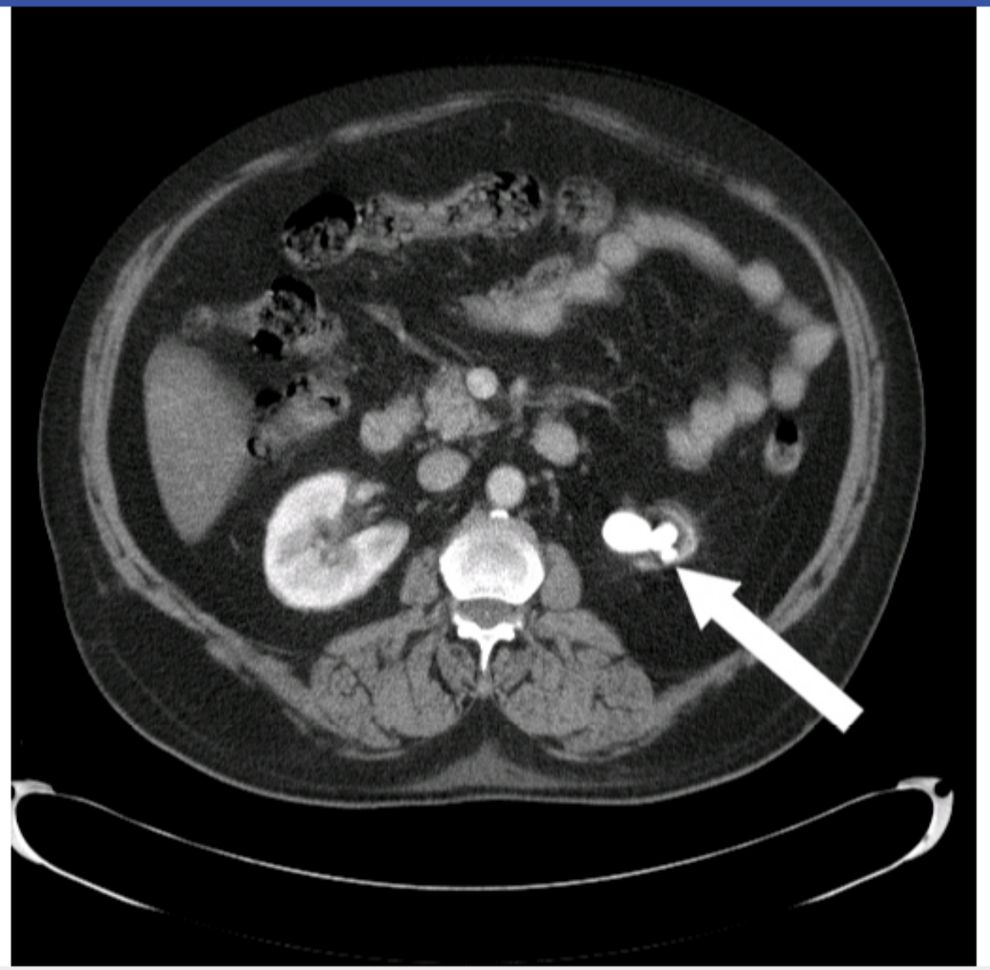
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Exhibit Display



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Surgery Gastrointestinal & Nutrition Diverticular disease

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Item 26 of 40
Question Id: 16061

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A 28-year-old man is admitted to the intensive care unit after a motor vehicle collision. The patient was intubated and received volume resuscitation at the scene. The patient sustained bladder injury, open fractures of the tibia and fibula bilaterally, a complicated pelvic ring injury, and fractures of the right 4th-7th ribs. No head or spinal injuries were detected. Over the course of 8 days, the patient undergoes laparotomy and daily surgeries to address extremity fractures, which require the patient to remain supine and intubated until all the surgeries are completed. On day 9, the respiratory therapist notes 4 hours of increasing secretions and worsening oxygenation: the patient requires an increase in FiO2 from 30% to 70% in order to maintain oxygen saturation of 92%. Vital signs reveal new-onset tachycardia. Temperature is 39.2 C (102.6 F), blood pressure is 125/80 mm Hg, pulse is 125/min, and respirations are 22/min. Portable chest radiograph reveals new right and left lower lobe infiltrates with a left-sided pleural effusion. What is the most likely diagnosis?

A. Acute respiratory distress syndrome
B. Atelectasis due to mucus plugging
C. Fat embolism
D. Pulmonary contusion
E. Pulmonary thromboembolism
F. Ventilator-associated pneumonia
G. Volume overload

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Item 26 of 40
Question Id: 16061

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- A. Acute respiratory distress syndrome (12%)
- B. Atelectasis due to mucus plugging (6%)
- C. Fat embolism (5%)
- D. Pulmonary contusion (1%)
- E. Pulmonary thromboembolism (5%)
- ✓ F. Ventilator-associated pneumonia (67%)
- G. Volume overload (1%)

Omitted
Correct answer
F

67%
Answered correctly

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Explanation

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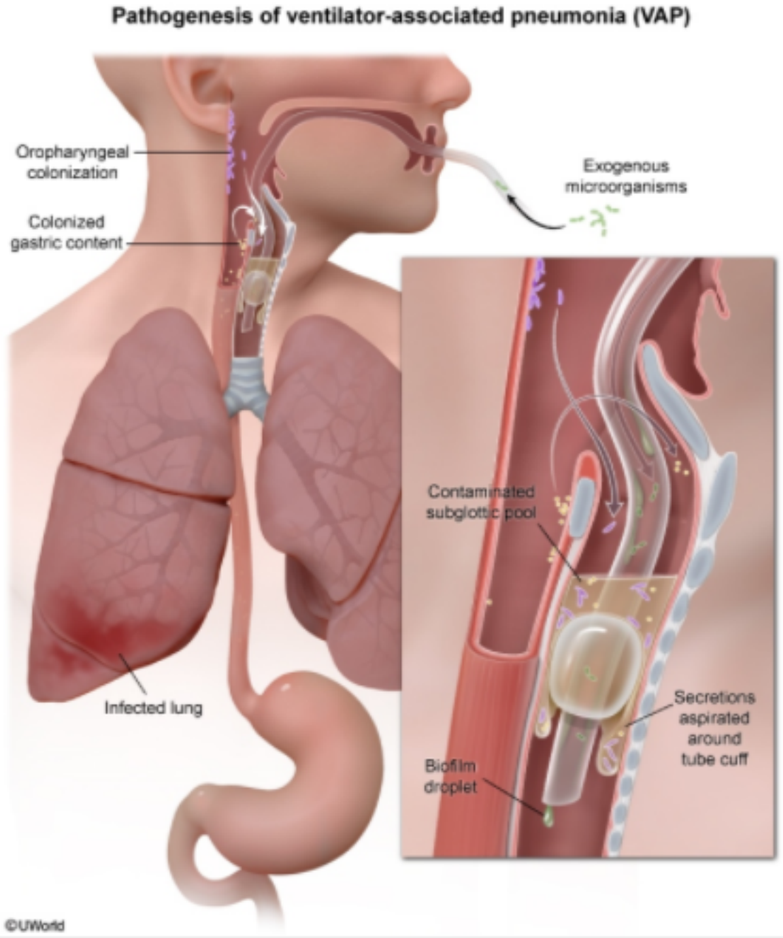
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Pathogenesis of ventilator-associated pneumonia (VAP)

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Infected lung

Secretions

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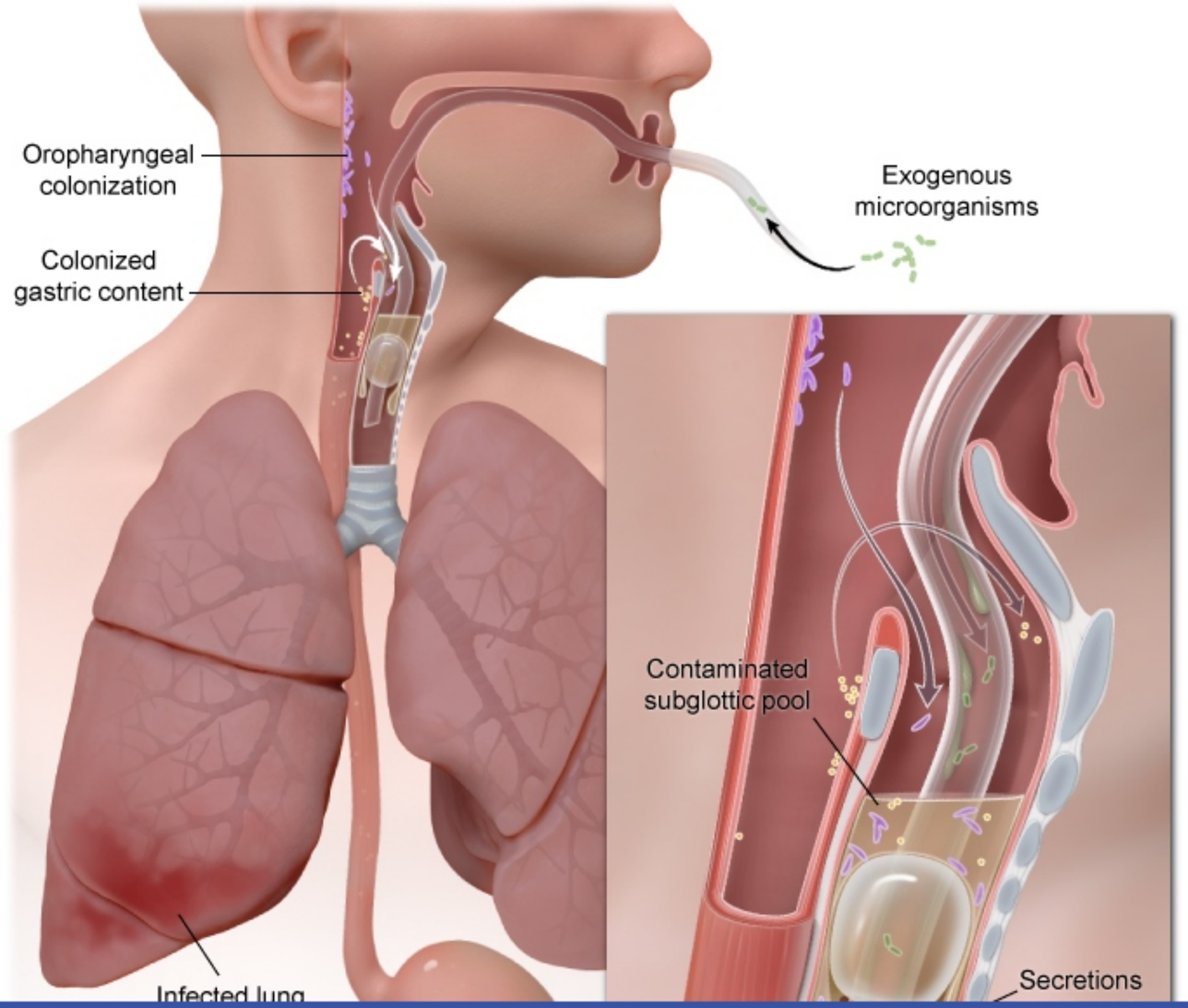
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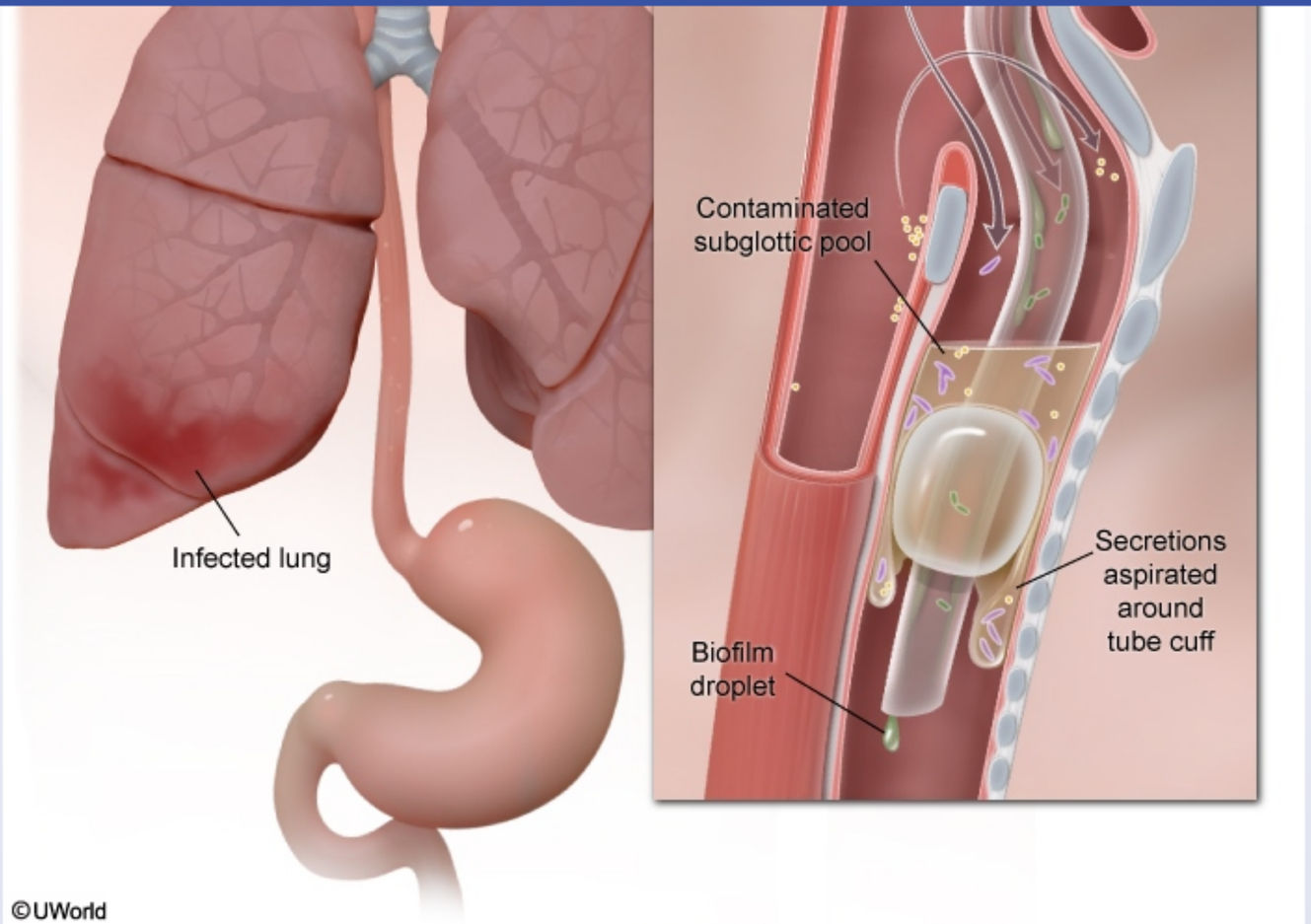
Pathogenesis of ventilator-associated pneumonia (VAP)



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This intubated patient has increased respiratory secretions, worsening oxygenation, fever, tachycardia, and new pulmonary infiltrates on chest x-ray, raising strong suspicion for **ventilator-associated pneumonia** (VAP), a type of hospital-acquired pneumonia that occurs **≥48 hours after intubation**. Most cases arise due to aspiration of oropharyngeal or gastric secretions.

VAP is usually suspected when an intubated patient develops several of the following:

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This intubated patient has increased respiratory secretions, worsening oxygenation, fever, tachycardia, and new pulmonary infiltrates on chest x-ray, raising strong suspicion for **ventilator-associated pneumonia** (VAP), a type of hospital-acquired pneumonia that occurs **≥48 hours after intubation**. Most cases arise due to aspiration of oropharyngeal or gastric secretions.

VAP is usually suspected when an intubated patient develops several of the following:

- **New pulmonary infiltrates**
- **Increased respiratory secretions**
- Signs of worsened respiratory status, such as **worsening oxygenation,** lower tidal volumes, and increased inspiratory pressure
- Systemic signs of infection, such as **fever**, leukocytosis, and tachycardia

However, no constellation of manifestations conclusively proves VAP (eg, intubated patients often have pulmonary infiltrates on x-ray in the absence of VAP). Therefore, noninvasive (eg, endotracheal aspiration) or invasive (eg, bronchoalveolar lavage) **sampling of the lower respiratory tract** is required for confirmation; moderate or heavy growth of ≥1 microorganism is generally diagnostic.

(Choice A) Acute respiratory distress syndrome is often seen in patients with severe trauma and frequently causes increased oxygen requirements and pulmonary infiltrates. However, most cases occur within 72 hours of the inciting event; in addition, fever and increased secretions would be atypical.

(Choice B) Atelectasis due to mucus plugging is often associated with worsened oxygenation. However, high fever and pleural effusion would be less likely.

(Choice C) Fat embolism is common with serious trauma to the pelvis and long bones (eg, femur). Although it frequently causes acute respiratory decompensation, it generally presents within 24-72 hours of the injury, does not usually cause lobar infiltrates, and would not be associated with increased secretions.

(Choice D) Pulmonary contusion can occur in patients with blunt trauma to the chest and often causes increased oxygen requirements. However, it generally presents within the first 24 hours following the injury (not at day 9), and it is not associated with increased secretions.

(Choice E) Major pulmonary thromboembolism can cause acute respiratory decompensation but is not usually associated with increased

respiratory decompensation, it generally presents within 24-72 hours of the injury, does not usually cause lobar infiltrates, and would not be associated with increased secretions.

(Choice D) Pulmonary contusion can occur in patients with blunt trauma to the chest and often causes increased oxygen requirements. However, it generally presents within the first 24 hours following the injury (not at day 9), and it is not associated with increased secretions.

(Choice E) Major pulmonary thromboembolism can cause acute respiratory decompensation but is not usually associated with increased secretions or lobar infiltrates.

(Choice G) Although volume overload can increase oxygen requirement and cause pulmonary infiltrates, fever and increased secretions are not commonly seen.

Educational objective:
Ventilator-associated pneumonia should be suspected when an intubated patient develops new pulmonary infiltrates on chest x-ray, worsened respiratory status (eg, increased oxygen requirement, increased secretions), and clinical signs of infection (eg, fever, leukocytosis). Confirmation requires the identification of an organism in a lower respiratory tract sample.

References

- International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia: guidelines for the management of hospital-acquired pneumonia (HAP)/ventilator-associated pneumonia (VAP) of the European Respiratory Society (ERS), European Society of Intensive Care Medicine (ESICM), European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and Asociación Latinoamericana del Tórax (ALAT).
- Management of adults with hospital-acquired and ventilator-associated pneumonia: 2016 clinical practice guidelines by the Infectious Diseases Society of America and the American Thoracic Society.

Surgery	Pulmonary & Critical Care	Healthcare associated pneumonia
Subject	System	Topic

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A 16-year-old boy comes to the office for follow-up after having an appendectomy 3 days ago. The patient was hospitalized for abdominal pain, vomiting, and fever; subsequent evaluation revealed early retrocecal appendicitis. He had an emergent appendectomy without any perioperative complications and was discharged home the next day. Today, his family noticed yellowing of his eyes, but he has not had any abdominal pain or nausea since the surgery and is tolerating a normal diet. The patient does not use tobacco or alcohol. Temperature is 37 C (98.6 F), blood pressure is 118/80 mm Hg, and pulse is 68/min. On examination, there is mild scleral icterus. Cardiopulmonary examination is normal. Abdominal surgical incisions are healing well without any surrounding redness. Laboratory results are as follows:

Complete blood count	
Hemoglobin	14.4 g/dL
Platelets	260,000/mm^3
Leukocytes	7,500/mm^3
Liver function studies	
Total bilirubin	3.3 mg/dL
Direct bilirubin	0.4 mg/dL
Alkaline phosphatase	70 U/L
Aspartate aminotransferase	27 U/L
Alanine aminotransferase	24 U/L

Which of the following is the most likely diagnosis?

A. Acalculous cholecystitis

B. Acute viral hepatitis

Leukocytes	7,500/mm^3

Liver function studies

Total bilirubin	3.3 mg/dL
Direct bilirubin	0.4 mg/dL
Alkaline phosphatase	70 U/L
Aspartate aminotransferase	27 U/L
Alanine aminotransferase	24 U/L

Which of the following is the most likely diagnosis?

A. Acalculous cholecystitis
B. Acute viral hepatitis
C. Anesthetic hepatotoxicity
D. Gilbert syndrome
E. Glucose-6-phosphate dehydrogenase deficiency
F. Iatrogenic biliary injury

Submit

Leukocytes	7,500/mm^3

Liver function studies

Total bilirubin	3.3 mg/dL
Direct bilirubin	0.4 mg/dL
Alkaline phosphatase	70 U/L
Aspartate aminotransferase	27 U/L
Alanine aminotransferase	24 U/L

Which of the following is the most likely diagnosis?

- A. Acalculous cholecystitis (2%)
- B. Acute viral hepatitis (0%)
- C. Anesthetic hepatotoxicity (7%)
- ✓ D. Gilbert syndrome (75%)
- E. Glucose-6-phosphate dehydrogenase deficiency (5%)
- F. Iatrogenic biliary injury (7%)

Omitted
Correct answer

75%
Answered correctly

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Explanation

Gilbert syndrome	
Epidemiology	• More common in males • Most common inherited disorder of bilirubin glucuronidation
Pathogenesis	• AR or AD mutation in *UGT1A1* gene • ↓ UDP-glucuronosyltransferase activity → ↑ **unconjugated bilirubin**
Clinical findings	• Intermittent episodes of mild **jaundice** • Provoked by **stress** (eg, infection, fasting, vigorous exercise, surgery)
Diagnosis	• Unconjugated hyperbilirubinemia on repeat testing • Normal CBC, blood smear, reticulocyte count • **Normal** AST, ALT, alkaline phosphatase
Treatment	• No specific treatment

AD = autosomal dominant; **ALT** = alanine aminotransferase; **AR** = autosomal recessive; **AST** = aspartate aminotransferase; **CBC** = complete blood count; ***UGT1A1*** = UDP glucuronosyltransferase family 1 member A1.

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This patient with mild scleral icterus following appendectomy has elevated indirect (unconjugated) bilirubin levels (given his elevated total bilirubin level of 3.3 mg/dL without direct bilirubin predominance) with normal liver function test results and no evidence of hemolysis (given the normal hemoglobin level). This presentation is consistent with **Gilbert syndrome**, the most common inherited disorder of bilirubin glucuronidation.

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This patient with mild scleral icterus following appendectomy has elevated indirect (unconjugated) bilirubin levels (given his elevated total bilirubin level of 3.3 mg/dL without direct bilirubin predominance) with normal liver function test results and no evidence of hemolysis (given the normal hemoglobin level). This presentation is consistent with **Gilbert syndrome**, the most common inherited disorder of bilirubin glucuronidation.

Gilbert syndrome is characterized by recurrent episodes of **mild jaundice** due to decreased activity of the **UDP-glucuronosyltransferase enzyme**, responsible for bilirubin conjugation in the liver. These episodes may be precipitated by **stressors** (eg, infection, fasting, vigorous exercise, surgery). Gilbert syndrome is diagnosed by elevated levels of **unconjugated bilirubin** on repeat testing with normal liver function test results and complete blood count results. No specific treatment is indicated, but it is important to educate patients about the **benign** nature of the condition and its inheritance pattern to prevent unnecessary diagnostic studies.

(Choice A) Acalculous cholecystitis is an inflammatory condition of the gallbladder most commonly seen in critically ill, hospitalized patients. Laboratory results are nonspecific but often show a leukocytosis along with hyperbilirubinemia and sometimes mild elevation in alkaline phosphatase and aminotransferase levels.

(Choice B) Patients with acute viral hepatitis present with anorexia, nausea, and vomiting. Aminotransferase levels are extremely elevated (eg, >25x upper limits of normal).

(Choice C) Halogenated inhalational anesthetics (eg, halothane) are associated with severe hepatotoxicity. Due to this concern, halothane use is not recommended in adults. There are 2 types of halothane hepatotoxicity: a mild, self-limiting form characterized by mild elevations in aminotransferase levels, and a severe form that causes liver necrosis, fever, and jaundice with grossly elevated aminotransferase levels.

(Choice E) Glucose-6-phosphate dehydrogenase (G6PD) deficiency predisposes patients to hemolytic anemias and resultant jaundice due to oxidant damage of red blood cells. Some drugs (eg, antimalarials, sulfonamides) may precipitate acute hemolysis in patients with G6PD deficiency; laboratory studies reveal anemia, elevated lactate dehydrogenase levels, and decreased haptoglobin levels. Heinz bodies and/or bite cells can be seen on peripheral smear.

(Choice F) Iatrogenic biliary injury occurs most commonly following laparoscopic cholecystectomy but would be unlikely following an appendectomy. Manifestations include jaundice, fever, and epigastric pain.

Educational objective:

Laboratory results are nonspecific but often show a leukocytosis along with hyperbilirubinemia and sometimes mild elevation in alkaline phosphatase and aminotransferase levels.

(Choice B) Patients with acute viral hepatitis present with anorexia, nausea, and vomiting. Aminotransferase levels are extremely elevated (eg, >25x upper limits of normal).

(Choice C) Halogenated inhalational anesthetics (eg, halothane) are associated with severe hepatotoxicity. Due to this concern, halothane use is not recommended in adults. There are 2 types of halothane hepatotoxicity: a mild, self-limiting form characterized by mild elevations in aminotransferase levels, and a severe form that causes liver necrosis, fever, and jaundice with grossly elevated aminotransferase levels.

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(Choice F) Iatrogenic biliary injury occurs most commonly following laparoscopic cholecystectomy but would be unlikely following an appendectomy. Manifestations include jaundice, fever, and epigastric pain.

Educational objective:
Gilbert syndrome, the most common inherited disorder of bilirubin glucuronidation, is characterized by recurrent episodes of mild jaundice precipitated by stressors (eg, infection, fasting, vigorous exercise, surgery). With the exception of elevated unconjugated bilirubin, liver function test results and complete blood counts are normal.

References

- Gilbert syndrome.

Surgery	Gastrointestinal & Nutrition	Gilbert syndrome
Subject	System	Topic

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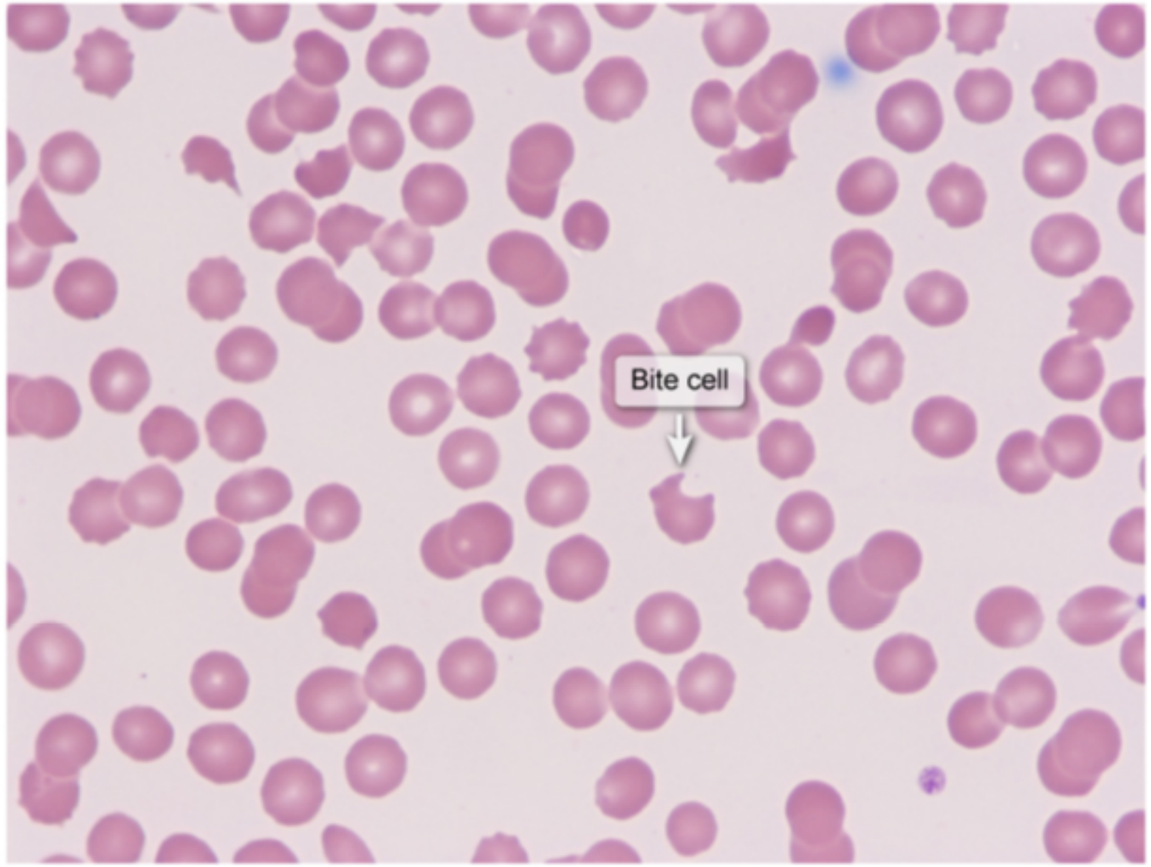
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Laboratory results are nonspecific but often show a leukocytosis along with hyperbilirubinemia and sometimes mild elevation in alkaline

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G6PD deficiency anemia



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Item 28 of 40
Question Id: 4608

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An 88-year-old man is evaluated due to severe right calf pain several hours after undergoing a right femoral artery embolectomy. He also has a burning sensation in the posterior aspect of the right leg. The patient has persistent atrial fibrillation and hypertension. His medical history also includes an ischemic stroke, bleeding duodenal ulcer, type 2 diabetes mellitus, and diabetic nephropathy. Temperature is 36.5 C (97.7 F), blood pressure is 160/70 mm Hg, and pulse is 100/min and irregular. The right calf is swollen, tense, and exquisitely tender, with pain that is worse with passive dorsiflexion of the ankle. The skin is shiny and cool to the touch. Sensation over the leg is decreased and the patient is unable to move his toes. Dorsalis pedis and posterior tibial pulses are palpable. Which of the following is the most likely cause of this patient's symptoms?

A. Compartment syndrome
B. Necrotizing fasciitis
C. Recurrent embolism
D. Vaso-occlusive crisis
E. Venous thrombosis

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Item 28 of 40
Question Id: 4608

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- ✓ A. Compartment syndrome (64%)
- B. Necrotizing fasciitis (0%)
- C. Recurrent embolism (8%)
- D. Vaso-occlusive crisis (8%)
- E. Venous thrombosis (18%)

Omitted
Correct answer
A

64%
Answered correctly

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Last Updated

Explanation

Clinical features of compartment syndrome	
	• Pain out of proportion to injury

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Clinical features of compartment syndrome	
Common	• Pain out of proportion to injury • **Pain ↑ on passive stretch** • Rapidly increasing & tense swelling • **Paresthesia (early)**
Uncommon	• ↓ Sensation • Motor weakness (within hours) • Paralysis (late) • ↓ Distal pulses (uncommon)

This patient's acute pain and paresthesias following a lower extremity embolectomy are likely due to **ischemia-reperfusion syndrome**, a form of **compartment syndrome** (CS). CS is a limb-threatening condition caused by increased pressure within an enclosed fascial space that limits perfusion of muscle and nerve tissues. It is most common following traumatic injuries (eg, long-bone fracture) or prolonged compression of an extremity but may also occur following **reperfusion** of an acutely ischemic limb due to interstitial **edema** and possibly intracellular swelling.

The diagnosis of CS can be confirmed by measuring compartment pressures (eg, needle manometry); a **delta pressure** (diastolic blood pressure − compartment pressure) **≤30 mm Hg** is strongly suggestive of CS. Definitive management includes **urgent fasciotomy**, although some patients may be managed conservatively with close observation if compartment pressures are falling and delta pressures are rising.

(Choice B) Deep-tissue infection (eg, necrotizing fasciitis, clostridial gas gangrene) is commonly due to group A *Streptococcus* or mixed anaerobic infection. Like CS, these syndromes can present with severe pain out of proportion to clinical signs, but symptoms generally evolve over several hours to days and are usually associated with skin necrosis, bullae, crepitus, and significant systemic toxicity (eg, high fever, hypotension).

(Choice C) Recurrent embolism may produce features similar to CS (eg, severe pain, paresthesias) but would typically be associated with absent pulses, pallor of the affected limb, and lack of local swelling.

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(Choice C) Recurrent embolism may produce features similar to CS (eg, severe pain, paresthesias) but would typically be associated with absent pulses, pallor of the affected limb, and lack of local swelling.

(Choice D) Vaso-occlusive crisis is a complication of sickle cell disease characterized by severe pain and tissue ischemia. Episodes are typically precipitated by dehydration, cold, exertion, or hypoxemia, and typically manifest in early childhood with recurrent crises. Examination findings may include erythema and warmth, but swelling is unusual and clinical features are often bilateral and symmetric.

(Choice E) Deep venous thrombosis may cause calf pain and swelling, but severe pain and sensory or motor deficits are more consistent with CS.

Educational objective:
Ischemia-reperfusion syndrome is a form of compartment syndrome that occurs following reperfusion of an acutely ischemic limb. Symptoms include severe pain that is worsened on passive range of motion, paresthesias, and sensory and motor deficits. The diagnosis is confirmed by measuring compartment pressures. Definitive management includes urgent fasciotomy.

References

- Acute compartment syndrome.

perfusion of muscle and nerve tissues. It is most common following traumatic injuries (eg, long-bone fracture) or prolonged compression of an extremity but may also occur following **reperfusion** of an acutely ischemic limb due to interstitial **edema** and possibly intracellular swelling.

The diagnosis of CS can be confirmed by measuring compartment pressures (eg, needle manometry); a **delta pressure** (diastolic blood pressure − compartment pressure) **≤30 mm Hg** is strongly suggestive of CS. Definitive management includes **urgent fasciotomy**, although some patients may be managed conservatively with close observation if compartment pressures are falling and delta pressures are rising.

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Educational objective:
Ischemia-reperfusion syndrome is a form of compartment syndrome that occurs following reperfusion of an acutely ischemic limb. Symptoms include severe pain that is worsened on passive range of motion, paresthesias, and sensory and motor deficits. The diagnosis is confirmed by measuring compartment pressures. Definitive management includes urgent fasciotomy.

References

- Acute compartment syndrome.
- Acute limb ischemia.

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A 55-year-old man is evaluated for new-onset shortness of breath after a right hemicolectomy 3 days ago. He has no chest pain, cough, or hemoptysis. The patient came to the hospital 4 days ago with a history of constipation, weight loss, and abdominal distension. He was found to have an obstructing cecal mass and underwent right hemicolectomy with ileocolic anastomosis. The patient has no significant medical history other than a 35-pack-year smoking history. Temperature is 37.2 C (99 F), blood pressure is 120/80 mm Hg, pulse is 98/min, and respirations are 22/min. Pulse oximetry shows 88% on room air. Lung examination reveals dullness to percussion and absence of breath sounds on the left. Chest x-ray is shown below.



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Question Id: 3734

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Chest x-ray at the time of admission was normal. Which of the following is the most likely cause of this patient's pulmonary findings?

- A. Bronchial mucus plug
- B. Diaphragm perforation
- C. Endobronchial tumor
- D. Large pleural effusion
- E. Multilobar pneumonia
- F. Tension pneumothorax

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Settings

Item 29 of 40
Question Id: 3734

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Chest x-ray at the time of admission was normal. Which of the following is the most likely cause of this patient's pulmonary findings?

- ✓ A. Bronchial mucus plug (24%)
- B. Diaphragm perforation (21%)
- C. Endobronchial tumor (1%)
- D. Large pleural effusion (42%)
- E. Multilobar pneumonia (6%)
- F. Tension pneumothorax (3%)

Omitted
Correct answer

24%
Answered correctly

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Time Spent

01/23/2020
Last Updated

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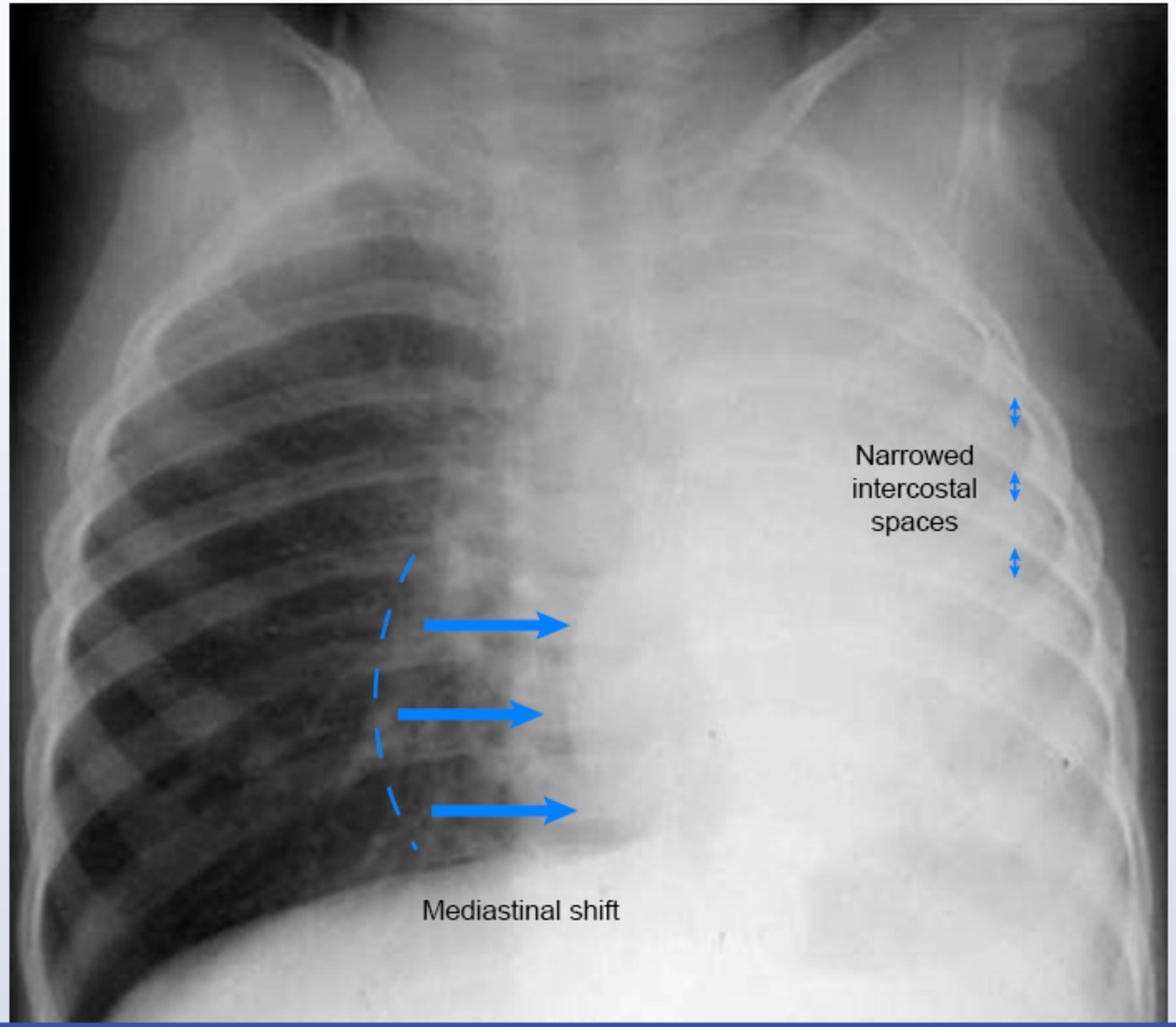
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Question Id: 3734

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This patient likely has **atelectasis** of the left lung due to a left mainstem **bronchial mucus plug**. Airway obstruction (eg, mucus, tumor, foreign body) creates distal air trapping in the alveoli. Eventually, the trapped air molecules diffuse into the bloodstream; because no additional air can enter the **obstructed airway**, the **alveoli** become devoid of matter and **collapse**. To occupy the vacated space, mediastinal structures (eg, carina, heart) are pulled toward the atelectasis (assuming the atelectasis is large). Patients typically present with respiratory distress (eg, dyspnea, tachypnea, tachycardia) and hypoxemia, and lung examination reveals dullness to percussion and absence of breath sounds in the affected lung area. Chest x-ray demonstrates **opacification** of the affected lung area with **mediastinal shifting toward** the side of opacification. In addition, rib spacing becomes narrower in the affected hemithorax.

Surgery (under anesthesia) and smoking increase the risk of mucus plugging. Chest physiotherapy is often useful in preventing mucus plugging and can be used to treat relatively minor atelectasis due to mucus plugging. Large-volume atelectasis typically requires bronchoscopy to remove the mucus plug.

(Choice B) Diaphragmatic perforation is usually caused by blunt abdominal trauma and typically presents with respiratory distress or signs of small bowel obstruction (eg, vomiting, colicky pain). Chest x-ray demonstrates stomach or bowel herniating into the thoracic cavity.

(Choice C) An endobronchial tumor can lead to obstructive atelectasis; however, this patient's lack of cough or hemoptysis and his acute presentation following surgery make bronchial mucus plugging more likely.

(Choice D) A large pleural effusion can cause large opacification on chest x-ray. However, because the effusion is occupying space, the mediastinum will be shifted away from (rather than toward) the side of effusion.

(Choice E) Multilobar pneumonia can cause opacification of an entire hemithorax on chest x-ray. However, the mediastinum does not typically shift in either direction, and fever and cough would be expected.

(Choice F) A tension pneumothorax typically demonstrates radiolucency (rather than opacification) of the affected lung field with shifting of the mediastinum away from (rather than toward) the side of the pneumothorax.

Educational objective:
Mucus plugging can lead to large-volume atelectasis (lung collapse) due to airway obstruction. Chest x-ray demonstrates opacification of the affected lung area and mediastinal shifting toward the side of atelectasis.

Surgery (under anesthesia) and smoking increase the risk of mucus plugging. Chest physiotherapy is often useful in preventing mucus plugging and can be used to treat relatively minor atelectasis due to mucus plugging. Large-volume atelectasis typically requires bronchoscopy to remove the mucus plug.

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Educational objective:
Mucus plugging can lead to large-volume atelectasis (lung collapse) due to airway obstruction. Chest x-ray demonstrates opacification of the affected lung area and mediastinal shifting toward the side of atelectasis.

References

- Postoperative atelectasis.

Surgery	Pulmonary & Critical Care	Atelectasis
Subject	System	Topic

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Question Id: 15831

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A 50-year-old man comes to the office for a routine physical. He has had no recent concerns and his review of systems is unremarkable. Five years ago, the patient underwent mechanical aortic valve replacement due to endocarditis. Since then, he has been taking warfarin for anticoagulation and has been compliant with the regimen. The patient is a lifelong nonsmoker. All his vaccinations are up to date. He is afebrile, blood pressure is 122/65 mm Hg, and pulse is 73/min and regular. On auscultation, a 2/6 diastolic murmur is heard at the left sternal border and is best appreciated with a breath-hold at expiration. The lungs are clear. Abdominal and extremity examinations are unremarkable. His last INR check 5 days ago was 2.9. Which of the following is the best next step in management of this patient?

A. Complete blood count with blood smear
B. Echocardiography
C. Exercise stress testing
D. Hypercoagulability studies
E. Routine clinical follow-up

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- A. Complete blood count with blood smear (5%)
- ✓ B. Echocardiography (66%)
- C. Exercise stress testing (0%)
- D. Hypercoagulability studies (3%)
- E. Routine clinical follow-up (24%)

Omitted
Correct answer
B

66%
Answered correctly

01 sec
Time Spent

04/18/2020
Last Updated

Explanation

Prosthetic valve dysfunction	
	• Transvalvular regurgitation (cusp

Prosthetic valve dysfunction	
Types & causes	• Transvalvular regurgitation (cusp degeneration) • Paravalvular leak (annular degeneration, IE) • Valvular obstruction/stenosis (valve thrombus)
Clinical manifestations	• New murmur (regurgitant or stenotic) • Macroangiopathic hemolytic anemia • Heart failure symptoms, thromboembolism
Diagnosis	• Echocardiography

IE = infective endocarditis.

This patient has a diastolic murmur consistent with valvular **aortic regurgitation** (which is best heard at the left sternal border, in contrast to aortic regurgitation due to root dilation, best heard at the traditional aortic auscultation area in the right sternal border). Given his history of a **mechanical prosthetic aortic valve**, this presentation should raise suspicion for **prosthetic valve dysfunction (PVD)**, which most commonly occurs in the following forms:

- **Paravalvular leak** (regurgitation around the valve): more commonly occurs with mechanical (rather than bioprosthetic) valves and results from dehiscence of the valve from the aortic or mitral annulus, often due to annular degeneration or underlying infective endocarditis.
- **Transvalvular regurgitation** (regurgitation through the valve): more commonly affects bioprosthetic (rather than mechanical) valves and can result from cusp degeneration or occasionally valvular thrombus that impairs valve closure. Patients are often initially asymptomatic but can develop severe **heart failure**; those with significant regurgitation generally have a poor prognosis.

PVD can also involve valvular obstruction (stenosis), which typically results from valvular thrombus or cusp malfunction (ie, failed opening) and presents with a characteristic stenotic, rather than a regurgitant, murmur.

The best initial evaluation for PVD is **echocardiography**, which allows visualization of the valve and surrounding anatomy. Depending on the

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The best initial evaluation for PVD is **echocardiography**, which allows visualization of the valve and surrounding anatomy. Depending on the cause and extent of dysfunction, further studies and possible surgical intervention may be indicated.

(Choice A) PVD can cause mechanical damage to red blood cells (as they are passing through the malfunctioning valve) and lead to macroangiopathic hemolytic anemia. Complete blood count and peripheral blood smear (revealing schistocytes) are used for diagnosis. However, significant anemia is unlikely in this asymptomatic patient; in addition, mild hemolysis may be seen normally with a prosthetic valve, also making a peripheral smear less helpful.

(Choice C) Exercise stress testing is indicated for patients with symptoms consistent with stable angina (eg, chest pain reproducible with exertion and relieved by rest); however, it has limited use in evaluating this asymptomatic patient with a murmur suggesting PVD.

(Choice D) Hypercoagulability studies may be appropriate if valvular thrombus is identified. However, this patient's therapeutic INR (eg, INR 2-3 for mechanical aortic valve) and adherence to warfarin therapy make thrombus less likely. In addition, echocardiography is needed first to evaluate PVD.

(Choice E) Routine clinical follow-up is not appropriate because this patient's murmur suggests possible serious PVD that should be evaluated with echocardiography

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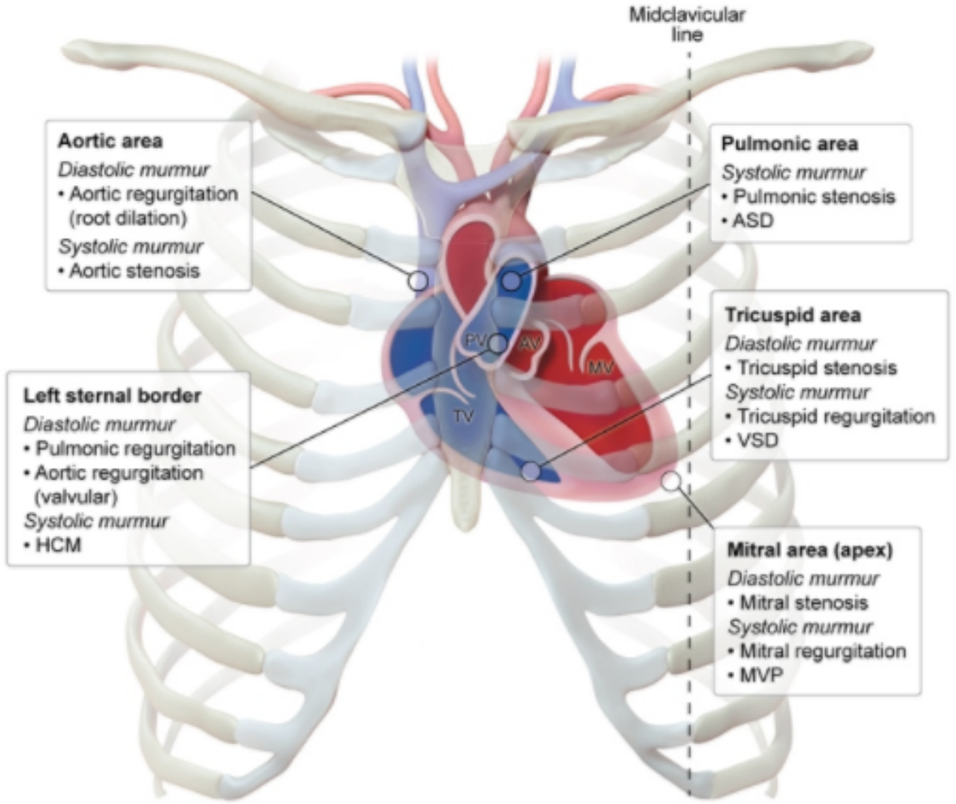
Item 30 of 40
Question Id: 15831

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This patient has a diastolic murmur consistent with valvular **aortic regurgitation** (which is best heard at the left sternal border, in contrast to aortic

Exhibit Display

Cardiac auscultatory locations



ASD = atrial septal defect; **AV** = aortic valve; **HCM** = hypertrophic cardiomyopathy; **MV** = mitral valve; **MVP** = mitral valve prolapse; **PV** = pulmonic valve; **TV** = tricuspid valve; **VSD** = ventricular septal defect.

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with echocardiography

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(Choice E) Routine clinical follow-up is not appropriate because this patient's murmur suggests possible serious PVD that should be evaluated with echocardiography.

Educational objective:
A regurgitant murmur over a prosthetic valve suggests prosthetic valve dysfunction (PVD) in the form of a paravalvular leak or transvalvular regurgitation. PVD can lead to serious complications (eg, heart failure) and should be promptly evaluated with echocardiography.

Surgery	Cardiovascular System	Mechanical valve
Subject	System	Topic

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A 43-year-old previously healthy man is brought by his wife to a rural emergency department after he accidentally amputated most of his right thumb with a bandsaw. Initially there was profuse bleeding from the stump, but this stopped with application of direct pressure. The patient's wife picked up the amputated part and brought it along in a plastic bag. The patient is right hand dominant and works as a heavy equipment mechanic. Blood pressure is 128/86 mm Hg and pulse is 96/min. Physical examination shows a transverse amputation through the middle of the right thumb proximal phalanx, with exposed bone. The rest of the right hand and fingers are uninjured. The amputated part is in one piece without overt contamination. Transfer of the patient to a hospital with an on-call hand surgeon is arranged. Which of the following is the best way to transport the amputated digit?

A. Directly covered by ice on all sides

B. Left open to air in a plastic bag over a bed of ice

C. Submerged in antiseptic solution in a plastic bag immersed in ice water

D. Submerged in water in a plastic bag over a bed of ice

E. Wrapped with saline-moistened gauze in a plastic bag immersed in ice water

Submit

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- A. Directly covered by ice on all sides (8%)
- B. Left open to air in a plastic bag over a bed of ice (5%)
- C. Submerged in antiseptic solution in a plastic bag immersed in ice water (7%)
- D. Submerged in water in a plastic bag over a bed of ice (3%)
- ✓ E. Wrapped with saline-moistened gauze in a plastic bag immersed in ice water (74%)

Omitted
Correct answer
E

74%
Answered correctly

02 secs
Time Spent

05/06/2020
Last Updated

Explanation

This patient sustained a **traumatic amputation** of his dominant thumb. Thumb replantation will likely be attempted, especially given that his profession (ie, mechanic) requires manual dexterity and that the thumb provides an estimated 40% of hand function. **Optimal care** of the amputated part during transport improves the chances of replantation success

This patient sustained a **traumatic amputation** of his dominant thumb. Thumb replantation will likely be attempted, especially given that his profession (ie, mechanic) requires manual dexterity and that the thumb provides an estimated 40% of hand function. **Optimal care** of the amputated part during transport improves the chances of replantation success.

Care of an **amputated part**, regardless of the level of injury (eg, digit, hand, forearm), begins with gentle removal (eg, saline irrigation) of gross contamination (eg, sawdust, debris). Following this, the part should be **wrapped in** sterile **saline-moistened gauze** and sealed **in a plastic bag**. The bag should be then placed in a container of **ice water** to be transported with the patient. **Cooling** of the amputated part decreases tissue metabolism and oxygen demand, thereby minimizing ischemic damage and prolonging the window of viability for replantation. An ice water bath (temperature ~0 C [32 F]) provides adequate cooling while minimizing the risk of frostbite, which can occur if the amputated part, or even the bag containing the part, is placed directly on ice **(Choice A)**.

(Choice B) The amputated part should be kept moist, rather than open to air, to prevent desiccation of the exposed tissues, which can cause further tissue damage.

(Choices C and D) The amputated part should be kept moist but should not remain submerged in any solution during transport. Prolonged submersion in water can injure digital vessels, making microsurgical vessel repair more difficult or impossible. Prolonged submersion in antiseptic solution can cause chemical injury. Instead, to decrease infection risk, the amputated part should be thoroughly cleansed (eg, saline irrigation) and prepped (eg, betadine) at the same time in the operating room prior to attempted replantation.

Educational objective:
In cases of traumatic amputation, the amputated part should be transported by wrapping it in saline-moistened gauze, sealing it in a plastic bag, and placing the bag in a bath of ice water. Cooling of the amputated part prolongs the window for replantation.

References

- Upper extremity replantation: current concepts.
- Finger replantation: surgical technique and indications.

Surgery	General Principles	Amputation
Subject	System	Topic

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Item 32 of 40
Question Id: 2614

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A 64-year-old woman comes to the office for evaluation of a painless neck lump. The patient first noticed right-sided neck swelling a month ago. She has not had fevers, chills, cough, or shortness of breath but has had decreased appetite and weight loss. Medical history is significant for obesity, type 2 diabetes mellitus, and nonalcoholic fatty liver disease. The patient has smoked a pack of cigarettes daily for the past 29 years. She drinks alcohol socially. Vital signs are within normal limits. Physical examination reveals a 2-cm, hard, nontender cervical lymph node close to the right submandibular gland. There is no other lymphadenopathy. The lungs are clear to auscultation and heart sounds are normal. The abdomen is soft and nontender; mild hepatomegaly is present. The remainder of the examination is normal. Fine-needle aspiration of the lymph node reveals squamous cell carcinoma. Which of the following would be most helpful to establish the primary source of this patient's malignancy?

A. Abdominal CT scan
B. Breast imaging
C. Colonoscopy
D. Laryngopharyngoscopy
E. Liver biopsy
F. Thyroid ultrasound

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Item 32 of 40
Question Id: 2614

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A 64-year-old woman comes to the office for evaluation of a painless neck lump. The patient first noticed right-sided neck swelling a month ago. She has not had fevers, chills, cough, or shortness of breath but has had decreased appetite and weight loss. Medical history is significant for obesity, type 2 diabetes mellitus, and nonalcoholic fatty liver disease. The patient has smoked a pack of cigarettes daily for the past 29 years. She drinks alcohol socially. Vital signs are within normal limits. Physical examination reveals a 2-cm, hard, nontender cervical lymph node close to the right submandibular gland. There is no other lymphadenopathy. The lungs are clear to auscultation and heart sounds are normal. The abdomen is soft and nontender; mild hepatomegaly is present. The remainder of the examination is normal. Fine-needle aspiration of the lymph node reveals squamous cell carcinoma. Which of the following would be most helpful to establish the primary source of this patient's malignancy?

A. Abdominal CT scan (9%)
B. Breast imaging (3%)
C. Colonoscopy (1%)
✓ D. Laryngopharyngoscopy (81%)
E. Liver biopsy (1%)
F. Thyroid ultrasound (2%)

Omitted
Correct answer
D

81%
Answered correctly

02 secs
Time Spent

03/29/2020
Last Updated

Explanation

Malignancy is extremely likely in a patient with a persistent (>2 weeks), palpable (>1.5 cm), firm neck mass, who has a smoking history and no

TUTOR

1 | Feedback | Suspend | End Block

Explanation

Malignancy is extremely likely in a patient with a persistent (>2 weeks), palpable (>1.5 cm), firm neck mass, who has a smoking history and no history of a preceding infection. By far the most common malignancy to manifest in an upper cervical lymph node is mucosal **head and neck squamous cell carcinoma** (SCC). Head and neck SCC is common in patients with a significant history of **alcohol and tobacco use** (as in this patient). The first (and only) apparent manifestation is often a palpable **cervical lymph node**, which represents regional nodal metastasis.

Identification of the **primary source** of SCC is of paramount importance because it directs all treatment decisions. Although SCC can originate from many sites (eg, skin, uterine cervix, upper esophagus), the vast majority of cervical nodal SCC arises from the mucosal surfaces of the head and neck (ie, nasopharynx, oral cavity, oropharynx, larynx). Thorough examination of these structures must include endoscopic visualization using **laryngopharyngoscopy**.

(Choices A and C) Abdominal malignancies (eg, stomach, pancreas, colon, ovaries) can spread via the thoracic duct to the left supraclavicular lymph nodes (Virchow node)—an ominous sign. However, most of these abdominal malignancies are adenocarcinomas rather than SCC. In addition, submandibular lymphadenopathy (as seen in this patient) reflects lymphatic drainage from the head and neck rather than the thoracic duct, making abdominal malignancy less likely.

(Choice B) Although breast cancer commonly affects the axillary and internal mammary lymph nodes, it occasionally metastasizes to the cervical nodes. However, it generally affects the supraclavicular nodes rather than the submandibular nodes, and most types of breast cancer are adenocarcinomas rather than SCC.

(Choice E) Hepatomegaly can sometimes reflect liver neoplasm, either primary (eg, hepatocellular carcinoma [HCC]) or metastatic. HCC typically metastasizes to the lungs, portal vein, and portal lymph nodes and is unlikely to cause cervical adenopathy. Conversely, head and neck SCC does not commonly spread to the liver. This patient's hepatomegaly is likely due to nonalcoholic fatty liver disease.

(Choice F) Thyroid cancer metastasizes to cervical nodes. However, thyroid cancers are papillary, follicular, medullary, or anaplastic, not squamous cell.

Educational objective:
Squamous cell carcinoma in a cervical lymph node, especially in a smoker, likely has a mucosal head and neck primary site and requires examination of the laryngopharyngeal mucosa.

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laryngopharyngoscopy.

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(Choice B) Although breast cancer commonly affects the axillary and internal mammary lymph nodes, it occasionally metastasizes to the cervical nodes. However, it generally affects the supraclavicular nodes rather than the submandibular nodes, and most types of breast cancer are adenocarcinomas rather than SCC.

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(Choice F) Thyroid cancer metastasizes to cervical nodes. However, thyroid cancers are papillary, follicular, medullary, or anaplastic, not squamous cell.

Educational objective:
Squamous cell carcinoma in a cervical lymph node, especially in a smoker, likely has a mucosal head and neck primary site and requires examination of the laryngopharyngeal mucosa.

References

- Clinical practice guideline: evaluation of the neck mass in adults.
- Diversity of breast carcinoma: histological subtypes and clinical relevance.

Surgery	Hematology & Oncology	Head and neck cancers
Subject	System	Topic

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Item 33 of 40
Question Id: 15679

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A 30-year-old man is admitted for observation following a motorcycle collision. He was hemodynamically stable at presentation, and the initial workup revealed an isolated liver laceration. The patient has no chronic medical conditions and takes no medications. He consumes 3-4 alcoholic drinks daily and has been smoking 1 pack of cigarettes daily for the past 10 years. Overnight, his hemoglobin levels acutely decreased, and a packed red blood cell transfusion was ordered. An hour after the transfusion starts, the patient develops difficulty breathing. The transfusion is stopped. Temperature is 36.9 C (98.4 F), blood pressure is 86/42 mm Hg, pulse is 110/min, and respirations are 26/min. Pulse oximetry shows 88% on room air. Lung examination reveals bilateral crackles. Skin examination is normal. Chest x-ray reveals bilateral pulmonary infiltrates. Which of the following is the best next step in management of this patient's respiratory distress?

A. Anticoagulation therapy
B. Broad-spectrum antibiotics
C. Diuretic therapy
D. Intravenous antihistamines
E. Respiratory supportive care only

Submit

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- A. Anticoagulation therapy (2%)
- B. Broad-spectrum antibiotics (1%)
- C. Diuretic therapy (10%)
- D. Intravenous antihistamines (20%)
- ✓ E. Respiratory supportive care only (65%)

Omitted
Correct answer
E

65%
Answered correctly

02 secs
Time Spent

05/10/2020
Last Updated

Explanation

Transfusion reactions associated with hypotension

Transfusion reactions associated with hypotension			
Reaction	**Onset***	**Cause**	**Clinical features**
Anaphylaxis	Seconds to minutes	Recipient anti-IgA antibodies	• Shock, angioedema/urticaria & respiratory distress
Transfusion-related acute lung injury	Minutes to hours	Donor antileukocyte antibodies	• Respiratory distress & noncardiogenic pulmonary edema • Bilateral pulmonary infiltrates
Acute hemolysis	Minutes to hours	ABO incompatibility	• Fever, flank pain, hemoglobinuria & DIC
Bacterial sepsis	Minutes to hours	Bacterial contamination of donor product	• Fever, chills, septic shock & DIC

*Time after transfusion initiation.

DIC = disseminated intravascular coagulation.

This patient developed respiratory distress, hypotension, and pulmonary infiltrates during blood transfusion, findings concerning for **transfusion-related acute lung injury (TRALI)**. TRALI is an uncommon but **potentially fatal** transfusion reaction in which neutrophils activated by a component in the transfused blood (eg, anti-leukocyte antibodies) cause damage to pulmonary microvasculature. Risk factors for TRALI include smoking, alcohol abuse, and critical illness.

Damage to the capillary endothelium results in **inflammatory pulmonary edema**. Hypoxia and **dyspnea** develop within 6 hours after transfusion initiation. Tachycardia, **hypotension**, and fever may also be present. Chest x-ray reveals **bilateral pulmonary infiltrates**.

Treatment of TRALI includes immediate transfusion cessation and **respiratory supportive care**; most patients require ventilatory support. Some patients recover within 24-48 hours, but up to 50% of previously critically ill patients expire.

(Choice A) Anticoagulation is indicated for pulmonary embolism, which causes tachycardia and hypoxia. Bilateral pulmonary infiltrates would be

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(Choice A) Anticoagulation is indicated for pulmonary embolism, which causes tachycardia and hypoxia. Bilateral pulmonary infiltrates would be unusual, and the temporal association with transfusion makes TRALI more likely.

(Choice B) Broad-spectrum antibiotics are administered for transfusion-transmitted bacterial infection, which most commonly occurs after platelet transfusion and presents with fever, rigors, tachycardia, and hypotension. This patient's pulmonary findings and lack of fever make this diagnosis unlikely.

(Choice C) Diuretic therapy is the treatment for transfusion-associated circulatory overload (TACO). Patients have respiratory distress within 6 hours after transfusion initiation; however, hypertension due to fluid overload is typically present. In addition, this patient has not received a significant amount of fluid, making TACO less likely.

(Choice D) In addition to intramuscular epinephrine, intravenous antihistamine administration is indicated in anaphylactic transfusion reactions, which can present with respiratory distress and hypotension. However, anaphylaxis occurs within minutes after transfusion initiation. Moreover, examination typically reveals wheezing (not crackles), and pulmonary infiltrates would not be seen.

Educational objective:
Transfusion-related acute lung injury is a potentially fatal transfusion reaction, presenting with acute dyspnea and hypoxia, bilateral pulmonary infiltrates, and possible hypotension. Management involves transfusion cessation and respiratory supportive care.

References

Treatment of TRALI includes immediate transfusion cessation and **respiratory supportive care**; most patients require ventilatory support. Some patients recover within 24-48 hours, but up to 50% of previously critically ill patients expire.

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Educational objective:
Transfusion-related acute lung injury is a potentially fatal transfusion reaction, presenting with acute dyspnea and hypoxia, bilateral pulmonary infiltrates, and possible hypotension. Management involves transfusion cessation and respiratory supportive care.

References

- Blood transfusion associated lung injury.

Surgery	Hematology & Oncology	Blood transfusion
Subject	System	Topic

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Item 34 of 40
Question Id: 16699

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A 20-year-old woman comes to the office due to hearing loss. The patient is a student and has difficulty hearing her professors, even when sitting in the front row. She also has trouble with balancing poses during yoga. The patient has no medical conditions and takes only oral contraceptives. She drinks alcohol on weekends and does not smoke. Her mother also developed hearing loss in her 20s. Ear examination is normal. Gait is normal, but standing on 1 foot is difficult, especially with closed eyes. Audiogram shows bilateral sensorineural hearing loss.
Which of the following is the most likely cause of this patient's symptoms?

A. Congenital long QT syndrome
B. Mitochondrial disorder
C. Multiple sclerosis
D. Neurofibromatosis
E. Otosclerosis

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Item 34 of 40
Question Id: 16699

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

- A. Congenital long QT syndrome (12%)
- B. Mitochondrial disorder (15%)
- C. Multiple sclerosis (2%)
- ✓ D. Neurofibromatosis (54%)
- E. Otosclerosis (14%)

Omitted
Correct answer
D

54%
Answered correctly

02 secs
Time Spent

02/06/2020
Last Updated

Explanation

Neurofibromatosis type II	
Genetics	• Autosomal dominant • *NF2* gene on chromosome 22 encoding merlin (tumor suppressor)

TUTOR

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Neurofibromatosis type II	
Genetics	• Autosomal dominant • *NF2* gene on chromosome 22 encoding merlin (tumor suppressor) • Variable expressivity, usually at age 20-30
Clinical manifestations	• Bilateral vestibular schwannomas • Intracranial meningiomas • Spinal tumors (eg, schwannomas, ependymomas) • Cataracts • Cutaneous tumors or skin plaques
Tumor surveillance	• Audiogram • Ophthalmologic evaluation • MRI of the brain & spine

This young woman with bilateral sensorineural hearing loss associated with imbalance likely has bilateral vestibular schwannomas. This, in conjunction with her family history of hearing loss, is characteristic of **neurofibromatosis type II (NF2)**.

Vestibular schwannoma primarily affects the cochlear and vestibular nerves. Cochlear nerve involvement results in sensorineural **hearing loss** (~95% of patients). Vestibular nerve involvement can cause **imbalance**, particularly when patients are deprived of visual input (eg, eyes closed when standing on 1 foot, yoga poses). Most patients do not experience vertigo because the tumor's slow growth allows for central compensation of gradual loss of input.

Sporadic vestibular schwannomas are typically unilateral and manifest around age 50. In contrast, the presence of **bilateral, hereditary vestibular schwannomas** in a young patient, as seen in this case, should raise suspicion for NF2. NF2 is caused by an **autosomal dominant** defect in merlin (a cell-membrane tumor-suppressor protein) and usually presents at age 20-30. Vestibular schwannomas are the most common tumor seen; however, patients also may have intracranial meningiomas, spinal tumors, or peripheral neuropathies. Cataracts and cutaneous tumors also can be seen.

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(Choice A) Jervell and Lange-Nielsen syndrome, a congenital long QT syndrome, also causes inheritable sensorineural hearing loss due to the associated mutations affecting endolymph production. In contrast to NF2, congenital long QT syndrome typically presents in childhood with profound bilateral deafness and episodes of arrythmia-induced syncope during periods of stress.

(Choice B) Mitochondrial disorders are maternally inherited and can present with diverse symptoms that may include hearing loss or imbalance. However, they typically involve multiple organ systems and myopathy is often present.

(Choice C) Multiple sclerosis can present in young women and may have a hereditary component. In contrast to this patient with NF2, those with multiple sclerosis typically initially have optic neuritis, lateral rectus palsy, or multiple signs of cerebellar involvement (eg, ataxia, diplopia). Sensorineural hearing loss as an initial manifestation is uncommon.

(Choice E) Otosclerosis causes fixation of the stapes, is often hereditary, and is most commonly seen in young women. However, it would present with a conductive, rather than a sensorineural, hearing loss.

Educational objective:
Vestibular schwannomas present with hearing loss and imbalance. Bilateral, hereditary schwannomas are most often associated with

vestibular schwannomas in a young patient, as seen in this case, should raise suspicion for NF2. NF2 is caused by an **autosomal dominant** defect in merlin (a cell-membrane tumor-suppressor protein) and usually presents at age 20-30. Vestibular schwannomas are the most common tumor seen; however, patients also may have intracranial meningiomas, spinal tumors, or peripheral neuropathies. Cataracts and cutaneous tumors also can be seen.

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Educational objective:
Vestibular schwannomas present with hearing loss and imbalance. Bilateral, hereditary schwannomas are most often associated with neurofibromatosis type II.

References

- An update on the CNS manifestations of neurofibromatosis type 2.

Surgery	Nervous System	Neurofibromatosis
Subject	System	Topic

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Item 35 of 40
Question Id: 2303

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A 60-year-old woman with a history of poorly controlled type 2 diabetes mellitus comes to the emergency department due to worsening perianal pain. The patient is febrile, hypotensive, and tachycardic. Physical examination reveals tenderness and swelling in the perianal and gluteal region with dusky overlying skin and palpable crepitus. Leukocyte count is 27,000/mm^3, and CT scan shows edema of the gluteal and perineal subcutaneous tissue with free gas. Intravenous fluids and antibiotics are initiated, and the patient undergoes urgent surgical debridement of the necrotic tissue. Several hours later, she experiences increasing dyspnea and hypoxemia. Chest x-ray reveals new bilateral lung infiltrates. Bedside echocardiography shows a hyperdynamic left ventricle with no significant valve disease. Which of the following best describes this patient's current pulmonary condition?

	Hypoxemia correction with moderate-flow O2	Lung compliance	A-a gradient
A.	Yes	Low	High
B.	Yes	Low	Normal
C.	Yes	High	High
D.	No	Low	High
E.	No	Normal	High

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A 60-year-old woman with a history of poorly controlled type 2 diabetes mellitus comes to the emergency department due to worsening perianal pain. The patient is febrile, hypotensive, and tachycardic. Physical examination reveals tenderness and swelling in the perianal and gluteal region with dusky overlying skin and palpable crepitus. Leukocyte count is 27,000/mm^3, and CT scan shows edema of the gluteal and perineal subcutaneous tissue with free gas. Intravenous fluids and antibiotics are initiated, and the patient undergoes urgent surgical debridement of the necrotic tissue. Several hours later, she experiences increasing dyspnea and hypoxemia. Chest x-ray reveals new bilateral lung infiltrates. Bedside echocardiography shows a hyperdynamic left ventricle with no significant valve disease. Which of the following best describes this patient's current pulmonary condition?

		Hypoxemia correction with moderate-flow O2	Lung compliance	A-a gradient
	A. (28%)	Yes	Low	High
	B. (7%)	Yes	Low	Normal
	C. (4%)	Yes	High	High
✓	D. (43%)	No	Low	High
	E. (16%)	No	Normal	High

Omitted
Correct answer

43%
Answered correctly

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Time Spent

06/23/2020
Last Updated

Causes of hypoxemia			
	Examples	**A-a gradient**	**Corrects with supplemental O_2?**
Reduced PiO_2	High altitude	Normal	Yes
Hypoventilation	CNS depression, morbid obesity	Normal	Yes
Diffusion limitation	Emphysema, ILD	Increased	Yes
V/Q mismatch*	Small PE, lobar pneumonia	Increased	Yes
Large intrapulmonary shunt	Diffuse pulmonary edema	Increased	No
Large dead-space ventilation	Massive PE, right-to-left intracardiac shunt	Increased	No

*Caused by localized dead-space ventilation and/or intrapulmonary shunting.

A-a gradient = alveolar-arterial oxygen gradient; **ILD** = interstitial lung disease; **PE** = pulmonary embolism; **PiO_2** = partial pressure of inspired oxygen; **V/Q** = ventilation/perfusion ratio.

This patient with hypoxemia and bilateral lung infiltrates likely has **acute respiratory distress syndrome** (ARDS) due to sepsis from necrotizing fasciitis. ARDS involves an inflammatory response that leads to capillary leakage and **diffuse pulmonary edema**.

Fluid from pulmonary edema fills the alveoli and facilitates alveolar collapse. Alveolar ventilation (V) is zero, which results in an **extreme ventilation/perfusion (V/Q) mismatch** (right-to-left intrapulmonary shunting), causing hypoxemia. Because diffuse pulmonary edema prevents air from reaching the alveoli throughout much of the lungs (eg, >50%), an increase in the fraction of inspired O_2 (FiO_2) **does not correct the hypoxemia**.

Increased alveolar-arterial (A-a) gradient is another characteristic of pulmonary edema, as with any process causing V/Q mismatch or impaired diffusion across the A-a membrane. Finally, pulmonary edema also leads to fluid collection within the lung interstitium, resulting in stiffening of the lungs **(decreased lung compliance)**.

V/Q = ventilation/perfusion ratio.

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In contrast to hypoxemia due to diffuse pulmonary edema, hypoxemia due to localized intrapulmonary shunting (eg, lobar pneumonia, atelectasis, basilar pulmonary edema) typically does correct with increased FiO_2 because only a portion of the lungs is affected and the normally ventilated alveoli compensate via increased O_2 transfer.

(Choices A and C) Interstitial lung disease involves stiffening of the alveolar walls and decreased lung compliance. Emphysema involves destruction of alveolar walls and increased lung compliance. In both, hypoxemia results largely from impaired diffusion of O_2 across the disrupted A-a membrane as well as some V/Q mismatching. Because alveolar ventilation is generally intact, increased FiO_2 usually improves the hypoxemia.

(Choice B) Obesity hypoventilation syndrome involves decreased compliance of the chest wall with impaired lung expansion. Although ventilation is decreased, diffusion and V/Q matching are intact; therefore, the A-a gradient is normal and increased FiO_2 increases gas exchange and improves hypoxemia.

(Choice E) Large-scale dead-space ventilation (eg, massive pulmonary embolism) is the other major cause of hypoxemia that does not correct with supplemental O_2. Although alveolar ventilation is normal, there is no perfusion of large portions of the lung (extreme V/Q mismatch), resulting in minimal gas exchange.

Educational objective:

Increased alveolar-arterial (A-a) gradient is another characteristic of pulmonary edema, as with any process causing V/Q mismatch or impaired diffusion across the A-a membrane. Finally, pulmonary edema also leads to fluid collection within the lung interstitium, resulting in stiffening of the lungs **(decreased lung compliance)**.

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(Choices A and C) Interstitial lung disease involves stiffening of the alveolar walls and decreased lung compliance. Emphysema involves destruction of alveolar walls and increased lung compliance. In both, hypoxemia results largely from impaired diffusion of O_2 across the disrupted A-a membrane as well as some V/Q mismatching. Because alveolar ventilation is generally intact, increased FiO_2 usually improves the hypoxemia.

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Educational objective:
Pulmonary edema causes hypoxemia due to right-to-left intrapulmonary shunting, an extreme ventilation/perfusion (V/Q) mismatch. When the edema is diffuse, alveolar ventilation is zero throughout much of the lungs and the hypoxemia does not correct with supplemental O_2. As with any type of V/Q mismatch, pulmonary edema leads to an increase in the alveolar-arterial O_2 gradient. It also causes stiffening of the lungs and decreased lung compliance.

References

- Gas exchange and ventilation-perfusion relationships in the lung.

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Item 36 of 40
Question Id: 4726

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A 56-year-old woman comes to the office due to eye irritation, painful eye movements, and diplopia. Over the last few weeks, she has also experienced weight loss and fatigue. The patient smokes a pack of cigarettes a day and has a 25-pack-year history. Other medical problems include chronic obstructive pulmonary disease treated with an inhaled corticosteroid and bronchodilators. She also suffered a head injury in a motor vehicle accident 6 months ago. Blood pressure is 146/70 mm Hg, pulse is 110/min, and respirations are 18/min. On physical examination, the patient is unable to maintain eye convergence and experiences diplopia on upward gaze. Her eyes are shown in the image below.



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

A. Brain stem injury
B. Increased intracranial pressure
C. Increased intraocular pressure

TUTOR

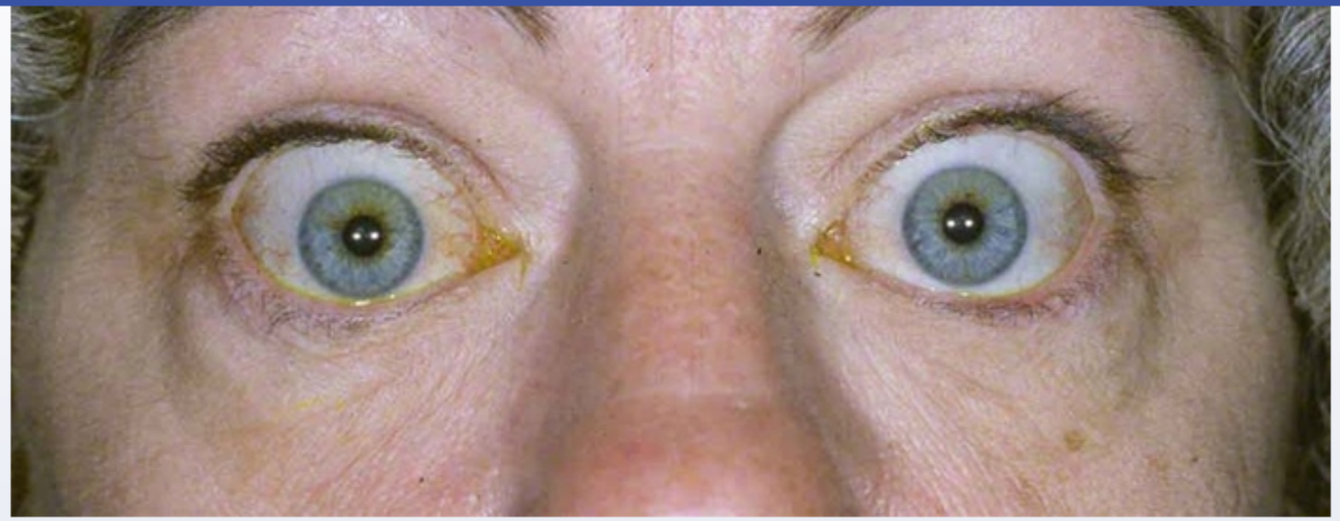
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Item 36 of 40
Question Id: 4726

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

A. Brain stem injury
B. Increased intracranial pressure
C. Increased intraocular pressure
D. Neuromuscular junction disorder
E. Orbital tissue expansion
F. Paraneoplastic syndrome

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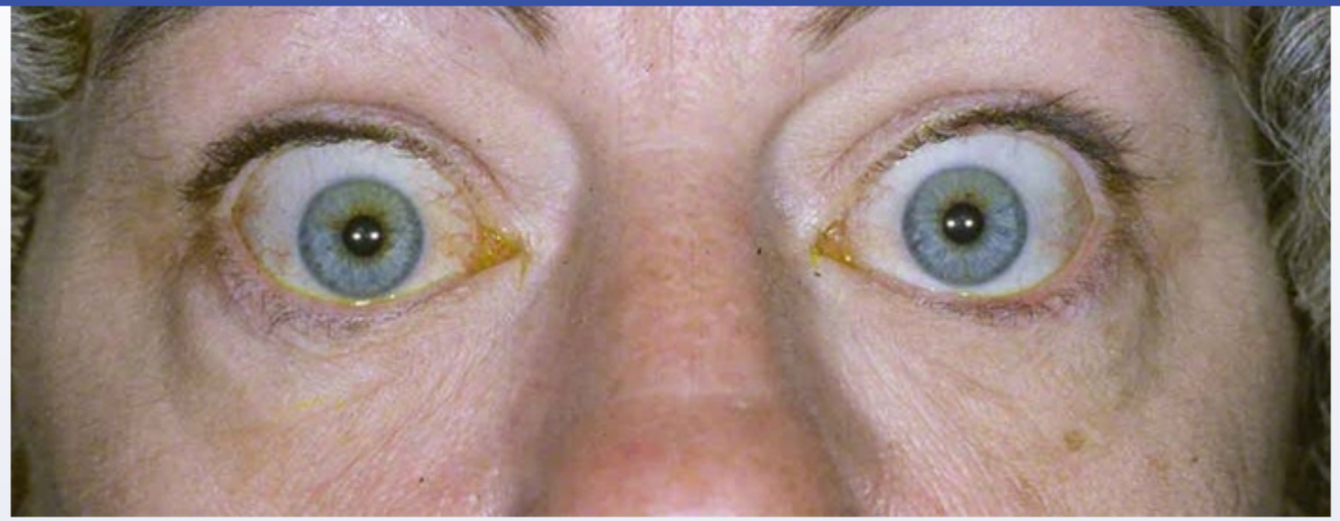
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Question Id: 4726
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Which of the following is the most likely cause of this patient's examination findings?

A. Brain stem injury (4%)
B. Increased intracranial pressure (6%)
C. Increased intraocular pressure (5%)
D. Neuromuscular junction disorder (6%)
✓ E. Orbital tissue expansion (61%)
F. Paraneoplastic syndrome (16%)

Omitted
Correct answer

61%
Answered correctly

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Time Spent

05/04/2020
Last Updated

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Clinical manifestations of Graves disease	
General	Heat intolerance, weight loss, sweating
Eyes	Lid lag, **proptosis**, diplopia
Skin	Hair loss, **infiltrative dermopathy** (pretibial myxedema)
Cardiovascular	Tachycardia, hypertension, atrial fibrillation
Nails	Onycholysis, clubbing (acropachy)
Endocrine	Hyperglycemia, hypercalcemia, bone loss, menstrual irregularities
Gastrointestinal	Diarrhea
Neurology	Tremors, hyperreflexia, proximal muscle weakness

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This patient has clinical features of hyperthyroidism (ie, weight loss, tachycardia) with proptosis and impaired extraocular motion (decreased convergence, diplopia) consistent with **Graves ophthalmopathy**. Other common symptoms include irritation (eg, gritty or sandy sensation), redness, photophobia, pain, and tearing. Ophthalmopathy in Graves disease is typically diagnosed at the same time as hyperthyroidism but may occur before or after the onset of hyperthyroidism. Risk factors include female sex, advancing age, and smoking.

In Graves disease, **thyrotropin (TSH) receptor autoantibodies** (TRAB) stimulate thyroid hormone production, resulting in hyperthyroidism. Thyroid hormone increases sensitivity to catecholamines, and thyrotoxicosis of any etiology may cause lid lag and retraction due to sympathetic

This patient has clinical features of hyperthyroidism (ie, weight loss, tachycardia) with proptosis and impaired extraocular motion (decreased convergence, diplopia) consistent with **Graves ophthalmopathy**. Other common symptoms include irritation (eg, gritty or sandy sensation), redness, photophobia, pain, and tearing. Ophthalmopathy in Graves disease is typically diagnosed at the same time as hyperthyroidism but may occur before or after the onset of hyperthyroidism. Risk factors include female sex, advancing age, and smoking.

In Graves disease, **thyrotropin (TSH) receptor autoantibodies** (TRAB) stimulate thyroid hormone production, resulting in hyperthyroidism. Thyroid hormone increases sensitivity to catecholamines, and thyrotoxicosis of any etiology may cause lid lag and retraction due to sympathetic activation and contraction of the superior tarsal muscle. However, true **exophthalmos** with impaired extraocular motion is seen only in Graves disease and is due to T cell activation and stimulation of orbital fibroblasts and adipocytes by TRAB, resulting in **orbital tissue expansion** and lymphocytic infiltration.

(Choice A) Brain stem dysfunction can cause diplopia but not proptosis. Furthermore, because many neural tracts are tightly packed in the brain stem, other neurologic findings (eg, weakness, sensory deficits, altered sensorium) are usually present.

(Choice B) Increased intracranial pressure (eg, pseudotumor cerebri) can cause papilledema but would not cause proptosis.

(Choice C) Graves ophthalmopathy can cause increased intraocular pressure due to orbital tissue expansion and compression of the globe. However, increased intraocular pressure alone (eg, glaucoma) does not cause proptosis.

(Choices D and F) Myasthenia gravis (MG) is a disorder of the neuromuscular junction caused by autoantibodies against acetylcholine receptors on the motor end plate. Ocular involvement may cause fluctuating diplopia and ptosis. Lambert-Eaton myasthenic syndrome (LEMS) is a paraneoplastic syndrome that may also cause diplopia. However, ocular involvement by LEMS is less common than involvement of the proximal limb muscles, and neither MG nor LEMS would cause ocular irritation, painful movement, or proptosis.

Educational objective:
Graves ophthalmopathy is characterized by ocular irritation, impaired extraocular motion, and proptosis. It is caused by T cell activation and stimulation of orbital fibroblasts by thyrotropin (TSH) receptor autoantibodies, leading to expansion of orbital tissues.

References

- Evaluating Graves' orbitopathy.
- Graves' ophthalmopathy.

A 50-year-old man undergoes surgery for a peptic ulcer perforation. The patient's early postoperative course is complicated by fever and hypotension, which are treated with broad-spectrum antibiotics and intravenous fluid support. He then recovers well until postoperative day 7. The patient subsequently develops nausea, abdominal pain, and profuse watery diarrhea. He is not currently on antibiotics. Temperature is 38.9 C (102 F), blood pressure is 112/70 mm Hg, pulse is 120/min and regular, and respirations are 18/min. Lungs are clear to auscultation. Abdominal examination is without distension and shows a well-healing midline scar. There is tenderness in the left lower quadrant. Test of the stool for occult blood is negative. Laboratory results are as follows:

Hemoglobin	11.5 g/dL
Platelets	180,000/mm^3
Leukocytes	17,500/mm^3
Segmented neutrophils	75%
Bands	10%
Eosinophils	1%
Lymphocytes	14%

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

A. Blood cultures and broad-spectrum antibiotics
B. CT scan of the abdomen
C. Laparoscopy
D. Nothing by mouth and parenteral feeding
E. Stool cultures

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B. CT scan of the abdomen
C. Laparoscopy
D. Nothing by mouth and parenteral feeding
E. Stool cultures
F. Stool toxin testing

Submit

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Leukocytes	17,500/mm^3
Segmented neutrophils	75%
Bands	10%
Eosinophils	1%
Lymphocytes	14%

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

A. Blood cultures and broad-spectrum antibiotics (6%)
B. CT scan of the abdomen (8%)
C. Laparoscopy (0%)
D. Nothing by mouth and parenteral feeding (1%)
E. Stool cultures (8%)
✓ F. Stool toxin testing (73%)

Omitted
Correct answer

73%
Answered correctly

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Time Spent

06/04/2020
Last Updated

***Clostridioides* (formerly *Clostridium*) *difficile* colitis in adults**	
Risk factors	• Recent antibiotics • Hospitalization • Advanced age • PPI
Clinical presentation	• Profuse diarrhea (most common) • Fulminant colitis or toxic megacolon
Diagnosis	• Stool PCR for *C difficile* toxin gene • Stool EIA for *C difficile* toxin & glutamate dehydrogenase antigen
Treatment	• Oral vancomycin or fidaxomicin
Infection control	• Hand hygiene with soap & water • Contact isolation • Sporicidal disinfectants (eg, bleach)

EIA = enzyme immunoassay; **PCR** = polymerase chain reaction; **PPI** = proton pump inhibitor.

This hospitalized patient who recently completed a course of antibiotics has new-onset diarrhea, fever, and leukocytosis, suggesting ***Clostridioides*** (formerly *Clostridium*) ***difficile*** **infection** (CDI). CDI occurs most commonly in patients with **recent antibiotic use** (usually fluoroquinolones, penicillins, cephalosporins, and clindamycin). Other risk factors include **recent hospitalization**, advanced age (>65), and gastric acid suppression (eg, proton pump inhibitor, H2 blocker). Unexplained **leukocytosis** in hospitalized patients should also raise suspicion for CDI, even in the absence of diarrhea.

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CDI can present as a spectrum, from mild colitis (ie, **watery diarrhea**, low-grade fever, abdominal pain, leukocytosis) to fulminant colitis with toxic megacolon. The diagnosis is confirmed with **stool studies**, which usually include either:

- Enzyme immunoassay for ***C difficile*** **toxins** and **glutamate dehydrogenase antigen** (a protein present on all *C difficile* strains)
- Stool polymerase chain reaction for ***C difficile*** **toxin genes**

Testing for cure is not recommended because stool assays may remain positive for days to weeks after clinical recovery.

(Choice A) Blood cultures and broad-spectrum antibiotics are indicated in a patient with new-onset fever due to suspected bacteremia. However, broad-spectrum antibiotics would likely worsen the CDI. Treatment of CDI includes oral vancomycin or fidaxomicin.

(Choice B) CT scan of the abdomen can diagnose diverticulitis, which can also present with diarrhea, fever, and left lower-quadrant pain. However, this patient already received broad-spectrum antibiotics, making diverticulitis less likely. Although the CT scan may show colitis, this finding is nonspecific.

(Choice C) Laparoscopy is usually reserved for patients with peritonitis (eg, rebound tenderness, guarding), toxic megacolon, or severe ileus.

(Choice D) Patients with significant abdominal pain from an acute abdominal process (eg, pancreatitis) are given nothing by mouth, and parenteral feeding may be required for those on prolonged bowel rest. However, bowel rest is usually not required for CDI.

(Choice E) Stool anerobic culture is rarely used to diagnose CDI; however, it takes days for results, and culture cannot distinguish between toxigenic or nontoxigenic strains. Stool toxin studies are more sensitive and specific for CDI.

Educational objective:
Risk factors for *Clostridioides* (formerly *Clostridum*) *difficile* include recent hospitalization, advanced age, and recent antibiotic use. Manifestations can range from mild colitis (ie, watery diarrhea, low-grade fever, abdominal pain, leukocytosis) to fulminant colitis with toxic megacolon. Diagnosis

CDI can present as a spectrum, from mild colitis (ie, **watery diarrhea**, low-grade fever, abdominal pain, leukocytosis) to fulminant colitis with toxic megacolon. The diagnosis is confirmed with **stool studies**, which usually include either:

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(Choice A) Blood cultures and broad-spectrum antibiotics are indicated in a patient with new-onset fever due to suspected bacteremia. However, broad-spectrum antibiotics would likely worsen the CDI. Treatment of CDI includes oral vancomycin or fidaxomicin.

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Educational objective:
Risk factors for *Clostridioides* (formerly *Clostridium*) *difficile* include recent hospitalization, advanced age, and recent antibiotic use. Manifestations can range from mild colitis (ie, watery diarrhea, low-grade fever, abdominal pain, leukocytosis) to fulminant colitis with toxic megacolon. Diagnosis is confirmed with stool studies for *C difficile* toxin and glutamate dehydrogenase antigen and/or stool assay for *C difficile* exotoxin genes.

References

- Guidelines for diagnosis, treatment, and prevention of Clostridium difficile infections.

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Item 38 of 40
Question Id: 2922

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A 56-year-old man is brought to the emergency department by a friend after vomiting bright red blood several times during the past 2 hours. The patient has no abdominal pain or diarrhea. He has a history of peptic ulcer disease and alcoholic cirrhosis. His friend says that the patient continues to drink alcohol and is not sure whether he is taking his medications regularly. Temperature is 37.6 C (99.7 F), blood pressure is 96/62 mm Hg, and pulse is 112/min. The patient has muscle wasting and scleral icterus. The abdomen is nontender and distended with bulging flanks. Rectal examination shows internal hemorrhoids and maroon stool that is positive for occult blood. He is receiving a normal saline infusion through a peripheral intravenous catheter. Which of the following is the best next step in management of this patient?

A. Administer octreotide infusion
B. Obtain second intravenous access
C. Perform esophagogastroduodenoscopy
D. Perform mesenteric arteriography
E. Place Sengstaken-Blakemore tube

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A 56-year-old man is brought to the emergency department by a friend after vomiting bright red blood several times during the past 2 hours. The patient has no abdominal pain or diarrhea. He has a history of peptic ulcer disease and alcoholic cirrhosis. His friend says that the patient continues to drink alcohol and is not sure whether he is taking his medications regularly. Temperature is 37.6 C (99.7 F), blood pressure is 96/62 mm Hg, and pulse is 112/min. The patient has muscle wasting and scleral icterus. The abdomen is nontender and distended with bulging flanks. Rectal examination shows internal hemorrhoids and maroon stool that is positive for occult blood. He is receiving a normal saline infusion through a peripheral intravenous catheter. Which of the following is the best next step in management of this patient?

- A. Administer octreotide infusion (27%)
- ✓ B. Obtain second intravenous access (43%)
- C. Perform esophagogastroduodenoscopy (24%)
- D. Perform mesenteric arteriography (0%)
- E. Place Sengstaken-Blakemore tube (3%)

Omitted
Correct answer
B

43%
Answered correctly

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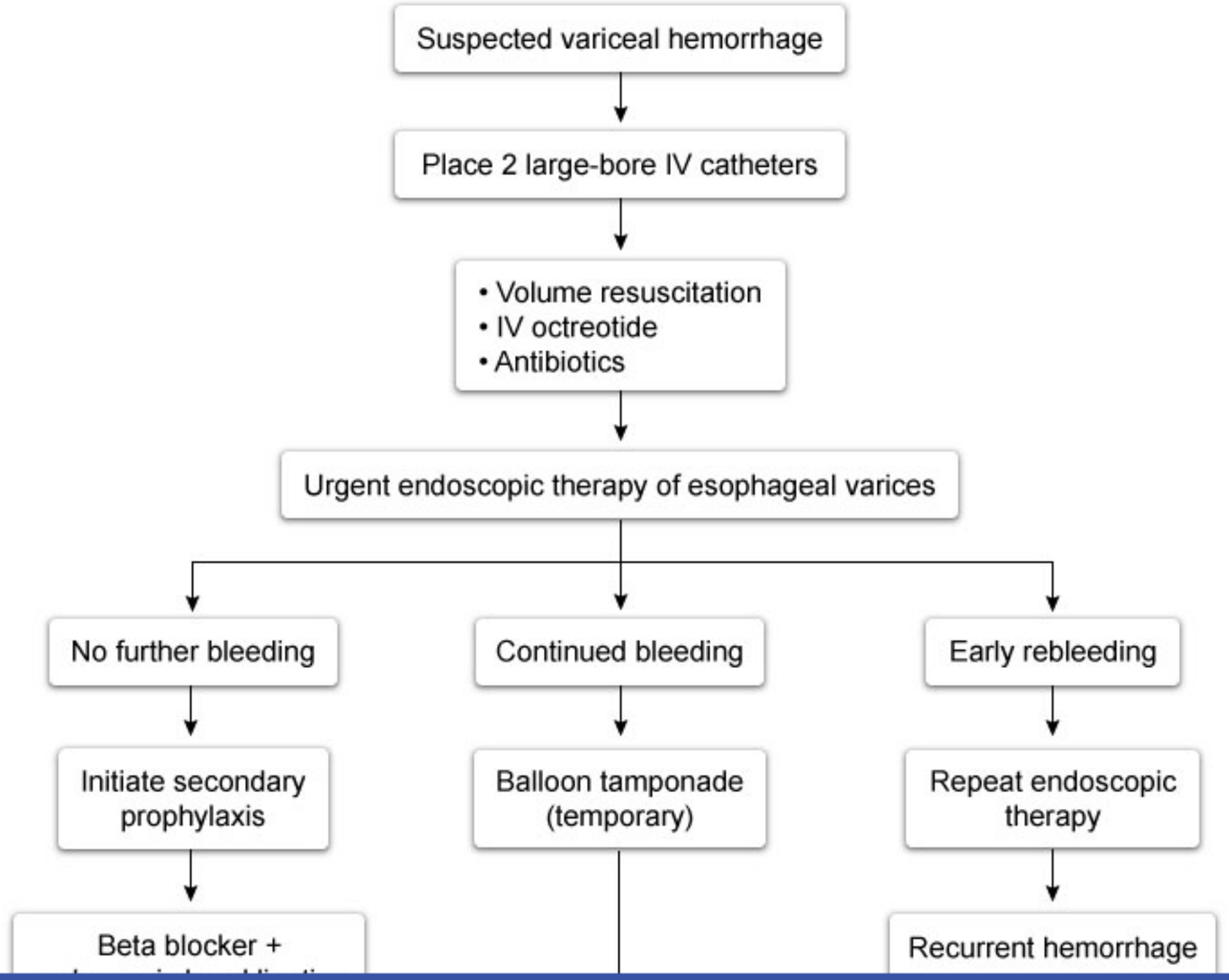
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Explanation

Variceal hemorrhage bleed algorithm

Suspected variceal hemorrhage

Variceal hemorrhage bleed algorithm



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Exhibit Display

Variceal hemorrhage bleed algorithm



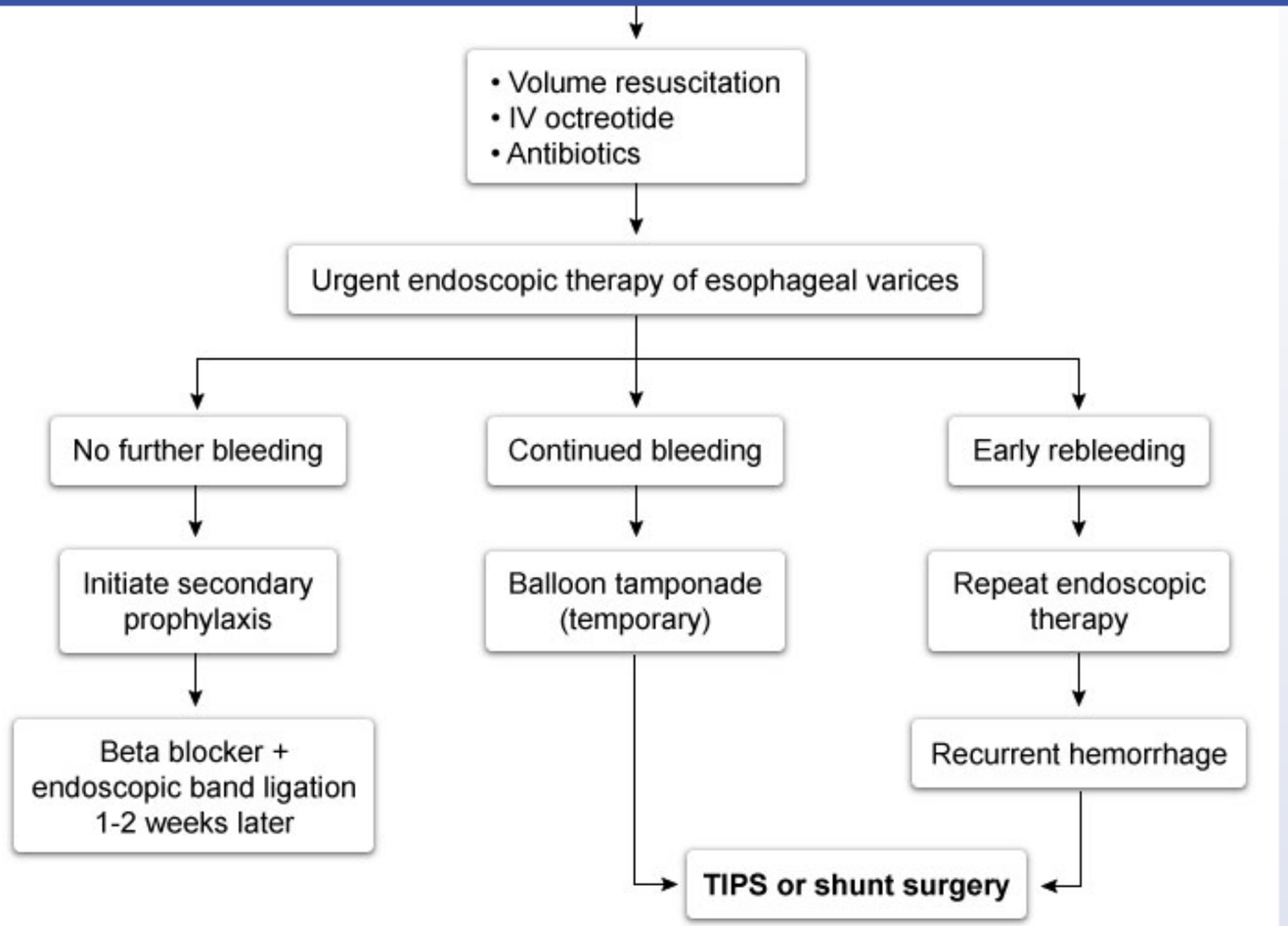
IV = intravenous; **TIPS** = transjugular intrahepatic portosystemic shunt.

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IV = intravenous; **TIPS** = transjugular intrahepatic portosystemic shunt.

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This patient has hematemesis in the setting of a history of peptic ulcer disease and alcoholic cirrhosis, which places him at risk for rapid, life-threatening **upper gastrointestinal bleeding** (UGIB). Therefore, prompt and aggressive fluid resuscitation should be the first step in management. All patients with acute hemorrhage should have vascular access established **immediately** with at least **2 large-bore intravenous lines**.

This patient has hematemesis in the setting of a history of peptic ulcer disease and alcoholic cirrhosis, which places him at risk for rapid, life-threatening **upper gastrointestinal bleeding** (UGIB). Therefore, prompt and aggressive fluid resuscitation should be the first step in management. All patients with acute hemorrhage should have vascular access established **immediately** with at least **2 large-bore intravenous lines**.

Once appropriate vascular access has been established, fluid **resuscitation** with crystalloid should be undertaken while any necessary blood products are prepared for transfusion (eg, packed red blood cell transfusion to maintain hemoglobin at least ≥7 g/dL). In addition, patients' airway, vital signs, cardiac rhythm, and urine output should be closely monitored. Patients with UGIB should also receive acid suppression with intravenous proton pump inhibitors and have all oral intake restricted. If variceal bleeding is suspected, as in this case, an octreotide infusion should be considered **(Choice A)**. Patients with cirrhosis should also receive prophylactic antibiotics.

Once patients are stabilized, upper endoscopy should be performed to identify and control the source of hemorrhage and to prevent recurrent episodes **(Choice C)**. In approximately 50% of cases of variceal bleeding, the hemorrhage ceases on its own without further intervention; this rate is significantly lower than that seen in UGIB due to other causes, which approaches 90%.

(Choice D) Contrast angiography should be considered in the small number of patients with UGIB who are not able to be stabilized sufficiently to undergo upper endoscopy or in whom upper endoscopy is unsuccessful in controlling hemorrhage.

(Choice E) Balloon tamponade with the Sengstaken-Blakemore, Minnesota, or Linton-Nachlas tubes can be used for the temporary control of bleeding when early endoscopy is unavailable or other modalities are unavailable and medical management is unsuccessful. This method is most often used to control hemorrhage until the patient can be transferred to a tertiary care hospital; it is not considered first-line treatment.

Educational objective:
The first step in the treatment of acute upper gastrointestinal bleeding is to establish vascular access with 2 large-bore intravenous catheters to initiate resuscitation with intravenous fluids.

References

- Management of variceal and nonvariceal upper gastrointestinal bleeding in patients with cirrhosis.
- Diagnosis and management of upper gastrointestinal bleeding.

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Question Id: 16455

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An 59-year-old woman is brought to the emergency department after falling from a standing height. The patient became lightheaded after rising quickly from bed and fell sideways. She struck her left posterior chest against the nightstand but did not hit her head or lose consciousness. The patient now has left-sided chest and shoulder pain, which is worse with deep breathing. Blood pressure is 102/54 mm Hg, pulse is 114/min, and respirations are 20/min. Oxygen saturation is 96% on room air. On examination, the patient is alert and mildly diaphoretic. The trachea is midline and neck veins are flat. Exquisite tenderness and a palpable step-off are present over the left lower ribs posteriorly. Bilateral breath sounds are normal. Heart sounds are unremarkable. The extremities have symmetric strength and no gross deformities. Chest x-ray reveals displaced fractures of the posterior ninth and tenth ribs. Which of the following is the best next step in management of this patient?

A. CT angiography of the chest
B. CT scan of the abdomen
C. Left shoulder x-ray series
D. Noncontrast CT of the head
E. Plain x-ray of the abdomen
F. Transthoracic echocardiography

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Item 39 of 40
Question Id: 16455

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A. CT angiography of the chest (11%)
✓ B. CT scan of the abdomen (65%)
C. Left shoulder x-ray series (6%)
D. Noncontrast CT of the head (2%)
E. Plain x-ray of the abdomen (7%)
F. Transthoracic echocardiography (6%)

Omitted
Correct answer
B

65%
Answered correctly

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05/04/2020
Last Updated

Explanation

TUTOR

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Rib fracture location & associated injuries	
Location	**Associated injuries**
Ribs 1-3	Subclavian vessels, brachial plexus, mediastinal vessels (eg, aorta)
Ribs 3-6	Cardiovascular
Ribs 9-12	Intraabdominal: liver (right), spleen (left), kidney (posterior ribs 11 & 12)
Any level	Pulmonary

This patient's fall resulted in displaced, left-sided **lower rib fractures** capable of injuring the spleen. In this setting, the patient's tachycardia is concerning for early hemorrhagic shock, and her left shoulder pain (with normal neuromuscular examination) is concerning for referred pain from the left diaphragm. Because of the intimate association between the diaphragm and splenic capsule, a contained splenic bleed can present with referred left shoulder pain prior to the onset of more significant abdominal symptoms.

Fractures of ribs 9-12 can **injure intraabdominal organs**. Unlike hollow viscus injuries, which may show subdiaphragmatic free air on upright x-ray, solid organ (eg, liver, spleen, kidney) injuries are typically not visible on plain abdominal x-ray **(Choice E)**. Therefore, suspicion of intraabdominal organ injury should prompt **CT scan of the abdomen**, provided that the patient is not hemodynamically unstable (ie, systolic blood pressure <90 mm Hg). The use of **IV contrast** better visualizes solid organ injury and potentially detects contrast "blush" (extravasation) at the site of bleeding.

Focused Assessment with Sonography for Trauma (FAST) would also be a reasonable next step; however, CT scan should be performed whether or not FAST detects free fluid, given the high suspicion for intraabdominal injury.

(Choice A) CT angiography of the chest can identify injuries to the intrathoracic vasculature. Injuries to major vessels (eg, aorta, subclavian vessels) are more common with fractures of ribs 1-3.

(Choice C) A left shoulder x-ray series can diagnose fracture or dislocation. There was no history of direct trauma to the patient's left shoulder, and examination revealed no extremity deformities or decreased strength. This makes left shoulder injury less likely, especially when the patient

This patient's fall resulted in displaced, left-sided **lower rib fractures** capable of injuring the spleen. In this setting, the patient's tachycardia is concerning for early hemorrhagic shock, and her left shoulder pain (with normal neuromuscular examination) is concerning for referred pain from the left diaphragm. Because of the intimate association between the diaphragm and splenic capsule, a contained splenic bleed can present with referred left shoulder pain prior to the onset of more significant abdominal symptoms.

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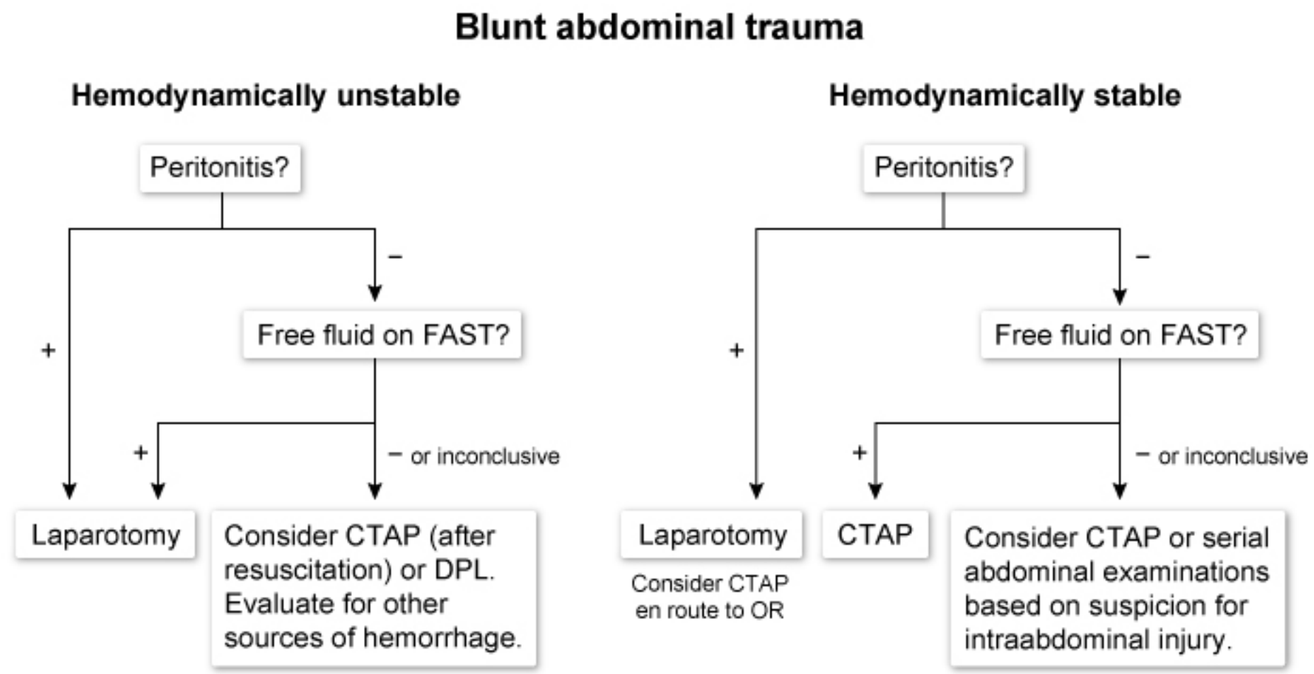
(Choice D) Noncontrast CT of the head evaluates for intracranial hemorrhage, especially after head trauma or unexplained loss of consciousness. This patient did not hit her head or lose consciousness when she fell.

(Choice F) Transthoracic echocardiography may eventually be obtained to work up this patient's lightheadedness and fall, but evaluation for possible intraabdominal injury takes precedence, particularly because of her normal heart sounds, flat neck veins, and lack of lower extremity edema.

Educational objective:
Displaced fractures of ribs 9-12 can injure intraabdominal organs, including the spleen. Bleeding that irritates the diaphragm may cause referred pain (eg, to the left shoulder).

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CTAP = CT scan of the abdomen & pelvis; **DPL** = diagnostic peritoneal lavage;
FAST = Focused Assessment with Sonography for Trauma; **OR** = operating room.

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References

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References

- Traumatic rib injury: patterns, imaging pitfalls, complications, and treatment.
- Western Trauma Association critical decisions in trauma: management of rib fractures.

Surgery	Pulmonary & Critical Care	Blunt thoracic trauma
Subject	System	Topic

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Question Id: 16060

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A 63-year-old man with chronic obstructive pulmonary disease comes to the emergency department due to 3 days of increasing dyspnea after running out of his maintenance and rescue inhalers. At first, he had dyspnea with exertion only, but it is now present at rest and associated with wheezing and a nonproductive cough. Chest x-ray reveals lung hyperinflation but no infiltrates. The patient is admitted to the medical floor and started on appropriate therapy. He does not respond to treatment; therefore, he is intubated and mechanically ventilated for worsening hypercapnia and increased work of breathing. Following intubation, portable chest radiograph confirms appropriately positioned endotracheal tube with no infiltrates, effusions, or pneumothorax. Which of the following interventions would be most likely to prevent this patient from developing ventilator-associated pneumonia?

A. Early parenteral nutrition via central line
B. Elevating the head of the bed to a 45-degree angle
C. Maintaining maximum sedation
D. Proton pump inhibitor for stress ulcer prophylaxis
E. Tight glycemic control with insulin infusion

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A. Early parenteral nutrition via central line (3%)
✓ B. Elevating the head of the bed to a 45-degree angle (84%)
C. Maintaining maximum sedation (2%)
D. Proton pump inhibitor for stress ulcer prophylaxis (2%)
E. Tight glycemic control with insulin infusion (6%)

Omitted
Correct answer
B

84%
Answered correctly

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Explanation

Major risk factors for ventilator-associated pneumonia

Major risk factors for ventilator-associated pneumonia
• Acid suppression (eg, PPI, H2R blocker, antacid) • Supine position • Pooled subglottic secretions • Paralysis & excessive sedation • Excessive patient movement while intubated • Frequent ventilator circuit changes

H2R = histamine-2 receptor; **PPI** = proton pump inhibitor.

Ventilator-associated pneumonia (VAP) is defined as pneumonia that develops ≥48 hours after **endotracheal intubation**. It is generally caused by **aspiration** of microorganisms from the **oropharynx or stomach** into the pulmonary parenchyma. Although endotracheal tubes have inflatable cuffs that seal the upper airway to prevent passage of secretions into the lungs, aspiration can still occur due to leakage around the cuff because of supine positioning, pooling of secretions in the subglottal area, or excessive endotracheal tube movement (eg, during patient transport).

The following is recommended for intubated patients to reduce the risk of VAP:

- **Head of bed elevation at 30-45 degrees** to reduce retrograde movement of gastric secretions
- Continuous or intermittent **suction of subglottic secretions** to prevent pooling above the endotracheal cuff
- Minimization of patient transport to prevent movement of the endotracheal tube
- **Limited use of gastric acid inhibitors** (eg, proton pump inhibitor, histamine-2 receptor blockers, antacids) to reduce the burden of microorganisms in gastric secretions

(Choice A) Although enteral nutrition through a nasogastric tube can increase the risk of aspiration (particularly when patients are supine), it should be used when possible because total parenteral nutrition, which is administered through a central line, is associated with a high rate of complications (eg, bloodstream infection due to the central line).

(Choice C) Excessive sedation increases the risk of VAP because it prolongs the number of days on mechanical ventilation and suppresses gag reflex. Daily sedation breaks help lower the risk of VAP due to the reduction of time on mechanical ventilation.

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(Choice C) Excessive sedation increases the risk of VAP because it prolongs the number of days on mechanical ventilation and suppresses gag reflex. Daily sedation breaks help lower the risk of VAP due to the reduction of time on mechanical ventilation.

(Choice D) Elevated gastric pH allows microorganisms to grow in gastric secretions, which increases the risk of VAP. Therefore, gastric acid suppression (eg, via proton pump inhibitor) should not be routinely used for stress ulcer prophylaxis. Acid suppression is generally reserved for patients at high risk for gastrointestinal bleeding (eg, thrombocytopenia, a recent gastrointestinal bleed).

(Choice E) Tight glycemic control is not recommended in the intensive care unit setting due to an elevated risk of hypoglycemia. In general, blood glucose levels between 140 and 180 mg/dL are recommended. Although poor glycemic control increases the risk of infection, rates of VAP are not strongly linked to moderate elevations in blood glucose.

Educational objective:
Ventilator-associated pneumonia is a hospital-acquired pneumonia that develops ≥48 hours after endotracheal intubation. Most cases arise due to aspiration of oropharyngeal or gastric secretions. Therefore, the risk is reduced by elevating the head of the bed to 30-45 degrees, suctioning

microorganisms in gastric secretions

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Educational objective:
Ventilator-associated pneumonia is a hospital-acquired pneumonia that develops ≥48 hours after endotracheal intubation. Most cases arise due to aspiration of oropharyngeal or gastric secretions. Therefore, the risk is reduced by elevating the head of the bed to 30-45 degrees, suctioning subglottic secretions, limiting endotracheal tube movement, and avoiding gastric acid suppression, unless patients are at high risk of stress ulcers.

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