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Question Id: 2372

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A 22-year-old primigravida at 34 weeks gestation is brought to the emergency department by ambulance for sudden loss of consciousness followed by generalized shaking. The paramedics started an intravenous magnesium sulfate bolus, which was running wide open when the patient arrived at the hospital. She says she is very tired and has blurry vision and a headache. The patient also has muscle pain and sore joints and is not able to move her right arm. Blood pressure is 145/98 mm Hg, pulse is 112/min, and respirations are 16/min. The patient holds the right arm adducted and internally rotated. Examination shows loss of external rotation of the right arm but no sensory deficits. Deep tendon reflexes are 2+ bilaterally, and handgrip and wrist strength is preserved on both sides. Urinalysis shows 3+ protein. Which of the following is the most likely cause of this patient's arm weakness?

- A. Anterior shoulder dislocation (24%)
- B. Magnesium toxicity (5%)
- ✓ C. Posterior shoulder dislocation (50%)
- D. Postictal (Todd) paralysis (17%)
- E. Radial nerve compression (1%)

Omitted
Correct answer
C

50%
Answered correctly

09 secs
Time Spent

01/16/2020
Last Updated

Explanation

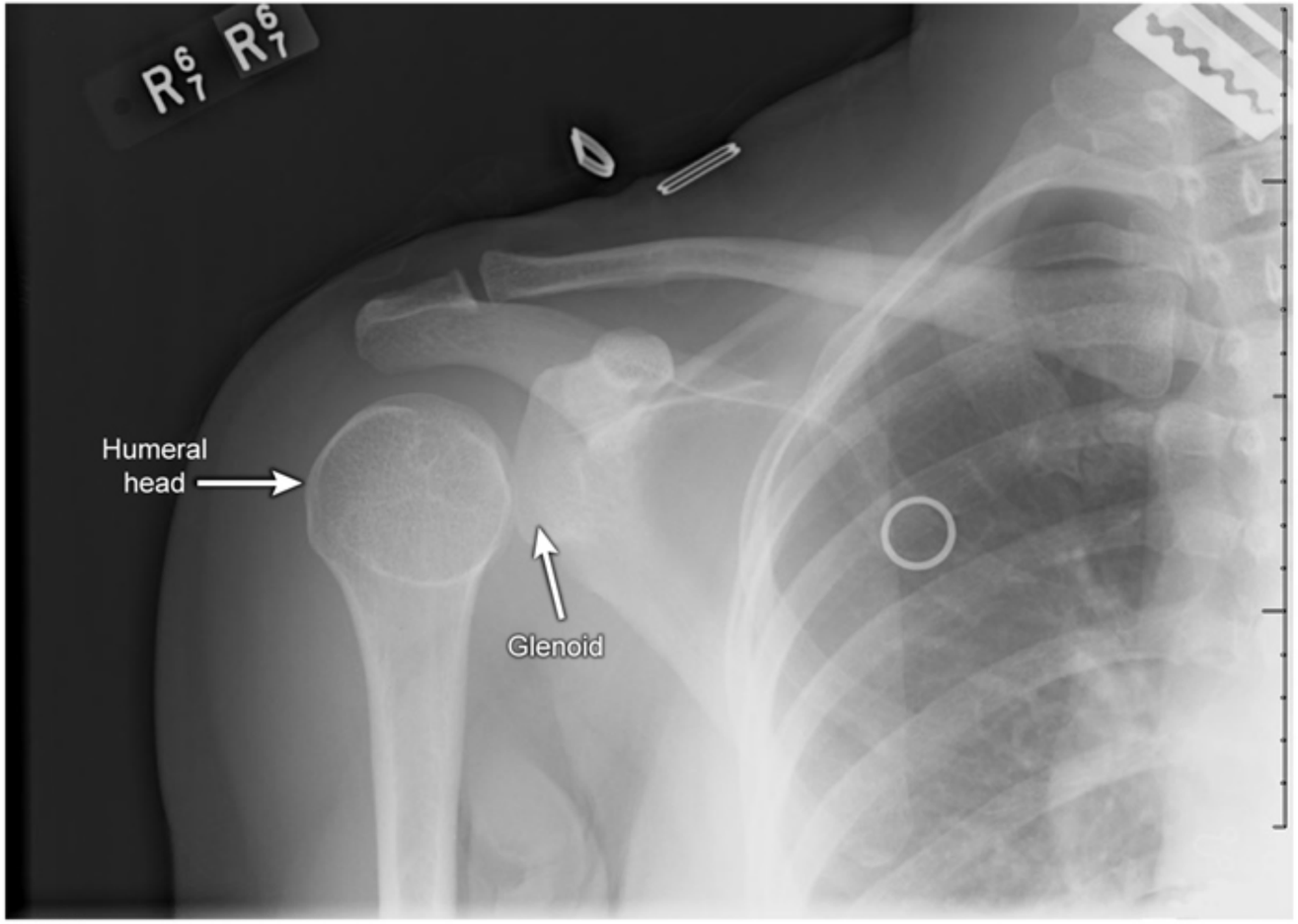
Posterior shoulder dislocation

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Posterior shoulder dislocation



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This pregnant patient has hypertension, proteinuria, and a generalized tonic-clonic **seizure**, findings consistent with eclampsia. Violent muscle contractions, as seen in a seizure or electrocution injury, are a common cause of **posterior shoulder dislocation**.

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This pregnant patient has hypertension, proteinuria, and a generalized tonic-clonic **seizure**, findings consistent with eclampsia. Violent muscle contractions, as seen in a seizure or electrocution injury, are a common cause of **posterior shoulder dislocation**.

In a posterior dislocation, the arm is typically held in **adduction** and **internal rotation**, with impaired external rotation, visible flattening of the anterior aspect of the shoulder, and prominence of the coracoid process. Radiographic findings may include:

- Loss of the normal overlap between the humeral head and the glenoid; a normal shoulder x-ray with normal overlap is given for comparison
- Internal rotation of the humeral head, which causes a circular appearance (light bulb sign) on anterior views
- Widened joint space >6 mm (rim sign) or 2 parallel cortical bone lines on the medial aspect of the humeral head (trough line sign)

Potential complications include fractures of the proximal humerus, labral injuries, and tears to the rotator cuff system. Most posterior dislocations are managed with closed reduction.

(Choice A) Anterior dislocation is the most common form of shoulder dislocation and is usually caused by a direct blow or fall on an outstretched arm. In anterior dislocations, the patient holds the arm slightly abducted and externally rotated.

(Choice B) Common adverse effects of magnesium sulfate include headache, nausea, fatigue, and diaphoresis. Signs of magnesium toxicity include somnolence, loss of deep tendon reflexes, and respiratory depression but not focal weakness. This patient's reflexes are normal.

(Choice D) Todd paralysis refers to transient unilateral weakness following a tonic-clonic seizure that usually spontaneously resolves. Adduction and internal rotation of the arm are not seen.

(Choice E) Radial nerve compression from trauma can occasionally be seen in shoulder dislocations but most commonly occurs in the forearm. It often results in hand weakness and decreased handgrip, which are not seen in this patient.

Educational objective:
Violent muscle contractions (eg, seizure, electrocution injury) can cause posterior shoulder dislocation. On examination, the arm is held in adduction and internal rotation, with flattening of the anterior aspect of the shoulder. X-rays show loss of the normal relation between the humeral head and glenoid and internal rotation of the humeral head. Most posterior dislocations are managed with closed reduction.

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This pregnant patient has hypertension, proteinuria, and a generalized tonic-clonic **seizure**, findings consistent with eclampsia. Violent muscle contractions, as seen in a seizure or electrocution injury, are a common cause of **posterior shoulder dislocation**.

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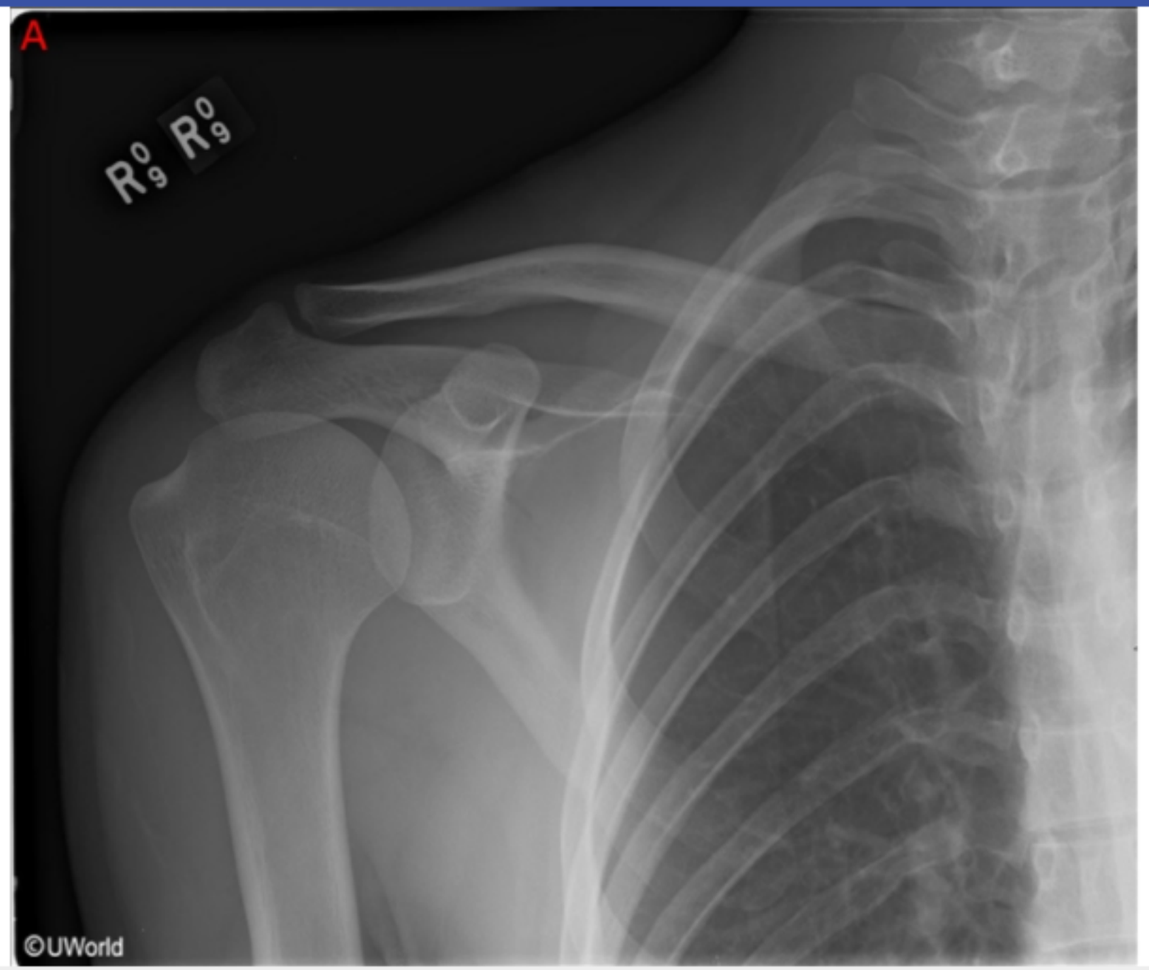
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Exhibit Display



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References

- Neglected bilateral posterior shoulder fracture dislocation in an uncontrolled seizure patient.

Surgery	Miscellaneous (Multisystem)	Shoulder dislocation
Subject	System	Topic

- Internal rotation of the humeral head, which causes a circular appearance (light bulb sign) on anterior views
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A 5-year-old boy is brought to the office due to left wrist pain lasting a day. His mother states that he refuses to use the left hand because of the pain. The patient has no previous medical conditions and is up to date with immunizations. He consumes a balanced diet. Vital signs and growth parameters are within normal limits for his age. On physical examination, the patient holds the left arm against his body. There is tenderness of the left wrist with no visible deformity. When instructed, the patient moves all fingers except the left thumb. Radiograph of the left forearm is shown in the image below:



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

A. Avascular bone necrosis
B. Dietary vitamin D deficiency
C. Hematogenous osteomyelitis
D. Incomplete radial fracture
E. Primary bone malignancy

Submit

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

A. Avascular bone necrosis (24%)
B. Dietary vitamin D deficiency (9%)
C. Hematogenous osteomyelitis (2%)
✓ D. Incomplete radial fracture (61%)
E. Primary bone malignancy (2%)

Omitted
Correct answer

61%
Answered correctly

07 secs
Time Spent

02/04/2020
Last Updated

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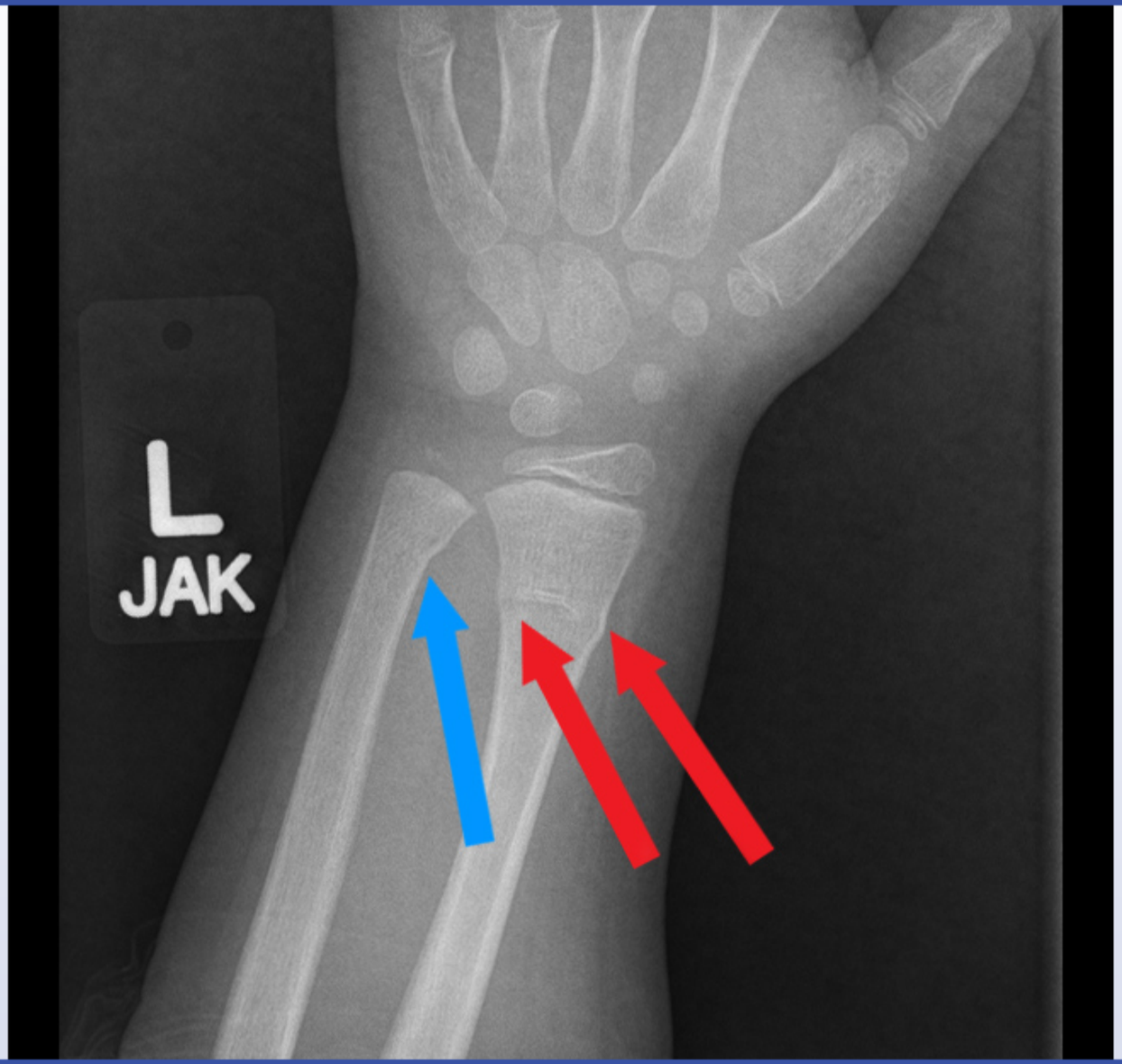
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Forearm fractures are common in children and most frequently involve the **distal radius** and/or **ulna** after a **fall onto an outstretched hand**. **Young children** (age <10) have porous bone, which allows for compression of the distal metaphyseal cortex after an injury. This results in a **buckle fracture**, which is considered a stable and **incomplete** fracture because it involves only one side of the bone.

Buckle fractures present with pain and tenderness over the fracture site. Wrist range of motion may be intact or slightly limited, and swelling is often absent. **X-ray** is required to confirm the diagnosis and exclude a greenstick or complete fracture. Rather than a fracture line, a **cortical bulge** (blue and red arrows) is visualized.

Treatment involves pain control and prevention of reinjury (eg, splint placement). Most buckle fractures heal within a few weeks without complication.

(Choice A) Avascular bone necrosis most commonly involves the hip (Legg-Calvé-Perthes disease) in children and presents with chronic joint pain and decreased range of motion. X-ray findings with prolonged disease include bony fragmentation and sclerosis.

(Choice B) Dietary vitamin D deficiency can lead to impaired bone mineralization (rickets), which can result in bowing of the long bones and fraying/cupping of the distal radius and ulna with widening of the wrist growth plate. These findings are not seen on this patient's x-ray.

(Choice C) Hematogenous osteomyelitis, a bone infection, typically presents with fever and bony tenderness, swelling, and erythema. X-ray is often normal in the first few days to weeks of symptoms but later shows soft tissue swelling and periosteal elevation.

(Choice E) Osteosarcoma is the most common primary bone malignancy in children and typically presents with localized bone pain and a soft tissue mass. Characteristic x-ray findings include Codman triangle (blue arrow) and a sunburst pattern indicating a periosteal reaction (red arrows), neither of which is seen in this patient.

Educational objective:
Buckle fractures are common in children and typically occur at the distal radius and/or ulna due to a fall onto an outstretched hand. X-ray is diagnostic and shows bulging of the bony cortex.

References

- Buckle fractures of the distal radius in children.

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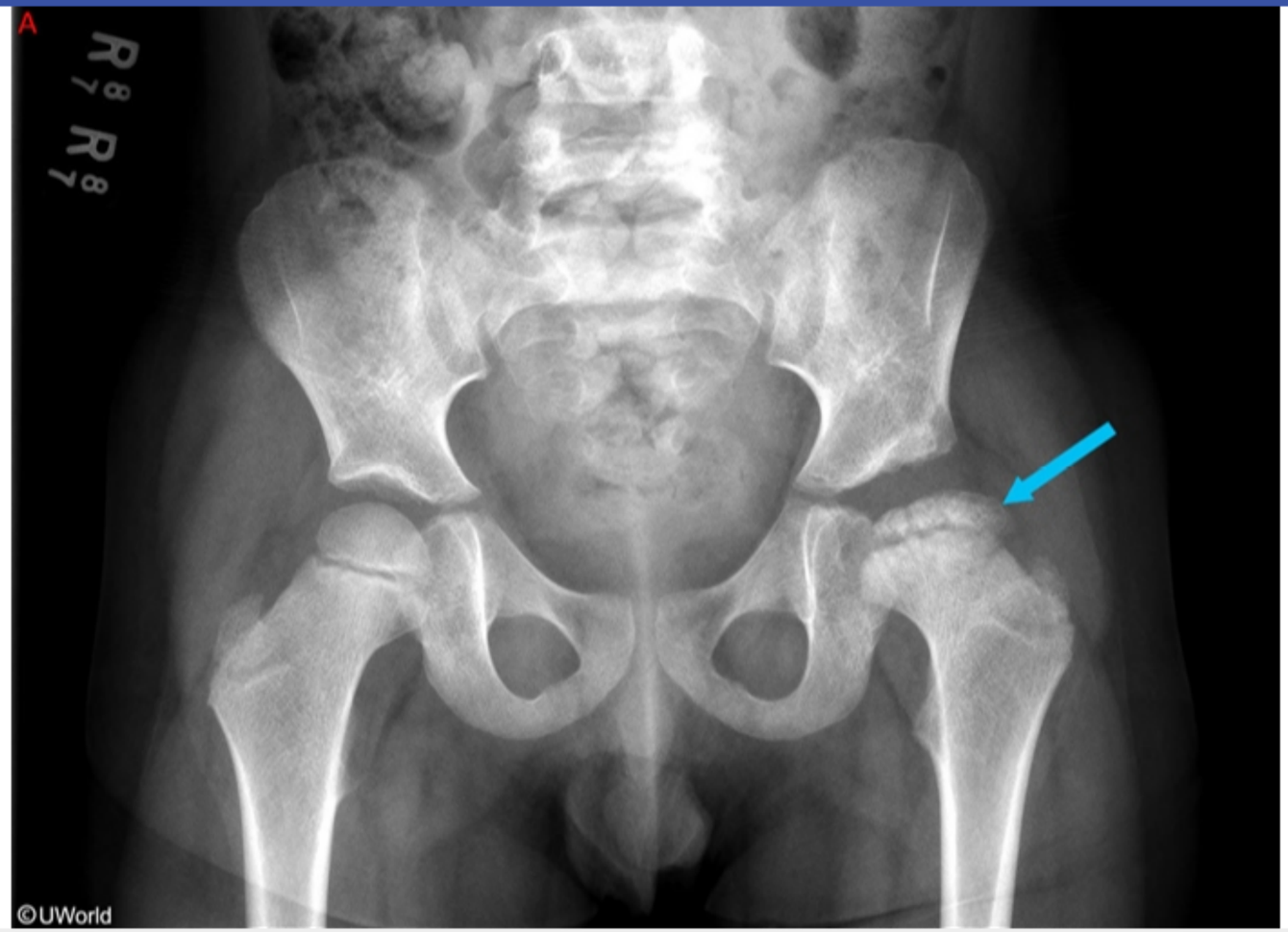
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Forearm fractures are common in children and most frequently involve the **distal radius** and/or **ulna** after a **fall onto an outstretched hand**.

Exhibit Display



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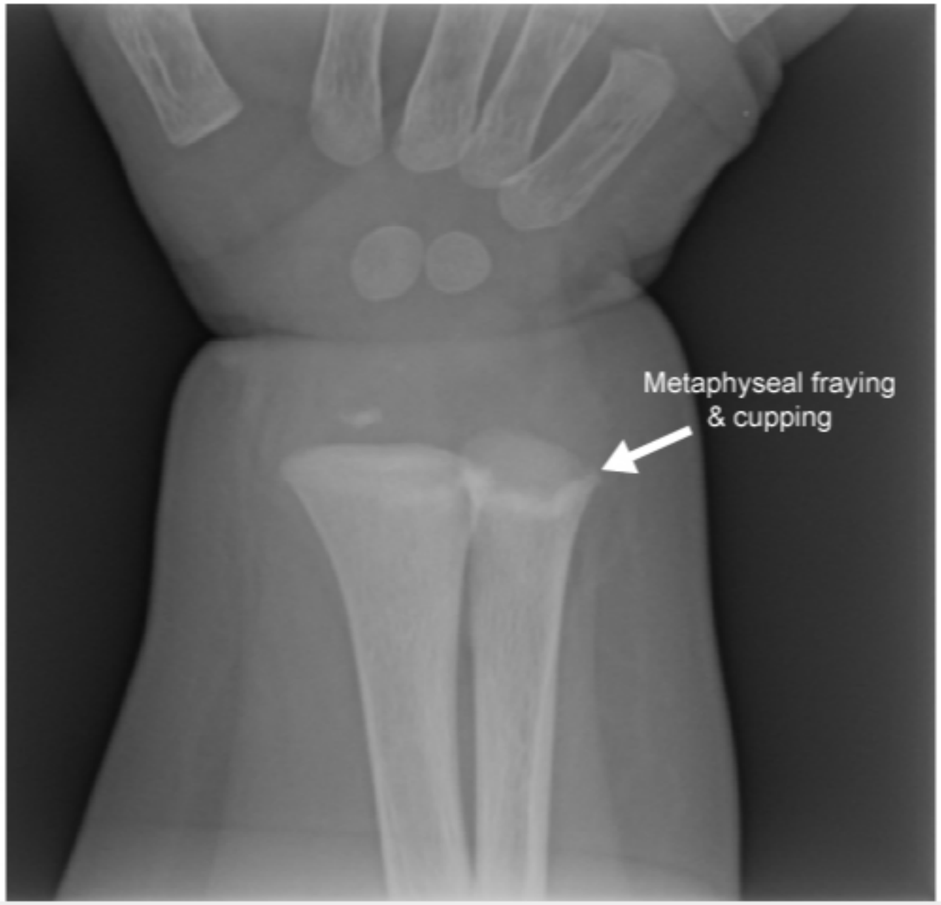
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Forearm fractures are common in children and most frequently involve the **distal radius** and/or **ulna** after a **fall onto an outstretched hand**.

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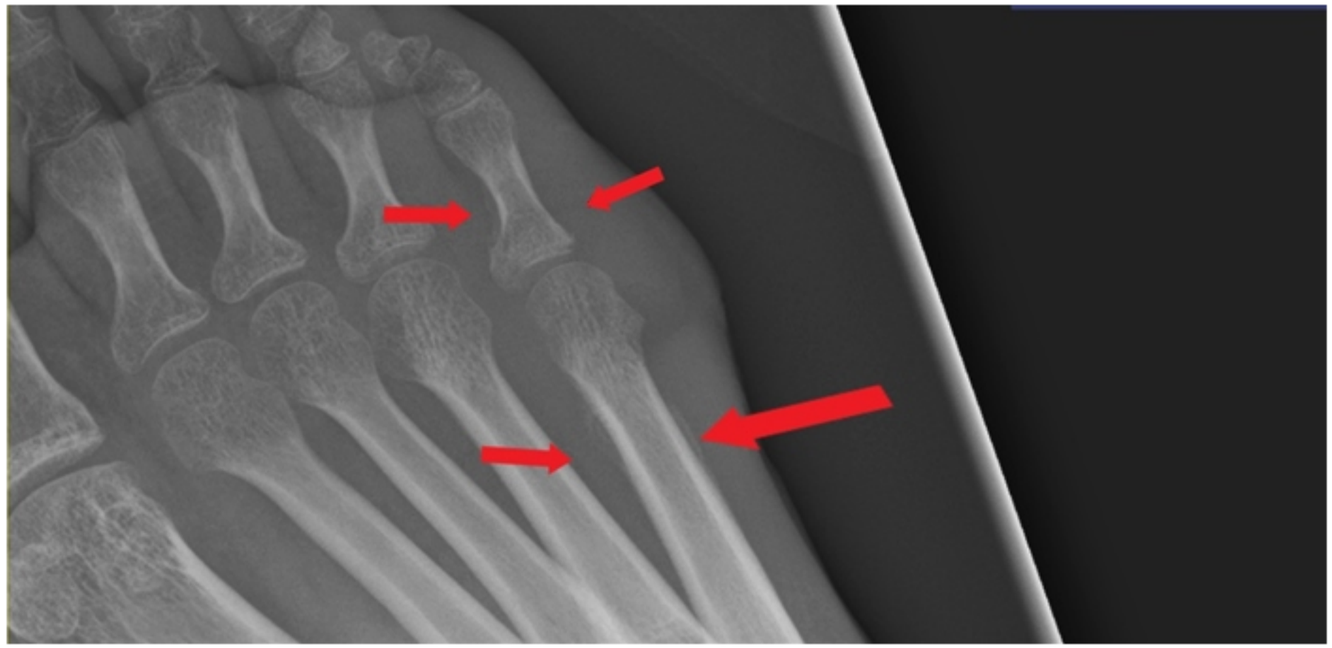
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Question Id: 4216

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A 28-year-old woman is hospitalized following a motor vehicle accident. She was returning home following a wine-tasting event when she veered off the road and rolled her car. Initial evaluation in the emergency department found severe hypotension, a hip fracture, multiple rib fractures, and evidence of blunt abdominal trauma. The patient underwent emergent laparotomy, which revealed a liver laceration and extensive hemoperitoneum. Her condition was stabilized with surgical intervention, fluid resuscitation, and blood transfusions. In the early postoperative period soon after extubation, the patient developed numbness in the fingertips and around her lips. She also developed forceful flexion of the wrist with abduction of the thumb while her nurse was measuring her blood pressure. Temperature is 37.4 C (99.3 F), blood pressure is 120/68 mm Hg, pulse is 80/min, and respirations are 12/min. Neurologic examination shows hyperactive reflexes diffusely with 5/5 muscle strength in all extremities. Which of the following is the most likely diagnosis?

A. Alcohol withdrawal
B. Anxiety
C. Fat embolism
D. Hypermagnesemia
E. Hypocalcemia

Submit

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Item 3 of 40
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A. Alcohol withdrawal (1%)
B. Anxiety (0%)
C. Fat embolism (1%)
D. Hypermagnesemia (3%)
✓ E. Hypocalcemia (93%)

Omitted
Correct answer
E

93%
Answered correctly

02 secs
Time Spent

04/02/2020
Last Updated

Explanation

Acute hypocalcemia

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Acute hypocalcemia	
Causes	• **Neck surgery** (parathyroidectomy) • Pancreatitis • Sepsis • Tumor lysis syndrome • Acute alkalosis • **Chelation**: blood (citrate) transfusion, EDTA, foscarnet
Clinical features	• Muscle cramps • Chvostek & Trousseau signs • Paresthesias • Hyperreflexia/tetany • Seizures
Treatment	• IV calcium gluconate/chloride
EDTA = ethylenediaminetetraacetic acid; **IV** = intravenous.	

This patient has paresthesias, carpal spasm (Trousseau sign), and hyperreflexia. In the setting of high-volume transfusion, these neurologic features are most likely due to **hypocalcemia**. Other potential features of severe hypocalcemia include tetany, laryngospasm, seizures, encephalopathy, and heart failure. Patients with chronic hypocalcemia may have only mild symptoms, but patients with acute hypocalcemia will have more severe manifestations at the same calcium concentration.

Citrate in **transfused blood** binds **ionized calcium**, which is the biologically active fraction (total calcium levels will not be significantly affected). Hypocalcemia is uncommon following blood transfusion in patients with normal liver function as citrate is rapidly metabolized by the liver; however, this patient likely has hepatic dysfunction due to the liver laceration as well as ischemic liver injury due to hypotension. Other infused substances that can chelate calcium in the blood include lactate, foscarnet, and sodium ethylenediaminetetraacetic acid (EDTA).

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(Choice A) Alcohol withdrawal is most pronounced 12-48 hours following the last drink. Clinical features may include hyperreflexia, tremor, diaphoresis, and gastrointestinal upset, but carpal spasm and paresthesias are more consistent with hypocalcemia.

(Choice B) Hyperventilation due to anxiety can cause acute respiratory alkalosis, increasing the binding of calcium to albumin and reducing ionized calcium concentrations. However, this patient's respiratory rate is only 12/min.

(Choice C) Fat embolism can occur following pelvic or long bone fractures. Manifestations of fat embolism include respiratory insufficiency, hypoxemia, altered mental state, and petechial rash.

(Choice D) Hypomagnesemia (not hypermagnesemia) can present similarly to hypocalcemia. Severe hypermagnesemia causes hyporeflexia, paralysis, apnea, and cardiac arrest. Rarely, very severe hypermagnesemia can cause hypocalcemia by inhibiting parathyroid hormone release, but this would typically be seen with infusions of magnesium, such as in the treatment of severe preeclampsia and eclampsia.

Educational objective:
High-volume blood transfusion can cause symptomatic hypocalcemia due to chelation of ionized calcium by citrate in transfused blood. Patients with impaired hepatic function are at increased risk due to decreased clearance of citrate by the liver.

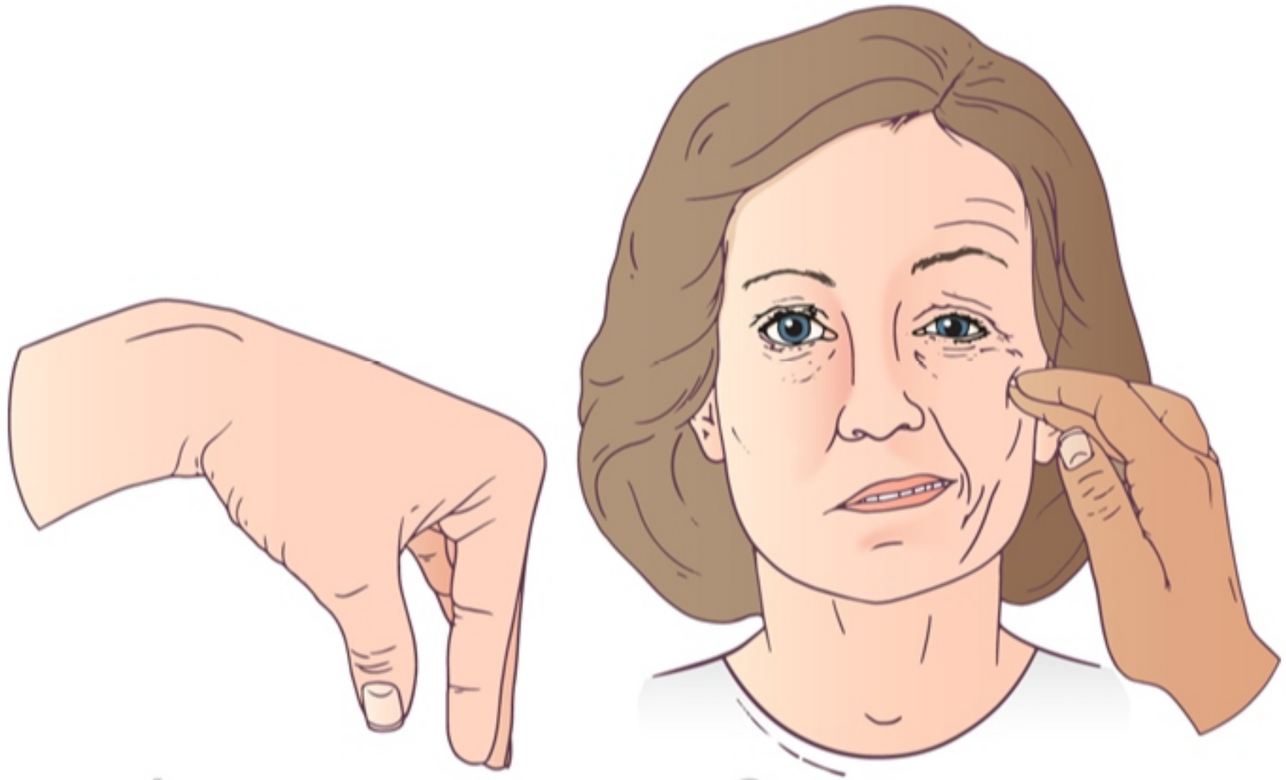
References

- Effects of liver function on ionized hypocalcaemia following rapid blood transfusion

- **Chelation**: blood (citrate) transfusion, EDTA, foscarnet

Exhibit Display

Signs of hypocalcemia



1 Trousseau sign

2 Chvostek sign

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(Choice D) Hypomagnesemia (not hypermagnesemia) can present similarly to hypocalcemia. Severe hypermagnesemia causes hyporeflexia,

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EDTA = ethylenediaminetetraacetic acid; IV = intravenous.

This patient has paresthesias, carpal spasm (Trousseau sign), and hyperreflexia. In the setting of high-volume transfusion, these neurologic features are most likely due to **hypocalcemia**. Other potential features of severe hypocalcemia include tetany, laryngospasm, seizures, encephalopathy, and heart failure. Patients with chronic hypocalcemia may have only mild symptoms, but patients with acute hypocalcemia will have more severe manifestations at the same calcium concentration.

Citrate in **transfused blood** binds **ionized calcium**, which is the biologically active fraction (total calcium levels will not be significantly affected). Hypocalcemia is uncommon following blood transfusion in patients with normal liver function as citrate is rapidly metabolized by the liver; however, this patient likely has hepatic dysfunction due to the liver laceration as well as ischemic liver injury due to hypotension. Other infused substances that can chelate calcium in the blood include lactate, foscarnet, and sodium ethylenediaminetetraacetic acid (EDTA).

(Choice A) Alcohol withdrawal is most pronounced 12-48 hours following the last drink. Clinical features may include hyperreflexia, tremor, diaphoresis, and gastrointestinal upset, but carpal spasm and paresthesias are more consistent with hypocalcemia.

(Choice B) Hyperventilation due to anxiety can cause acute respiratory alkalosis, increasing the binding of calcium to albumin and reducing ionized calcium concentrations. However, this patient's respiratory rate is only 12/min.

(Choice C) Fat embolism can occur following pelvic or long bone fractures. Manifestations of fat embolism include respiratory insufficiency, hypoxemia, altered mental state, and petechial rash.

(Choice D) Hypomagnesemia (not hypermagnesemia) can present similarly to hypocalcemia. Severe hypermagnesemia causes hyporeflexia, paralysis, apnea, and cardiac arrest. Rarely, very severe hypermagnesemia can cause hypocalcemia by inhibiting parathyroid hormone release, but this would typically be seen with infusions of magnesium, such as in the treatment of severe preeclampsia and eclampsia.

Educational objective:
High-volume blood transfusion can cause symptomatic hypocalcemia due to chelation of ionized calcium by citrate in transfused blood. Patients with impaired hepatic function are at increased risk due to decreased clearance of citrate by the liver.

References

- Effects of liver function on ionized hypocalcaemia following rapid blood transfusion

have more severe manifestations at the same calcium concentration.

Citrate in **transfused blood** binds **ionized calcium**, which is the biologically active fraction (total calcium levels will not be significantly affected). Hypocalcemia is uncommon following blood transfusion in patients with normal liver function as citrate is rapidly metabolized by the liver; however, this patient likely has hepatic dysfunction due to the liver laceration as well as ischemic liver injury due to hypotension. Other infused substances that can chelate calcium in the blood include lactate, foscarnet, and sodium ethylenediaminetetraacetic acid (EDTA).

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(Choice B) Hyperventilation due to anxiety can cause acute respiratory alkalosis, increasing the binding of calcium to albumin and reducing ionized calcium concentrations. However, this patient's respiratory rate is only 12/min.

(Choice C) Fat embolism can occur following pelvic or long bone fractures. Manifestations of fat embolism include respiratory insufficiency, hypoxemia, altered mental state, and petechial rash.

(Choice D) Hypomagnesemia (not hypermagnesemia) can present similarly to hypocalcemia. Severe hypermagnesemia causes hyporeflexia, paralysis, apnea, and cardiac arrest. Rarely, very severe hypermagnesemia can cause hypocalcemia by inhibiting parathyroid hormone release, but this would typically be seen with infusions of magnesium, such as in the treatment of severe preeclampsia and eclampsia.

Educational objective:
High-volume blood transfusion can cause symptomatic hypocalcemia due to chelation of ionized calcium by citrate in transfused blood. Patients with impaired hepatic function are at increased risk due to decreased clearance of citrate by the liver.

References

- Effects of liver function on ionized hypocalcaemia following rapid blood transfusion

Surgery	Endocrine, Diabetes & Metabolism	Hypocalcemia
Subject	System	Topic

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A 56-year-old man comes to the emergency department due to worsening abdominal discomfort and distension. The discomfort is diffuse and began 1 day prior, after the patient woke up from a night of heavy drinking that included a fall in which he struck his lower abdomen. He has also had increasing abdominal girth over the past day. Medical history includes alcohol use disorder and hypertension; there is a remote history of appendectomy. Review of systems is negative for fever or vomiting but positive for inability to void. Temperature is 36.7 C (98.1 F), blood pressure is 158/90 mm Hg, and pulse is 90/min. Heart and lung sounds are normal. The abdomen is distended, mildly tender to palpation diffusely, and dull to percussion with a positive fluid wave. Laboratory results are as follows:

Complete blood count	
Hemoglobin	13.2 g/dL
Platelets	240,000/mm^3
Leukocytes	11,200/mm^3
Serum chemistry	
Blood urea nitrogen	50 mg/dL
Creatinine	3.5 mg/dL
Liver function studies	
Total protein	6.5 g/dL
Albumin	4.1 g/dL
Total bilirubin	0.9 mg/dL

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

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Leukocytes	11,200/mm^3
Serum chemistry	
Blood urea nitrogen	50 mg/dL
Creatinine	3.5 mg/dL
Liver function studies	
Total protein	6.5 g/dL
Albumin	4.1 g/dL
Total bilirubin	0.9 mg/dL

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

A. Bladder rupture
B. Liver cirrhosis
C. Rhabdomyolysis
D. Small-bowel perforation
E. Splenic laceration

Submit

Leukocytes	11,200/mm^3
Serum chemistry	
Blood urea nitrogen	50 mg/dL
Creatinine	3.5 mg/dL
Liver function studies	
Total protein	6.5 g/dL
Albumin	4.1 g/dL
Total bilirubin	0.9 mg/dL

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

- A. Bladder rupture (76%)
- B. Liver cirrhosis (9%)
- C. Rhabdomyolysis (9%)
- D. Small-bowel perforation (1%)
- E. Splenic laceration (2%)

Omitted
Correct answer

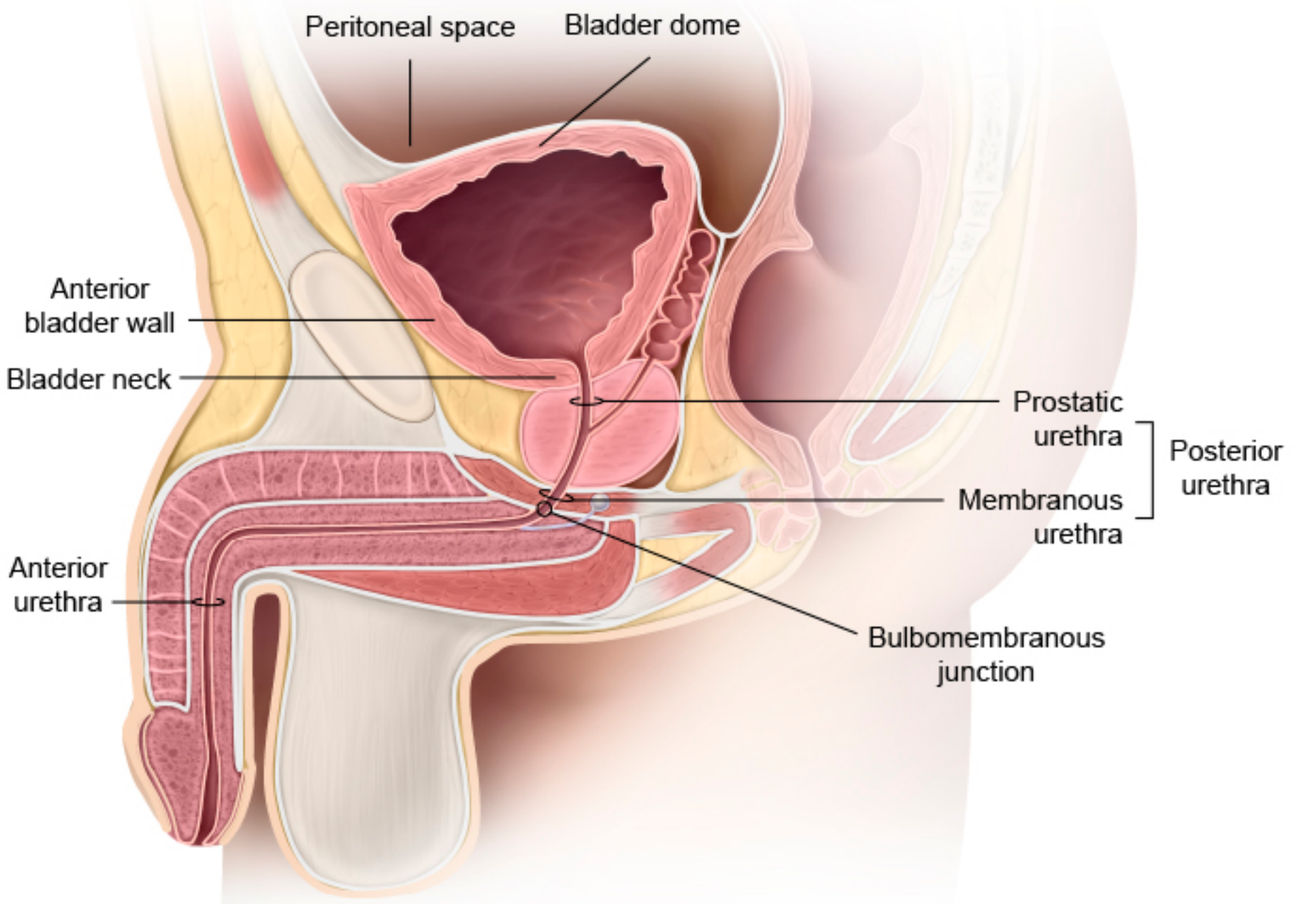
76%
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Last Updated

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Male urogenital anatomy



This patient with blunt lower abdominal **trauma** incurred during a night of heavy drinking (eg, likely **full bladder**) now has inability to void,

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Item 5 of 40
Question Id: 16226

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A 62-year-old man comes to the office for evaluation of hoarseness. He says that he has always had a deep voice, but over the past 4 months, it has become "rough" and "scratchy" and the hoarseness is constant; it does not change throughout the day. Medical history is significant for chronic obstructive pulmonary disease and gastroesophageal reflux disease. The patient has smoked a pack of cigarettes daily for the past 40 years. He drinks 12 beers weekly. Vital signs are within normal limits. Nasal mucosa is dry, and oral cavity examination shows poor dentition with mild thrush seen on the lateral surfaces of the tongue bilaterally. There is no cervical adenopathy. Flexible laryngoscopy reveals a clear nasal cavity and nasopharynx. The base of tongue has normal mucosa, and the tonsils are small with no lesions. The vocal cords are mobile bilaterally. The right vocal cord is clear with a straight edge. There is a fungating, irregular mass on the left vocal cord that appears white in some areas and red in others with some blood crusting. Which of the following would most likely be seen on biopsy of this vocal cord lesion?

A. Adenocarcinoma
B. Aphthous ulcer
C. Laryngeal candidiasis
D. Pemphigus vulgaris
E. Reflux laryngitis
F. Squamous cell carcinoma
G. Squamous papilloma
H. Vocal cord polyps

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Item 5 of 40
Question Id: 16226

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B. Aphthous ulcer
C. Laryngeal candidiasis
D. Pemphigus vulgaris
E. Reflux laryngitis
F. Squamous cell carcinoma
G. Squamous papilloma
H. Vocal cord polyps

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- A. Adenocarcinoma (2%)
- B. Aphthous ulcer (0%)
- C. Laryngeal candidiasis (3%)
- D. Pemphigus vulgaris (0%)
- E. Reflux laryngitis (0%)
- ✓ F. Squamous cell carcinoma (83%)
- G. Squamous papilloma (7%)
- H. Vocal cord polyps (2%)

Omitted
Correct answer
F

83%
Answered correctly

02 mins, 41 secs
Time Spent

04/11/2020
Last Updated

This patient with persistent hoarseness and a fungating laryngeal mass has **laryngeal squamous cell carcinoma** (SCC), which accounts for >90% of lesions in the adult larynx. The most important risk factors are **smoking** and alcohol use. Hoarseness is often the presenting symptom, due to impaired vibration or movement of the vocal cords. **Persistent hoarseness** (>30 days) should always be evaluated by laryngoscopy to ensure no delay in diagnosis of possible cancer.

Other presenting symptoms may include dysphagia or airway obstruction due to a mass blocking passage of food or air. Patients may have referred otalgia facilitated by either the glossopharyngeal nerve (CN IX) (which innervates both the base of tongue and the external auditory canal [EAC]) or the vagus nerve (CN X) (which innervates parts of the larynx/hypopharynx and the EAC). Hemoptysis may be seen due to tumor friability (eg, blood crusting). Regional nodal metastases manifest as cervical adenopathy.

(Choice A) Adenocarcinoma is unlikely in the larynx (<1% of laryngeal malignancies). Lung adenocarcinoma shares some risk factors (eg, smoking, age) and presenting symptoms (eg, cough, hemoptysis) with laryngeal SCC but would not metastasize to the larynx.

(Choice B) Aphthous ulcers are common, painful ulcers that typically resolve in <2 weeks and are usually seen in the oral cavity (eg, tongue, buccal mucosa) rather than the larynx and would not cause hoarseness.

(Choice C) Laryngeal candidiasis is an opportunistic infection that often occurs concurrently with oral candidiasis (thrush) in patients using corticosteroid inhalers (eg, due to chronic obstructive pulmonary disease). White patches or plaques on the mucosal surfaces are seen; a single, large laryngeal mass would not occur.

(Choice D) Pemphigus vulgaris is an autoimmune disease characterized by painful blisters of the skin and mucous membranes. However, the pain is severe, and there would be skin blistering and multiple ulcerations (not a mass isolated to the vocal cord).

(Choice E) Reflux laryngitis could cause hoarseness and dysphagia but not a laryngeal mass.

(Choice G) Recurrent respiratory papillomatosis is due to human papillomavirus. Wartlike proliferations described as multiple, raised, finger-shaped lesions are seen on the surface of the vocal cords. Squamous papillomas appear more uniform and do not invade deeper structures.

(Choice H) Vocal cord polyps often occur due to inefficient or excessive voice use (eg, teachers, telemarketers). They can cause hoarseness due to impaired vocal cord vibration. Polyps do not invade or ulcerate.

Educational objective:

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(Choice H) Vocal cord polyps often occur due to inefficient or excessive voice use (eg, teachers, telemarketers). They can cause hoarseness due to impaired vocal cord vibration. Polyps do not invade or ulcerate.

Educational objective:
A laryngeal ulcer in a smoker is likely squamous cell carcinoma. Persistent hoarseness should always be evaluated by laryngoscopy to ensure no delay in diagnosis of possible cancer.

References

- Adenocarcinoma of the larynx.
- Clinical practice guideline: hoarseness (dysphonia) (update).

Surgery Ear, Nose & Throat (ENT) Head and neck cancers

Settings

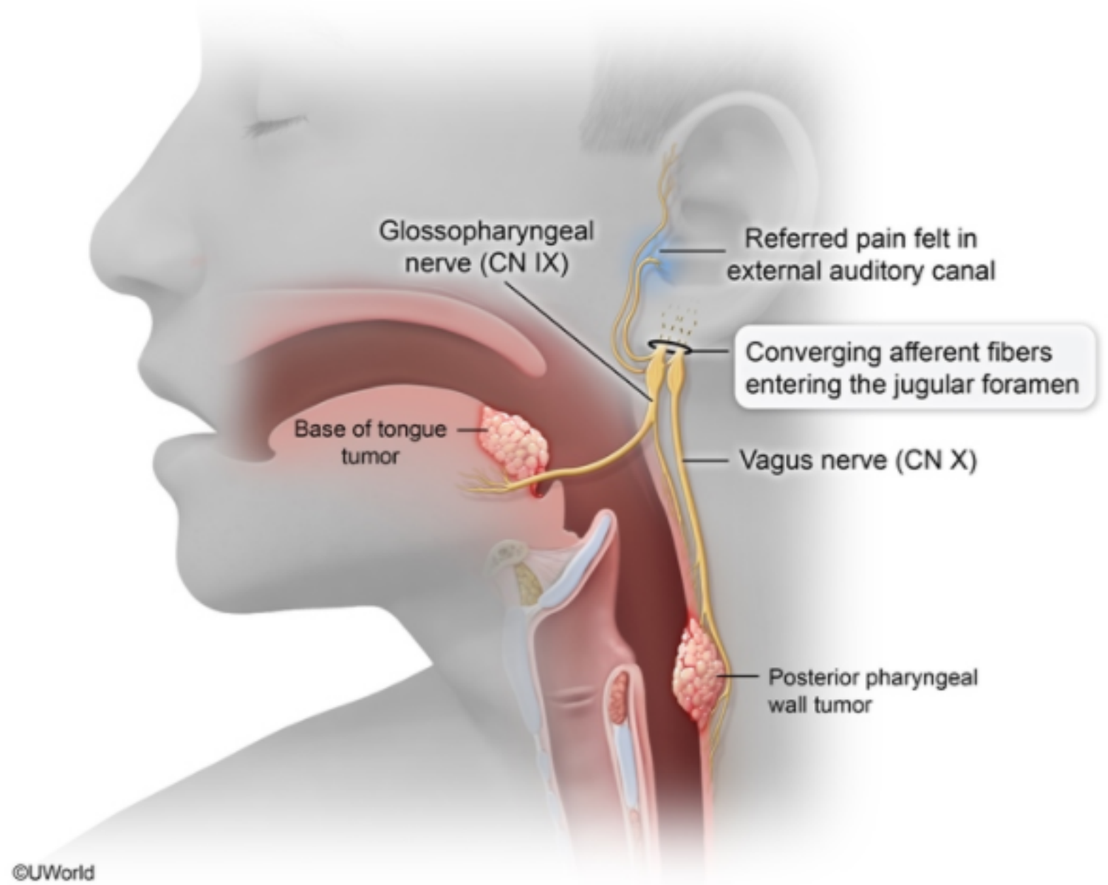
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Question Id: 16226
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G. Squamous papilloma (7%)

Exhibit Display

Referred otalgia



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Item 6 of 40
Question Id: 3834

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A 44-year-old woman comes to the physician with 2 months of low-grade fever, abdominal pain, and bloody diarrhea. Over the past 2 days, her symptoms have increased. She takes no medications and has no allergies. She has lost 4.5 kg (10 lb) over the past 4 weeks. Her temperature is 38.9 C (102 F), blood pressure is 102/70 mm Hg, pulse is 118/min, and respirations are 22/min. Examination shows pale and dry mucous membranes. Abdominal examination shows diffuse tenderness and distension. Laboratory results are as follows:

Hemoglobin	9.5 g/dL
White blood cells	16,000/μL
Sodium	145 mEq/L
Potassium	3.0 mEq/L

Her HIV test is negative. An x-ray of the abdomen is shown below.



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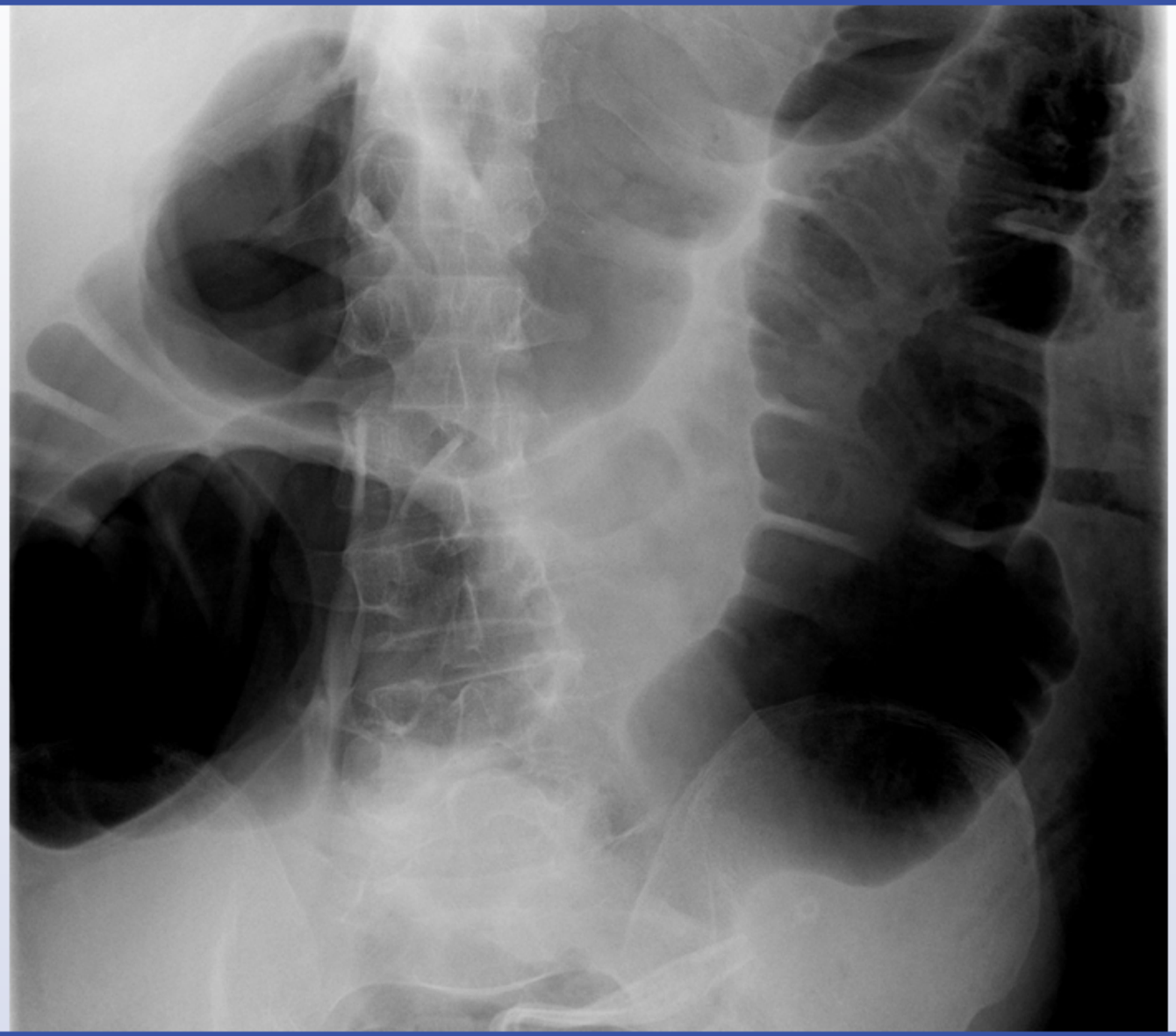
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Question Id: 3834

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Settings

Item 6 of 40
Question Id: 3834

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

A. *Campylobacter* colitis
B. *Cytomegalovirus* colitis
C. Ischemic colitis
D. Obstructed colon cancer
E. Pseudomembranous colitis
F. *Staphylococcus aureus* gastroenteritis
G. Toxic megacolon

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Item 6 of 40
Question Id: 3834

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

A. *Campylobacter* colitis (3%)
B. *Cytomegalovirus* colitis (0%)
C. Ischemic colitis (2%)
D. Obstructed colon cancer (10%)
E. Pseudomembranous colitis (2%)
F. *Staphylococcus aureus* gastroenteritis (0%)
✓ G. Toxic megacolon (80%)

Omitted
Correct answer

80%
Answered correctly

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Time Spent

05/29/2020
Last Updated

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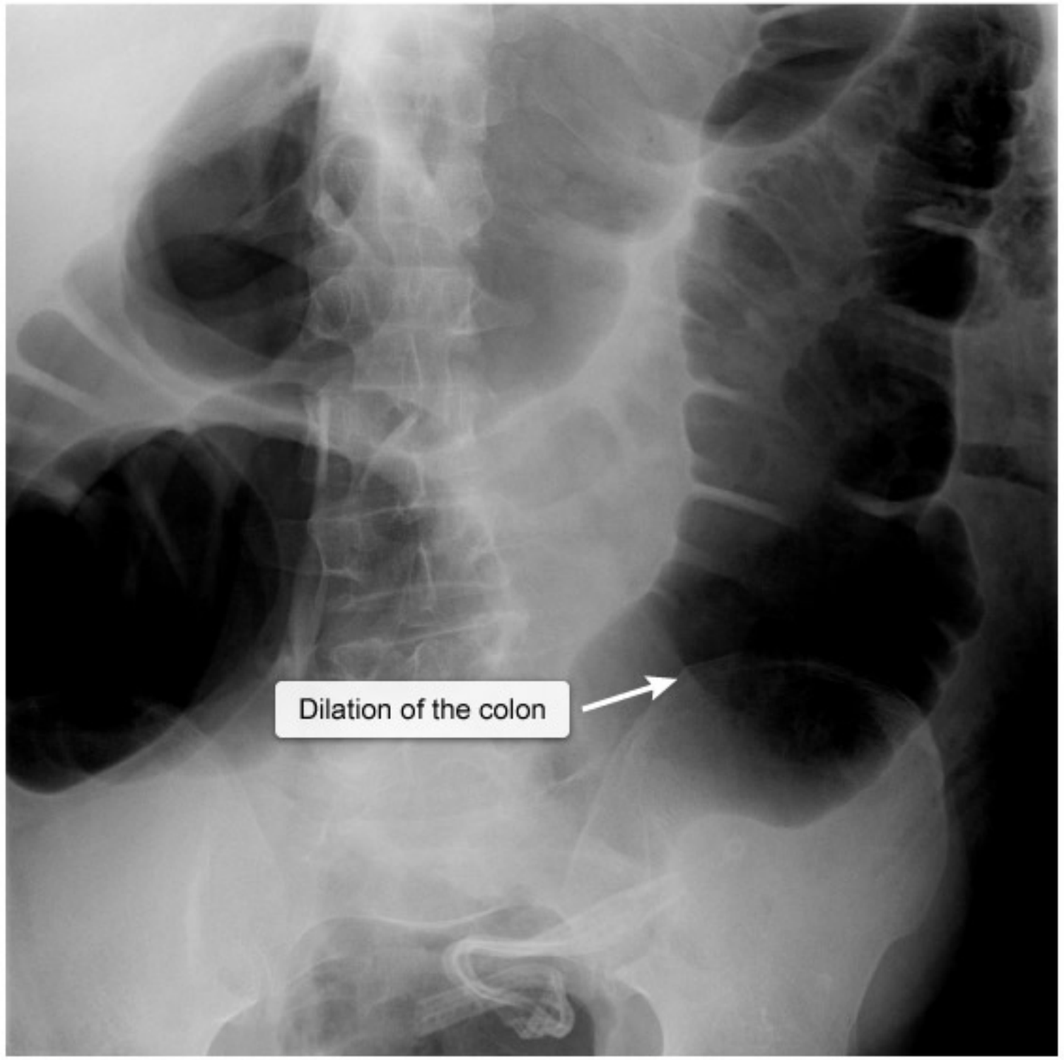
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Question Id: 3834

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Toxic megacolon



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This patient's presentation is consistent with likely inflammatory bowel disease (IBD). Her fever and 2 months of bloody diarrhea suggest ulcerative colitis (UC). Patients with UC typically develop multiple bloody bowel movements (sometimes >10-15/day) with systemic findings including fever and weight loss. UC patients usually have inflammation limited to the colonic mucosa. However, a subset develops inflammation extending to the smooth muscle layer, leading to muscle paralysis and colonic dilation.

Toxic megacolon typically presents with total or segmental nonobstructive colonic dilation, severe bloody diarrhea, and systemic findings (eg, fever, tachycardia). IBD patients are at the highest risk of developing toxic megacolon early in the disease, within 3 years of diagnosis in most cases. Other causes of toxic megacolon include ischemic colitis, volvulus, diverticulitis, infections (eg, *Clostridia difficile*), and obstructive colon cancer (less common). Diagnosis is confirmed by plain abdominal x-rays and ≥3 of the following: fever >38 C (100.4 F), pulse >120/min, white blood cells >10,500/µL, and anemia. Other findings can include volume depletion, altered mental status, hypotension, and electrolyte abnormalities. Plain films usually reveal dilated right or transverse colon (>6 cm), possible multiple air-fluid levels, and thick haustral markings that do not extend across the entire lumen (arrow in above image).

Toxic megacolon is a medical emergency that can progress rapidly and result in colonic perforation. Treatment includes intravenous fluids, broad-spectrum **antibiotics**, and bowel rest. **Intravenous corticosteroids** are preferred for treating IBD-induced toxic megacolon. Emergency surgery (subtotal colectomy with end-ileostomy as the procedure of choice) may be required if the colitis does not resolve.

(Choice A) *Campylobacter, Shigella,* and *Salmonella* infections are rarely complicated by toxic megacolon.

(Choice B) *Cytomegalovirus* colitis can cause toxic megacolon more commonly in HIV patients. This patient's negative HIV test makes this less likely.

(Choice C) This patient has no risk factors (eg, aortoiliac surgery, cardiopulmonary bypass, myocardial infarction, hemodialysis) for ischemic colitis. Even if the patient had these factors, her presentation would be acute rather than after 2 months of symptoms.

(Choice D) Right-sided colon cancer tends to present with anemia, whereas left-sided tumors present with bowel obstruction. Both types are usually associated with a change in bowel habits. Left-sided tumors can present with abdominal pain and bowel obstruction. However, these patients tend to have constipation rather than bloody diarrhea. In addition, obstructive colon cancer causes toxic megacolon less commonly than IBD.

(Choice E) Pseudomembranous colitis is usually due to *Clostridium difficile* colitis that is most commonly due to recent antibiotic use (eg,

(Choice B) *Cytomegalovirus* colitis can cause toxic megacolon more commonly in HIV patients. This patient's negative HIV test makes this less likely.

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(Choice E) Pseudomembranous colitis is usually due to *Clostridium difficile* colitis that is most commonly due to recent antibiotic use (eg, clindamycin, fluoroquinolones). Patients typically develop diarrhea, abdominal pain, and findings of colitis in the sigmoid/rectal area. This patient's absence of recent antibiotic use makes this less likely.

(Choice F) *Staphylococcus aureus* gastroenteritis is due to ingestion of preformed enterotoxin. It has a short incubation period and short duration. Patients usually develop vomiting and profuse watery diarrhea. However, it is not usually associated with the bloody diarrhea seen in this patient.

Educational objective:
Toxic megacolon typically presents with total or segmental nonobstructive colonic dilation, severe bloody diarrhea, and systemic findings (eg, fever, tachycardia). Patients with inflammatory bowel disease are at higher risk of developing toxic megacolon. Diagnosis is confirmed by plain abdominal x-rays and ≥3 of the following: fever >38 C (100.4 F), pulse >120/min, white blood cell count >10,500/µL, and anemia. Toxic megacolon is a medical emergency that requires prompt intravenous steroids, nasogastric decompression, antibiotics, and fluid management.

References

- Toxic megacolon.

Surgery	Gastrointestinal & Nutrition	Inflammatory bowel disease
Subject	System	Topic

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Item 7 of 40
Question Id: 3399

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A 25-year-old woman comes to the office due to a small ulcer on the right upper thigh. She went camping yesterday and while she was putting her pants on she suddenly had a feeling of being bitten over her right upper thigh. She ignored it, but the pain has been increasing. She has had no abdominal pain or difficulty breathing. The patient has no medical problems and takes no medications. Temperature is 36.8 C (98.2 F), blood pressure is 116/72 mm Hg, and pulse is 74/min. Physical examination shows an erythematous and painful ulcer on the lateral aspect of the right upper thigh; the remainder of the examination is unremarkable. Which of the following complications is most likely to develop in this patient over the next few days?

A. Abdominal rigidity and muscle cramps
B. Arthritis, arrhythmias, and facial palsy
C. Hemoglobinuria and bleeding
D. Muscle paralysis
E. Necrosis and eschar

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A. Abdominal rigidity and muscle cramps (8%)
B. Arthritis, arrhythmias, and facial palsy (18%)
C. Hemoglobinuria and bleeding (3%)
D. Muscle paralysis (6%)
✓ E. Necrosis and eschar (64%)

Omitted
Correct answer
E

64%
Answered correctly

17 secs
Time Spent

01/27/2020
Last Updated

Explanation

This patient's clinical presentation, with a small ulcer developing at the site of a recent bite, is highly suggestive of a **brown recluse spider bite**. Such bites commonly occur as patients are putting their clothes on, although they often go unrecognized initially; over the course of a few days, a deep skin **ulcer** develops at the site of bite with an erythematous halo and a **necrotic center**, which can progress to an eschar.

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Explanation

This patient's clinical presentation, with a small ulcer developing at the site of a recent bite, is highly suggestive of a **brown recluse spider bite**. Such bites commonly occur as patients are putting their clothes on, although they often go unrecognized initially; over the course of a few days, a deep skin **ulcer** develops at the site of bite with an erythematous halo and a **necrotic center**, which can progress to an eschar.

With basic wound management, the lesion often heals without scarring. Debridement should be avoided in the early stages of necrosis but may facilitate healing once the lesion is stable and well-demarcated; severe cases may require skin grafting.

(Choice A) By contrast to brown recluse spider bites, black widow spider bites often lead to more pronounced local and systemic manifestations due to effects of the toxin. These include muscle pain (a prominent finding), abdominal rigidity (sometimes mimicking a surgical abdomen), and muscle cramps (seen in >60% of patients). Wound ulceration is uncommon, and patients commonly develop nausea and vomiting within hours of the bite, making this an unlikely diagnosis in this patient.

(Choice B) Arthritis, arrhythmias, and facial palsy can occur as late complications of Lyme disease; these typically do not develop until months after the tick bite. The initial rash, erythema migrans, is classically a target lesion with central clearing (not ulceration) at the site of tick bite. The tick must remain attached for ~48 hours before transmission occurs.

(Choices C and D) Hemoglobinuria, bleeding, and muscle paralysis may be seen with snakebites, which would cause severe local pain, swelling, and discoloration within hours of the bite.

Educational objective:
Brown recluse spider bites can cause a deep necrotic ulcer at the bite site. The ulcer can progress over days to an eschar.

Surgery	Poisoning & Environmental Exposure	Insect bites and stings
Subject	System	Topic

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Item 8 of 40
Question Id: 3790

Mark

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A 42-year-old man with a history of Crohn disease comes to the office for follow-up. He had a partial ileal resection due to a stricture and also had multiple surgeries to treat an enterocutaneous fistula. The patient has received parenteral nutrition for the past several weeks and recently restarted oral feeding. He reports nonbloody diarrhea but no fever or abdominal pain. The patient says that food does not taste the same as before. On examination, he has patchy alopecia and a pustular, crusting skin rash with scaling and erythema around the mouth and on the extremities. No abdominal tenderness is present and bowel sounds are normal. The jugular venous pulse is normal and there is no lower extremity edema. Which of the following is most likely to improve this patient's current condition?

A. Elemental copper
B. Gluten avoidance
C. Niacin therapy
D. Selenium supplement
E. Zinc supplement

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A. Elemental copper (0%)
B. Gluten avoidance (2%)
C. Niacin therapy (40%)
D. Selenium supplement (4%)
✓ E. Zinc supplement (51%)

Omitted
Correct answer
E

51%
Answered correctly

02 secs
Time Spent

03/31/2020
Last Updated

Explanation

Clinical manifestations of trace mineral deficiencies	
Chromium	• Impaired glucose control in diabetes

Clinical manifestations of trace mineral deficiencies	
Chromium	• Impaired glucose control in diabetes
Copper	• Brittle hair • Skin depigmentation • Neurologic dysfunction (eg, ataxia, peripheral neuropathy) • Anemia • Osteoporosis
Iron	• Microcytic anemia
Selenium	• Thyroid dysfunction • Cardiomyopathy • Immune dysfunction
Zinc	• Alopecia • Pustular skin rash (perioral region & extremities) • Hypogonadism • Impaired wound healing • Impaired taste • Immune dysfunction

This patient most likely has **zinc deficiency**. Zinc is a trace mineral that is obtained from meat, nuts, and fortified cereal in the diet. It is an essential component of numerous enzymes in the body and plays an important role in gene transcription and cell division. Clinical manifestations of zinc deficiency in adults include hypogonadism, impaired wound healing, **impaired taste**, and immune dysfunction. Characteristic physical examination findings include **alopecia** as well as a skin **rash** consisting of erythematous pustules around body orifices (eg, mouth) and on the extremities.

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Zinc is absorbed mostly in the duodenum and jejunum, and deficiency can be due to **malabsorption** (eg, Crohn disease, celiac disease), bowel resection, gastric bypass, or poor nutritional intake. In addition, patients dependent on **parenteral nutrition (PN)** are at risk for trace mineral deficiency (eg, zinc, selenium, copper, chromium) due to inadequate supplementation of parenteral intake. Comorbid **diarrhea** and malabsorption further increase the risk of trace mineral deficiency in patients on PN due to excessive gastrointestinal losses.

(Choice A) Clinical manifestations of copper deficiency include fragile hair, skin depigmentation, neurologic dysfunction that can mimic vitamin B_{12} deficiency, and sideroblastic anemia. Impaired taste and a pustular skin rash would be unusual.

(Choice B) Gluten avoidance is used to treat celiac disease, which can lead to malabsorption and deficiency of zinc and other vitamins and minerals. Celiac disease is associated with dermatitis herpetiformis, an autoimmune-mediated vesicular skin rash that typically appears on the extremities. Perioral involvement would be unusual. In addition, celiac disease is less likely in this patient with alternate explanations for zinc deficiency (eg, Crohn disease, recent PN).

(Choice C) Niacin (vitamin B_3) deficiency (rare in developed countries) causes pellagra, which is characterized by dermatitis, diarrhea, and dementia. The rash associated with pellagra is hyperpigmented, occurs symmetrically in sun-exposed areas, and is not pustular.

(Choice D) Selenium deficiency can lead to thyroid dysfunction as well as cardiomyopathy. The absence of heart failure signs (eg, jugular venous distension, lower extremity edema) in this patient makes selenium deficiency less likely.

Educational objective:
Risk factors for trace mineral deficiency include malabsorption, bowel resection, poor nutritional intake, and dependence on parenteral nutrition. Clinical manifestations of zinc deficiency include hypogonadism, impaired taste, impaired wound healing, alopecia, and skin rash with perioral involvement.

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Educational objective:
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References

- Zinc: physiology, deficiency, and parenteral nutrition.

Surgery	Gastrointestinal & Nutrition	Zinc deficiency
Subject	System	Topic

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Item 9 of 40
Question Id: 16187

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A 67-year-old man is brought by his daughter to the emergency department with fever, back pain, and chest pain. The pain is constant and severe, and it does not vary with respirations. The patient has severe dysphagia due to esophageal achalasia, for which he frequently self-induces vomiting to relieve the sensation of choking. Other medical conditions include hypertension, peripheral vascular disease, and a 4-cm abdominal aortic aneurysm. He has a 30-pack-year smoking history and quit 5 years ago. The patient uses alcohol, usually during the weekends. He also has had a 5-kg (11-lb) weight loss over the past year. On examination, the patient is in distress due to pain. Temperature is 38.7 C (102 F), blood pressure is 100/60 mm Hg, pulse is 118/min, and respirations are 24/min. There is dullness to percussion and decreased breath sounds in the left lung base. Heart sounds are normal. Chest x-ray reveals left-sided pleural effusion; no additional infiltrates are seen. Which of the following is the most likely diagnosis?

A. Acute pancreatitis
B. Aortic dissection
C. Aspiration pneumonia
D. Congestive heart failure
E. Esophageal perforation
F. Lung cancer

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Item 9 of 40
Question Id: 16187

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- A. Acute pancreatitis (6%)
- B. Aortic dissection (7%)
- C. Aspiration pneumonia (20%)
- D. Congestive heart failure (0%)
- ✓ E. Esophageal perforation (55%)
- F. Lung cancer (9%)

Omitted
Correct answer
E

55%
Answered correctly

02 secs
Time Spent

04/06/2020
Last Updated

Explanation

TUTOR

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

This patient has chest/back pain, fever, and pleural effusion in the setting of self-induced vomiting, most concerning for **esophageal perforation**. Effort rupture of the esophagus (Boerhaave syndrome) can occur with repeated **vomiting**, particularly when the patient resists the vomiting reflex. Patients usually have **severe chest pain** (and/or back pain given the esophagus's posterior location) and a systemic inflammatory response (eg, **fever**, tachycardia). If esophageal contents leak through the perforation into the pleural space, **pleural effusion** results, usually on the left due to intrinsic weakness in the left posterolateral aspect of the distal intrathoracic esophagus.

Visualization of contrast extravasating from the esophagus into surrounding tissues, either by esophagography or CT scan with water-soluble contrast (barium is more inflammatory), confirms the diagnosis. Intravenous, broad-spectrum antibiotics and proton pump inhibitors should be administered, all oral intake restricted, and **emergent surgical consultation** obtained. Most perforations will require operative debridement and repair.

(Choice A) Acute pancreatitis can cause a unilateral, left pleural effusion and fever in severe cases. Associated pain may radiate to the back but

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(Choice A) Acute pancreatitis can cause a unilateral, left pleural effusion and fever in severe cases. Associated pain may radiate to the back but typically originates in the epigastrium, not the chest.

(Choice B) Severe chest/back pain is concerning for aortic dissection in a patient with multiple risk factors (hypertension, preexisting aortic aneurysm). However, aortic dissection often has associated findings of new heart murmur (aortic regurgitation from retrograde dissection) or pulse/blood pressure variation (eg, >20 mm Hg blood pressure difference between the extremities). Fever is uncommon.

(Choice C) This patient is at risk for aspiration pneumonia from self-induced emesis. Although fever, tachycardia, and diminished left breath sounds are concerning for pneumonia, severe chest/back pain is not typical, and infiltrates (possibly with effusion) would be expected on chest x-ray.

(Choice D) Hypertension, smoking, and likely coronary artery disease (given history of peripheral vascular disease) increase this patient's risk of congestive heart failure. Although congestive heart failure may present with pleural effusion, a history of progressive dyspnea and signs of peripheral congestion (eg, elevated jugular venous pulse, peripheral edema) are typically present. Fever is uncommon.

(Choice F) The patient's smoking history and weight loss are concerning for lung cancer. Lung cancer may cause malignant pleural effusion, but associated pain is typically dull/aching and fever is uncommon. Restricted food intake because of achalasia can explain the patient's slow weight loss.

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(Choice F) The patient's smoking history and weight loss are concerning for lung cancer. Lung cancer may cause malignant pleural effusion, but associated pain is typically dull/aching and fever is uncommon. Restricted food intake because of achalasia can explain the patient's slow weight loss.

Educational objective:
Effort rupture of the esophagus (Boerhaave syndrome) can occur with vomiting and may cause unilateral pleural effusion from leaked esophageal contents. Confirmation with esophagography or CT scan using water-soluble contrast should prompt emergent surgical consultation.

References

- Epidemiology, diagnosis, and management of esophageal perforations: systematic review.
- Esophageal perforation.

Surgery	Gastrointestinal & Nutrition	Esophageal rupture
Subject	System	Topic

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Item 10 of 40
Question Id: 6993

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A 62-year-old hospitalized woman is evaluated for worsening skin lesions. She was admitted 6 days ago for elective coronary artery bypass grafting due to extensive coronary artery disease. The surgery was uncomplicated, and the patient was extubated on hospital day 2. She has recovered well, but yesterday she noticed red patches on her abdomen that progressed to purple lesions today. The patient has a history of non-ST elevation myocardial infarction, type 2 diabetes mellitus, hypertension, and hyperlipidemia. She is receiving low-dose subcutaneous heparin for prophylaxis of deep venous thrombosis and has not received any oral anticoagulation. Temperature is 37.1 C (98.7 F), blood pressure is 130/82 mm Hg, and heart rate is 90/min. Cardiopulmonary examination reveals patchy rales and normal heart sounds. The sternal surgical site is healing well. Several large purple/black patches are seen in the periumbilical area, surrounded by erythema. Peripheral pulses are normal. Neurologic examination is unremarkable. Which of the following is the most likely cause of this patient's skin lesions?

A. Acquired deficiency of protein C
B. Antibodies against a platelet component
C. Delayed-type hypersensitivity reaction
D. Embolization of cholesterol
E. Reactivation of a latent virus

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- A. Acquired deficiency of protein C (11%)
- ✓ B. Antibodies against a platelet component (61%)
- C. Delayed-type hypersensitivity reaction (7%)
- D. Embolization of cholesterol (17%)
- E. Reactivation of a latent virus (1%)

Omitted
Correct answer
B

61%
Answered correctly

02 secs
Time Spent

01/07/2020
Last Updated

Explanation

Clinical features of type 2 heparin-induced thrombocytopenia

Clinical features of type 2 heparin-induced thrombocytopenia	
Clinical signs	Suspected with heparin exposure >5 days **&** any of the following: • Platelet count reduction >50% from baseline • Arterial or venous thrombosis • Necrotic skin lesions at heparin injection sites • Acute systemic (anaphylactoid) reactions after heparin
Diagnostic evaluation	• **Serotonin release assay**: Gold standard confirmatory test • Start treatment in suspected cases prior to confirmatory tests
Therapy	• Stop **ALL** heparin products • Start a direct thrombin inhibitor (eg, argatroban) or fondaparinux (synthetic pentasaccharide)

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Heparin-induced thrombocytopenia (HIT) is a life-threatening complication of heparin therapy. Heparin induces a conformational change in a platelet surface protein (platelet factor 4), which exposes a neoantigen. In patients with HIT, **HIT antibodies** form in response to the neoantigen and bind to the surface of platelets, causing platelet aggregation, **thrombocytopenia** (or drop in platelets >50%), and a **prothrombotic** state. In patients receiving heparin subcutaneously (eg, enoxaparin), a classic thrombotic complication of HIT is skin necrosis at the abdominal injection site.

HIT is diagnosed by immunoassay (only if high titer) or functional assay (eg, serotonin release assay [gold standard]). Treatment involves immediately discontinuing all heparin products (including heparin flushes) and initiating an alternate anticoagulant (eg, argatroban, fondaparinux). If HIT is suspected, treatment should not be delayed for laboratory confirmation as the risk of venous and arterial thrombosis is as high as 50% in untreated HIT.

(Choice A) Warfarin is an oral anticoagulant that can cause an acquired protein C deficiency, which may manifest as skin necrosis. However, this

Heparin-induced thrombocytopenia (HIT) is a life-threatening complication of heparin therapy. Heparin induces a conformational change in a platelet surface protein (platelet factor 4), which exposes a neoantigen. In patients with HIT, **HIT antibodies** form in response to the neoantigen and bind to the surface of platelets, causing platelet aggregation, **thrombocytopenia** (or drop in platelets >50%), and a **prothrombotic** state. In patients receiving heparin subcutaneously (eg, enoxaparin), a classic thrombotic complication of HIT is skin necrosis at the abdominal injection site.

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(Choice A) Warfarin is an oral anticoagulant that can cause an acquired protein C deficiency, which may manifest as skin necrosis. However, this patient has not received any oral anticoagulation. Warfarin is often used for chronic anticoagulation maintenance in HIT but not until argatroban or fondaparinux are initiated and platelets are >150,000/mm^3.

(Choice C) Delayed hypersensitivity reactions typically cause skin erythema, vesicles, or bullae. More severe reactions are associated with systemic symptoms, such as fever. This patient has necrotic lesions likely at the site of her low-molecular-weight heparin injections, making HIT much more likely.

(Choice D) Cholesterol embolization can occur due to plaque embolization into small arteries following coronary angiography. Cholesterol embolization classically causes skin findings (eg, livedo reticularis [mottled erythema], gangrene, cyanosis) that most commonly affect the lower extremities. With necrotic lesions on the abdominal wall, HIT is much more likely.

(Choice E) Viral reactivation is common with herpes zoster. Lesions are typically unilateral, in a single dermatome, and quite painful. They tend to be vesicular, not necrotic.

Educational objective:
Heparin-induced thrombocytopenia (HIT) should be suspected in patients on heparin who develop thrombocytopenia or thrombotic complications. In patients receiving heparin subcutaneously (eg, enoxaparin), a classic thrombotic complication is skin necrosis at the abdominal injection site. HIT is treated by discontinuing all heparin products and initiating an alternate anticoagulant (eg, argatroban, fondaparinux).

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Question Id: 6993

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HIT is treated by discontinuing all heparin products and initiating an alternate anticoagulant (eg, argatroban, fondaparinux).

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(Choice E) Viral reactivation is common with herpes zoster. Lesions are typically unilateral, in a single dermatome, and quite painful. They tend to be vesicular, not necrotic.

Educational objective:
Heparin-induced thrombocytopenia (HIT) should be suspected in patients on heparin who develop thrombocytopenia or thrombotic complications. In patients receiving heparin subcutaneously (eg, enoxaparin), a classic thrombotic complication is skin necrosis at the abdominal injection site. HIT is treated by discontinuing all heparin products and initiating an alternate anticoagulant (eg, argatroban, fondaparinux).

Surgery	Hematology & Oncology	Heparin induced thrombocytopenia
Subject	System	Topic

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A 17-year-old girl comes to the office for evaluation of right knee pain. For the past 3 months, the patient has had poorly localized, achy pain at the anterior right knee that is worse when she runs, sits for extended periods, or goes up or down a staircase. She has been taking nonsteroidal anti-inflammatory drugs, which partially relieve the pain but have lost effectiveness over time. The patient also has a sensation that the knee is "giving way" when she is running. Vital signs are normal. BMI is 19 kg/m^2. Physical examination shows a normal gait and no visible knee deformities. There is mild pain with flexion of the right knee. With the knee extended, compressing the patella into the trochlear groove reproduces the pain. Which of the following is the best next step in management of this patient?

A. Hinged knee brace
B. Intraarticular glucocorticoid injection
C. Knee immobilizer
D. Nonweight-bearing crutches for 2 weeks
E. Quadriceps strengthening exercises

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Item 11 of 40
Question Id: 12060

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A 17-year-old girl comes to the office for evaluation of right knee pain. For the past 3 months, the patient has had poorly localized, achy pain at the anterior right knee that is worse when she runs, sits for extended periods, or goes up or down a staircase. She has been taking nonsteroidal anti-inflammatory drugs, which partially relieve the pain but have lost effectiveness over time. The patient also has a sensation that the knee is "giving way" when she is running. Vital signs are normal. BMI is 19 kg/m^2. Physical examination shows a normal gait and no visible knee deformities. There is mild pain with flexion of the right knee. With the knee extended, compressing the patella into the trochlear groove reproduces the pain. Which of the following is the best next step in management of this patient?

A. Hinged knee brace (11%)
B. Intraarticular glucocorticoid injection (4%)
C. Knee immobilizer (8%)
D. Nonweight-bearing crutches for 2 weeks (7%)
✓ E. Quadriceps strengthening exercises (69%)

Omitted
Correct answer
E

69%
Answered correctly

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Last Updated

Explanation

Patellofemoral pain syndrome (PFPS)

Anterior view

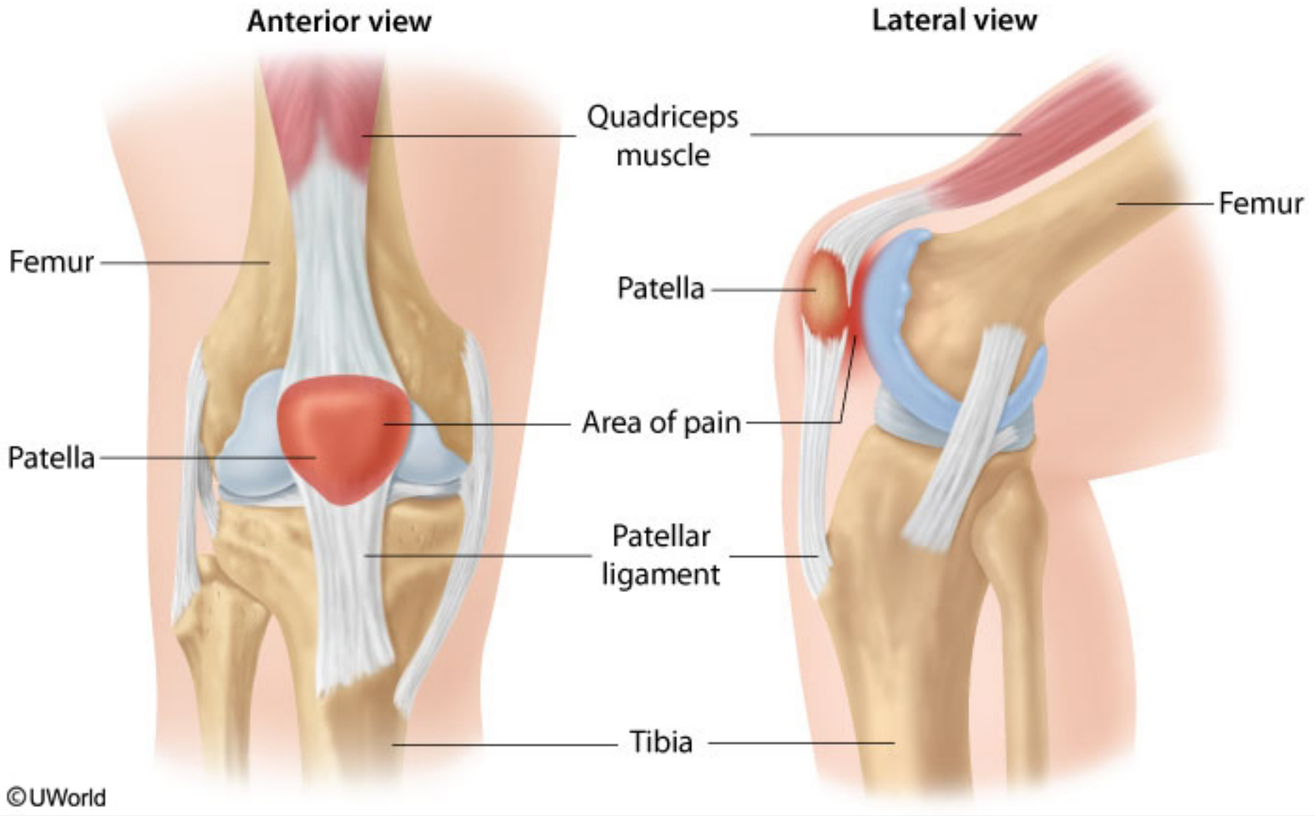
Lateral view

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Patellofemoral pain syndrome (PFPS)



This patient with poorly localized **anterior knee pain** has typical features of **patellofemoral pain syndrome** (PFPS). PFPS is one of the most common causes of chronic knee pain in **young women**. It is usually related to chronic **overuse** but can also occur acutely following trauma. Symptoms are typically worse during weight bearing with the knee flexed (eg, squatting, ascending/descending stairs) or when running or sitting for extended periods. The precise source of pain is variable and not well understood, but generally involves the track of the patella in the trochlear groove of the femur.

The diagnosis of PFPS is primarily based on characteristic history and examination findings; however, no individual finding has high clinical utility

This patient with poorly localized **anterior knee pain** has typical features of **patellofemoral pain syndrome** (PFPS). PFPS is one of the most common causes of chronic knee pain in **young women**. It is usually related to chronic **overuse** but can also occur acutely following trauma. Symptoms are typically worse during weight bearing with the knee flexed (eg, squatting, ascending/descending stairs) or when running or sitting for extended periods. The precise source of pain is variable and not well understood, but generally involves the track of the patella in the trochlear groove of the femur.

The diagnosis of PFPS is primarily based on characteristic history and examination findings; however, no individual finding has high clinical utility, and the examination is often normal. In general, the pain is provoked by maneuvers (eg, squatting) that involve tonic contraction of the quadriceps with the knee in flexion. The knee should also be examined for rotational or angular (varus/valgus) malalignment and dynamic abnormalities (eg, weakness or atrophy of the quadriceps or hip abductors). The patellofemoral compression test (reproduction of pain when the patella is compressed into the trochlear groove) is often helpful but may generate significant discomfort for the patient.

The initial management of PFPS includes **activity modification** (eg, reduced intensity of exercise) and nonsteroidal anti-inflammatory drugs. Patients also should be counseled on **stretching and strengthening** exercises with an emphasis on the **quadriceps and hip abductors**.

(Choice A) Soft patellofemoral braces and customized taping can be considered for patients with PFPS, but the benefits are inconsistent. In contrast, hinged knee orthotic braces are primarily used for the treatment of acute ligamentous injuries.

(Choice B) Intraarticular glucocorticoid injections are occasionally used in PFPS but are not likely to provide better long-term results than exercise and carry a small but clinically significant risk of complications (eg, tendon injury).

(Choice C) Rigid knee immobilizers are used for patellar fractures and tears of the quadriceps or patellar tendon, which present following major trauma with inability to extend the knee. Functional weakness (eg, buckling, giveway sensations) does not indicate tendon rupture but can occur in a wide variety of tendon, ligament, and joint disorders, including PFPS.

(Choice D) Nonweight-bearing ("3-point") crutches are typically used for acute fractures and sprains of the lower extremity. Although patients with PFPS should temporarily reduce the intensity of exercise and avoid activities that aggravate their symptoms, nonweight-bearing crutches are not necessary.

Educational objective:
Patellofemoral pain syndrome is a common cause of anterior knee pain in young women. It is usually due to chronic overuse or malalignment.

Patients also should be counseled on **stretching and strengthening** exercises with an emphasis on the **quadriceps and hip abductors**.

(Choice A) Soft patellofemoral braces and customized taping can be considered for patients with PFPS, but the benefits are inconsistent. In contrast, hinged knee orthotic braces are primarily used for the treatment of acute ligamentous injuries.

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(Choice D) Nonweight-bearing ("3-point") crutches are typically used for acute fractures and sprains of the lower extremity. Although patients with PFPS should temporarily reduce the intensity of exercise and avoid activities that aggravate their symptoms, nonweight-bearing crutches are not necessary.

Educational objective:
Patellofemoral pain syndrome is a common cause of anterior knee pain in young women. It is usually due to chronic overuse or malalignment. The pain is provoked by maneuvers (eg, squatting) that involve contraction of the quadriceps with the knee in flexion. Initial management includes activity modification, nonsteroidal anti-inflammatory drugs, and stretching and strengthening exercises.

References

- Knee orthoses for treating patellofemoral pain syndrome.
- Exercise for treating patellofemoral pain syndrome.

Surgery	Rheumatology/Orthopedics & Sports	Patellofemoral syndrome
Subject	System	Topic

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Item 12 of 40
Question Id: 4697

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A 70-year-old male presents to the emergency room complaining of weakness, dizziness and back pain. He denies nausea, vomiting, diarrhea, chest pain, palpitations, shortness of breath, urinary symptoms, or black stools. His past medical history is significant for diabetes mellitus, diabetic nephropathy and retinopathy, hypertension, atrial fibrillation and chronic leg cellulitis. He takes warfarin for chronic anticoagulation. On physical examination, his blood pressure is 120/70 mmHg and his heart rate is 110 and irregular. His WBC count is 10,500/mm^3, hemoglobin level is 7.0 g/dL and platelet count is 170,000/mm3. An abdominal CT image is shown on the slide below.



Which of the following is the most likely diagnosis?

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Item 12 of 40
Question Id: 4697

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Which of the following is the most likely diagnosis?

A. Renal cell carcinoma
B. Vertebral fracture
C. Retroperitoneal hematoma
D. Hydronephrosis
E. Mesenteric ischemia

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Item 12 of 40
Question Id: 4697

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Which of the following is the most likely diagnosis?

- A. Renal cell carcinoma (4%)
- B. Vertebral fracture (2%)
- ✓ C. Retroperitoneal hematoma (76%)
- D. Hydronephrosis (3%)
- E. Mesenteric ischemia (12%)

Omitted
Correct answer

76%
Answered correctly

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Last Updated

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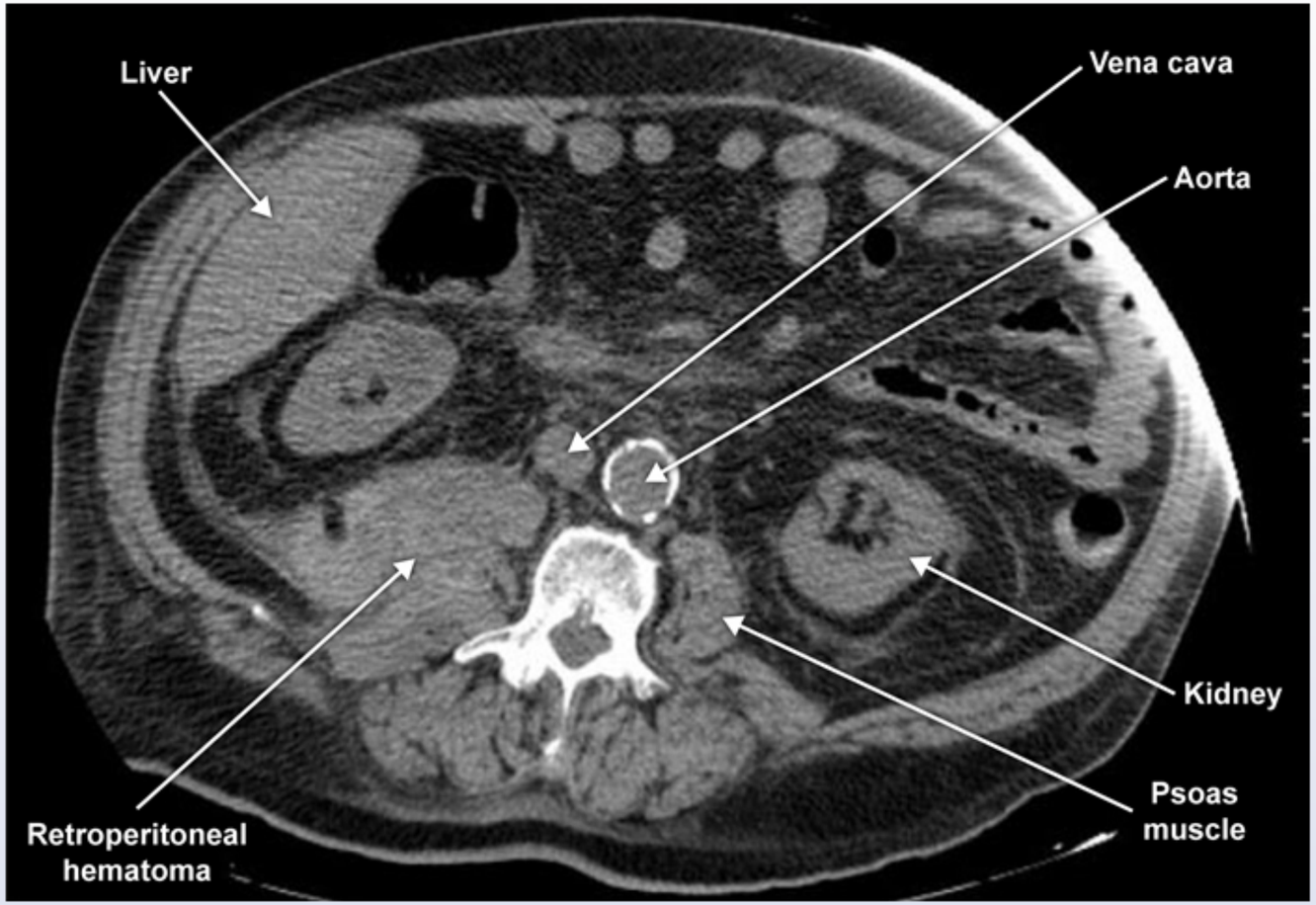
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Item 12 of 40
Question Id: 4697

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This patient's history of anticoagulation, symptoms of weakness and dizziness, and evidence of anemia and tachycardia should immediately raise concern for internal hemorrhage. The risk of bleeding while on warfarin therapy is greatest in patients with risk factors such as diabetes, age > 60, hypertension and alcoholism. A supratherapeutic INR also increases one's risk of hemorrhage, although in the case of retroperitoneal hematomas, even therapeutic-range INRs confer significant risk. This patient's back pain should put retroperitoneal hematoma high on the differential, and warrants an abdominal CT. The above CT image reveals a large isodense collection in the right retroperitoneum, which lies

TUTOR | 3 | Feedback | Suspend | End Block

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(Choice A) The classic triad of renal cell carcinoma (RCC) is hematuria, abdominal mass and flank pain. On abdominal CT, RCC presents as a lesion within the kidney parenchyma that enhances with contrast administration. The above lesion is extrinsic to the kidney.

(Choice B) A vertebral fracture could certainly cause back pain, and may occur in osteoporotic patients in the absence of trauma. However, the above CT image does not depict a vertebral abnormality.

(Choice D) Hydronephrosis is a condition in which the renal pelvis dilates due to distal obstruction of the genitourinary system. Patients present with flank pain. CT scan in hydronephrosis demonstrates dilation of the renal pelvis, and may help in identifying the source of obstruction (e.g. kidney stones).

(Choice E) Mesenteric ischemia presents with abdominal pain out of proportion to physical exam findings. It is most common in elderly patients, and may result from a cardiac embolus (as in atrial fibrillation), arterial thrombosis (as in atherosclerosis), or other etiology (as in shock or vasoconstriction). CT findings include bowel wall thickening, pneumatosis intestinalis, and mesenteric thrombi.

Educational objective:
Anticoagulation with warfarin places patients at risk for hemorrhage. Retroperitoneal hematoma may occur even without a supratherapeutic INR. Back pain and signs and symptoms of hemodynamic compromise should raise suspicion for retroperitoneal hematoma.

Surgery	Gastrointestinal & Nutrition	Retroperitoneal hematoma
Subject	System	Topic

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concern for internal hemorrhage. The risk of bleeding while on warfarin therapy is greatest in patients with risk factors such as diabetes, age > 60, hypertension and alcoholism. A supratherapeutic INR also increases one's risk of hemorrhage, although in the case of retroperitoneal hematomas, even therapeutic-range INRs confer significant risk. This patient's back pain should put retroperitoneal hematoma high on the differential, and warrants an abdominal CT. The above CT image reveals a large isodense collection in the right retroperitoneum, which lies anterior to the psoas muscle and displaces the right kidney anteriorly. The CT findings are consistent with a spontaneous retroperitoneal hematoma **(Choice C)**.

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Educational objective:
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Surgery	Gastrointestinal & Nutrition	Retroperitoneal hematoma
Subject	System	Topic

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A 68-year-old man is brought to the hospital due to acute fever, malaise, lower abdominal discomfort, and right flank pain. Six months ago, he was hospitalized for similar symptoms and was diagnosed with a urinary tract infection; at that time, his urine culture grew *Escherichia coli*, and his symptoms completely resolved with antibiotic therapy. Over the past year, the patient has experienced frequent nighttime urination and dribbling but no gross hematuria. Medical history is significant for major depressive disorder and mild idiopathic pulmonary fibrosis. Temperature is 38.7 C (101.7 F), blood pressure is 130/80 mm Hg, and pulse is 98/min. The patient appears acutely ill. Bilateral basal crackles are present. There is right costovertebral angle tenderness. Laboratory results are as follows:

Complete blood count

Leukocytes	16,800/mm^3

Serum chemistry

Creatinine	1.2 mg/dL

Urinalysis

Blood	moderate
Bacteria	many
White blood cells	50+/hpf

Which of the following is the most likely underlying cause of the patient's current condition?

A. Detrusor overactivity
B. High post-void residual volume
C. Infectious urethritis

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Complete blood count

Leukocytes	16,800/mm^3

Serum chemistry

Creatinine	1.2 mg/dL

Urinalysis

Blood	moderate
Bacteria	many
White blood cells	50+/hpf

Which of the following is the most likely underlying cause of the patient's current condition?

A. Detrusor overactivity
B. High post-void residual volume
C. Infectious urethritis
D. Selective IgA deficiency
E. Staghorn calculi

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Complete blood count

Leukocytes	16,800/mm^3

Serum chemistry

Creatinine	1.2 mg/dL

Urinalysis

Blood	moderate
Bacteria	many
White blood cells	50+/hpf

Which of the following is the most likely underlying cause of the patient's current condition?

- A. Detrusor overactivity (2%)
- ✓ B. High post-void residual volume (73%)
- C. Infectious urethritis (8%)
- D. Selective IgA deficiency (2%)
- E. Staghorn calculi (13%)

Omitted
Correct answer

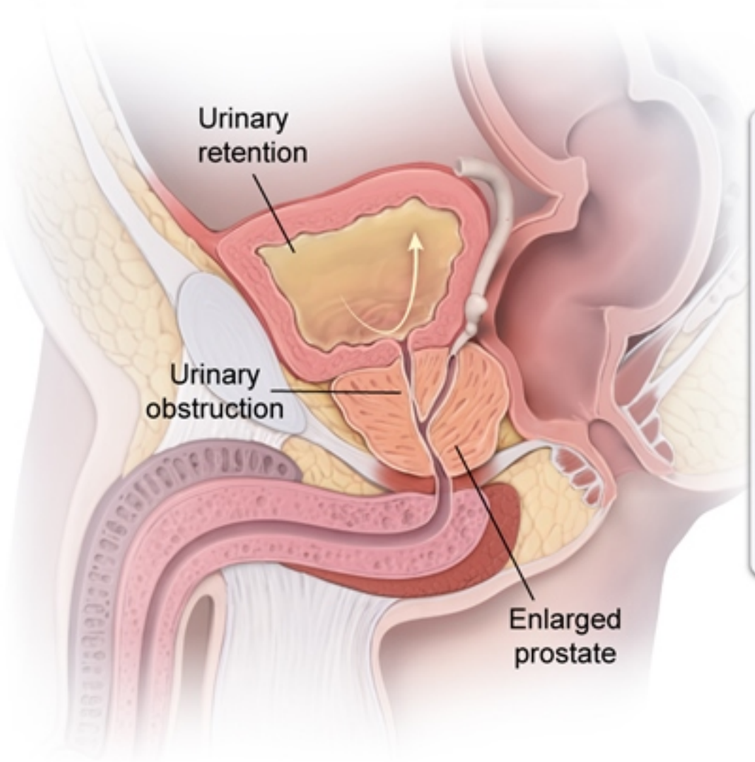
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Benign prostatic hyperplasia (BPH)



Voiding (obstructive) symptoms

- Weak urinary stream
- Intermittency
- Incomplete emptying
- Hesitancy
- Straining to void

Storage (irritative, filling) symptoms

- Frequency
- Urgency
- Nocturia
- Incontinence

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This patient's fever, costovertebral angle tenderness, leukocytosis, and urinalysis findings of bacteriuria, pyuria, and hematuria (due to urinary tract inflammation) are consistent with **acute pyelonephritis**. Urinary tract infections (eg, pyelonephritis) are uncommon in men due to the distance between the anus and urethral opening, the length of the male urethra, and the antibacterial substances in prostatic fluid. However, risk is elevated with **benign prostatic hyperplasia** (BPH) because periurethral prostatic enlargement impinges the urethra and prevents complete evacuation of the bladder; this allows fecal flora that have contaminated the urinary tract to proliferate rather than be evacuated with urination. Bacterial ascent to the kidneys can lead to unilateral (or less commonly bilateral) pyelonephritis.

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As seen in this patient, BPH usually presents with manifestations of gradual urethral impingement, including:

- **Voiding symptoms** (slow stream, split stream, hesitancy, straining)
- Incomplete bladder emptying (eg, elevated postvoid residual volumes) with **bladder storage symptoms** (eg, frequency, nocturia, urgency).

This patient's pulmonary crackles on examination are likely due to pulmonary fibrosis rather than prostatic or infectious issues.

(Choice A) Detrusor overactivity can cause urinary frequency, urgency, nocturia, and incontinence. However, voiding symptoms (eg, decreased force of stream, dribbling) and recurrent urinary tract infections are atypical because outlet obstruction does not occur.

(Choice C) Urethritis is most commonly caused by *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Symptoms generally include dysuria and urethral discharge; flank pain and costovertebral tenderness would not be seen.

(Choice D) Selective IgA deficiency can be associated with respiratory tract (eg, sinusitis, pneumonia) and gastrointestinal (eg, giardiasis) infections but the risk of urinary tract infection is not generally increased. This patient's lung crackles are consistent with pulmonary fibrosis and do not indicate a respiratory infection.

(Choice E) Staghorn calculi are caused by urease-producing organisms (eg, *Proteus*, *Klebsiella*) and are usually present with flank pain and hematuria. *Escherichia coli* is not a urease-producing organism. Furthermore, the presence of voiding symptoms makes underlying BPH with elevated post-void residuals the most likely inciting factor.

Educational objective:
Benign prostatic hyperplasia can gradually compress the prostatic urethra, leading to incomplete bladder emptying and an increased risk for recurrent urinary tract infections.

Bacterial ascent to the kidneys can lead to unilateral (or less commonly bilateral) pyelonephritis.

As seen in this patient, BPH usually presents with manifestations of gradual urethral impingement, including:

- **Voiding symptoms** (slow stream, split stream, hesitancy, straining)
- Incomplete bladder emptying (eg, elevated postvoid residual volumes) with **bladder storage symptoms** (eg, frequency, nocturia, urgency).

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Educational objective:
Benign prostatic hyperplasia can gradually compress the prostatic urethra, leading to incomplete bladder emptying and an increased risk for recurrent urinary tract infections.

Surgery	Male Reproductive System	Benign prostatic hyperplasia
Subject	System	Topic

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A 69-year-old man has had 3 days of pain in the lower left abdomen. The pain was intermittent but has been constant over the past day. He has had nausea and fever for the past 2 days and is urinating more frequently than usual. The patient has a history of chronic constipation and right inguinal hernia repair 20 years ago. He currently takes no medications. His temperature is 38.6 C (101.3 F), blood pressure is 122/80 mm Hg, pulse is 98/min, and respirations are 16/min. His abdomen is soft but tender to palpation in the lower left quadrant. Deep palpation is difficult and reveals no masses or organomegaly. Bowel sounds are present. Rectal examination reveals normal prostate without nodules or enlargement. Costovertebral angle tenderness is absent. Laboratory results are as follows:

Leukocytes	14,500/mm^3
Hemoglobin	13.1 g/dL
Blood urea nitrogen	18 mg/dL
Creatinine	1.0 mg/dL

Urinalysis

Red blood cells	1/hpf
Leukocytes	2-3/hpf
Leukocyte esterase	negative
Nitrites	negative

Which of the following is the most appropriate next test to diagnose this patient's condition?

A. Abdominal CT scan with contrast
B. Barium contrast enema

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Blood urea nitrogen	18 mg/dL
Creatinine	1.0 mg/dL
Urinalysis	
Red blood cells	1/hpf
Leukocytes	2-3/hpf
Leukocyte esterase	negative
Nitrites	negative

Which of the following is the most appropriate next test to diagnose this patient's condition?

A. Abdominal CT scan with contrast
B. Barium contrast enema
C. Sigmoidoscopy
D. Small bowel follow-through
E. Upright abdominal film
F. Urine culture

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Blood urea nitrogen	18 mg/dL
Creatinine	1.0 mg/dL
Urinalysis	
Red blood cells	1/hpf
Leukocytes	2-3/hpf
Leukocyte esterase	negative
Nitrites	negative

Which of the following is the most appropriate next test to diagnose this patient's condition?

- ✓ A. Abdominal CT scan with contrast (69%)
- B. Barium contrast enema (6%)
- C. Sigmoidoscopy (9%)
- D. Small bowel follow-through (0%)
- E. Upright abdominal film (10%)
- F. Urine culture (4%)

Omitted
Correct answer

69%
Answered correctly

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Clinical features of acute diverticulitis	
Clinical presentation	• Abdominal pain (usually lower left quadrant) • Fever, nausea & vomiting • Ileus (peritoneal irritation)
Diagnosis	• Abdominal CT (oral & intravenous contrast)
Management	• Bowel rest • Antibiotics (eg, ciprofloxacin, metronidazole)
Complications	• Abscess, obstruction, fistula, perforation

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This patient's clinical presentation is concerning for **acute diverticulitis** (inflammation due to microperforation of a diverticulum). Chronic constipation and a low-fiber, high-fat diet are risk factors for diverticular disease. Patients with diverticulitis present with abdominal pain (usually **lower left quadrant**), fever, nausea/vomiting, and **leukocytosis**. Some (10%-15%) have urinary urgency, frequency, or dysuria due to bladder irritation from an inflamed sigmoid colon. **Abdominal CT** scan (oral and intravenous contrast) is the best diagnostic test for diverticulitis, differentiating it from other diseases (eg, colon cancer, kidney infection). Findings suggestive of diverticulitis include increased inflammation in pericolic fat, presence of diverticula, bowel wall thickening, soft tissue masses (eg, phlegmons), and pericolic fluid collections suggesting abscess.

(Choice B) Barium contrast enema can detect strictures or inflammation in ulcerative colitis or Crohn disease. It is contraindicated in the setting of diverticulitis until perforation has been ruled out.

(Choice C) Sigmoidoscopy or colonoscopy is contraindicated in the setting of acute diverticulitis as it may cause perforation; colonoscopy can be done to exclude underlying malignancy following resolution of the diverticulitis.

(Choice D) Small bowel follow through is performed by giving oral contrast to the patient and using fluoroscopy to follow the contrast into the

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(Choice D) Small bowel follow-through is performed by giving oral contrast to the patient and using fluoroscopy to follow the contrast into the small bowel. The test is usually indicated for diagnosing small bowel pathology (eg, stricture, obstruction, masses) and is not as useful for diagnosing diverticulitis in the colon.

(Choice E) Upright abdominal film can reveal nonspecific findings sometimes associated with acute diverticulitis (eg, dilated small/large bowel with air-fluid levels due to ileus or obstruction, soft tissue densities due to abscess). It can also occasionally reveal air under the diaphragm or in the retroperitoneum (perforation). However, abdominal CT is more sensitive (~94%) as well as specific (~99%) for diagnosing diverticulitis and differentiating it from other causes of abdominal pain.

(Choice F) The patient has a normal rectal examination without costovertebral angle tenderness or marked pyuria (increased leukocytes in the urine), making genitourinary causes of abdominal pain less likely. His urinary symptoms are likely due to bladder irritation from diverticulitis.

Educational objective:
Abdominal CT scan is the best diagnostic test for diagnosing acute diverticulitis and differentiating it from other causes of abdominal pain.

References

- Differentiating sigmoid diverticulitis from carcinoma on CT scans: mesenteric inflammation suggests diverticulitis

(Choice B) Barium contrast enema can detect strictures or inflammation in ulcerative colitis or Crohn disease. It is contraindicated in the setting of diverticulitis until perforation has been ruled out.

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Educational objective:
Abdominal CT scan is the best diagnostic test for diagnosing acute diverticulitis and differentiating it from other causes of abdominal pain.

References

- Differentiating sigmoid diverticulitis from carcinoma on CT scans: mesenteric inflammation suggests diverticulitis.
- Diagnostic imaging of acute abdominal pain in adults.

Surgery	Gastrointestinal & Nutrition	Diverticular disease
Subject	System	Topic

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A 75-year-old man undergoes surgical repair of a large abdominal aortic aneurysm. Postoperatively, he develops left lower quadrant abdominal pain followed by bloody diarrhea. The patient has a history of prostate cancer and received radiation therapy several years ago. His other medical problems include type 2 diabetes mellitus, hypertension, and hypercholesterolemia. He eats a low-fiber diet and recently quit smoking. Vital signs show a low-grade fever. Examination shows tenderness in the left lower quadrant, with gross blood visible on rectal examination. CT scan of the abdomen demonstrates thickening of the colon at the rectosigmoid junction. On colonoscopy, ulcerations are seen in the same area, but the colon above and below the lesions is completely normal. Which of the following is the most likely cause of his symptoms?

A. Acute diverticulitis
B. *Clostridium difficile* colitis
C. Ischemic colitis
D. Radiation proctitis
E. Ulcerative colitis

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- A. Acute diverticulitis (9%)
- B. *Clostridium difficile* colitis (1%)
- ✓ C. Ischemic colitis (73%)
- D. Radiation proctitis (10%)
- E. Ulcerative colitis (5%)

Omitted
Correct answer
C

73%
Answered correctly

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Time Spent

02/27/2020
Last Updated

Explanation

Colonic ischemia	
	• Usually nonocclusive, "watershed" ischemia

Colonic ischemia	
Pathophysiology	• Usually nonocclusive, "watershed" ischemia • Underlying atherosclerotic disease • State of low blood flow (eg, hypovolemia)
Clinical features	• Moderate abdominal pain & tenderness • Hematochezia, diarrhea • Leukocytosis, lactic acidosis
Diagnosis	• CT scan: Colonic wall thickening, fat stranding • Endoscopy: Edematous & friable mucosa
Management	• Intravenous fluids & bowel rest • Antibiotics with enteric coverage • Colonic resection if necrosis develops

This patient with abdominal pain and bloody diarrhea following a vascular procedure has typical features of **ischemic colitis** (IC). The pain of IC is usually moderate and lateralizes to the affected side. Repair of an **abdominal aortic aneurysm** is a common precipitating event as patients are often older and have extensive atherosclerotic vascular disease. Contributing factors may include loss of collateral circulation, manipulation of vessels with surgical instruments, prolonged aortic clamping, and **impaired blood flow** through the inferior mesenteric artery.

CT imaging in IC can show edema and air (pneumatosis) in the bowel wall. **Colonoscopy** shows segments of cyanotic mucosa and hemorrhagic ulcerations, with a sharp transition from affected to unaffected mucosa. Unless the patient has perforation or bowel gangrene, most cases are managed conservatively with intravenous fluids, bowel rest, and antibiotics.

(Choice A) Acute diverticulitis would cause left lower quadrant pain, and diverticula may cause rectal bleeding. However, diverticulitis and diverticular hemorrhage are independent events, and this patient's colonoscopy does not show diverticula.

(Choice B) *Clostridium difficile* colitis presents with abdominal pain, fever, and nonbloody, watery diarrhea. It is usually seen in patients with

Colonic ischemia	
Pathophysiology	• Usually nonocclusive, "watershed" ischemia • Underlying atherosclerotic disease • State of low blood flow (eg, hypovolemia)
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(Choice B) *Clostridium difficile* colitis presents with abdominal pain, fever, and nonbloody, watery diarrhea. It is usually seen in patients with recent antibiotic exposure, and typical colonoscopy findings include erythema, edema, and ulceration of the bowel wall.

(Choice D) Chronic radiation proctopathy often causes bloody stools, but usually presents for the first time within the first year. Colonoscopy would show pale mucosa with ulcers, strictures, telangiectasias, and focal hemorrhage.

(Choice E) Ulcerative colitis can cause abdominal pain and bloody diarrhea; however, it would be unlikely to present for the first time at age 75. In addition, IC usually spares the rectum (due to collateral circulation) whereas ulcerative colitis would not.

Educational objective:
Ischemic colitis is a common complication of vascular surgery, as patients are often older and have extensive underlying atherosclerosis. CT imaging can show thickening of the bowel wall. Colonoscopy shows cyanotic mucosa and hemorrhagic ulcerations.

References

- Ischemic colitis: surging waves of update.

Surgery	Gastrointestinal & Nutrition	Colonic ischemia
Subject	System	Topic

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Item 15 of 40
Question Id: 3877

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Exhibit Display



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Subject System Topic

TUTOR

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A 56-year-old man with a recent diagnosis of cirrhosis comes to the hospital for elective upper gastrointestinal endoscopy to evaluate for esophageal varices. The patient has elevated liver aminotransferase levels, and a hepatitis serology was positive for chronic hepatitis C. Abdominal imaging studies revealed mild ascites, a nodular-appearing liver, and splenomegaly. He has no other medical problems. The patient has a remote history of injection drug use and does not use tobacco or alcohol. Vital signs are within normal limits. Benzocaine throat spray is used for topical anesthesia, and procedural sedation is obtained with midazolam and fentanyl. During the procedure, the patient's oxygen saturation by pulse oximetry gradually decreases to 85% on ambient air and does not improve with application of supplemental oxygen via face mask. Physical examination demonstrates bluish discoloration of the lips and fingertips. Lung fields are clear to auscultation, and heart sounds are normal. Results of urgent laboratory tests are as follows:

Hematocrit	39%
Arterial blood gases	
pH	7.39
PaO_2	142 mm Hg
$PaCO_2$	34 mm Hg
Oxygen saturation	99%

Which of the following is the most likely cause of this patient's decrease in oxygen saturation?

A. Allergic drug reaction
B. Altered state of hemoglobin
C. Alveolar hypoventilation
D. Cardiogenic pulmonary edema
E. Decreased diaphragmatic excursion

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are normal. Results of urgent laboratory tests are as follows:

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C. Alveolar hypoventilation
D. Cardiogenic pulmonary edema
E. Decreased diaphragmatic excursion
F. Pulmonary arteriovenous shunting
G. Segmental lung collapse

Submit

are normal. Results of urgent laboratory tests are as follows:

Hematocrit	39%
Arterial blood gases	
pH	7.39
PaO_2	142 mm Hg
$PaCO_2$	34 mm Hg
Oxygen saturation	99%

Which of the following is the most likely cause of this patient's decrease in oxygen saturation?

- A. Allergic drug reaction (7%)
- ✓ B. Altered state of hemoglobin (51%)
- C. Alveolar hypoventilation (11%)
- D. Cardiogenic pulmonary edema (1%)
- E. Decreased diaphragmatic excursion (10%)
- F. Pulmonary arteriovenous shunting (14%)
- G. Segmental lung collapse (2%)

Omitted
Correct answer

51%
Answered correctly

04 secs
Time Spent

01/25/2020
Last Updated

Explanation

This patient has new-onset hypoxia by pulse oximetry (85%) during an endoscopic procedure, with a significant difference between the oxygen saturation value estimated on blood gas analysis and that obtained on pulse oximetry (ie, large oxygen saturation gap). He likely has **acquired methemoglobinemia** due to anesthetic use.

Some medications - most commonly **topical anesthetics** (eg, benzocaine), **dapsone**, and nitrates (in infants) - cause the iron component of hemoglobin to be oxidized, thereby forming methemoglobin, which **cannot** bind oxygen. The remaining normal hemoglobin also has an increased affinity for oxygen, resulting in less oxygen delivery to tissues. Because methemoglobin absorbs light at distinct wavelengths, **pulse oximetry** commonly is **~85%** (as seen in this patient) regardless of the true oxygen saturation. In parallel, blood gas analysis frequently returns a **falsely elevated** result for oxygen saturation (eg, 99% in this patient) as it provides an estimate based only on the PaO_2, not on effective hemoglobin-oxygen binding. These inaccurate readings create the **large oxygen saturation gap**.

Cyanosis can occur when methemoglobin comprises ~10% of total hemoglobin, but hypoxia symptoms (eg, headache, lethargy) occur only when levels surpass 20%. At levels $\geq$50%, there is risk of severe symptoms (eg, altered mental status, seizures, respiratory depression) and death. Treatment involves discontinuing the causative agent and administering methylene blue, which helps reduce iron to its normal state.

(Choice A) Anaphylaxis (eg, due to medication) can lead to respiratory compromise and hypoxia but is associated with symptoms such as wheezing, stridor, and dyspnea.

(Choices C and G) Although atelectasis and mucus plugging can lead to transient hypoxemia due to a collapsed portion of lung, the hypoxemia is commonly reversible with supplemental oxygen and would not explain the oxygen saturation gap. Procedural hypoventilation should also correct with supplemental oxygen.

(Choice D) This patient has clear lung fields and normal heart sounds, making pulmonary edema less likely. Pulmonary edema also typically improves with supplemental oxygen and is not characterized by a large oxygen saturation gap.

(Choice E) Patients with liver disease can have large-volume ascites and severe muscle wasting, which may lead to decreased diaphragmatic excursion and resultant hypoxia. However, this patient has only mild ascites on ultrasound and no evidence of muscle wasting.

(Choice F) Hepatopulmonary syndrome results from arteriovenous shunting in the lungs and can occur after years of liver disease. Patients

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levels surpass 20%. At levels >30%, there is risk of severe symptoms (eg, altered mental status, seizures, respiratory depression) and death. Treatment involves discontinuing the causative agent and administering methylene blue, which helps reduce iron to its normal state.

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(Choice F) Hepatopulmonary syndrome results from arteriovenous shunting in the lungs and can occur after years of liver disease. Patients frequently exhibit platypnea (induced dyspnea in the upright position) and orthodeoxia (hypoxia in the upright position). This syndrome would not explain the patient's large oxygen saturation gap.

Educational objective:
Acquired methemoglobinemia results from the oxidization of iron in hemoglobin, which is most commonly due to topical anesthetic agents or dapsone. It presents with hypoxia, a characteristic pulse oximetry reading of ~85%, and a large oxygen saturation gap.

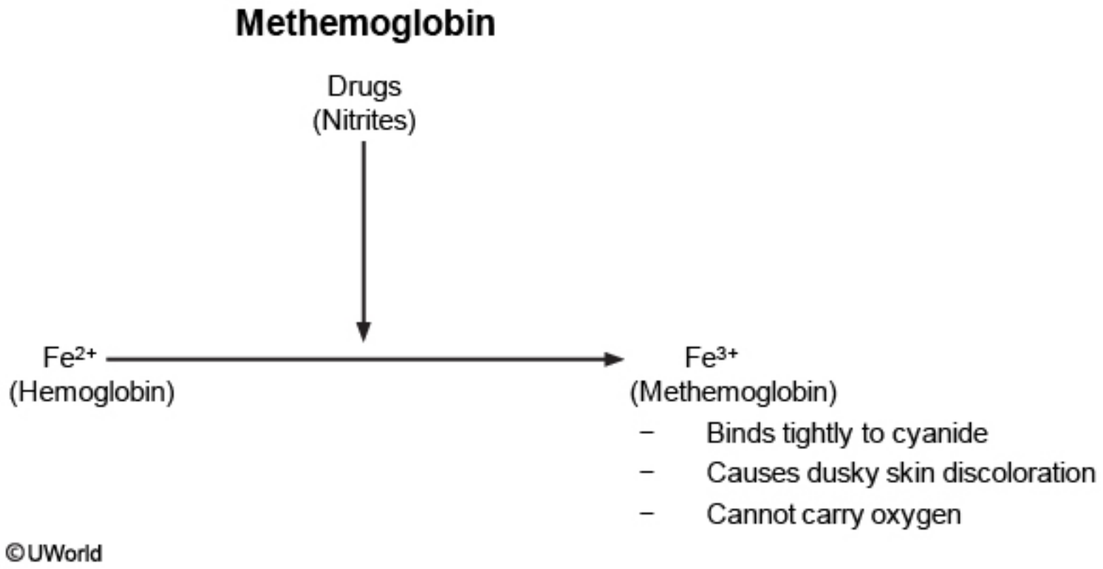
References

- Methemoglobin--it's not just blue: a concise review.

Surgery	Hematology & Oncology	Methemoglobinemia
Subject	System	Topic

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Exhibit Display



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Item 17 of 40
Question Id: 15935

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A 55-year-old man comes to the office due to 2 weeks of urinary urgency, frequency, dysuria, and perineal pain. He had a similar episode 3 months ago, and a short course of antibiotic therapy completely resolved his symptoms. The patient has a history of type 2 diabetes mellitus and hyperlipidemia. He has smoked a pack of cigarettes daily for 20 years. Temperature is 37.5 C (99.5 F), blood pressure is 120/80 mm Hg, and pulse is 80/min. Examination shows suprapubic tenderness. There is no urethral discharge, and testicles are normal without tenderness. There is no costovertebral angle tenderness. Digital rectal examination reveals a symmetrically enlarged, smooth, and tender prostate. Complete blood count is normal. Urinalysis shows pyuria, many bacteria, and no red blood cells. Urine culture will most likely reveal which of the following organisms?

A. *Chlamydia trachomatis*
B. *Escherichia coli*
C. *Mycobacterium tuberculosis*
D. *Staphylococcus aureus*
E. *Ureaplasma urealyticum*

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Item 17 of 40
Question Id: 15935

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A. *Chlamydia trachomatis* (2%)
✓ B. *Escherichia coli* (94%)
C. *Mycobacterium tuberculosis* (0%)
D. *Staphylococcus aureus* (1%)
E. *Ureaplasma urealyticum* (1%)

Omitted
Correct answer
B

94%
Answered correctly

02 secs
Time Spent

02/01/2020
Last Updated

Explanation

Chronic bacterial prostatitis	

TUTOR

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Chronic bacterial prostatitis	
Epidemiology	• Young & middle-aged men • ↑ Risk with diabetes, smoking, urinary tract procedure
Pathogens	• Coliforms enter from urethra via intraprostatic reflux • *Escherichia coli* causes >75% of cases
Presentation	• Recurrent urinary tract infection (with the same organism) • +/- Prostatic tenderness & swelling (often absent) • Pain with ejaculation • History of antibiotic treatment → transient improvement
Diagnosis	• Pyuria and bacteriuria on urinalysis • Bacteria in prostatic fluid > bacteria in urine
Treatment	• Fluoroquinolones (eg, ciprofloxacin) for 6 weeks

This patient's recurrent urinary symptoms (eg, urgency, frequency, dysuria), prostatic tenderness, and pyuria/bacteriuria suggest **chronic bacterial prostatitis (CBP)**. Most cases arise when coliform organisms contaminate the urethra and subsequently enter the prostate via intraprostatic reflux of urine. ***Escherichia coli*** is the leading pathogen, causing >75% of cases; other enteric organisms such as *Enterococcus faecalis*, *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Pseudomonas aeruginosa* are also common. Risk is greatest in those with diabetes mellitus, tobacco abuse, and recent urinary tract procedure.

CBP manifestations are often subtle, but patients generally have:

- Symptoms of **recurrent urinary tract infections** (eg, dysuria, frequency, urgency, perineal tenderness, pyuria, bacteriuria) that **transiently resolve** with a short course of antibiotics
- An enlarged, swollen, and **tender prostate**

CBP manifestations are often subtle, but patients generally have:

- Symptoms of **recurrent urinary tract infections** (eg, dysuria, frequency, urgency, perineal tenderness, pyuria, bacteriuria) that **transiently resolve** with a short course of antibiotics
- An enlarged, swollen, and **tender prostate**

The diagnosis is generally made presumptively, but confirmation requires prostatic massage and examination of prostatic fluid (levels of bacteria in prostatic fluid are greater than those in urine prior to prostatic massage). **Prolonged antibiotic therapy** (4-6 weeks) is necessary to prevent recurrence; fluoroquinolones are considered first-line therapy because they achieve high concentration in prostatic tissue and provide good coverage for enteric pathogens.

(Choice A) *Chlamydia trachomatis* generally causes nongonococcal urethritis with painful urination and mucoid urethral discharge. It is an infrequent cause of CBP and cannot be identified on urinalysis gram-stain because the cell wall lacks peptidoglycan.

(Choice C) *Mycobacterium tuberculosis* primarily causes pulmonary infection; the prostate is not a frequent site of bacterial spread.

(Choice D) Gram-positive skin flora such as *Staphylococcus aureus* primarily cause urinary infections in the setting of bacteremia or indwelling urinary hardware (eg, long-standing Foley catheter). *S aureus* is a less common cause of CBP.

(Choice E) *Ureaplasma urealyticum* is often a urinary commensal organism but may occasionally cause CBP. However, *Ureaplasma* is not associated with bacteriuria on urinalysis because the pathogen lacks a cell wall.

Educational objective:
Chronic bacterial prostatitis generally causes recurrent urinary tract infection symptoms and prostatic swelling and tenderness. Most cases arise when coliform pathogens enter the prostate from the urethra; *Escherichia coli* is the leading pathogen.

References

- Common questions about chronic prostatitis.

Surgery Male Reproductive System Prostatitis

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Item 18 of 40
Question Id: 4204

Mark

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A 69-year-old man is evaluated shortly after undergoing elective surgical repair of a descending thoracic aortic aneurysm. He has weakness in both lower extremities and urinary retention, which were not present before the procedure. The surgery was complicated by significant blood loss requiring multiple transfusions. The patient has a history of osteoarthritis, hypertension, hyperlipidemia, type 2 diabetes mellitus, and coronary artery disease. He also has 70% stenosis of his right carotid artery. Neurologic examination shows flaccid paralysis and loss of pain sensation in the lower extremities; vibratory sensation is intact. Upper extremity examination reveals no abnormalities. Which of the following is the most likely cause of this patient's neurologic dysfunction?

A. Cervical spondylotic myelopathy
B. Epidural hematoma compressing the spinal cord
C. Intraoperative cortical stroke
D. Lumbar plexopathy
E. Spinal cord infarction

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A. Cervical spondylotic myelopathy (1%)
B. Epidural hematoma compressing the spinal cord (15%)
C. Intraoperative cortical stroke (3%)
D. Lumbar plexopathy (6%)
✓ E. Spinal cord infarction (74%)

Omitted
Correct answer
E

74%
Answered correctly

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Time Spent

02/24/2020
Last Updated

Explanation

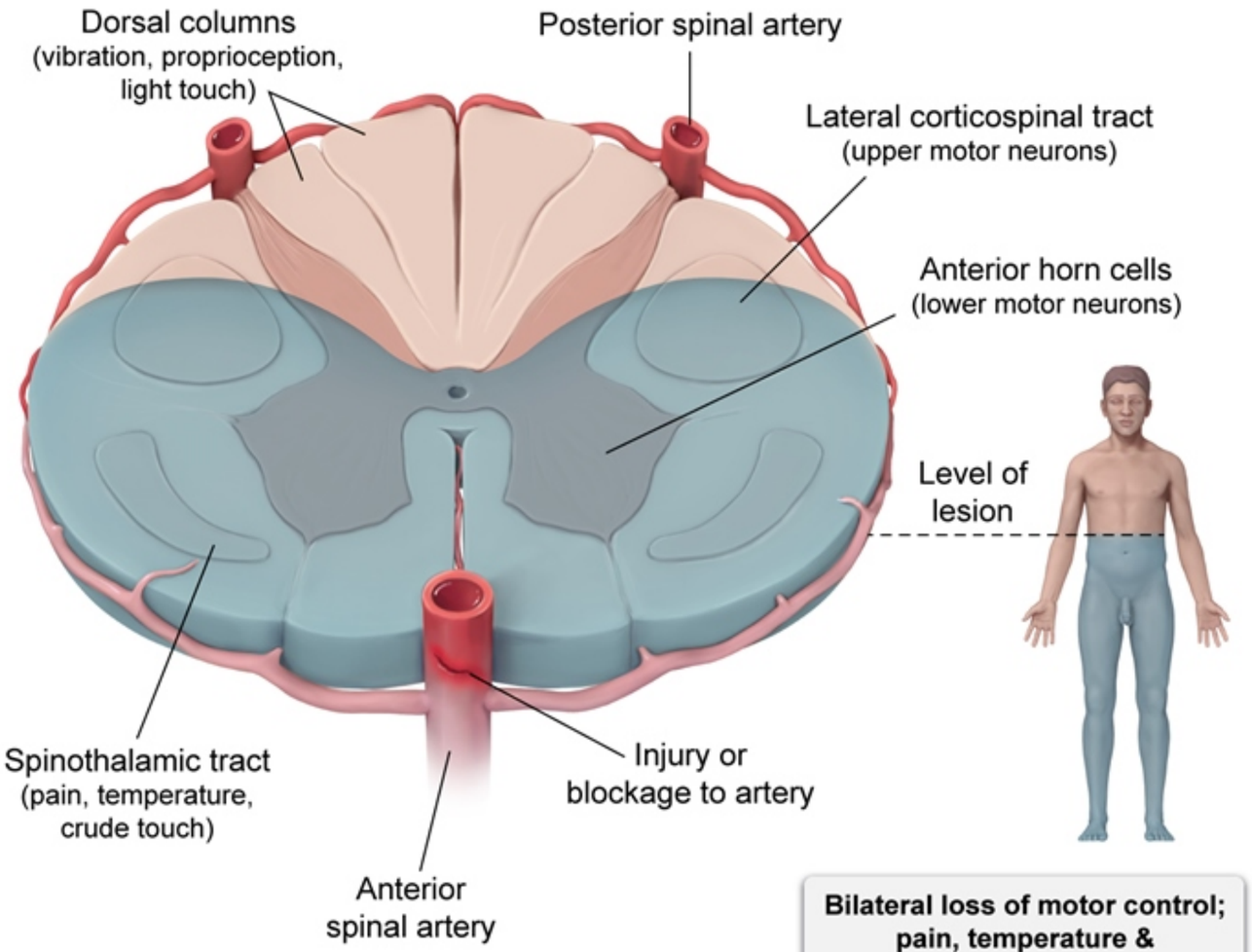
Anterior cord syndrome

Dorsal columns

Posterior spinal artery

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Anterior cord syndrome



Spinal cord (SC) **ischemia** is a devastating but not uncommon (~5%-15%) **complication** of thoracic aortic aneurysm (TAA) repair. **TAA repair**

Spinal cord (SC) **ischemia** is a devastating but not uncommon (~5%-15%) **complication** of thoracic aortic aneurysm (TAA) repair. **TAA repair** can disrupt SC blood flow: Aortic cross-clamping causes temporary SC hypoperfusion, and vascular graft placement (to recreate the luminal wall) can **disrupt** segmental arteries arising from the aorta. Because the anterior spinal artery relies on blood supply from these segmental arteries, the SC territory that it supplies—the anterior two-thirds of the SC—is particularly susceptible to ischemic infarct.

Infarction of the anterior SC results in **anterior cord syndrome**, with the following findings distal to the lesion:

- Bilateral paralysis from damage to the lateral corticospinal tracts and anterior horn cells
- Loss of pain/temperature and crude touch sensation from damage to the lateral and anterior spinothalamic tracts
- Urinary retention from damage to the descending autonomic tracts involved in bladder control

In contrast, the posterior spinal arteries, which arise off the vertebral/posterior inferior cerebellar artery, are intact and maintain perfusion to the posterior SC. Therefore, vibratory, proprioceptive, and light touch sensation (conveyed by the dorsal columns) are typically preserved.

Although flaccid paralysis due to spinal shock (ie, temporary loss of all distal SC function) occurs initially, upper motor neuron signs such as spasticity and hyperreflexia subsequently develop over days to weeks.

(Choice A) Neck hyperextension (eg, during intubation) in the setting of cervical spondylosis (ie, degenerative changes in the spine) classically causes central cord syndrome, characterized by disproportionately greater motor impairment in the upper extremities compared with the lower extremities.

(Choice B) SC compression from a spinal epidural hematoma can cause lower extremity motor and sensory deficits. However, epidural hematomas more commonly complicate procedures involving puncture of the spinal dura and are not a common complication of TAA repair.

(Choice C) Intraoperative hypoperfusion in the setting of right carotid artery atherosclerosis can cause a cortical stroke. However, this typically presents with unilateral, contralateral neurologic deficits rather than bilateral deficits.

(Choice D) Lumbar plexopathy, a peripheral neuropathy involving multiple adjacent nerve roots, can cause lower extremity weakness and diminished sensation. However, findings are typically asymmetric and focal (eg, unilateral footdrop) rather than symmetric and diffuse (eg, bilateral flaccid paralysis), and both pain/temperature and vibratory/proprioceptive sensation are affected.

Educational objective:

Although flaccid paralysis due to spinal shock (ie, temporary loss of all distal SC function) occurs initially, upper motor neuron signs such as spasticity and hyperreflexia subsequently develop over days to weeks.

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Educational objective:
Thoracic aortic aneurysm repair can cause spinal cord ischemia, especially of the anterior cord. Anterior cord syndrome typically presents with distal, bilateral flaccid paralysis; loss of pain/temperature and crude touch sensation; and urinary retention.

References

- Spinal cord injury following thoracic and thoracoabdominal aortic repairs.
- Incomplete cord syndromes: clinical and imaging review.

Surgery	Nervous System	Anterior cord syndrome
Subject	System	Topic

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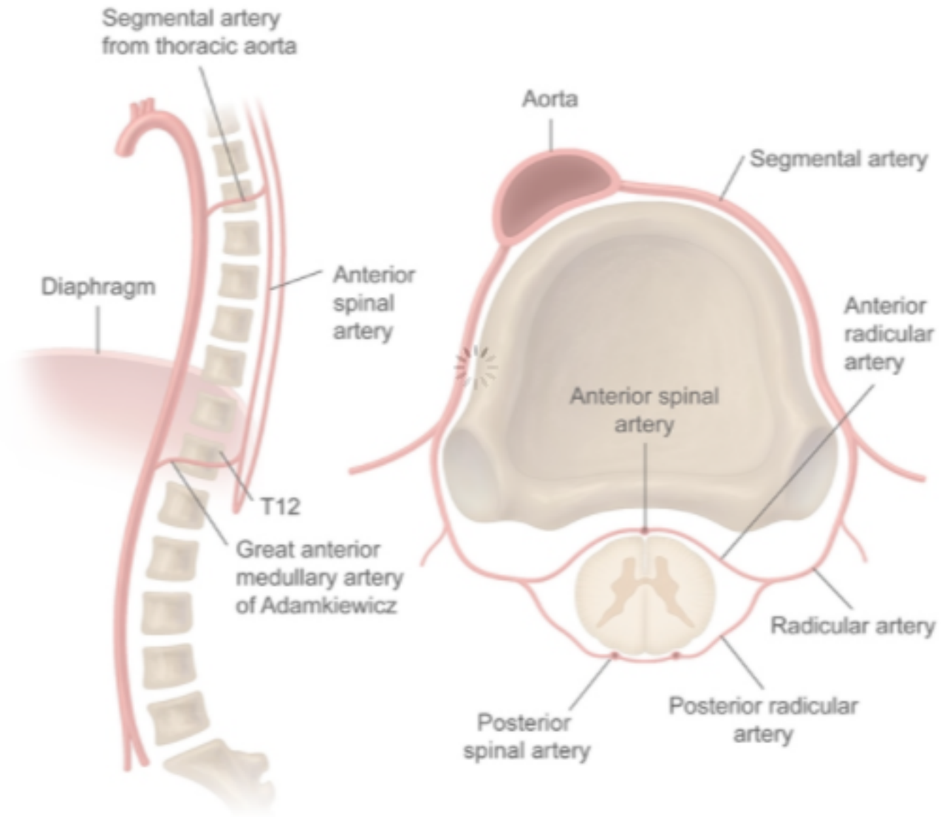
Item 18 of 40
Question Id: 4204

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Exhibit Display

Blood supply of the spinal cord



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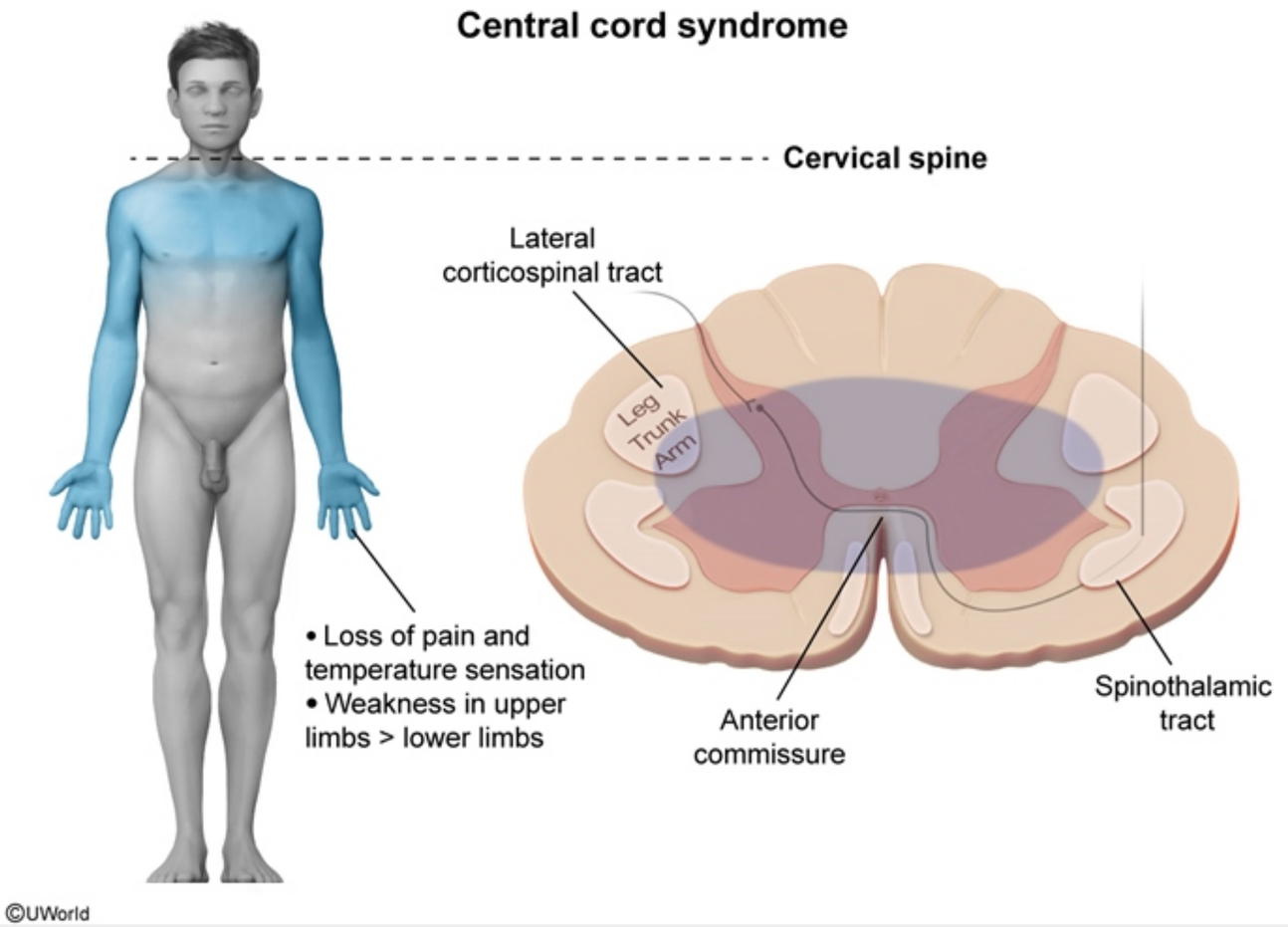
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Item 18 of 40
Question Id: 4204

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Exhibit Display



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A 21-year-old man comes to the office requesting a refill of an opioid medication for new-onset left hip pain. The pain started 3 weeks ago and was initially only with weightbearing, but has progressively worsened and is now present at rest and overnight. He has no history of trauma. Medical history is notable for sickle cell disease with several hospitalizations for acute pain crisis. His last hospitalization was 3 months ago. The patient has been taking some leftover opioid pain medications from that hospitalization, in addition to regularly scheduled folic acid and hydroxyurea. He is sexually active with a new female partner. The patient does not use alcohol, tobacco, or illicit drugs. His temperature is 37.2 C (99 F), blood pressure is 100/70 mm Hg, pulse is 80/min, and respirations are 16/min. Physical examination reveals no local tenderness, but there is restriction of abduction and internal rotation of the left hip. The right hip and other joints are normal. Hip x-rays and erythrocyte sedimentation rate are normal. Which of the following is the most likely diagnosis?

A. Bacterial infection of the proximal femur
B. Gonococcal infection of the synovial fluid
C. Opioid drug-seeking behavior
D. Osteonecrosis of the proximal femur
E. Slippage of the femoral head epiphyseal plate

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A. Bacterial infection of the proximal femur (2%)
B. Gonococcal infection of the synovial fluid (5%)
C. Opioid drug-seeking behavior (10%)
✓ D. Osteonecrosis of the proximal femur (79%)
E. Slippage of the femoral head epiphyseal plate (1%)

Omitted
Correct answer
D

79%
Answered correctly

02 secs
Time Spent

04/02/2020
Last Updated

Explanation

Avascular necrosis

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

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

This patient has features typical of **osteonecrosis (aseptic necrosis) of the femoral head**, including progressive **hip pain**, limited **internal rotation and abduction**, unremarkable x-rays (can remain normal for months), and normal inflammatory markers (eg, erythrocyte sedimentation rate [ESR]). Osteonecrosis is caused by **occlusion of end arteries** supplying the femoral head, leading to necrosis and collapse of the periarticular bone and cartilage.

Osteonecrosis is common in patients with **sickle cell disease** due to disruption of microcirculation in the bone by sickling as well as increased

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Osteonecrosis is common in patients with **sickle cell disease** due to disruption of microcirculation in the bone by sickling as well as increased intraosseous pressure due to bone marrow hyperplasia. The femoral head has 2 main sources of blood - the ascending arteries and the foveal artery, which lies within the ligamentum teres. The foveal artery is patent early in life, but may become obliterated in older patients. For this reason, aseptic necrosis of the femoral head is uncommon in children but the risk rises in older patients.

(Choice A) Osteomyelitis is a recognized complication of sickle cell disease, and is usually due to *Staphylococcus aureus* or *Salmonella*. It is most common in children, often multifocal, and typically accompanied by fever, malaise, and elevated ESR.

(Choice B) *Neisseria gonorrhoeae* can cause acute purulent arthritis (usually without associated skin lesions or fever). However, involvement of the distal large joints (eg, knees, wrists, ankles) is more common, and it would usually be associated with elevated ESR.

(Choice C) Features that suggest drug-seeking behavior include "lost" or "stolen" medication, premature refill requests, and pain inconsistent with examination findings or known pathology. This patient's pain is easily explainable by osteonecrosis, which is a recognized complication of his underlying disease.

(Choice E) Slipped capital femoral epiphysis (SCFE) is characterized by pain and altered gait. Obesity is an important risk factor. SCFE most often occurs in early adolescence and is usually visible on x-rays.

Educational objective:
Osteonecrosis (aseptic necrosis) of the femoral head is a common complication of sickle cell disease and presents with hip pain, reduced range of motion, and normal findings on initial x-rays. It is due to occlusion of end arteries supplying the femoral head, leading to necrosis and collapse of the periarticular bone and cartilage.

References

- Managing femoral head osteonecrosis in patients with sickle cell disease.

Osteonecrosis is common in patients with **sickle cell disease** due to disruption of microcirculation in the bone by sickling as well as increased intraosseous pressure due to bone marrow hyperplasia. The femoral head has 2 main sources of blood - the ascending arteries and the foveal artery, which lies within the ligamentum teres. The foveal artery is patent early in life, but may become obliterated in older patients. For this reason, aseptic necrosis of the femoral head is uncommon in children but the risk rises in older patients.

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Educational objective:
Osteonecrosis (aseptic necrosis) of the femoral head is a common complication of sickle cell disease and presents with hip pain, reduced range of motion, and normal findings on initial x-rays. It is due to occlusion of end arteries supplying the femoral head, leading to necrosis and collapse of the periarticular bone and cartilage.

References

- Managing femoral head osteonecrosis in patients with sickle cell disease.

Surgery	Rheumatology/Orthopedics & Sports	Osteonecrosis
Subject	System	Topic

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A 65-year-old man comes to the emergency department due to severe right leg pain and is found to have an acute thrombotic occlusion of the right popliteal artery. He has a history of hypertension, type 2 diabetes mellitus, and hyperlipidemia. The patient is admitted to the surgical floor and initiated on intravenous unfractionated heparin. The following morning, he undergoes surgical revascularization of the right leg. The patient's hospital course progresses well, but 5 days postoperatively his platelet count decreases from 240,000/mm^3 on admission to 65,000/mm^3. His vital signs are stable. The surgical wound is healing well. There are no rashes or pitting edema. Which of the following is the most appropriate next step in management of this patient?

A. Continue heparin and obtain a serotonin release assay
B. Stop heparin and observe
C. Stop heparin and order a platelet transfusion
D. Stop heparin and start argatroban
E. Stop heparin and start warfarin
F. Switch to low molecular weight heparin

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- A. Continue heparin and obtain a serotonin release assay (2%)
- B. Stop heparin and observe (7%)
- C. Stop heparin and order a platelet transfusion (2%)
- ✓ D. Stop heparin and start argatroban (74%)
- E. Stop heparin and start warfarin (4%)
- F. Switch to low molecular weight heparin (7%)

Omitted
Correct answer
D

74%
Answered correctly

02 secs
Time Spent

06/23/2020
Last Updated

Explanation

Clinical features of type 2 heparin-induced thrombocytopenia

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Clinical features of type 2 heparin-induced thrombocytopenia	
Clinical signs	Suspected with heparin exposure >5 days **&** any of the following: • Platelet count reduction >50% from baseline • Arterial or venous thrombosis • Necrotic skin lesions at heparin injection sites • Acute systemic (anaphylactoid) reactions after heparin
Diagnostic evaluation	• **Serotonin release assay**: Gold standard confirmatory test • Start treatment in suspected cases prior to confirmatory tests
Therapy	• Stop **ALL** heparin products • Start a direct thrombin inhibitor (eg, argatroban) or fondaparinux (synthetic pentasaccharide)

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Type 2 **heparin-induced thrombocytopenia** (HIT) is a life-threatening complication of heparin therapy. A drop in the platelet count by **>50%** or a new thrombus within **5-10 days** of initiating heparin should raise suspicion for HIT (HIT may manifest sooner in patients previously exposed to heparin). HIT is **antibody mediated** and causes a mild to moderate **thrombocytopenia** (rarely <20,000/mm^3) with minimal bleeding risk. However, venous and arterial **thrombotic risk** is significant, as high as 50% in untreated HIT.

If HIT is suspected, all heparin products (including heparin flushes) should be **discontinued immediately**, and **anticoagulation** should be initiated with a nonheparin medication (eg, argatroban, fondaparinux).

(Choices A, B, and C) Although the diagnosis of HIT is confirmed with a high titer immunoassay or a functional assay of the blood (eg, serotonin release assay), discontinuing heparin and initiating nonheparin anticoagulation should not be delayed for laboratory results due to the high risk of thrombus. Platelet counts typically normalize 2-7 days after stopping heparin; transfusions are not required unless the patient is overtly bleeding

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(Choice E) Warfarin is used for anticoagulation maintenance in patients with HIT but only after the patient has received another anticoagulant and the platelet count is >150,000/mm^3. Initial treatment with warfarin is contraindicated in patients with HIT as it rapidly lowers protein C levels, which may transiently increase the risk of thrombus.

(Choice F) All heparin products, including low molecular weight heparin, should be avoided in patients with HIT.

Educational objective:
Suspected heparin-induced thrombocytopenia requires immediate cessation of all forms of heparin and initiation of anticoagulation with an alternate agent (eg, argatroban, fondaparinux). Once the platelet count is >150,000/mm^3, most patients can be switched safely to warfarin.

References

- Heparin-induced thrombocytopenia: an update.

Surgery	Hematology & Oncology	Heparin induced thrombocytopenia
Subject	System	Topic

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A 52-year-old obese woman comes to the clinic complaining of intermittent right upper-quadrant pain and nausea. She had an elective cholecystectomy for gallstones a year ago. The pain is located in the right subcostal area and generally lasts 30-60 minutes. The patient recalls that she had similar pain episodes before the surgery. Laboratory results after one of the episodes are as follows:

Total bilirubin	2.1 mg/dL
Direct bilirubin	1.2 mg/dL
Alkaline phosphatase	185 U/L
Aspartate aminotransferase (AST, SGOT)	84 U/L
Alanine aminotransferase (ALT, SGPT)	72 U/L

An ultrasound of the abdomen reveals mild dilation of the common bile duct. The pancreas is visualized and appears normal. Which of the following is the best next step in management of this patient?

A. Antimitochondrial antibodies
B. Endoscopic retrograde cholangiopancreatography
C. *Helicobacter pylori* stool antigen testing
D. Liver biopsy
E. Ursodeoxycholic acid therapy

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An ultrasound of the abdomen reveals mild dilation of the common bile duct. The pancreas is visualized and appears normal. Which of the following is the best next step in management of this patient?

A. Antimitochondrial antibodies (13%)
✓ B. Endoscopic retrograde cholangiopancreatography (77%)
C. *Helicobacter pylori* stool antigen testing (0%)
D. Liver biopsy (1%)
E. Ursodeoxycholic acid therapy (7%)

Omitted
Correct answer
B

77%
Answered correctly

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Explanation

This patient's presentation is concerning for postcholecystectomy syndrome (PCS). PCS refers to persistent abdominal pain or dyspepsia (eg, nausea) that occurs either postoperatively (early) or months to years (late) after a cholecystectomy. PCS can be due to biliary (eg, retained common bile duct or cystic duct stone, biliary dyskinesia) or extra-biliary (eg, pancreatitis, peptic ulcer disease, coronary artery disease) causes. Patients usually notice the same pain they had prior to surgery, new pain just after surgery, or the same pain that never went away.

Laboratory findings can include elevated alkaline phosphatase, mildly abnormal serum aminotransferases, and dilated common bile duct on abdominal ultrasound. These findings usually suggest common bile duct stones or biliary sphincter of Oddi dysfunction. The next step involves endoscopic ultrasound, endoscopic retrograde cholangiopancreatography (ERCP), or magnetic resonance cholangiopancreatography for final diagnosis and guiding therapy. Treatment for PCS is directed at the causative factor.

(Choice A) Antimitochondrial antibodies are usually elevated in primary biliary cirrhosis. These patients typically have other symptoms (eg, pruritus, fatigue, jaundice) along with abdominal pain. Although primary biliary cirrhosis can present with laboratory findings similar to those seen in this patient, imaging typically does not show a dilated common bile duct.

(Choice C) *Helicobacter pylori* stool antigen testing is used for diagnosing *H pylori* infection in patients with peptic ulcer disease. It is not typically associated with abnormal liver function tests and/or dilated common bile duct.

(Choice D) Liver biopsy should be done when initial evaluation (laboratory analysis and imaging) cannot provide a definitive diagnosis or determine the severity of liver disease. This patient may require liver biopsy if ERCP and other laboratory tests for hepatitis are unremarkable.

(Choice E) Ursodeoxycholic acid can treat cholesterol gallstones in patients with mild symptoms who are not candidates for cholecystectomy. It is also used to treat primary biliary cirrhosis and primary sclerosing cholangitis.

Educational objective:
Postcholecystectomy syndrome is persistent abdominal pain or dyspepsia either postoperatively (early) or months to years (late) after cholecystectomy. Etiologies include biliary (eg, retained common bile duct, cystic duct stone) or extra-biliary (eg, pancreatitis, peptic ulcer disease) causes. Abdominal imaging (eg, ultrasound) followed by direct visualization (eg, endoscopic retrograde cholangiopancreatography,

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Educational objective:
Postcholecystectomy syndrome is persistent abdominal pain or dyspepsia either postoperatively (early) or months to years (late) after cholecystectomy. Etiologies include biliary (eg, retained common bile duct, cystic duct stone) or extra-biliary (eg, pancreatitis, peptic ulcer disease) causes. Abdominal imaging (eg, ultrasound) followed by direct visualization (eg, endoscopic retrograde cholangiopancreatography, magnetic resonance cholangiopancreatography) can establish the diagnosis and guide therapy toward the causative factor.

References

- Biliary causes of postcholecystectomy syndrome.
- Postcholecystectomy syndrome (PCS).

Surgery	Gastrointestinal & Nutrition	Gallstone disease
Subject	System	Topic

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Item 22 of 40
Question Id: 15710

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A 35-year-old man comes to the office for follow-up of an abnormal chest x-ray finding. The patient went to the emergency department 2 weeks ago after a chest injury; during a softball game, he was struck in the chest by a ball thrown from a distance of 4 feet. Initial evaluation showed no significant trauma or rib fracture, but the chest x-ray revealed an air/fluid level posterior to the cardiac silhouette consistent with a sliding hiatal hernia. The patient feels well and has had no heartburn, regurgitation, difficulty swallowing, or abdominal discomfort. He has no other medical conditions and takes no medications. The patient does not use tobacco, alcohol, or illicit drugs. Vital signs are within normal limits. Physical examination shows no abnormalities. Which of the following is the best next step in management of this patient?

A. 24-hour esophageal pH monitoring
B. Esophageal manometry
C. Laparoscopic Nissen fundoplication
D. Reassurance and observation
E. Upper gastrointestinal endoscopy

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- A. 24-hour esophageal pH monitoring (2%)
- B. Esophageal manometry (1%)
- C. Laparoscopic Nissen fundoplication (6%)
- ✓ D. Reassurance and observation (80%)
- E. Upper gastrointestinal endoscopy (9%)

Omitted
Correct answer
D

80%
Answered correctly

02 secs
Time Spent

04/06/2020
Last Updated

Explanation

This patient has an asymptomatic **sliding hiatal hernia**. The distal esophagus is attached circumferentially to the diaphragm at the esophageal hiatus by the phrenoesophageal membrane. Sliding hiatal hernias occur due to **laxity** of this membrane, typically in the setting of age-related degeneration or repetitive stress (eg, vomiting, coughing). This allows the **gastroesophageal junction** and proximal stomach to slide into the thoracic cavity

This patient has an asymptomatic **sliding hiatal hernia**. The distal esophagus is attached circumferentially to the diaphragm at the esophageal hiatus by the phrenoesophageal membrane. Sliding hiatal hernias occur due to **laxity** of this membrane, typically in the setting of age-related degeneration or repetitive stress (eg, vomiting, coughing). This allows the **gastroesophageal junction** and proximal stomach to slide into the thoracic cavity.

Most sliding hiatal hernias are discovered incidentally during imaging performed for other reasons. Plain radiography typically reveals a retrocardiac opacity (often with an air/fluid level) within the thoracic cavity. Although sliding hiatal hernias predispose patients to developing gastroesophageal reflux disease (GERD) (eg, heartburn, dysphagia, chest pain), **asymptomatic** patients require no further evaluation beyond **observation**. Patients with reflux symptoms should be medically managed (eg, proton pump inhibitors). Those with refractory GERD symptoms can be considered for antireflux surgery (eg, Nissen fundoplication) **(Choice C)**.

(Choices A, B, and E) 24-hour esophageal pH monitoring can be used in the evaluation of GERD; esophageal manometry is indicated to evaluate suspected esophageal motility disorders; upper gastrointestinal endoscopy is used to visualize and intervene in a variety of gastrointestinal disorders. These procedures, as well as barium swallow (the most sensitive test for diagnosis of hiatal hernia), may be performed for further evaluation prior to surgical intervention in patients with refractory reflux symptoms. However, they are not indicated in asymptomatic patients.

Educational objective:
Hiatal hernia is a common disorder that occurs when the contents of the abdominal cavity herniate through the diaphragm into the thoracic cavity at the esophageal hiatus. Plain radiography typically reveals a retrocardiac opacity (often with an air/fluid level) within the thoracic cavity. Asymptomatic sliding hiatal hernias do not require further workup or intervention whereas patients with gastroesophageal reflux disease should be medically managed.

Surgery	Gastrointestinal & Nutrition	Hiatal hernia
Subject	System	Topic

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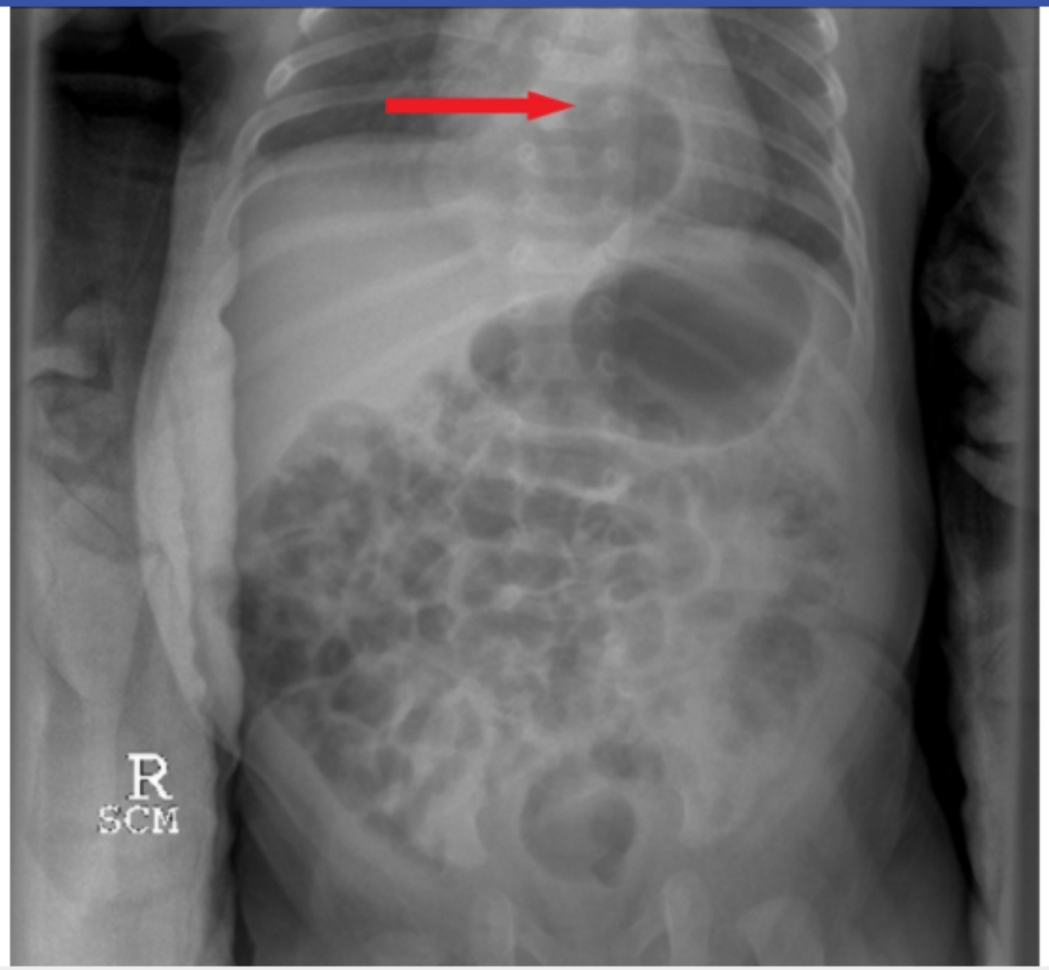
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Item 22 of 40
Question Id: 15710

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Item 23 of 40
Question Id: 4241

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A 73-year-old man comes to the physician because of right anterior thigh pain that is worse with walking. He has a history of stable angina, hypertension, hypercholesterolemia, and COPD with periodic exacerbations. He takes ipratropium, aspirin, metoprolol and pravastatin. He smokes 2 packs a day and drinks alcohol occasionally. Physical examination shows a small pulsatile mass in the right groin area. Which of the following is the most likely diagnosis?

A. Femoral vein aneurysm
B. Femoral artery aneurysm
C. Indirect inguinal hernia
D. Direct inguinal hernia
E. Femoral hernia

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A. Femoral vein aneurysm (1%)
✓ B. Femoral artery aneurysm (82%)
C. Indirect inguinal hernia (5%)
D. Direct inguinal hernia (4%)
E. Femoral hernia (6%)

Omitted
Correct answer
B

82%
Answered correctly

03 secs
Time Spent

04/08/2020
Last Updated

Explanation

The clinical scenario described is consistent with a femoral artery aneurysm. A pulsatile groin mass below the inguinal ligament is characteristic; anterior thigh pain is due to the compression of the femoral nerve that runs lateral to the artery. Femoral artery aneurysm is the second most common peripheral artery aneurysm after popliteal aneurysm. It may be associated with an abdominal aortic aneurysm.

(Choice E) Femoral hernias are located below the inguinal ligament, but are not pulsatile.

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E. Femoral hernia (0%)

Omitted
Correct answer
B

82%
Answered correctly

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Time Spent

04/08/2020
Last Updated

Explanation

The clinical scenario described is consistent with a femoral artery aneurysm. A pulsatile groin mass below the inguinal ligament is characteristic; anterior thigh pain is due to the compression of the femoral nerve that runs lateral to the artery. Femoral artery aneurysm is the second most common peripheral artery aneurysm after popliteal aneurysm. It may be associated with an abdominal aortic aneurysm.

(Choice E) Femoral hernias are located below the inguinal ligament, but are not pulsatile.

(Choices C and D) Inguinal hernias are located above the inguinal ligament; an indirect hernia may descend into the scrotum.

(Choice A) Femoral vein dilatation usually results from AV fistula (typically traumatic); venous hypertension usually results.

Educational Objective:
Peripheral artery aneurysm manifests as a pulsatile mass that can compress adjacent structures (nerves, veins), and can result in thrombosis and ischemia. Popliteal and femoral artery aneurysms are the most common peripheral artery aneurysms. They are frequently associated with abdominal aortic aneurysms.

Surgery	Cardiovascular System	Peripheral artery aneurysms
Subject	System	Topic

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A 34-year-old man is brought to the emergency department after being involved in a motor vehicle collision. He was a restrained driver and used his arm to brace the impact. The patient has severe pain in his right arm. Vital signs are within normal limits. Examination shows a deformed right upper arm that appears shorter than the left. The midportion of the right arm is swollen and tender. He has limited extension at the wrist joint and decreased sensation over the dorsoradial aspect of the right hand. Radial pulse is 1+ on the right and 2+ on the left. An x-ray of the arm shows an oblique fracture of the midshaft of the right humerus. Which of the following is the best next step in management of this patient?

A. Application of a neutral wrist splint only
B. Electromyogram of the right upper extremity
C. Long arm hanging cast of the right upper extremity
D. Open reduction and surgical exploration
E. Placement of an external fixation device

Submit

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A. Application of a neutral wrist splint only (0%)
B. Electromyogram of the right upper extremity (3%)
C. Long arm hanging cast of the right upper extremity (5%)
✓ D. Open reduction and surgical exploration (84%)
E. Placement of an external fixation device (5%)

Omitted
Correct answer
D

84%
Answered correctly

02 secs
Time Spent

04/12/2020
Last Updated

Explanation

This patient with arm pain, deformity, and swelling and evidence of radial nerve injury (eg, limited extension at wrist joint) has a **midshaft humeral fracture**, confirmed by x-ray. Fractures of the humeral shaft are generally seen following a direct blow to the arm, a fall, an automobile injury, or a crushing injury. The **radial nerve** is commonly stretched in such fractures, leading to limited wrist extension and associated sensory deficits, as seen in this patient; however, most cases represent **neurapraxia** that resolves after management of the fracture.

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Explanation

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Although most cases of isolated diaphyseal (midshaft) humeral fracture can be treated **nonsurgically** (eg, closed reduction followed by arm immobilization with a coaptation or sugar-tong splint), **open reduction and surgical exploration** are indicated with open fractures, significant **displacement** (eg, arm shortening, as in this patient), **neurovascular compromise** (eg, asymmetric radial pulses, as in this patient), polytrauma, and pathologic fractures.

(Choices A and C) A neutral wrist splint alone might help this patient's radial nerve symptoms but would not provide definitive management of the fracture. A long arm hanging cast (with the cast hung from the neck and the elbow flexed at 90 degrees) can be used in some cases of midshaft humeral fracture, but this patient's neurovascular compromise is an indication for open reduction and surgical exploration.

(Choice B) Although an electromyogram (EMG) can evaluate nerve injuries, radial nerve neurapraxia due to midshaft humeral fracture resolves in up to 90% of cases, including with nonsurgical management. EMG can be considered if radial nerve function does not recover following surgery.

(Choice E) External fixation (eg, with external pins) is used in cases of polytrauma; severe, comminuted open fractures with defects in skin, bone, or soft tissue; and some burn-related injuries.

Educational objective:
Midshaft humeral fractures occur due to direct blows to the arm and can cause pain, swelling, deformity, and shortening. Associated radial nerve neurapraxia is common and often resolves with appropriate management of the fracture. Many midshaft humeral fractures can be treated nonsurgically. Indications for open reduction and surgical exploration include open fractures, neurovascular compromise, and significant displacement.

Surgery Rheumatology/Orthopedics & Sports Upper extremity long bone fracture

crushing injury. The **radial nerve** is commonly stretched in such fractures, leading to limited wrist extension and associated sensory deficits, as seen in this patient; however, most cases represent **neurapraxia** that resolves after management of the fracture.

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Educational objective:
Midshaft humeral fractures occur due to direct blows to the arm and can cause pain, swelling, deformity, and shortening. Associated radial nerve neurapraxia is common and often resolves with appropriate management of the fracture. Many midshaft humeral fractures can be treated nonsurgically. Indications for open reduction and surgical exploration include open fractures, neurovascular compromise, and significant displacement.

Surgery	Rheumatology/Orthopedics & Sports	Upper extremity long bone fracture
Subject	System	Topic

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Item 25 of 40
Question Id: 3420

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A 48-year-old man is brought to the emergency department after being stabbed once in the abdomen during a robbery. The patient sustained no other injuries. Blood pressure is 114/68 mm Hg and pulse is 118/min. Bilateral breath sounds are clear and equal. Heart sounds are normal without murmur. Abdominal examination shows a nonbleeding puncture wound to the left upper quadrant measuring approximately 2.5×1 cm. The abdomen is rigid and diffusely tender. Rectal examination reveals no blood. Resuscitation with intravenous crystalloid is ongoing. Which of the following is the best next step in management of this patient?

A. CT scan of the abdomen with intravenous contrast
B. Diagnostic peritoneal lavage
C. Exploratory laparotomy
D. Local wound exploration
E. Observation with serial abdominal examinations

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Item 25 of 40
Question Id: 3420

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

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A. CT scan of the abdomen with intravenous contrast (22%)
B. Diagnostic peritoneal lavage (3%)
✓ C. Exploratory laparotomy (63%)
D. Local wound exploration (8%)
E. Observation with serial abdominal examinations (2%)

Omitted
Correct answer
C

63%
Answered correctly

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03/04/2020
Last Updated

Explanation

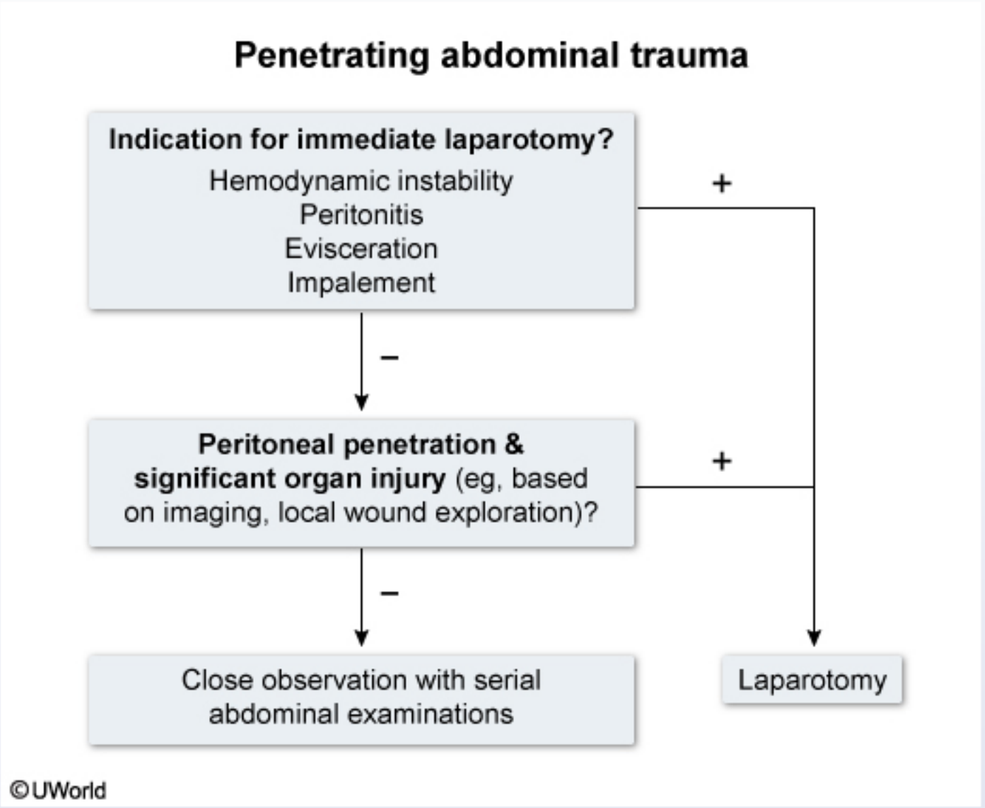
Penetrating abdominal trauma

Indication for immediate laparotomy?
Hemodynamic instability

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This patient has **penetrating abdominal trauma (PAT)** (ie, stab wound) to the left upper quadrant with possible injury to underlying organs (eg, stomach, small bowel, spleen). In addition to tachycardia (ie, possible early hemorrhagic shock), the patient has **peritonitis** (rigidity, diffuse tenderness). This presentation is highly concerning for intraabdominal injury with ongoing hemorrhage and warrants immediate **exploratory laparotomy**.

For patients with PAT, any of the following is an indication for immediate exploratory laparotomy:

- Evidence of ongoing hemorrhage: hemodynamic instability (systolic blood pressure <90 mm Hg) or frank blood in the nasogastric tube or rectum

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For patients with PAT, any of the following is an indication for immediate exploratory laparotomy:

- Evidence of ongoing hemorrhage: hemodynamic instability (systolic blood pressure <90 mm Hg) or frank blood in the nasogastric tube or rectum
- Peritonitis (eg, rigidity, rebound tenderness)
- Evisceration (ie, externally exposed intestines)
- Impalement (ie, penetrating object still in situ)

In contrast, patients without an indication for immediate laparotomy should undergo further evaluation to determine whether peritoneal penetration occurred (eg, CT scan **[Choice A]**, local wound exploration for anterior stab wounds) and/or whether intraabdominal injuries are present (eg, Focused Assessment with Sonography for Trauma, CT scan). The presence of either typically warrants surgical exploration.

(Choice B) Diagnostic peritoneal lavage is not commonly performed, but it can help rule out intraabdominal injuries in patients with PAT who have no indication (eg, peritonitis) for immediate laparotomy.

(Choice D) In patients with isolated anterior stab wounds, an experienced surgeon may perform local wound exploration under local anesthetic to look for violation of the peritoneum (eg, visualization of intraabdominal contents), which usually prompts definitive surgical exploration. However, this patient's peritonitis implies peritoneal penetration with intraabdominal injury and warrants immediate surgical intervention.

(Choice E) In some patients, a stab wound may violate the peritoneum but miss important intraabdominal organs. When this is suspected (eg, small wound with otherwise benign abdominal examination, normal vital signs, nonconcerning imaging), serial abdominal examinations may be performed to rule out progression of an occult injury. In contrast, this patient has peritonitis and requires immediate surgical intervention.

Educational objective:
Patients with penetrating abdominal trauma and hemodynamic instability, peritonitis, evisceration, or impalement should undergo immediate exploratory laparotomy.

- Evidence of ongoing hemorrhage: hemodynamic instability (systolic blood pressure <90 mm Hg) or frank blood in the nasogastric tube or rectum
- Peritonitis (eg, rigidity, rebound tenderness)
- Evisceration (ie, externally exposed intestines)
- Impalement (ie, penetrating object still in situ)

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Educational objective:
Patients with penetrating abdominal trauma and hemodynamic instability, peritonitis, evisceration, or impalement should undergo immediate exploratory laparotomy.

References

- Evaluation and management of abdominal stab wounds: a Western Trauma Association critical decisions algorithm.

Surgery	General Principles	Penetrating abdominal trauma
Subject	System	Topic

A 28-year-old woman develops tachycardia in the postoperative recovery room. She was admitted for a right femur fracture following a motor vehicle collision and had an open reduction and internal fixation of the fracture. While in the recovery area, she began experiencing nausea and vomiting, and became anxious and agitated. The patient has no known medical problems. She drinks 1 or 2 glasses of wine on weekends. Her temperature is 39.4 C (103 F), blood pressure is 160/90 mm Hg, pulse is 148/min, and respirations are 24/min. Pulse oximetry shows 98% on room air. On examination, the patient is delirious and has fine tremor. Mild lid lag is present. She has no muscle rigidity and deep-tendon reflexes are 2+ in the bilateral extremities. Laboratory results are as follows:

Hematocrit	30%
Sodium	135 mEq/L
Potassium	4.5 mEq/L
Bicarbonate	24 mEq/L
Blood urea nitrogen	32 mg/dL
Creatinine	1.2 mg/dL
Glucose	120 mg/dL
Creatine kinase, serum	176 U/L

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

A. Echocardiogram
B. Fluid bolus and intravenous dexamethasone
C. Intravenous dantrolene
D. Intravenous lorazepam

Hematocrit	30%
Sodium	135 mEq/L
Potassium	4.5 mEq/L
Bicarbonate	24 mEq/L
Blood urea nitrogen	32 mg/dL
Creatinine	1.2 mg/dL
Glucose	120 mg/dL
Creatine kinase, serum	176 U/L

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

A. Echocardiogram
B. Fluid bolus and intravenous dexamethasone
C. Intravenous dantrolene
D. Intravenous lorazepam
E. Plasma free metanephrines
F. Thyroid function tests and propranolol

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Hematocrit	30%
Sodium	135 mEq/L
Potassium	4.5 mEq/L
Bicarbonate	24 mEq/L
Blood urea nitrogen	32 mg/dL
Creatinine	1.2 mg/dL
Glucose	120 mg/dL
Creatine kinase, serum	176 U/L

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

A. Echocardiogram (1%)
B. Fluid bolus and intravenous dexamethasone (11%)
C. Intravenous dantrolene (35%)
D. Intravenous lorazepam (9%)
E. Plasma free metanephrines (1%)
✓ F. Thyroid function tests and propranolol (39%)

Omitted
Correct answer

39%
Answered correctly

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Clinical features of thyroid storm

Precipitating factors	• Thyroid or non-thyroid surgery • Acute illness (eg, trauma, infection), childbirth • Acute iodine load (eg, iodine contrast)
Clinical presentation	• Fever as high as 40-41.1 C (104-106 F) • Tachycardia, hypertension, congestive heart failure, cardiac arrhythmias (eg, atrial fibrillation) • Agitation, delirium, seizure, coma • Goiter, lid lag, tremor, warm & moist skin • Nausea, vomiting, diarrhea, jaundice
Treatment	• Beta blocker (eg, propranolol) to ↓ adrenergic manifestations • PTU followed by iodine solution (SSKI) to ↓ hormone synthesis & release • Glucocorticoids (eg, hydrocortisone) to ↓ peripheral T4 to T3 conversion & improve vasomotor stability • Identify trigger & treat, supportive care

PTU = propylthiouracil; **SSKI** = potassium iodide.

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This patient's presentation is concerning for **thyroid storm**, a life-threatening thyrotoxicosis usually triggered by a specific event (eg, thyroid or non-thyroid surgery, trauma, infection) in patients with undiagnosed or inadequately treated hyperthyroidism. Proposed mechanisms include a rapid increase in serum thyroid hormone levels or increased sensitivity to thyroid hormone. Characteristic features include tachycardia, hypertension, cardiac arrhythmias (eg, atrial fibrillation), and fever up to 40-41 C (104-106 F). Other findings include anxiety, altered mentation, seizure, severe nausea, vomiting, hepatic dysfunction, tremor, lid lag, and goiter.

Diagnosis is suspected clinically and confirmed by thyroid function studies documenting hyperthyroidism. Treatment includes beta blockers (eg, propranolol) for symptom control, thionamides (eg, propylthiouracil) to block new hormone synthesis, iodine solution to block thyroid hormone release (given at least an hour after propylthiouracil to prevent excess iodine incorporation into thyroid hormone), and glucocorticoids to decrease peripheral conversion of T4 to T3 (and treat a potential relative adrenal insufficiency).

(Choice A) Echocardiography can identify causes of congestive heart failure or arrhythmias (eg, abnormal valves, ventricular dysfunction). However, this patient has no features of heart failure, and echocardiography is not needed.

(Choice B) Fluid resuscitation and intravenous dexamethasone should be given to patients with suspected acute adrenal insufficiency. These patients will have hypotension often associated with tachycardia, abdominal pain, vomiting, and weakness.

(Choice C) Intravenous dantrolene can treat malignant hyperthermia (MH), a hypermetabolic syndrome due to volatile anesthetics leading to sustained muscle contraction and breakdown. MH typically presents with hypercarbia, sinus tachycardia, muscle rigidity, significantly elevated creatine kinase (can reach >10,000-20,000 U/L), hyperkalemia (due to muscle breakdown), and hyperthermia. In this patient, the presence of lid lag, the absence of muscle rigidity, and the normokalemia are more consistent with thyroid storm than MH. Her moderate creatine kinase elevation likely reflects muscle injury related to trauma or surgery.

(Choice D) Intravenous lorazepam can treat alcohol withdrawal, which usually presents with tachycardia, hypertension, and altered mental status. Fever is atypical with early withdrawal but can occur with delirium tremens, which develops 72-96 hours after the last drink. This patient's history of moderate alcohol use makes withdrawal less likely, and alcohol withdrawal would not explain her lid lag.

(Choice E) Free plasma metanephrines are elevated in pheochromocytoma, which usually presents with episodic hypertension and the classic triad (episodic headache, diaphoresis, and tachycardia). Pheochromocytoma is usually not associated with high fever.

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Exhibit Display

Acute adrenal insufficiency (adrenal crisis)	
Risk factors	Adrenal hemorrhage/infarction Acute illness, injury, or surgery in patients with: • Chronic adrenal insufficiency • Chronic glucocorticoid use • Congenital adrenal hyperplasia
Clinical features	• **Hypotension/shock** • Nausea/vomiting, abdominal pain • Weakness • Fever • Acute kidney injury
Diagnostic testing	• Cortisol • Electrolytes, BUN, creatinine, glucose • ACTH • Renin • ACTH stimulation test when stable
Treatment	• **Hydrocortisone or dexamethasone** • High-flow intravenous fluids • Monitor serum electrolytes

BUN = blood urea nitrogen.

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(Choice A) Echocardiography can identify causes of congestive heart failure or arrhythmias (eg, abnormal valves, ventricular dysfunction). However, this patient has no features of heart failure, and echocardiography is not needed.

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(Choice E) Free plasma metanephrines are elevated in pheochromocytoma, which usually presents with episodic hypertension and the classic triad (episodic headache, diaphoresis, and tachycardia). Pheochromocytoma is usually not associated with high fever.

Educational objective:
Thyroid storm is a life-threatening thyrotoxicosis often triggered by thyroid or non-thyroid surgery, trauma, infection, iodine contrast, or childbirth. It is characterized by tachycardia, hypertension, cardiac arrhythmias, high fever, tremor, altered mentation, and lid lag.

References

- Thyroid storm: an updated review.

Surgery	Endocrine, Diabetes & Metabolism	Hyperthyroidism
Subject	System	Topic

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Item 27 of 40
Question Id: 14484

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A 35-year-old woman is brought to the emergency department after being caught in a house fire. She has no chronic medical conditions and no known allergies. Temperature is 35 C (95 F), blood pressure is 80/58 mm Hg, pulse is 156/min, and respirations are 35/min. Oxygen saturation is 67% on room air. The patient is disoriented. Black soot is seen in the nose and mouth. At least 50% of the body has burns, and there are full-thickness burns on the arms and legs. Intravenous access is obtained, and the patient is intubated and sedated due to signs of smoke inhalation and severe injuries. The wounds are cleaned, and topical antibiotics are placed over the burns. Which of the following is the most appropriate fluid management for this patient during the next 24 hours?

A. Dextrose 5% in water
B. Fresh frozen plasma
C. Half-normal saline
D. Lactated Ringer solution
E. Normal saline

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A. Dextrose 5% in water (4%)
B. Fresh frozen plasma (1%)
C. Half-normal saline (2%)
✓ D. Lactated Ringer solution (55%)
E. Normal saline (36%)

Omitted
Correct answer
D

55%
Answered correctly

02 secs
Time Spent

04/25/2020
Last Updated

Explanation

Intravenous fluids		
Tonicity	**Fluid type**	**Clinical use**

Intravenous fluids		
Tonicity	**Fluid type**	**Clinical use**
Isotonic	0.9% (normal) saline	Volume resuscitation (eg, hypovolemia, shock)
	Lactated Ringer solution	
	Albumin (5% or 25%)*	Volume replacement, treatment of SBP or HRS
Hypotonic	Dextrose 5% in water**	Free water deficit
	0.45% (half-normal) saline	
	Dextrose 5% in 0.45% (half-normal) saline**	Maintenance hydration
Hypertonic	3% (hypertonic) saline	Severe, symptomatic hyponatremia

HRS = hepatorenal syndrome; **SBP** = spontaneous bacterial peritonitis.

*Colloid solution; all other listed fluid types are crystalloid solutions.

**Dextrose 5% in water (initially slightly hypotonic) & dextrose 5% in 0.45% saline (initially hypertonic) become markedly hypotonic due to metabolism of glucose.

Severe **burn injuries** often result in rapid development of intravascular volume depletion and shock due to both insensible fluid loss (due to decreased skin integrity) and massive fluid shift into the extravascular space (due to increased vascular permeability). Patients with extensive burns require **aggressive fluid resuscitation** to maintain tissue perfusion and reduce mortality. This is accomplished with the infusion of an **isotonic crystalloid** solution (eg, normal saline, **lactated Ringer solution** [LR]), which have similar osmolality to the blood (~288 mOsm/kg H_2O).

Although these agents are equally effective at plasma volume expansion, LR, a **balanced fluid**, is preferred for resuscitation in burn victims. It contains near-physiologic levels of chloride, potassium, and calcium and includes sodium lactate, a buffer that is hepatically metabolized to

glucose.

Severe **burn injuries** often result in rapid development of intravascular volume depletion and shock due to both insensible fluid loss (due to decreased skin integrity) and massive fluid shift into the extravascular space (due to increased vascular permeability). Patients with extensive burns require **aggressive fluid resuscitation** to maintain tissue perfusion and reduce mortality. This is accomplished with the infusion of an **isotonic crystalloid** solution (eg, normal saline, **lactated Ringer solution** [LR]), which have similar osmolality to the blood (~288 mOsm/kg H_2O).

Although these agents are equally effective at plasma volume expansion, LR, a **balanced fluid**, is preferred for resuscitation in burn victims. It contains near-physiologic levels of chloride, potassium, and calcium and includes sodium lactate, a buffer that is hepatically metabolized to bicarbonate, which helps correct acidosis and **maintain normal blood pH**. Normal saline is considered an **unbalanced** fluid because its chloride concentration is supraphysiologic (154 vs 103 mmol/L) and can cause a **hyperchloremic metabolic acidosis**. It has also been associated with hypocoagulability **(Choice E)**.

(Choices A and C) Dextrose 5% in water is initially a slightly hypotonic crystalloid solution that quickly becomes markedly hypotonic with the metabolism of dextrose; it is administered to patients with a free-water deficit (ie, hypernatremia). Half-normal saline is a hypotonic crystalloid that is also useful in treating hypernatremia. It is also used as a maintenance fluid in those unable to maintain adequate oral hydration and may be used after this patient has been adequately resuscitated. However, these solutions must be infused slowly because the low osmolality causes much of the fluid volume to shift into the intracellular space following infusion, which can result in cerebral edema.

(Choice B) Fresh frozen plasma is a colloid solution that is indicated for replacement of coagulation factors (eg, diffuse intravascular coagulation, major bleeding on warfarin, massive transfusions). Colloids are less effective and more expensive than crystalloid solutions and not indicated for resuscitation for severe burns.

Educational objective:
Burn victims frequently develop intravascular volume depletion and require aggressive resuscitation with crystalloid solutions. Lactated Ringer solution, a balanced fluid, is preferred because it contains near-physiologic levels of electrolytes and includes a buffer that helps correct acidosis and maintain normal blood pH. Normal saline is associated with the development of hyperchloremic metabolic acidosis.

Surgery	General Principles	Thermal burn
Subject	System	Topic

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Question Id: 2853

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A 60-year-old woman comes to the emergency department due to decreasing vision and a dull ache over her left eye for the past 12 hours. She had a successful surgical cataract extraction in her left eye 5 days ago. Temperature is 38.1 C (100.6 F), blood pressure is 140/90 mm Hg, pulse is 92/min, and respirations are 14/min. Examination of the left eye reveals a swollen eyelid, edematous conjunctiva, and exudates in the anterior chamber. Testing with Snellen's chart demonstrates decreased visual acuity in her left eye. What is the most likely diagnosis?

A. Conjunctivitis
B. Corneal ulceration
C. Uveitis
D. Postoperative endophthalmitis
E. Cavernous sinus thrombosis

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A. Conjunctivitis (6%)
B. Corneal ulceration (2%)
C. Uveitis (19%)
✓ D. Postoperative endophthalmitis (68%)
E. Cavernous sinus thrombosis (2%)

Omitted
Correct answer
D

68%
Answered correctly

02 secs
Time Spent

02/03/2020
Last Updated

Explanation

Postoperative endophthalmitis is the most common form of endophthalmitis. It usually occurs within 6 weeks of surgery. Endophthalmitis refers to a **bacterial or fungal** infection within the eye, particularly the vitreous. Patients usually present with pain and decreased visual acuity. Examination reveals swollen eyelids and conjunctiva, hypopyon, corneal edema and infection. The vitreous can be sent for Gram stain and culture. Based on the severity, intravitreal antibiotic injection or vitrectomy is done.

(Choice A) Conjunctivitis presents with excessive tearing, burning sensation, mild pain, conjunctival, and eyelid edema. Vision is not affected.

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Explanation

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(Choice A) Conjunctivitis presents with excessive tearing, burning sensation, mild pain, conjunctival, and eyelid edema. Vision is not affected.

(Choice B) Corneal ulceration presents as a foreign body sensation, blurred vision, photophobia, and pain. A history of contact lens use, recent trauma, or ocular disease may be present. The eye is erythematous, and ciliary injection is present. Purulent exudates are seen in the conjunctival sac and on the ulcer surface.

(Choice C) Uveitis (ie, viral or parasitic infection within the eye) presents as blurred vision with moderate pain, conjunctival injection, and constricted pupils. Hypopyon (cell layering within the anterior chamber) is seen in severe anterior uveitis. Keratic precipitates ("mutton fat") and iris nodules may be seen. It is associated with HLA B27-related conditions.

(Choice E) Cavernous sinus thrombosis is characterized by proptosis, ophthalmoplegia, chemosis, and visual loss. It occurs due to hematogenous spread from an infected, inflamed sinus.

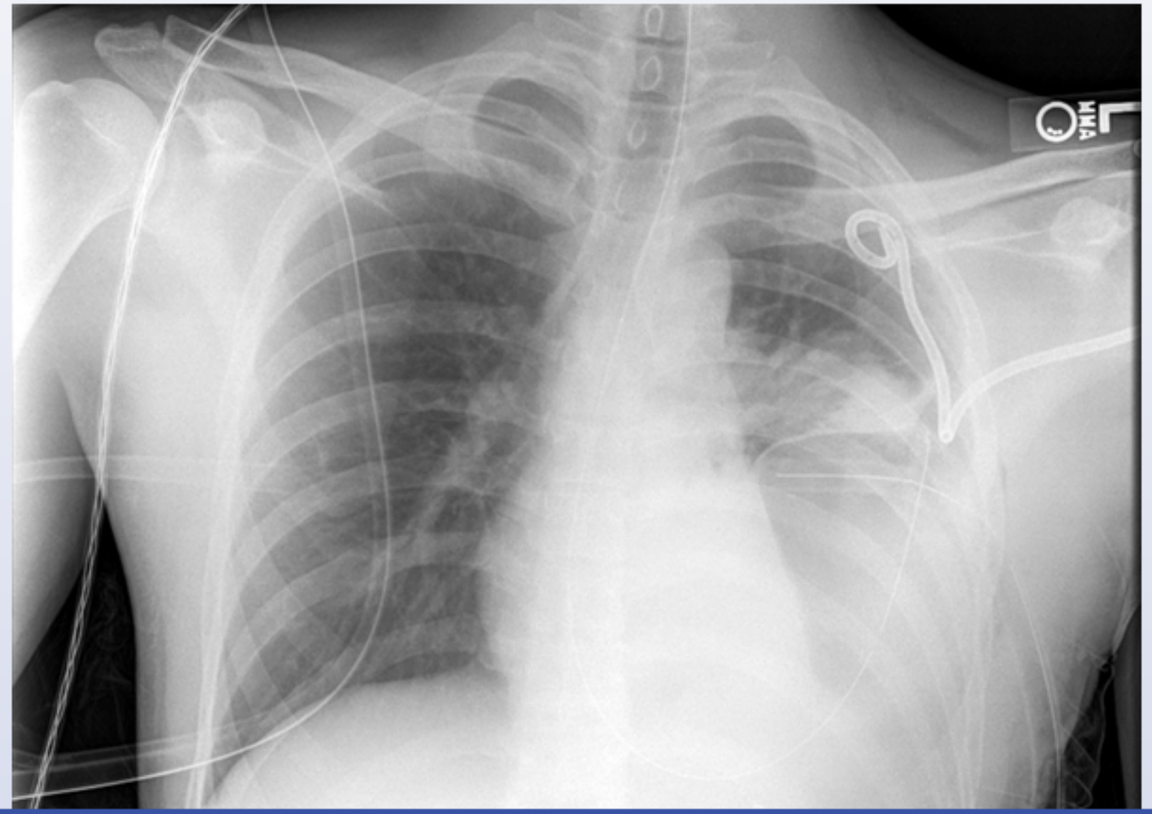
Educational objective:
Postoperative endophthalmitis is the most common form of endophthalmitis. It usually occurs within 6 weeks of surgery. Patients usually present with pain and decreased visual acuity. Examination reveals swollen eyelids and conjunctiva, hypopyon, corneal edema and infection.

Surgery	Ophthalmology	Endopthalmitis
Subject	System	Topic

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A 27-year-old man is brought to the emergency department after a high-speed motor vehicle collision. On arrival, his blood pressure is 90/52 mm Hg, pulse is 122/min, and respirations are 30/min. The patient is in moderate respiratory distress. There are bruises on the anterior chest wall and abdomen. No breath sounds are heard in the left lung, and initial chest x-ray shows hemopneumothorax. Fluid resuscitation is given, left-sided chest tubes and a nasogastric tube are placed, and the patient is admitted to the trauma floor after stabilization. Four days later, the chest tubes continue to drain appropriate serosanguinous fluid, but the patient still feels short of breath. He has an occasional dry, nonproductive cough. Current temperature is 36.8 C (98.2 F), blood pressure is 118/78 mm Hg, pulse is 88/min, and respirations are 20/min. A repeat chest x-ray shows the following.

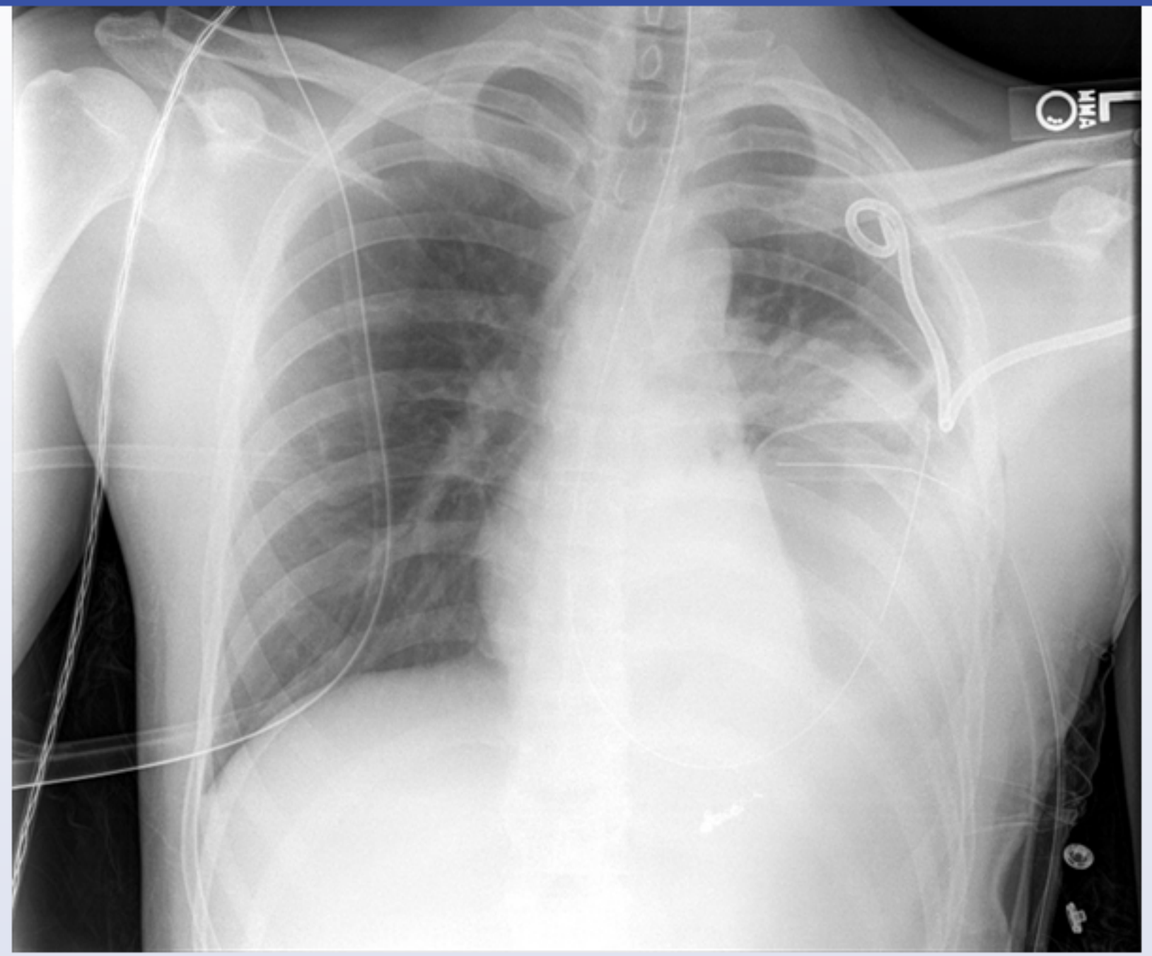


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Which of the following is the most likely cause of the patient's continued respiratory distress?

A. Aortic rupture

B. Diaphragmatic injury

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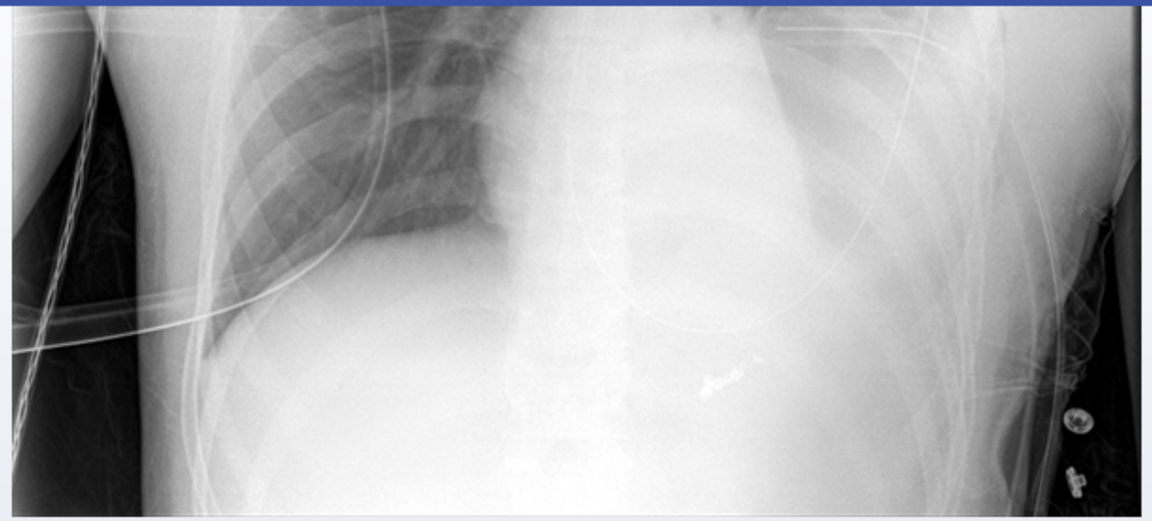
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Question Id: 4229

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Which of the following is the most likely cause of the patient's continued respiratory distress?

A. Aortic rupture
B. Diaphragmatic injury
C. Flail chest
D. Left lower lobe pneumonia
E. Pulmonary embolism
F. Recurrent pneumothorax

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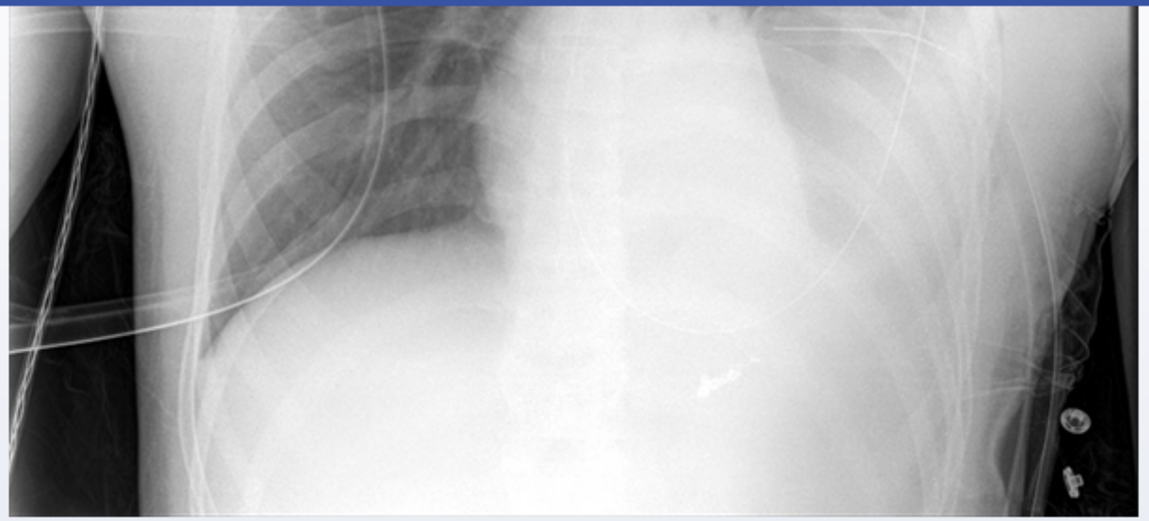
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Which of the following is the most likely cause of the patient's continued respiratory distress?

- A. Aortic rupture (3%)
- ✓ B. Diaphragmatic injury (50%)
- C. Flail chest (7%)
- D. Left lower lobe pneumonia (12%)
- E. Pulmonary embolism (3%)
- F. Recurrent pneumothorax (23%)

Omitted
Correct answer

50%
Answered correctly

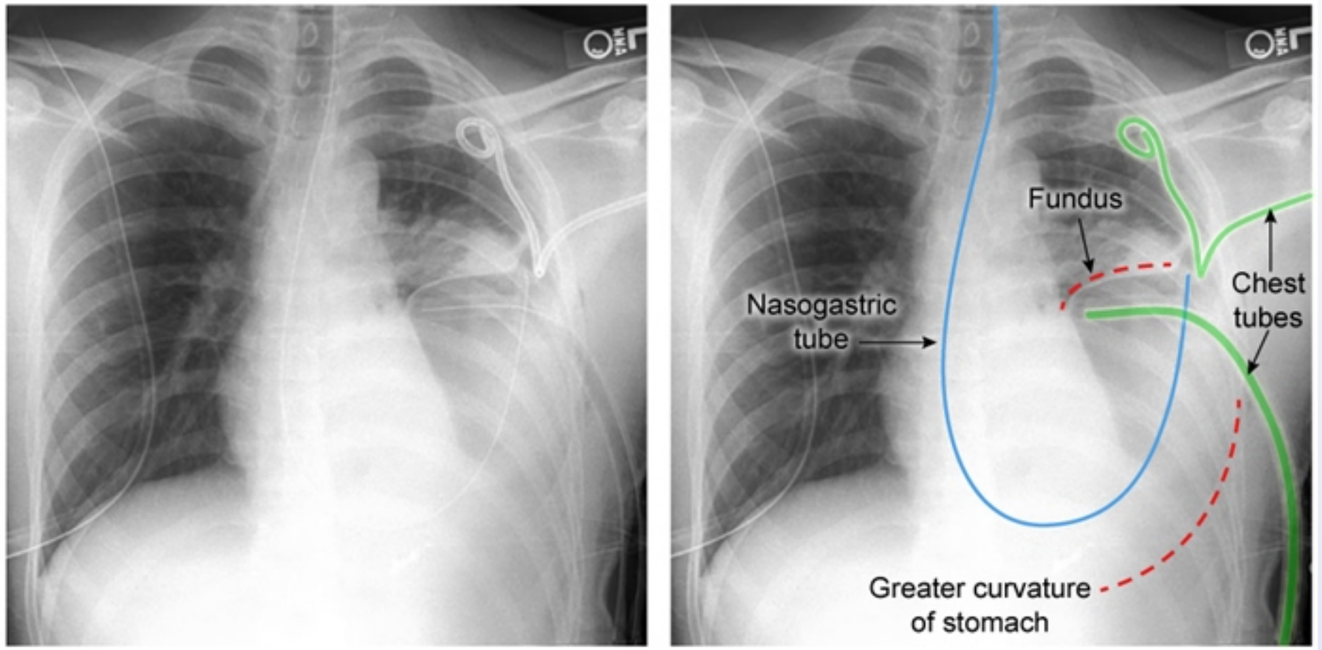
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04/18/2020
Last Updated

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Diaphragmatic hernia



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This patient experienced **blunt thoracoabdominal trauma** (motor vehicle collision, anterior chest wall bruises) resulting in hemopneumothorax that required chest tube placement. He now has continued shortness of breath despite appropriate chest tube drainage. A repeat chest x-ray shows that the chest tubes (shown in green) are in place; however, the nasogastric tube (shown in blue), correctly positioned along the greater curvature of the stomach, is located abnormally in the left hemithorax. This presentation is consistent with **diaphragmatic hernia**.

Blunt thoracoabdominal trauma causes diaphragmatic rupture by a sudden increase in pressure that creates large radial tears or avulsion from side wall attachments. The diaphragmatic defect allows migration of intra-abdominal contents into the chest (ie, diaphragmatic hernia) with resulting symptoms due to lung compression (eg, **respiratory distress**) or bowel obstruction (eg, nausea, vomiting, abdominal pain). Most patients with diaphragmatic rupture require immediate treatment, often with associated injuries. However, some patients with smaller ruptures can

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Diagnosis is made with imaging. Chest x-ray may show abdominal organs within the chest (with or without mediastinal deviation) but is typically nondiagnostic (elevation of the hemidiaphragm may be the only abnormal finding). CT scans of the chest and abdomen are usually required to confirm the diagnosis. Patients require **surgical repair** because diaphragmatic hernia can potentially result in intestinal strangulation and death.

(Choice A) Aortic rupture usually results in instantaneous death. Patients with contained ruptures may rarely survive to have severe chest pain, hypotension, and a widened mediastinum on chest x-ray.

(Choice C) Flail chest, caused by fracture of ≥3 adjacent ribs in ≥2 places, can produce respiratory distress due to the unstable segment moving paradoxically to respiration. Rib fractures are not present on this chest x-ray.

(Choice D) Left lower lobe pneumonia may cause consolidation on chest x-ray but usually includes symptoms of fever and productive cough. This patient's intrathoracic nasogastric tube is more consistent with a diaphragmatic hernia.

(Choice E) Trauma and immobility both increase the risk of deep venous thrombosis in this patient, but pulmonary embolism typically presents with a normal chest x-ray.

(Choice F) Recurrent pneumothorax is unlikely with functioning chest tubes. In addition, a visceral pleural line would be seen on chest x-ray, separated from the parietal pleura by radiolucent gas.

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Educational objective:
Diaphragmatic rupture can have a delayed presentation after blunt thoracoabdominal trauma due to progressive enlargement of the diaphragmatic defect and herniation of abdominal organs into the thoracic cavity. Chest x-ray may show elevation of the hemidiaphragm or abdominal organs (eg, stomach) in the thorax.

References

- Traumatic injuries of the diaphragm: overview of imaging findings and diagnosis.
- Emergency surgery due to diaphragmatic hernia: case series and review.

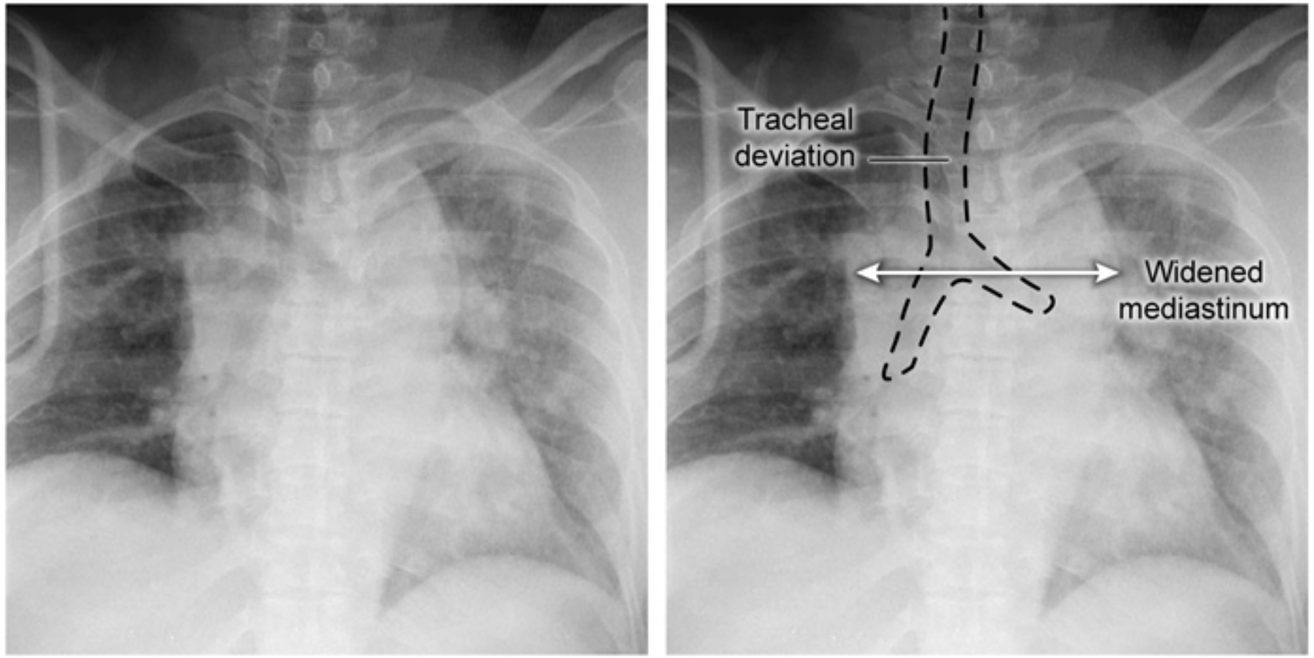
Surgery	Pulmonary & Critical Care	Blunt thoracic trauma
Subject	System	Topic

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nondiagnostic (elevation of the hemidiaphragm may be the only abnormal finding). CT scans of the chest and abdomen are usually required to

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Aortic injury



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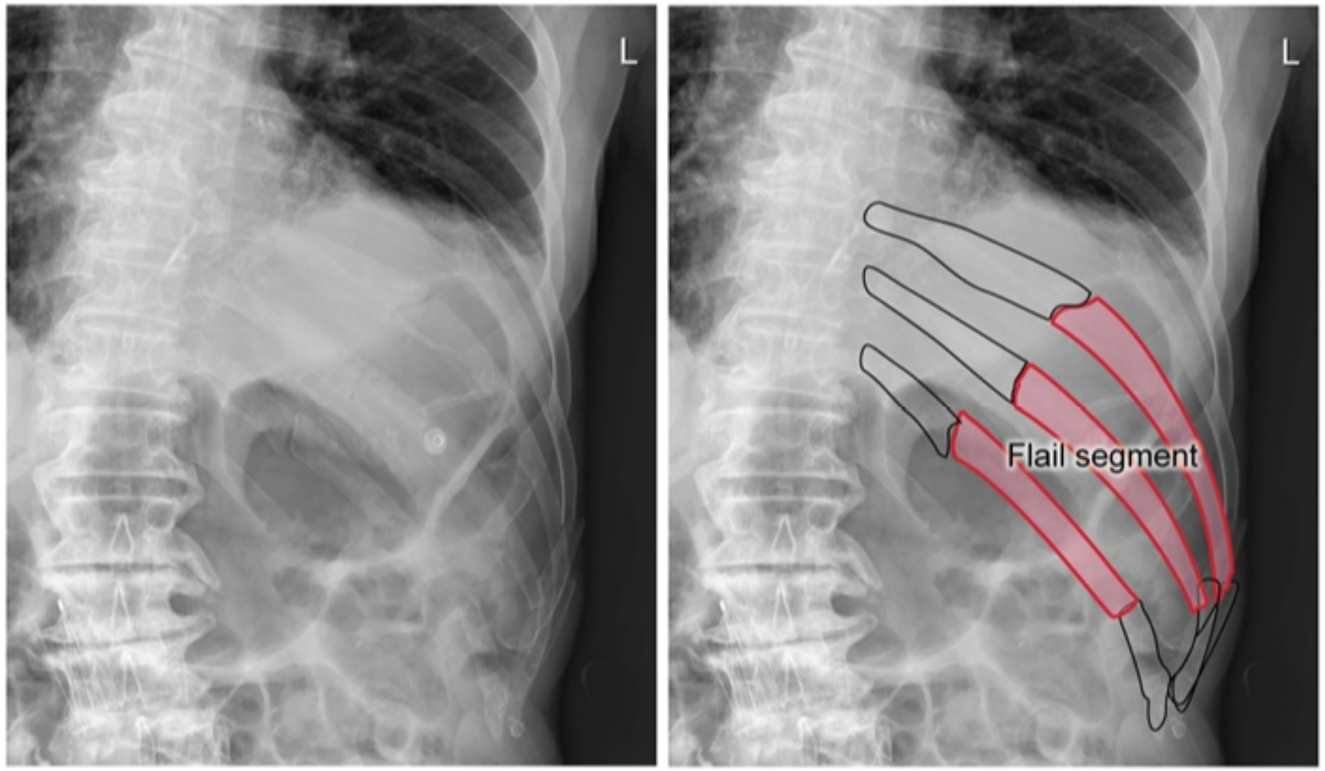
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nondiagnostic (elevation of the hemidiaphragm may be the only abnormal finding). CT scans of the chest and abdomen are usually required to

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Flail chest



≥3 adjacent ribs broken in ≥2 places

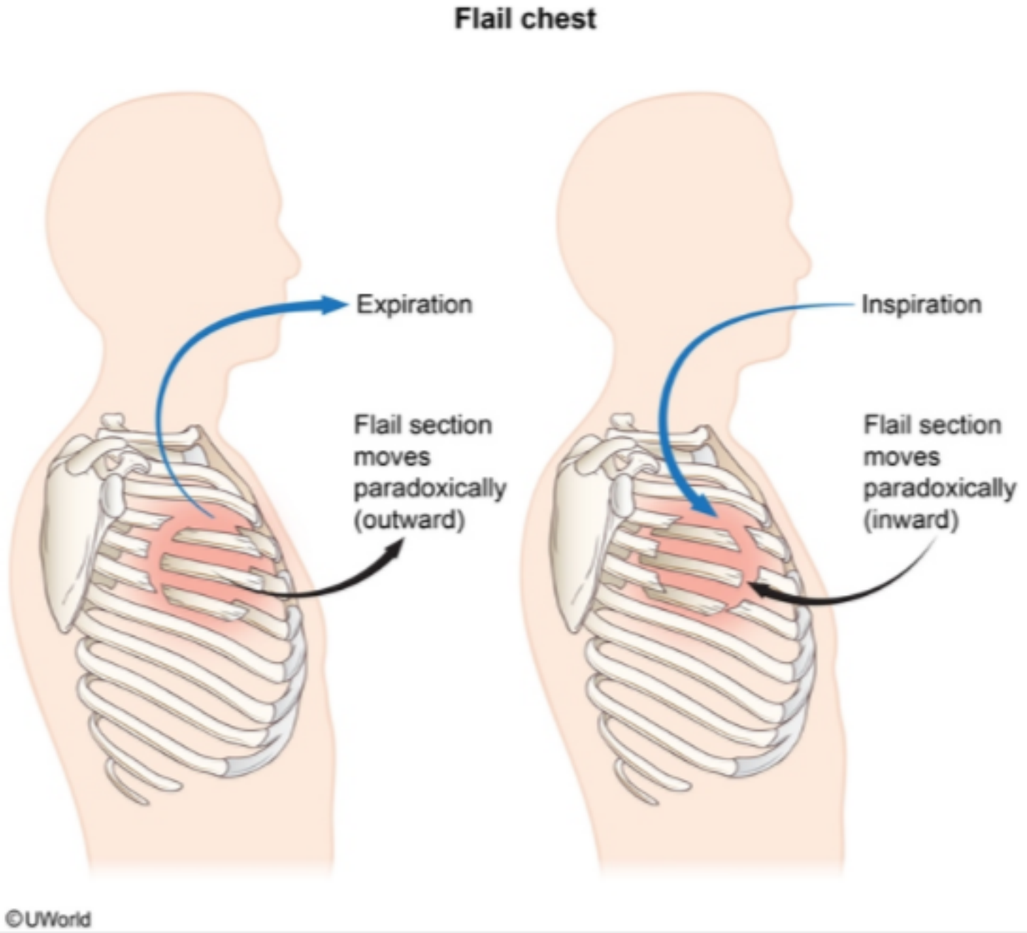
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nondiagnostic (elevation of the hemidiaphragm may be the only abnormal finding). CT scans of the chest and abdomen are usually required to

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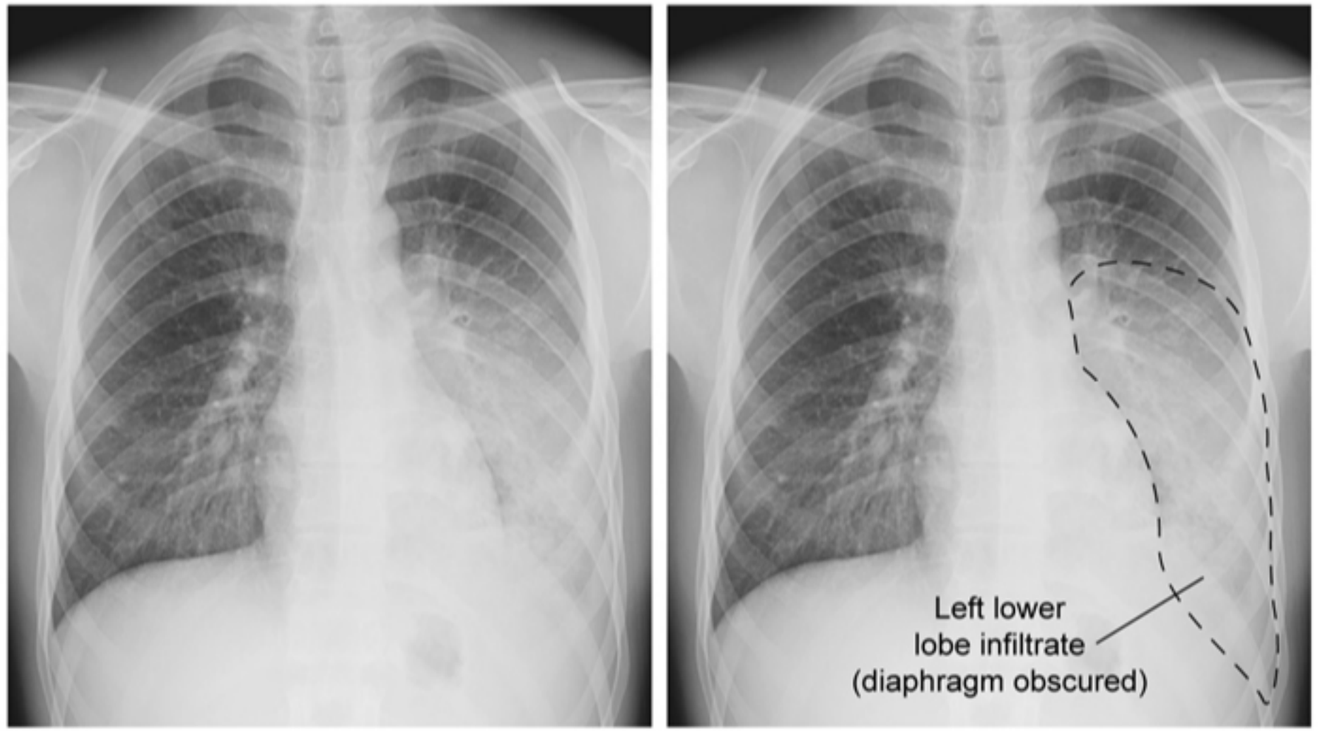
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Left lower lobe pneumonia



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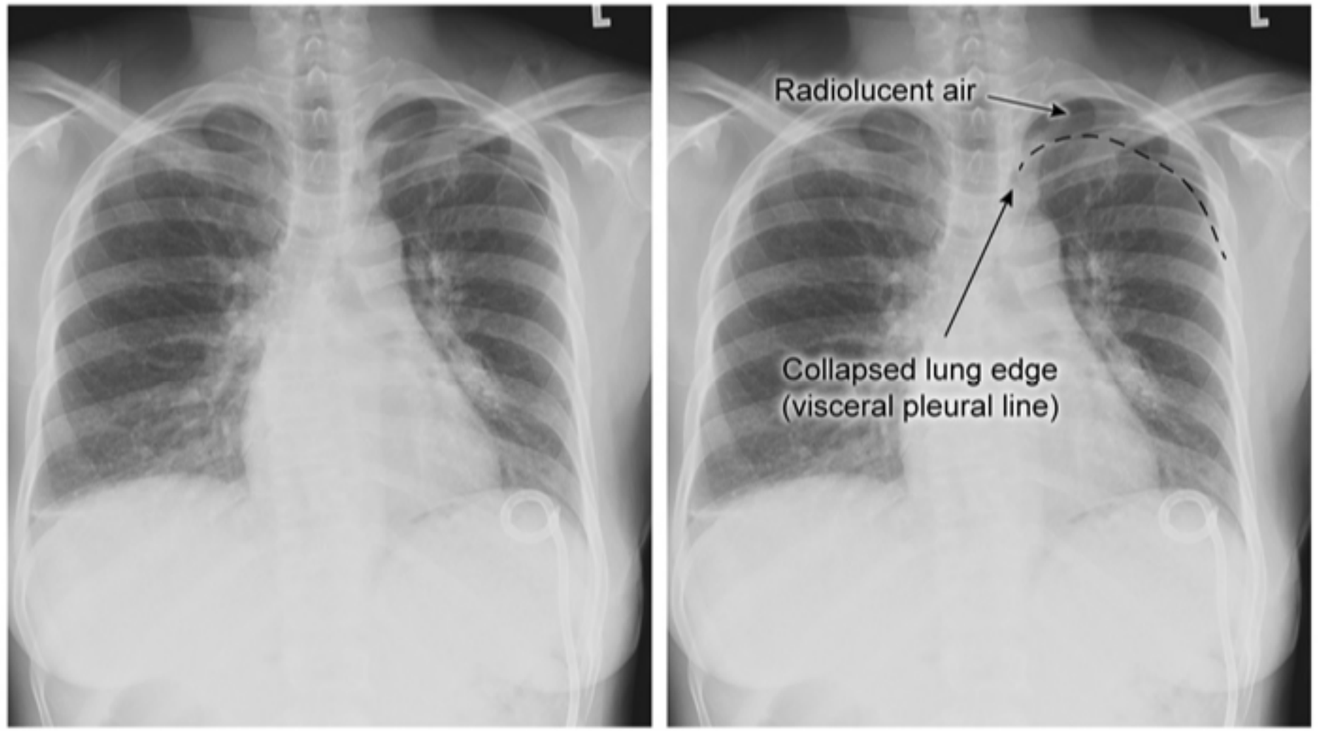
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nondiagnostic (elevation of the hemidiaphragm may be the only abnormal finding). CT scans of the chest and abdomen are usually required to

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Left pneumothorax



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Item 30 of 40
Question Id: 14963

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A 13-year-old boy is brought to the emergency department due to refusal to bear weight on the right leg. He has had vague right knee pain for the last 4 days that is now localized to his proximal thigh. Today, the pain has worsened and he is unable to bear weight. The boy has also had a decreased appetite and high fever for the last 3 days. He has had no recent trauma. The patient has no known medical conditions and has had no surgeries. Weight is >95th percentile, height is at the 25th percentile, and BMI is >95th percentile. Palpation over the anterior femur elicits point tenderness. Bilateral hips have full range of motion. The skin overlying the right proximal femur is slightly swollen and erythematous. The remainder of the examination is normal. Which of the following best describes the pathogenesis of this patient's current condition?

A. Avascular necrosis of the femoral head
B. Decreased mineralization of the femoral metaphysis
C. Displacement of the proximal femoral physis
D. Hematogenous spread of infection to the femoral metaphysis
E. Malignant degeneration of the femoral diaphysis

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A. Avascular necrosis of the femoral head (11%)
B. Decreased mineralization of the femoral metaphysis (1%)
C. Displacement of the proximal femoral physis (34%)
✓ D. Hematogenous spread of infection to the femoral metaphysis (48%)
E. Malignant degeneration of the femoral diaphysis (3%)

Omitted
Correct answer
D

48%
Answered correctly

03 secs
Time Spent

01/16/2020
Last Updated

Explanation

Osteomyelitis in children	
Pathogenesis	• Hematogenous spread

Osteomyelitis in children	
Pathogenesis	• Hematogenous spread • *Staphylococcus aureus* most common cause
Clinical features	• Fever, irritability • Limited function (eg, limp) • Bony tenderness, swelling
Diagnosis	• Elevated ESR, CRP, WBC count • Blood culture • X-ray (often normal), MRI • Definitive: Bone biopsy/culture
Treatment	• Antistaphylococcal antibiotic (eg, vancomycin)
CRP = C-reactive protein; **ESR** = erythrocyte sedimentation rate; **WBC** = white blood cell.	

This patient's fever, leg pain, and refusal to bear weight are concerning for acute **osteomyelitis**. Although trauma (eg, surgery, injury) can sometimes introduce infection to bone, in children osteomyelitis is most commonly caused by **hematogenous spread**. Bacteria (typically *Staphylococcus aureus*) travel through the bloodstream and seed the well-vascularized metaphysis of long bones (eg, femur), resulting in focal bone marrow infection. Inflammation compromises blood flow, allowing the infection to penetrate the bony cortex and cause necrosis.

Signs of bony inflammation include **fever** and pain (which may initially be referred to the knee) as well as swelling, erythema, and **point tenderness** over the affected area. Inflammatory markers are typically elevated and blood culture can help determine the infectious etiology. Radiographs may be normal initially or reveal periosteal elevation (due to subcortical purulence) or cortical thickening. Although inflammation on MRI typically confirms the diagnosis, biopsy and culture of the infected bone is the gold standard for diagnosis. Treatment is with antistaphylococcal antibiotics (eg, vancomycin).

(Choice A) Avascular necrosis of the femoral head, or Legg-Calvé-Perthes disease, presents with chronic hip (or referred knee) pain and a limp.

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(Choice A) Avascular necrosis of the femoral head, or Legg-Calvé-Perthes disease, presents with chronic hip (or referred knee) pain and a limp. Patients are afebrile and have limited range of motion of the hip without soft-tissue swelling on examination.

(Choice B) Decreased mineralization of bone is seen in rickets and can lead to generalized, chronic bone pain and bowing. Patients are at increased risk for fracture, not osteomyelitis.

(Choice C) Displacement of the proximal femoral physis occurs in slipped capital femoral epiphysis, which presents in obese adolescent boys with chronic dull hip (or referred knee) pain and a limp. Patients are afebrile with limited internal rotation of the hip on examination.

(Choice E) Ewing sarcoma is a malignant degeneration of bone commonly found in the femoral diaphysis. Findings include localized pain and swelling; however, symptoms typically present over weeks to months and are often worse at night.

Educational objective:
Pediatric acute osteomyelitis is most commonly caused by hematogenous spread of bacteria to the metaphysis of long bones. Patients have fever, refusal to bear weight, and point tenderness over the affected bone.

References

- Pediatric acute hematogenous osteomyelitis.

sometimes introduce infection to bone; in children osteomyelitis is most commonly caused by **hematogenous spread**. Bacteria (typically *Staphylococcus aureus*) travel through the bloodstream and seed the well-vascularized metaphysis of long bones (eg, femur), resulting in focal bone marrow infection. Inflammation compromises blood flow, allowing the infection to penetrate the bony cortex and cause necrosis.

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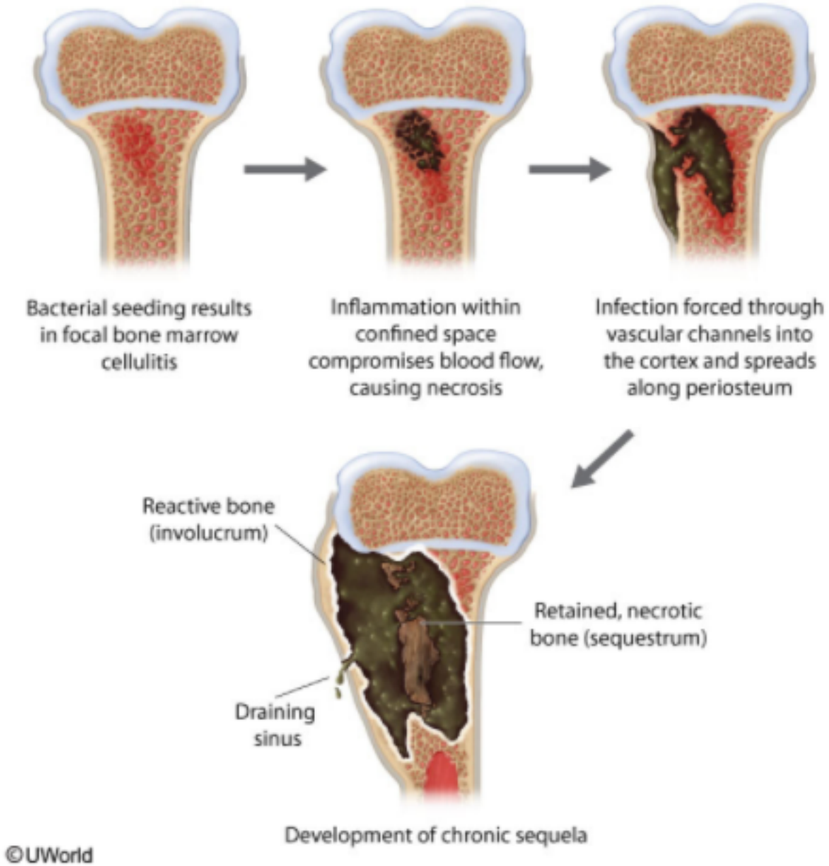
Surgery	Rheumatology/Orthopedics & Sports	Osteomyelitis
Subject	System	Topic

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WBC = white blood cell

Exhibit Display

Progression of hematogenous osteomyelitis



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

- Pediatric acute hematogenous osteomyelitis.

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Item 31 of 40
Question Id: 16772

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A 46-year-old woman comes to the office due to worsening lower extremity tingling and numbness. She has also had difficulty walking, especially at night. Review of systems is positive for hair loss. The patient had gastric bypass surgery 5 years ago and has lost 30 kg (66 lb). She was originally prescribed multivitamin and mineral supplements but now takes only zinc. Physical examination shows gait ataxia with loss of vibration and position sensation in the feet. There is mild lower extremity edema and scattered areas of skin depigmentation. Laboratory studies reveal hypochromic microcytic anemia. Deficiency of which of the following is the most likely cause of this patient's current condition?

A. Copper
B. Thiamine
C. Selenium
D. Folate
E. Vitamin C

Submit

TUTOR

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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

Item 31 of 40
Question Id: 16772

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- ✓ A. Copper (29%)
- B. Thiamine (29%)
- C. Selenium (22%)
- D. Folate (12%)
- E. Vitamin C (6%)

Omitted
Correct answer
A

29%
Answered correctly

02 secs
Time Spent

02/06/2020
Last Updated

Explanation

Clinical manifestations of trace mineral deficiencies	
Chromium	• Impaired glucose control in diabetes
	• Brittle hair

TUTOR

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Clinical manifestations of trace mineral deficiencies	
Chromium	• Impaired glucose control in diabetes
Copper	• Brittle hair • Skin depigmentation • Neurologic dysfunction (eg, ataxia, peripheral neuropathy) • Anemia • Osteoporosis
Iron	• Microcytic anemia
Selenium	• Thyroid dysfunction • Cardiomyopathy • Immune dysfunction
Zinc	• Alopecia • Pustular skin rash (perioral region & extremities) • Hypogonadism • Impaired wound healing • Impaired taste • Immune dysfunction

This woman with distal extremity paresthesia, loss of proprioception and vibration sense, and ataxia has peripheral neuropathy. In association with anemia, skin depigmentation, and edema, this presentation suggests **copper deficiency**. Acquired copper deficiency is most often due to malabsorption from prior gastric surgery (eg, **bariatric surgery**). Other risk factors include chronic malabsorptive syndromes (eg, inflammatory bowel disease, celiac disease) and **excessive ingestion of zinc**, which competes with copper for absorption in the gastrointestinal tract.

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Copper is a required cofactor in many enzymes, including those involved with protein synthesis, cellular division, iron absorption, and normal central nervous system function. Neurologic manifestations are often the presenting symptoms and begin several years after surgery with a slowly progressive myeloneuropathy **similar to subacute combined degeneration** from B12 deficiency (eg, paresthesia, numbness, sensory ataxia). Myelopathic symptoms (eg, spasticity, upper motor neuron signs) occur in advanced disease.

Hematologic abnormalities are also characteristic. **Hypochromic microcytic anemia** occurs from copper deficiency–induced impairment of iron absorption, although macrocytic or normocytic anemia is also common. Leukopenia may occur. Other symptoms include hair fragility, **skin depigmentation**, hepatosplenomegaly, **edema**, and osteoporosis. The diagnosis is confirmed with low serum copper and ceruloplasmin levels; management includes copper supplementation and discontinuation of zinc.

(Choice B) Acute thiamine deficiency can occur after bariatric surgery and results in Wernicke encephalopathy. Although ataxia is common, it typically also causes abrupt onset oculomotor dysfunction and confusion. Korsakoff syndrome is a late manifestation characterized by severe anterograde and retrograde amnesia. Anemia and skin findings are unexpected.

(Choice C) Selenium deficiency causes cardiomyopathy and macrocytosis, as well as immune and thyroid dysfunction. It does not typically cause neuropathy or microcytic anemia.

(Choice D) Folate deficiency typically causes a megaloblastic, macrocytic anemia (mean corpuscular volume >100 μm^3); neurologic dysfunction and skin changes would be unexpected.

(Choice E) Vitamin C deficiency classically causes scurvy, which is characterized by petechiae, perifollicular hemorrhage, gingivitis, bruising, and poor wound healing, none of which is seen in this patient.

Educational objective:
Copper deficiency typically occurs in patients with a history of gastric surgery (eg, bariatric), chronic malabsorption (eg, inflammatory bowel disease), or excessive zinc ingestion. Symptoms include slowly progressive myeloneuropathy similar to that of vitamin B_{12} deficiency (eg, distal

progressive myeloneuropathy **similar to subacute combined degeneration** from B12 deficiency (eg, paresthesia, numbness, sensory ataxia). Myelopathic symptoms (eg, spasticity, upper motor neuron signs) occur in advanced disease.

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Educational objective:
Copper deficiency typically occurs in patients with a history of gastric surgery (eg, bariatric), chronic malabsorption (eg, inflammatory bowel disease), or excessive zinc ingestion. Symptoms include slowly progressive myeloneuropathy similar to that of vitamin B_{12} deficiency (eg, distal extremity paresthesia, numbness, sensory ataxia), anemia, hair fragility, skin depigmentation, hepatosplenomegaly, edema, and osteoporosis.

Surgery	Nervous System	Copper deficiency
Subject	System	Topic

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Item 32 of 40
Question Id: 16017

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A 46-year-old man is brought to the emergency department after a burn injury. The patient is a cook and spilled hot oil on his trunk and legs 30 minutes ago. The patient has no significant medical history. Temperature is 36.2 C (97.2 F), blood pressure is 140/90 mm Hg, pulse is 102/min, and respirations are 20/min. On physical examination, the patient appears distressed and in pain. Partial- to full-thickness burns cover approximately 25% of the body surface area, including the lower abdomen, genitalia, and lower extremities. Intravenous fluids are begun after access is obtained with 2 large-bore peripheral catheters. Which of the following is the best immediate step in management of this patient?

A. Cold application to injured areas
B. Endotracheal intubation
C. Sharp surgical debridement
D. Topical antibiotic application
E. Urethral catheterization

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TUTOR

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- A. Cold application to injured areas (6%)
- B. Endotracheal intubation (12%)
- C. Sharp surgical debridement (8%)
- D. Topical antibiotic application (14%)
- ✓ E. Urethral catheterization (56%)

Omitted
Correct answer
E

56%
Answered correctly

02 secs
Time Spent

03/23/2020
Last Updated

Explanation

The first priorities of burn management are stabilization (eg, airway, breathing, circulation) and resuscitation (eg, intravenous fluids). Extensive burns can rapidly lead to hypovolemic shock due to a large release of proinflammatory mediators that increase vascular permeability and lead to third spacing of fluid. For this reason, patients with **major burns** (ie, >20% total body surface area [TBSA]) receive aggressive **fluid resuscitation**, which is usually begun based on a formula (eg, Parkland formula) and then **titrated** to maintain adequate urine output (goal: ≥0.5 ml/kg/hr), a marker of organ perfusion. For accurate monitoring of **urine output** in these patients, a **urethral catheter** (eg, Foley catheter) is

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In patients who have **genital burns** and other burns covering a large TBSA, a catheter should be placed as soon as possible; delay can lead to **edema that obstructs visualization and catheterization** of the urethra. In addition to facilitating measurement of urine output, the urinary catheter also ensures urinary continence so that urine does not soil burned areas or dressings.

Following urethral catherization, treatment of this patient's burns involves copious irrigation and gentle gauze debridement of affected areas. This is followed by application of topical antimicrobial agents (eg, topical antibiotic) and nonstick dressings **(Choice D)**.

(Choice A) Cool, not cold, saline-soaked gauze is sometimes applied to burned tissues within the first few hours after injury to decrease pain. However, cold application (eg, ice) is discouraged because it can further injure (eg, frostbite) the burned tissues and/or cause systemic hypothermia.

(Choice B) Endotracheal intubation is appropriate for patients with signs of smoke inhalation injury (eg, hoarse voice, singed nasal hair, carbonaceous sputum). Inhalational injury is unlikely in this patient who has none of these signs and who spilled hot oil directly onto his trunk, perineum, and legs.

(Choice C) Sharp surgical debridement and skin grafting will likely be required for this patient's full-thickness burns. However, these surgical procedures are not performed until after approximately 72 hours, when burns have fully demarcated; partial-thickness burns at presentation may progress to become full-thickness over that time.

Educational objective:
After initial stabilization, burn patients who require aggressive fluid resuscitation (eg, due to burns covering a large total body surface area) should undergo urethral catheterization as soon as possible.

References

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Educational objective:
After initial stabilization, burn patients who require aggressive fluid resuscitation (eg, due to burns covering a large total body surface area) should undergo urethral catheterization as soon as possible.

References

- ISBI practice guidelines for burn care
- Management of genital burns: a review.

Surgery	Male Reproductive System	Penile injury
Subject	System	Topic

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A 10-year-old boy is brought to the emergency department after being involved in a motor vehicle collision. Trauma workup is negative for major injuries but significant for bruising and severe pain over the right chest. Chest x-ray is normal. Over the next 6 hours of observation, the patient develops progressive tachycardia and tachypnea with need for supplemental oxygen. Temperature is 36.7 C (98 F), blood pressure is 110/66 mm Hg, pulse is 110/min, and respirations are 24/min. Breath sounds are decreased on the right side. Arterial blood gas results on 6 L of oxygen are as follows:

pH	7.42
PaO_2	60 mm Hg
$PaCO_2$	32 mm Hg

Repeat chest x-ray reveals patchy, irregular alveolar infiltrates of the peripheral right middle and lower lobes. Which of the following is the most likely diagnosis?

A. Acute respiratory distress syndrome
B. Aspiration pneumonia
C. Atelectasis
D. Fat embolism
E. Hemothorax
F. Pneumothorax
G. Pulmonary contusion
H. Pulmonary embolism

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pH	7.42
PaO_2	60 mm Hg
$PaCO_2$	32 mm Hg

Repeat chest x-ray reveals patchy, irregular alveolar infiltrates of the peripheral right middle and lower lobes. Which of the following is the most likely diagnosis?

- A. Acute respiratory distress syndrome (8%)
- B. Aspiration pneumonia (1%)
- C. Atelectasis (5%)
- D. Fat embolism (0%)
- E. Hemothorax (2%)
- F. Pneumothorax (1%)
- ✓ G. Pulmonary contusion (79%)
- H. Pulmonary embolism (1%)

Omitted
Correct answer

79%
Answered correctly

03 secs
Time Spent

01/07/2020
Last Updated

Pulmonary contusion	
Clinical features	• Present **<24 hours** after blunt thoracic trauma • Tachypnea, tachycardia, **hypoxia**
Diagnosis	• Rales or decreased breath sounds • CT scan (most sensitive) or CXR with patchy, alveolar infiltrate **not restricted by anatomical borders**
Management	• Pain control • Pulmonary hygiene (eg, incentive spirometry, chest PT) • Supplemental oxygen & ventilatory support

CXR = chest x-ray; PT = physiotherapy.

This patient with **blunt thoracic trauma** (eg, right chest wall bruising) has progressively worsening tachypnea, hypoxemia, and ipsilateral irregular infiltrates on chest x-ray, concerning for pulmonary contusion. **Pulmonary contusion** represents lung parenchymal bruising (due to transmitted kinetic energy) with resulting **alveolar hemorrhage** and **edema**. It is frequently associated with rib fractures but may occur in their absence, especially in children (whose more elastic chest walls can transmit more kinetic energy without fracturing).

Manifestations of pulmonary contusion include **tachypnea**, **hypoxemia**, and (often) **decreased breath sounds** (due to alveolar infiltrates). Because clinically significant alveolar edema may take hours to accumulate, the initial chest x-ray is often negative. CT scan (more sensitive) or repeat chest x-ray (as in this patient) may be necessary to reveal the **patchy**, **irregular alveolar infiltrates** characteristic of pulmonary contusion. Because these infiltrates reflect alveolar damage in the lung tissue adjacent to the injury site (eg, right peripheral lung in this patient), they are typically **nonlobular** (not restricted by anatomic landmarks). Management is supportive and involves pain control, pulmonary hygiene, and respiratory support.

(Choice A) Acute respiratory distress syndrome can cause increasing dyspnea, hypoxemia, and alveolar infiltrates following trauma; however, the alveolar infiltrates are typically bilateral and do not manifest until 24-48 hours following the traumatic event.

(Choice B) Aspiration pneumonia can cause tachypnea and hypoxemia but typically has accompanying fever, cough, and purulent sputum.

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(Choice B) Aspiration pneumonia can cause tachypnea and hypoxemia but typically has accompanying fever, cough, and purulent sputum.

(Choice C) Chest wall pain following trauma can lead to shallow breathing and atelectasis (lung tissue collapse), with resulting tachypnea and hypoxemia. However, atelectasis typically manifests on x-ray with bilateral, linear densities in the dependent, collapsed portions of the lungs.

(Choice D) Fat embolism can cause hypoxemia but typically occurs after long bone or pelvic fracture and is accompanied by petechial rash and neurologic changes.

(Choices E and F) Both hemothorax (eg, bleeding from injured lung parenchyma) and pneumothorax can cause tachypnea and hypoxemia. However, hemothorax would cause an effusion with partial opacification of the hemithorax or blunting of the costophrenic angle on upright chest x-ray. Pneumothorax would cause an area without lung markings, bordered by a visceral pleural line.

(Choice H) Trauma causes an inflammatory state that increases the risk of pulmonary embolism. However, chest x-ray is usually normal, and pulmonary embolism does not explain this patient's unilaterally decreased breath sounds with irregular alveolar infiltrates.

Educational objective:

Even without chest wall fracture, blunt thoracic trauma can cause pulmonary contusion. Tachypnea and hypoxemia are classic symptoms, and

typically **nonlobular** (not restricted by anatomic landmarks). Management is supportive and involves pain control, pulmonary hygiene, and respiratory support.

(Choice A) Acute respiratory distress syndrome can cause increasing dyspnea, hypoxemia, and alveolar infiltrates following trauma; however, the alveolar infiltrates are typically bilateral and do not manifest until 24-48 hours following the traumatic event.

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Educational objective:
Even without chest wall fracture, blunt thoracic trauma can cause pulmonary contusion. Tachypnea and hypoxemia are classic symptoms, and imaging often demonstrates patchy, irregular alveolar infiltrates.

References

- Lung contusion: a clinico-pathological entity with unpredictable clinical course.
- Pulmonary contusion.

Surgery	Pulmonary & Critical Care	Pulmonary contusion
Subject	System	Topic

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Item 34 of 40
Question Id: 2952

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A 57-year-old man comes to the office due to constant middle and low thoracic back pain. The pain started 4 weeks ago and has progressively worsened. It is greatest at night, particularly when he lies down. The patient has had no trauma to the back and has no bowel or bladder symptoms. Review of systems is positive for a 4.5 kg (10 lb) weight loss and fatigue. He has no chronic medical conditions and takes no medications other than a multivitamin. The patient has smoked cigarettes since high school and occasionally drinks beer on weekends. Temperature is 37 C (98.6 F), blood pressure is 110/70 mm Hg, pulse is 80/min, and respirations are 16/min. BMI is 28 kg/m^2. Examination of the spine shows no focal tenderness, and spinal range of motion is normal. Straight leg raise testing does not elicit pain. Muscle strength and sensation are intact in the lower extremities. Deep tendon reflexes are 2+ bilaterally. Babinski sign is absent. X-ray of the spine show no abnormalities. Complete blood count and serum creatinine are within normal limits. Which of the following is the most appropriate next step in management?

A. Blood culture
B. Bone marrow biopsy
C. CT scan of the abdomen
D. Physical therapy
E. Sacroiliac joint x-ray
F. Upper gastrointestinal endoscopy

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- A. Blood culture (0%)
- B. Bone marrow biopsy (8%)
- ✓ C. CT scan of the abdomen (65%)
- D. Physical therapy (8%)
- E. Sacroiliac joint x-ray (6%)
- F. Upper gastrointestinal endoscopy (9%)

Omitted
Correct answer
C

65%
Answered correctly

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04/07/2020
Last Updated

Explanation

Explanation

Although back pain is common and often benign, this patient has several features that suggest a more serious pathology. His **smoking** history, weight loss, and insidious back pain with normal neurologic and x-ray findings raise concern for **pancreatic cancer** in the tail of the pancreas. Although tumors in the head of the pancreas are frequently associated with obstructive jaundice, steatorrhea, and epigastric pain, tumors in the body or tail of the pancreas may present with progressive, **constant back pain** that is worse at night when lying supine.

The pancreas lies in a retroperitoneal position against the posterior abdominal wall and is innervated by the splanchnic nerves (from T5-T10). Pancreatic tumors often irritate visceral afferent fibers that conduct signals via the splanchnic nerve, leading to **referred thoracic** back pain. Because this referred pain does not arise from a spinal pathology, spinal/neurologic examination and spinal imaging are generally normal. **CT scan of the abdomen**, which has a sensitivity >90% for pancreatic lesions, is required.

(Choice A) Epidural abscess is associated with insidious back pain, fatigue, and often normal x-ray findings (early in the course of the infection). Most cases arise from hematogenous dissemination of bacteria, which can usually be identified with blood culture. However, most patients have focal back pain on examination, and fever and lower extremity neurologic deficits are common.

(Choice B) Bone marrow biopsy is required to diagnose multiple myeloma, which often presents with anemia, hypercalcemia, bone pain, and renal failure. However, radiographic studies usually show lytic bone lesions.

(Choice D) Physical therapy is sometimes used to treat acute lumbar radiculopathy (in addition to anti-inflammatory medications and early activity). Although this patient's examination and radiographic studies are normal, the presence of significant weight loss, fatigue, and constant, progressive pain that is worse at night necessitates further workup for cancer.

(Choice E) Sacroiliac joint imaging can help diagnose ankylosing spondylitis, an inflammatory joint disease that often presents with insidious back pain that is worse at night. However, most cases arise in men age <40, the pain typically improves with activity, and spinal mobility (range of motion) is usually impaired.

(Choice F) Upper endoscopy can identify gastric cancer, which is associated with weight loss and smoking. However, most patients have microcytic anemia (due to tumor bleeding into the gastric lumen) and mid-epigastric pain. Back pain is uncommon (because the stomach is intraperitoneal).

scan of the abdomen, which has a sensitivity >90% for pancreatic lesions, is required.

(Choice A) Epidural abscess is associated with insidious back pain, fatigue, and often normal x-ray findings (early in the course of the infection). Most cases arise from hematogenous dissemination of bacteria, which can usually be identified with blood culture. However, most patients have focal back pain on examination, and fever and lower extremity neurologic deficits are common.

(Choice B) Bone marrow biopsy is required to diagnose multiple myeloma, which often presents with anemia, hypercalcemia, bone pain, and renal failure. However, radiographic studies usually show lytic bone lesions.

(Choice D) Physical therapy is sometimes used to treat acute lumbar radiculopathy (in addition to anti-inflammatory medications and early activity). Although this patient's examination and radiographic studies are normal, the presence of significant weight loss, fatigue, and constant, progressive pain that is worse at night necessitates further workup for cancer.

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(Choice F) Upper endoscopy can identify gastric cancer, which is associated with weight loss and smoking. However, most patients have microcytic anemia (due to tumor bleeding into the gastric lumen) and mid-epigastric pain. Back pain is uncommon (because the stomach is intraperitoneal).

Educational objective:
Pancreatic cancer in the body or tail of the organ may present with constant, progressive back pain that is worse at night and when supine. Because this is a referred pain, back/neurologic examinations and radiographic imaging are generally normal. An abdominal CT scan is usually diagnostic.

Surgery	Gastrointestinal & Nutrition	Pancreatic cancer
Subject	System	Topic

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Item 34 of 40
Question Id: 2952

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scan of the abdomen, which has a sensitivity >90% for pancreatic lesions, is required.

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Item 35 of 40
Question Id: 15990

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A 3-day-old boy is being evaluated in the newborn nursery. The patient was born at 35 weeks gestation due to preterm prelabor rupture of membranes. The pregnancy and delivery were otherwise unremarkable. The workup for infection is negative. The patient is breastfeeding every 1-3 hours with adequate elimination. His parents have begun to give him a supplemental multivitamin. Length and weight are in the 25th percentile, adjusted for gestational age. Physical examination shows a sleeping newborn. The anterior fontanel is open, soft, and flat. Red reflexes are present bilaterally. The palate is intact. Cardiopulmonary examination is normal. The abdomen is soft with no organomegaly. Genitourinary examination shows an uncircumcised penis of normal length. The left testis is located within the inguinal canal, and the right testis is palpable in the scrotum. Which of the following is the best next step in management of this patient?

A. Frequent electrolyte monitoring
B. Immediate surgical correction
C. Karyotype analysis
D. Monitor for spontaneous descent
E. Systemic testosterone therapy

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TUTOR

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A 3-day-old boy is being evaluated in the newborn nursery. The patient was born at 35 weeks gestation due to preterm prelabor rupture of membranes. The pregnancy and delivery were otherwise unremarkable. The workup for infection is negative. The patient is breastfeeding every 1-3 hours with adequate elimination. His parents have begun to give him a supplemental multivitamin. Length and weight are in the 25th percentile, adjusted for gestational age. Physical examination shows a sleeping newborn. The anterior fontanel is open, soft, and flat. Red reflexes are present bilaterally. The palate is intact. Cardiopulmonary examination is normal. The abdomen is soft with no organomegaly. Genitourinary examination shows an uncircumcised penis of normal length. The left testis is located within the inguinal canal, and the right testis is palpable in the scrotum. Which of the following is the best next step in management of this patient?

- A. Frequent electrolyte monitoring (0%)
- B. Immediate surgical correction (7%)
- C. Karyotype analysis (0%)
- ✓ D. Monitor for spontaneous descent (91%)
- E. Systemic testosterone therapy (0%)

Omitted
Correct answer
D

91%
Answered correctly

02 secs
Time Spent

05/11/2020
Last Updated

Explanation

Cryptorchidism	

Cryptorchidism	
Risk factors	• Prematurity • Small for gestational age • Low birth weight (<2.5 kg [5.5 lb]) • Genetic disorders
Clinical features	• Empty, hypoplastic, poorly rugated scrotum or hemiscrotum • ± Inguinal fullness
Treatment	• Orchiopexy before age 1 year
Complications	• Inguinal hernia • Testicular torsion • Subfertility • Testicular cancer

Cryptorchidism, or an undescended testis, is due to failure of in utero testicular descent from the abdomen into the scrotum. Risk factors include prematurity, small for gestational age, and low birth weight (<2.5 kg). At birth, boys with cryptorchidism typically have an empty, poorly rugated scrotum. The testis may be palpable in the inguinal canal, as seen in this patient, or undetectable.

Because the cryptorchid testis often descends spontaneously in the first few months of life, **monitoring for testicular descent** is appropriate for this patient with unilateral cryptorchidism. However, testes that have not descended by **age 6 months** are unlikely to descend and require surgical intervention. **Orchiopexy** (surgical pinning of the testis) is performed, ideally before age 1, to reduce complications associated with cryptorchidism such as testicular torsion, infertility, and testicular malignancy.

(Choices A and C) Bilateral nonpalpable testes are concerning for a disorder of sex development, such as congenital adrenal hyperplasia (CAH). Workup includes karyotyping to distinguish a virilized genotypic female from an undervirilized genotypic male. In addition, electrolyte monitoring is required to evaluate for salt-wasting CAH, which can result in a potentially fatal adrenal crisis. In contrast, this patient has unilateral

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(Choices A and C) Bilateral nonpalpable testes are concerning for a disorder of sex development, such as congenital adrenal hyperplasia (CAH). Workup includes karyotyping to distinguish a virilized genotypic female from an undervirilized genotypic male. In addition, electrolyte monitoring is required to evaluate for salt-wasting CAH, which can result in a potentially fatal adrenal crisis. In contrast, this patient has unilateral cryptorchidism with a palpable testis in the inguinal canal.

(Choice B) Immediate surgical correction is required for testicular torsion, which occurs with increased frequency in cryptorchid testes. Torsion of an undescended testis presents with inguinal pain and swelling (intracanalicular testis) or an acute abdomen (intraabdominal testis). In contrast, asymptomatic unilateral cryptorchidism, as seen in this patient, is not an emergency, and routine monitoring is appropriate.

(Choice E) Increased local testosterone is required for testicular descent. Systemic testosterone therapy is not recommended because it does not sufficiently increase the local testosterone level.

Educational objective:
Unilateral cryptorchidism can be monitored until age 6 months, after which spontaneous descent is unlikely. In such a case, orchiopexy is indicated before age 1 to reduce the risk of testicular torsion, infertility, and testicular malignancy.

References

- Evaluation and treatment of cryptorchidism: AUA guideline.
- Risk factors for cryptorchidism.
- Cryptorchidism

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Question Id: 4930

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A 44-year-old man is brought to the emergency department after a motor vehicle collision. He was restrained in the driver's seat when a truck hit his car on the driver's side. The patient did not lose consciousness but was dazed for several minutes after the collision. Subsequently, he began to experience severe left leg pain. On arrival, blood pressure is 102/62 mm Hg and pulse is 118/min. Oxygen saturation is 96% on room air. The patient is conscious and answers questions appropriately. On physical examination, the pupils are equal and reactive to light. Multiple small facial lacerations are present. A cervical collar is in place. Breath sounds are symmetric and heart sounds are normal. The abdomen is diffusely tender. There is obvious deformity and tenderness of the left thigh. Portable chest x-ray reveals no pneumothorax or widened mediastinum. Rapid infusion of isotonic fluids is ongoing. Which of the following is the best immediate step in management of this patient?

A. CT scan of the chest with contrast
B. CT scan of the head without contrast
C. Focused Assessment with Sonography for Trauma
D. Left femur radiography
E. Portable abdominal radiography

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Item 36 of 40
Question Id: 4930

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- A. CT scan of the chest with contrast (0%)
- B. CT scan of the head without contrast (5%)
- ✓ C. Focused Assessment with Sonography for Trauma (85%)
- D. Left femur radiography (5%)
- E. Portable abdominal radiography (2%)

Omitted
Correct answer
C

85%
Answered correctly

02 secs
Time Spent

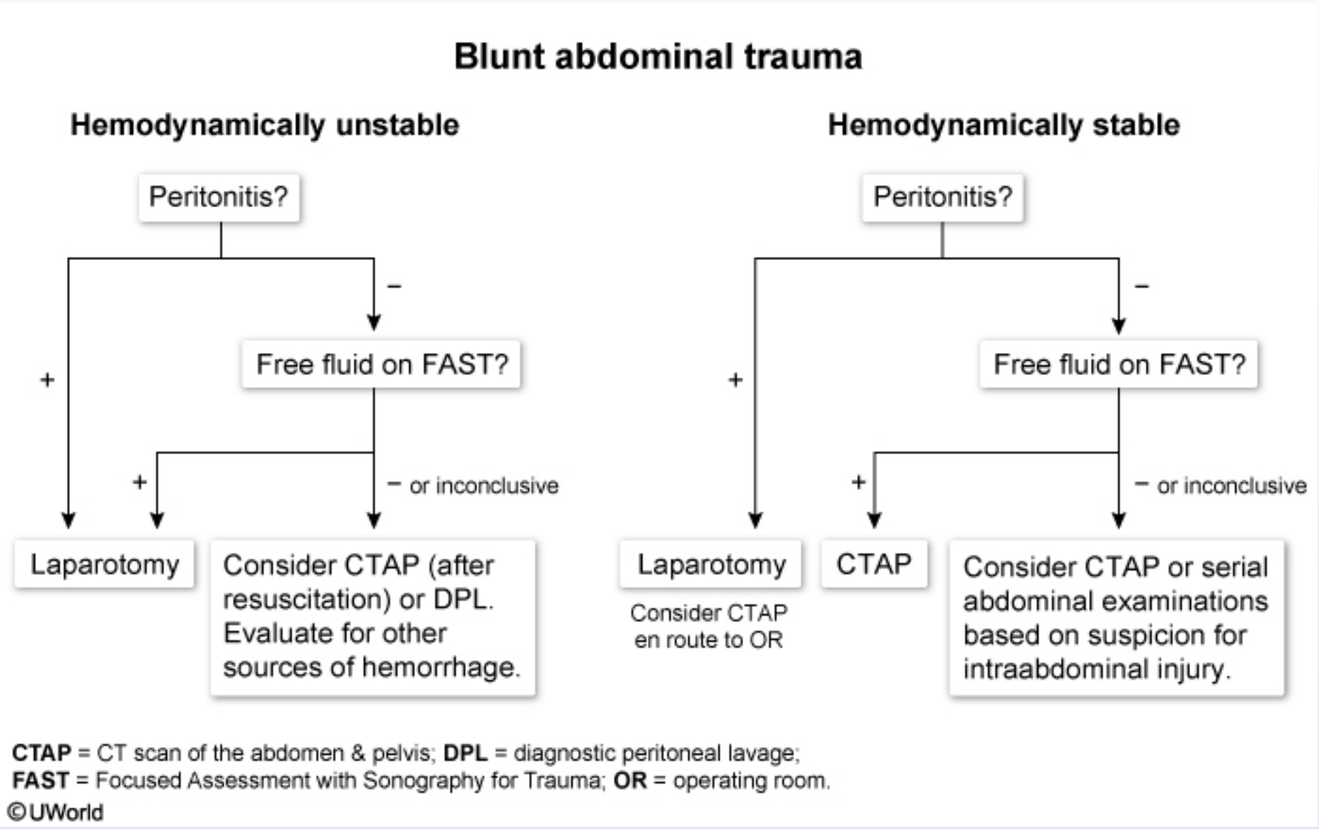
03/04/2020
Last Updated

Explanation

Blunt abdominal trauma

TUTOR

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This patient with **diffuse abdominal tenderness** and a deformed left lower extremity following a motor vehicle collision has polytrauma including **blunt abdominal trauma (BAT)**. For polytrauma patients, a trauma survey can quickly identify serious injuries and triage them for possible emergency surgery. When BAT is present, intraabdominal injury and hemorrhage must be investigated. The initial approach is similar in both hemodynamically stable (HDS) (eg, systolic blood pressure >90 mm Hg) and hemodynamically unstable (HDUS) patients:

- Peritonitis (eg, rigidity, rebound tenderness) is an indication for immediate surgery (not seen in this patient).
- In the absence of peritonitis, **Focused Assessment with Sonography for Trauma (FAST)** is typically the first step in abdominal imaging. This noninvasive, ultrasound-based examination can be rapidly performed at the bedside to detect significant **intraperitoneal free fluid** (eg,

This patient with **diffuse abdominal tenderness** and a deformed left lower extremity following a motor vehicle collision has polytrauma including **blunt abdominal trauma (BAT)**. For polytrauma patients, a trauma survey can quickly identify serious injuries and triage them for possible emergency surgery. When BAT is present, intraabdominal injury and hemorrhage must be investigated. The initial approach is similar in both hemodynamically stable (HDS) (eg, systolic blood pressure >90 mm Hg) and hemodynamically unstable (HDUS) patients:

- Peritonitis (eg, rigidity, rebound tenderness) is an indication for immediate surgery (not seen in this patient).
- In the absence of peritonitis, **Focused Assessment with Sonography for Trauma (FAST)** is typically the first step in abdominal imaging. This noninvasive, ultrasound-based examination can be rapidly performed at the bedside to detect significant **intraperitoneal free fluid** (eg, blood, urine [bladder rupture]).

A positive FAST strongly suggests intraabdominal injury. In HDS patients, such as this one, there is time to pursue more definitive imaging (eg, CT scan) to visualize the site and extent of injury. In contrast, HDUS patients with a positive FAST require immediate laparotomy.

A negative FAST does not rule out intraabdominal organ injury because injuries that do not produce large amounts of free fluid (eg, bowel perforation, diaphragmatic rupture) can be missed. Therefore, if FAST is negative or equivocal, further investigations (eg, CT scan) may be required depending on the patient's hemodynamic status and the clinician's level of suspicion for intraabdominal injury.

(Choices A and B) HDS patients with polytrauma often undergo a CT of the head and chest following a trauma survey. However, in this patient with diffuse abdominal tenderness (ie, higher likelihood of intraabdominal injury) and no emergency indications for CT of the head (eg, low Glasgow Coma Scale score) or chest (eg, widened mediastinum concerning for thoracic aortic injury), FAST should precede these studies.

(Choice D) Although this patient will require further radiographic evaluation of his femur fracture, ruling out life-threatening injuries (eg, intraabdominal hemorrhage) is a higher priority.

(Choice E) Chest radiography is routinely performed as part of the trauma survey and may reveal intraabdominal injury (eg, subdiaphragmatic free air). Abdominal radiography cannot detect intraperitoneal free fluid and would not provide additional pertinent information in this patient.

Educational objective:
Patients with blunt abdominal trauma should be assessed for intraabdominal injury, beginning with Focused Assessment with Sonography for Trauma (FAST), a rapid, noninvasive examination that can be performed at the bedside.

A positive FAST strongly suggests intraabdominal injury. In HDS patients, such as this one, there is time to pursue more definitive imaging (eg, CT scan) to visualize the site and extent of injury. In contrast, HDUS patients with a positive FAST require immediate laparotomy.

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Educational objective:
Patients with blunt abdominal trauma should be assessed for intraabdominal injury, beginning with Focused Assessment with Sonography for Trauma (FAST), a rapid, noninvasive examination that can be performed at the bedside.

References

- Correlation between intra-abdominal free fluid and solid organ injury in blunt abdominal trauma.
- Radiology for trauma and the general surgeon.

Surgery	Gastrointestinal & Nutrition	Blunt abdominal trauma
Subject	System	Topic

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Item 37 of 40
Question Id: 16182

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A 68-year-old woman comes to the office for evaluation of lower extremity weakness. The patient was hospitalized due to pneumonia and septic shock a month ago. She was intubated for respiratory failure at the time of admission and was treated in the intensive care unit for several days. After adequate improvement in her respiratory status, she was discharged to a physical rehabilitation facility. Since that time, the patient has had worsening lower extremity weakness that has failed to improve despite physical therapy. She also has had frequent occipital headaches and numbness and tingling in the hands and feet. The patient has a history of rheumatoid arthritis, hypertension, hypothyroidism, and right total knee replacement. She is a former smoker with a 20-pack-year history and does not drink alcohol. Blood pressure is 136/82 mm Hg and pulse is 72/min. Physical examination shows chronic joint deformities in both hands, clear lungs, normal heart sounds, and a nontender abdomen. Neurological examination reveals decreased lower extremity muscle strength, hyperactive knee reflexes, and decreased proprioception in the feet. Rapidly flicking the nail of the middle finger elicits flexion of the ipsilateral thumb. Which of the following is the most likely cause of this patient's current symptoms?

A. Anterior cerebral artery occlusion
B. Critical illness-related axonal injury
C. Immune-mediated nerve demyelination
D. Inadequate thyroid hormone replacement
E. Instability of the atlantoaxial joint

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- A. Anterior cerebral artery occlusion (6%)
- B. Critical illness-related axonal injury (29%)
- C. Immune-mediated nerve demyelination (14%)
- D. Inadequate thyroid hormone replacement (4%)
- ✓ E. Instability of the atlantoaxial joint (45%)

Omitted
Correct answer
E

45%
Answered correctly

03 secs
Time Spent

05/11/2020
Last Updated

Explanation

Clinical features of RA cervical myelopathy	
Symptoms	• Neck pain radiating to occipital region • Slowly progressive spastic quadriparesis • Painless sensory deficits in hands or feet • Respiratory dysfunction (eg, from vertebral artery compression)
Signs	• Protruding anterior arch of atlas • Scoliosis with loss of cervical lordosis • Upper motor neuron signs (eg, spastic paresis, hyperreflexia, Babinski sign) • Hoffman sign

RA = rheumatoid arthritis.

This patient developed weakness, paresthesias, and hyperreflexia after intubation; in the setting of her known **rheumatoid arthritis (RA)**, this presentation suggests spinal cord compression due to **atlantoaxial joint instability**. Although joint destruction in RA most commonly affects the small joints of the hands, the cervical spine can also be involved and may lead to **subluxation** (misalignment) of the atlantoaxial joints. Patients with severe RA (eg, elevated inflammatory markers, rapidly progressive erosive disease) and peripheral joint subluxation (eg, hand deformities) are at increased risk. Forced neck extension during **intubation** can worsen the subluxation, leading to **cord compression** and progressive cervical **myelopathy**; complete dislocation can result in paralysis and death.

The earliest symptom of atlantoaxial subluxation is typically cervical pain that radiates to the occiput. Cervical myelopathy classically presents with **slowly progressive, spastic paraparesis** characterized by weakness involving the upper and lower extremities, **hyperreflexia**, and sensory changes. **Upper motor neuron signs**, including Babinski sign, are present. Hoffman sign (flexion and adduction of the thumb when flicking the nail of the middle finger) suggests a corticospinal tract lesion and supports the diagnosis of cervical myelopathy; however, it is nonspecific and may be seen in normal patients.

Patients with evidence of subluxation should undergo urgent MRI of the cervical spine which demonstrates separation of C1 and C2. Management involves stiff surgical collars and neurosurgical intervention (eg, cervical fixation).

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(Choice A) Anterior cerebral artery stroke can result in extremity weakness with spastic paraparesis. However, stroke typically occurs acutely with maximum weakness upon presentation and the findings are unilateral; dysarthria and aphasia are also common.

(Choice B) Critical illness polyneuropathy is a complication of sepsis characterized by axonal injury of the peripheral nerves. It is a common cause of weakness after a prolonged stay in an intensive care unit. However, peripheral nerve injury results in hyporeflexia; upper motor neuron signs would not occur.

(Choice C) Guillain-Barré syndrome is characterized by immune-mediated nerve demyelination and typically presents as a rapidly progressive, ascending paralysis following a gastrointestinal or upper respiratory illness. Reflexes are typically decreased or absent, and Hoffman sign would be unexpected.

(Choice D) Severe hypothyroidism is occasionally associated with polyneuropathy or myopathy, which can cause weakness and paresthesia. However, the reflexes are diminished, and upper motor neuron signs would be unexpected.

Educational objective:

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Educational objective:
Patients with rheumatoid arthritis are at risk for atlantoaxial instability; neck extension during intubation can result in subluxation with cord compression and cervical myelopathy. Symptoms of cervical myelopathy include a slowly progressive, spastic paraparesis involving the upper and lower extremities, hyperreflexia, sensory changes, and a positive Babinski sign. Hoffman sign may also be positive.

References

- Cervical spine disease in rheumatoid arthritis: incidence, manifestations, and therapy.

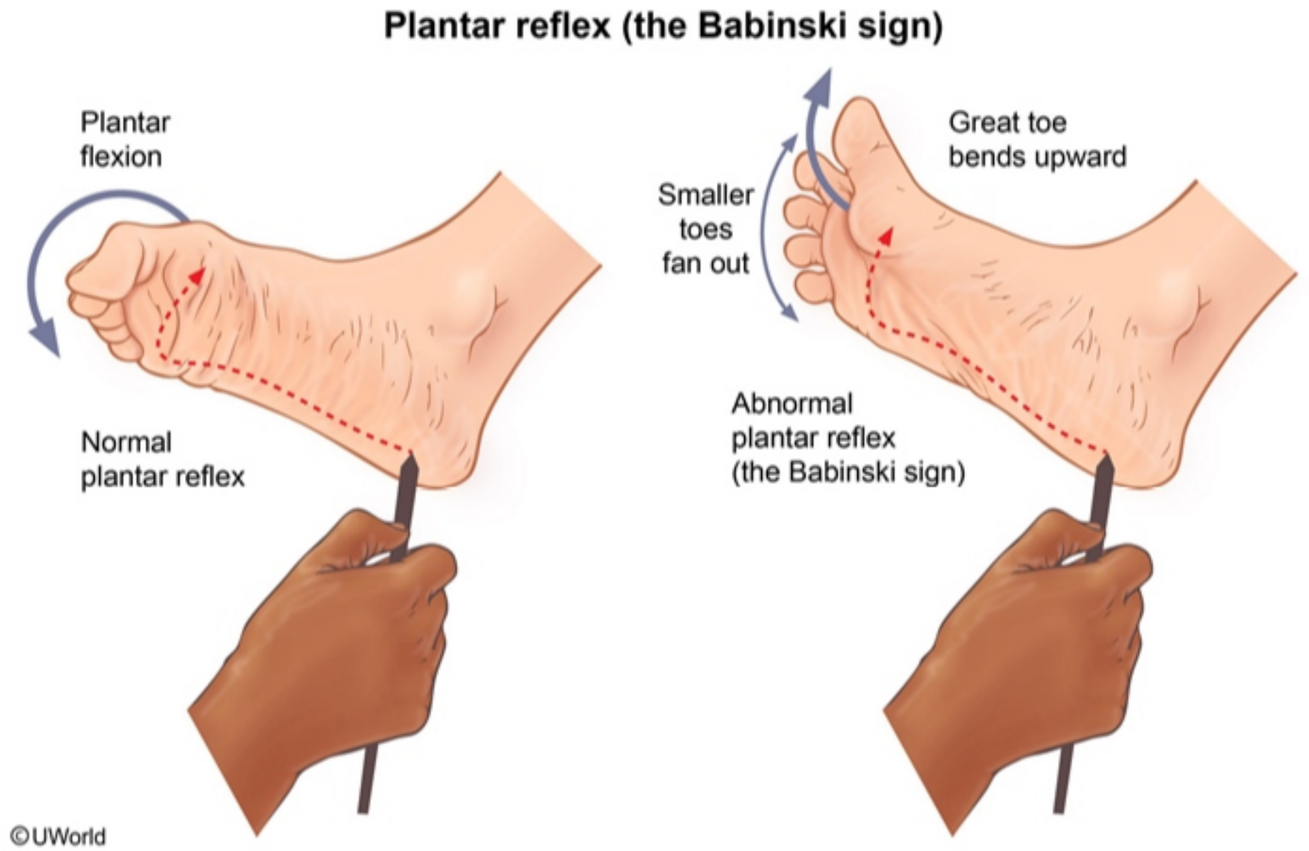
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The earliest symptom of atlantoaxial subluxation is typically cervical pain that radiates to the occiput. Cervical myelopathy classically presents

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A 72-year-old man comes to the office due to upper abdominal pain and weight loss. The abdominal pain is worse when eating food and is sometimes relieved with over-the-counter antacids. He has not had dysphagia, melena, or rectal bleeding. The patient has a history of hypertension, which is well controlled with chlorthalidone. He does not take other prescription or over-the-counter medications and does not use tobacco, alcohol, or illicit drugs. The patient emigrated from South Korea 20 years ago. Temperature is 36.8 C (98.2 F), blood pressure is 110/70 mm Hg, pulse is 84/min, and respirations are 14/min. BMI is 17.2 kg/m^2. Mucus membranes are dry. Cardiopulmonary examination shows no abnormalities. Epigastric fullness and tenderness are present, but there is no hepatosplenomegaly. Peripheral pulses are full and capillary refill is normal. Which of the following is the best next step in management?

A. Carcinoembryonic antigen testing
B. CT angiogram of the mesenteric vessels
C. CT scan of the abdomen
D. Esophagogastroduodenoscopy
E. Gastric emptying scan
F. *Helicobacter pylori* stool antigen testing

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- A. Carcinoembryonic antigen testing (0%)
- B. CT angiogram of the mesenteric vessels (1%)
- C. CT scan of the abdomen (14%)
- ✓ D. Esophagogastroduodenoscopy (68%)
- E. Gastric emptying scan (0%)
- F. *Helicobacter pylori* stool antigen testing (14%)

Omitted
Correct answer
D

68%
Answered correctly

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03/28/2020
Last Updated

Explanation

This patient's weight loss, epigastric fullness, and abdominal pain relieved with antacids raise suspicion for **gastric cancer**. Most cases arise in

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Explanation

This patient's weight loss, epigastric fullness, and abdominal pain relieved with antacids raise suspicion for **gastric cancer**. Most cases arise in the developing world; incidence is particularly high in **Eastern Asia** (eg, South Korea), Eastern Europe, and the Andean part of South America where diets are rich in salt-preserved foods (damages stomach mucosa) and nitroso compounds (carcinogenic). Other risk factors include *Helicobacter pylori* infection, smoking, alcohol use, and atrophic gastritis.

Patients with gastric cancer usually develop persistent **epigastric pain** that often worsens with eating (due to the irritant effects of gastric acid on the tumor) and **weight loss** (due to insufficient caloric intake). Proximal stomach tumors may also cause dysphagia and postprandial nausea and vomiting. The diagnosis is generally established using **esophagogastroduodenoscopy (EGD)** to visualize the stomach and obtain biopsy samples of suspicious lesions.

(Choice A) Although carcinoembryonic antigen (CEA) may be elevated in some cases of gastric cancer, this test has low sensitivity and cannot be used to rule out or screen for a gastric tumor. CEA is used for follow-up (not screening or diagnosis) of colorectal cancer, which is unlikely to cause upper abdominal pain and is associated with rectal bleeding.

(Choice B) CT angiogram of the mesenteric vessels can diagnose mesenteric ischemia, which often causes severe abdominal pain following eating (ie, "intestinal angina"). However, relief with antacids would be atypical, and most patients have risk factors (eg, smoking, hyperlipidemia, diabetes mellitus) for atherosclerotic disease.

(Choice C) Abdominal CT scan is often normal in early gastric cancer, so it is not used for initial evaluation. However, abdominal CT scan may be performed later to evaluate for distant metastases (eg, liver).

(Choice E) A gastric emptying scan can diagnose gastroparesis, which is most common in patients with uncontrolled diabetes mellitus. Most cases are marked by nausea, vomiting, abdominal pain, and bloating following eating.

(Choice F) *H pylori* is a major risk factor for gastritis, gastric ulcer, and gastric cancer. However, EGD is required prior to *H pylori* stool testing to establish the underlying stomach pathology.

Educational objective:
Gastric cancer is endemic to Eastern Asia, Eastern Europe, and the Andean portions of South America due to diets high in salt-preserved food

cause upper abdominal pain and is associated with rectal bleeding.

(Choice B) CT angiogram of the mesenteric vessels can diagnose mesenteric ischemia, which often causes severe abdominal pain following eating (ie, "intestinal angina"). However, relief with antacids would be atypical, and most patients have risk factors (eg, smoking, hyperlipidemia, diabetes mellitus) for atherosclerotic disease.

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(Choice E) A gastric emptying scan can diagnose gastroparesis, which is most common in patients with uncontrolled diabetes mellitus. Most cases are marked by nausea, vomiting, abdominal pain, and bloating following eating.

(Choice F) *H pylori* is a major risk factor for gastritis, gastric ulcer, and gastric cancer. However, EGD is required prior to *H pylori* stool testing to establish the underlying stomach pathology.

Educational objective:
Gastric cancer is endemic to Eastern Asia, Eastern Europe, and the Andean portions of South America due to diets high in salt-preserved food and nitroso compounds. Manifestations typically include weight loss and chronic mid-epigastric pain that worsens with eating. Esophagogastroduodenoscopy is the initial test of choice to establish the diagnosis.

References

- Screening of gastric cancer: who, when, and how
- Effective reduction of gastric cancer risk with regular use of nonsteroidal anti-inflammatory drugs in Helicobacter pylori-infected patients.
- Chronic mesenteric ischemia: diagnosis and treatment.

Surgery	Gastrointestinal & Nutrition	Gastric cancer
Subject	System	Topic

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Item 39 of 40
Question Id: 2335

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A 42-year-old man is evaluated for a 3-month history of burning, substernal chest pain after every meal. The patient has tried several over-the-counter antacids with partial relief. He undergoes upper gastrointestinal endoscopy, which reveals mucosal irregularity and ulceration of the squamocolumnar junction above the lower esophageal sphincter. Multiple biopsies are taken. Four hours after the procedure, the patient develops worsening substernal pain radiating to the back, along with mild shortness of breath. Temperature is 37.1 C (98.9 F), blood pressure is 110/70 mm Hg, pulse is 120/min, and respirations are 34/min. Chest x-ray reveals a small, left pleural effusion that was not present on a chest radiograph taken 2 weeks ago. ECG shows sinus tachycardia but is otherwise unremarkable. Which of the following is the best test to confirm the diagnosis?

A. Repeat upper gastrointestinal endoscopy
B. Serum amylase and lipase levels
C. Thoracentesis with fluid analysis
D. Transthoracic echocardiogram
E. Water-soluble contrast esophagogram

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A 42-year-old man is evaluated for a 3-month history of burning, substernal chest pain after every meal. The patient has tried several over-the-counter antacids with partial relief. He undergoes upper gastrointestinal endoscopy, which reveals mucosal irregularity and ulceration of the squamocolumnar junction above the lower esophageal sphincter. Multiple biopsies are taken. Four hours after the procedure, the patient develops worsening substernal pain radiating to the back, along with mild shortness of breath. Temperature is 37.1 C (98.9 F), blood pressure is 110/70 mm Hg, pulse is 120/min, and respirations are 34/min. Chest x-ray reveals a small, left pleural effusion that was not present on a chest radiograph taken 2 weeks ago. ECG shows sinus tachycardia but is otherwise unremarkable. Which of the following is the best test to confirm the diagnosis?

- A. Repeat upper gastrointestinal endoscopy (4%)
- B. Serum amylase and lipase levels (4%)
- C. Thoracentesis with fluid analysis (6%)
- D. Transthoracic echocardiogram (3%)
- ✓ E. Water-soluble contrast esophagogram (81%)

Omitted
Correct answer
E

81%
Answered correctly

02 secs
Time Spent

04/11/2020
Last Updated

Explanation

Esophageal perforation	

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

This patient has acute chest pain and pleural effusion within hours after endoscopy, most concerning for **esophageal perforation (EP)**. **Endoscopy** is the most common cause of EP, with adjunctive procedures (eg, **biopsy**, stricture dilation) further increasing risk. Patients with EP commonly have **severe chest pain** and/or back pain due to the esophagus's posterior location. Associated clinical findings are due to outflow of esophageal air (eg, pneumomediastinum, pneumothorax) or fluid (eg, **pleural effusion**) into the surrounding tissues and the resulting inflammatory response (eg, tachycardia, **tachypnea**).

Esophagography with water-soluble contrast—which can visualize contrast extravasating through the perforation—is the best initial study to confirm EP. Barium contrast is more sensitive but can incite a granulomatous inflammatory response; it is only used when initial esophagography is nondiagnostic. Because EP is a life-threatening condition that can rapidly progress to mediastinitis and septic shock, **emergent surgical consultation** is indicated. Most perforations require operative debridement and repair.

(Choice A) Upper gastrointestinal endoscopy could likely visualize the esophageal injury in this patient but is not used for initial diagnosis of EP because air insufflation and instrumentation may worsen the injury.

This patient has acute chest pain and pleural effusion within hours after endoscopy, most concerning for **esophageal perforation (EP)**. **Endoscopy** is the most common cause of EP, with adjunctive procedures (eg, **biopsy**, stricture dilation) further increasing risk. Patients with EP commonly have **severe chest pain** and/or back pain due to the esophagus's posterior location. Associated clinical findings are due to outflow of esophageal air (eg, pneumomediastinum, pneumothorax) or fluid (eg, **pleural effusion**) into the surrounding tissues and the resulting inflammatory response (eg, tachycardia, **tachypnea**).

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(Choice A) Upper gastrointestinal endoscopy could likely visualize the esophageal injury in this patient but is not used for initial diagnosis of EP because air insufflation and instrumentation may worsen the injury.

(Choice B) Pancreatitis, which increases serum amylase and/or lipase, can present with severe pain and an exudative pleural effusion (usually left-sided). However, it typically causes epigastric rather than chest pain; although it can develop postprocedurally, it classically follows endoscopic retrograde cholangiopancreatography (due to instrumentation and dye injection involving the pancreatic duct) not upper endoscopy (which does not reach the pancreatic duct).

(Choice C) Elevated amylase in the pleural fluid (due to leaked saliva) could increase suspicion for EP. However, compared to contrast esophagography, pleural fluid analysis has less specificity for the diagnosis (eg, pancreatitis-associated effusion also has elevated amylase) and is unable to localize the tear in preparation for likely surgery.

(Choice D) Severe substernal pain raises concern for a cardiac etiology (eg, myocardial ischemia, pericarditis), which transthoracic echocardiography can help evaluate. However, the absence of concerning ECG findings (eg, ST changes) and this patient's lack of cardiac risk factors make EP a more likely cause of this patient's substernal pain, especially in the setting of recent endoscopy.

Educational objective:
Esophageal perforation is a life-threatening complication of endoscopy. Clinical presentation may include severe chest/back pain, systemic inflammatory response, and pleural effusion from leaked esophageal contents. Contrast esophagography is the best test to confirm the diagnosis.

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(Choice A) Upper gastrointestinal endoscopy could likely visualize the esophageal injury in this patient but is not used for initial diagnosis of EP because air insufflation and instrumentation may worsen the injury.

(Choice B) Pancreatitis, which increases serum amylase and/or lipase, can present with severe pain and an exudative pleural effusion (usually left-sided). However, it typically causes epigastric rather than chest pain; although it can develop postprocedurally, it classically follows endoscopic retrograde cholangiopancreatography (due to instrumentation and dye injection involving the pancreatic duct) not upper endoscopy (which does not reach the pancreatic duct).

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Educational objective:
Esophageal perforation is a life-threatening complication of endoscopy. Clinical presentation may include severe chest/back pain, systemic inflammatory response, and pleural effusion from leaked esophageal contents. Contrast esophagography is the best test to confirm the diagnosis.

References

- Esophageal perforation.
- Epidemiology, diagnosis, and management of esophageal perforations: systematic review.

Surgery	Gastrointestinal & Nutrition	Esophageal rupture
Subject	System	Topic

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Item 40 of 40
Question Id: 4025

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A 54-year-old man comes to the physician because of edema of his right ankle. He reports heaviness and cramping in the same leg that is worse after a long day at work. The swelling is usually reduced significantly when he wakes up in the morning and worsens progressively throughout the day. He denies any other symptoms. He has no significant medical problems except hypertension, for which he takes atenolol. His temperature is 36.7° C (98° F), blood pressure is 120/76 mm Hg, pulse is 80/min and respirations are 16/min. JVP is normal. Lungs are clear to auscultation. There are no murmurs. There is no hepatosplenomegaly. Examination shows edema of the right ankle. Doppler examination of the leg shows no evidence of thrombosis. Which of the following is the most likely cause of his edema?

A. Lymphatic obstruction
B. Impaired cardiac contraction
C. Reduced diastolic filling of the heart
D. Increased urinary loss of protein
E. Venous valve incompetence
F. Decreased liver protein synthesis
G. Arterial occlusion

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A 54-year-old man comes to the physician because of edema of his right ankle. He reports heaviness and cramping in the same leg that is worse after a long day at work. The swelling is usually reduced significantly when he wakes up in the morning and worsens progressively throughout the day. He denies any other symptoms. He has no significant medical problems except hypertension, for which he takes atenolol. His temperature is 36.7° C (98° F), blood pressure is 120/76 mm Hg, pulse is 80/min and respirations are 16/min. JVP is normal. Lungs are clear to auscultation. There are no murmurs. There is no hepatosplenomegaly. Examination shows edema of the right ankle. Doppler examination of the leg shows no evidence of thrombosis. Which of the following is the most likely cause of his edema?

- A. Lymphatic obstruction (13%)
- B. Impaired cardiac contraction (1%)
- C. Reduced diastolic filling of the heart (1%)
- D. Increased urinary loss of protein (1%)
- ✓ E. Venous valve incompetence (80%)
- F. Decreased liver protein synthesis (0%)
- G. Arterial occlusion (2%)

Omitted
Correct answer
E

80%
Answered correctly

02 secs
Time Spent

02/03/2020
Last Updated

Explanation

The patient described is experiencing unilateral lower extremity edema that worsens when the leg is dependent (i.e. while the patient is at work)

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The patient described is experiencing unilateral lower extremity edema that worsens when the leg is dependent (i.e. while the patient is at work) and improves with leg elevation (i.e. when the patient is sleeping). There are many potential causes of lower extremity edema. Indeed, all of the above mentioned conditions may cause edema of the legs, but in the clinical scenario provided, venous valvular incompetence is the most likely cause. Venous insufficiency is the most common cause of lower extremity edema; it affects approximately 2% of the population at large. Failure of venous valves allows blood to pool in dependent areas such as the legs resulting in an increase in capillary hydrostatic pressure. This increased pressure favors increased filtration of fluid out of the capillaries into the interstitial tissue. This process causes a decrease in intravascular volume, which stimulates the kidneys to retain water and salt ultimately leading to further progression of edema.

(Choice A) Lymphatic obstruction is an uncommon cause of edema. It may result from malignant obstruction of lymph nodes, lymph node resection, trauma and filariasis. It classically affects the dorsa of the feet and causes marked thickening and rigidity of the skin.

(Choices B & C) Impaired cardiac contraction and reduced diastolic filling of the heart may cause bilateral lower extremity edema due to pooling of blood in the venous circulation causing increased capillary hydrostatic pressure. However, respiratory symptoms and crackles on examination are common.

(Choices D & F) Increased urinary loss of protein and decreased liver protein synthesis causes decreased plasma oncotic pressure, which results in decreased reabsorption of interstitial fluid in distal capillaries and edema. Urinary protein loss occurs in nephrotic syndromes as well as in most cases of nephritis. Failure of liver protein synthesis typically occurs in the setting of cirrhosis or other forms of liver failure where the synthetic function of the liver is impaired. Other signs of liver failure and nephrotic syndrome are usually evident.

(Choice G) Arterial occlusion causes pain, pallor, paresthesias, pulselessness and coolness to the touch in affected extremities.

Educational objective:
Venous insufficiency (valvular incompetence) is the most common cause of lower extremity edema. It classically worsens throughout the day and resolves overnight when the patient is recumbent.

Surgery	Cardiovascular System	Chronic venous insufficiency
Subject	System	Topic

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